

Peripherality and the Impact of SME Takeovers

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Abstract

If large companies buy small dynamic enterprises, and move them to the headquarters' location or elsewhere, the process could suppress regional, or dependent, economy income and productivity. We investigate this hypothesis by analysing around 2 million observations of the UK enterprise-level Business Structure Database. Contrary to the experience of large firms, more productive small businesses are more subject to takeover. In addition, SMEs that have been acquired are also more likely to both exit and relocate to another region. This last finding however cuts both ways; a peripheral region or country may receive post-merger companies as well as lose them. With the exception of the core of London and the South East, British regions achieve an approximate numerical balance of relocations from SME takeovers.

JEL Classification L25, D21, R11

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1 Introduction

When the Guest family attained sole control of the Dowlais Iron Company of South Wales in the middle of the nineteenth century, the iron works was the largest in the world, employing more than 7000. Half a century later, Dowlais acquired Arthur Keen, of Smethwick, incorporating as Guest Keen. Within two years the new entity bought Nettlefold, also of Smethwick, becoming Guest, Keen and Nettlefold. Today GKN is a major international company, with 29 sites in the UK alone, but not one of them in the founder region, Wales (GKN 2008). Indeed the original location, Merthyr Tydfil, has the highest unemployment in the principality (WAG 2008).

More recently, and on a much smaller scale, the Bank of Wales founded by Julian Hodge in 1971, was taken over by the Bank of Scotland in 1985. In 2002 even the name disappeared (Julian Hodge Bank 2008; News Wales 2002). Wales still lacks anything comparable to the Scottish financial institutions.

These cases might suggest more generally that takeovers eventually strip peripheral regions and economies of their income and employment generation potential. Start-up firms are potentially the seed corn of economic development. Large firms unable to generate organic growth, are likely to scour markets for such enterprises with the ideas and products that will maintain their growth rates. One example is Smith & Nephew, a FTSE 100 company traditionally known for growth by acquisition of products such as Nivea, Dove soap, intraocular lenses, and hip replacements. This business used to search for small firms to buy up and absorb (Foreman-Peck 1995, pp. 136-7 pp. 212-3). Integrating these companies with the acquirer might well lead to closures of the original plant, with or without relocation.

By acquiring small start-up companies, large firms can compensate for their lack of 'intrapreneurship' (Baumol 2004). Yet home-grown SMEs are an important component of an economy's indigenous capacity for productivity increase. Exit of more dynamic SMEs because of acquisition by outside corporations therefore could hamper a region's economic growth.

Less able to utilise agglomeration economies than the core, a peripheral region or country will possess few large company headquarters. Alternatively or additionally finance may be differentially available by location, because for instance, information attenuates with distance from the financial centre of the national or world economy. Informational asymmetries or institutional reasons may deprive smaller firms of the same access to cheap finance as large, perhaps as a consequence of credit rationing (Stiglitz and Weiss 1981). The empirical evidence is that overdraft costs fall as firm size increases, and so does the frequency with which firms report difficulty accessing finance (Fraser 2005; Wilson 2004)¹. Therefore larger firms can find bargains among highly productive small firms, but not among the productive large (Caves 1998). If acquiring firms are headquartered outside a peripheral region, there may be a subsequent tendency to move the assets of the acquired SME from such regions, or perhaps deregister the enterprise altogether. This process could suppress regional, or perhaps dependent, economy income and productivity, by creaming off dynamic indigenous enterprise whenever it emerges.

On the other hand, relocation or exit might not follow from acquisition. Molecular Light Technology Research of Cardiff employs 41 people, having registered 15 patents and published over 80 research papers. The business was incorporated in 1991 as a 'spin out' from what is now Cardiff University Medical School. In 2003 the business was bought by the largest customer, the US firm Gen-Probe, who are investing £2.9m with a view to doubling turnover to £9m over the next 5 years (Molecular Light Technology 2008; PRNewswire 2003). This SME (vertical) takeover story is a happy one for the company, which continues to operate autonomously but with more resources, and for the region. Moreover it counts against the adverse view of takeovers. The experience is consistent with a benevolent market for corporate control, rather than a reason for underdevelopment of peripheral regions.

¹ Firm size is also an important determinant of the availability of short-term debt; larger firms have better access to longer-term debt - reducing their dependency on short-term finance (Bougheas et al. 2006).

We therefore investigate the overall impact of SME takeover and exit on periphery regions with around 2 million observations of the UK firm-level Business Structure Database (BSD), a version of Inter-Departmental Business Register. The paper is organised as follows. The model is presented in section 2. Section 3 briefly describes the data set. Section 4 contains some descriptive statistics on takeovers, exits and relocations. Section 5 introduces the multivariate analysis. Sections 6 and 7 describe our results respectively for takeovers and for exits/relocation. Section 8 concludes.

2 The Model

Much theorising and empirical research about mergers has focussed on large firms and whether their market power is enhanced by acquisition, or their efficiency increased (Davidson and Ferrett 2007; Gugler et al. 2003; Salant et al. 1983). Unlike large company mergers, small firm acquisition is unlikely to be profitable for reasons of market power². Effects of mergers, rather than the causes, have been the principal concern and the effects have typically lacked a spatial dimension.

Acquisition and Productivity

The Q theory of takeovers (Jovanovic and Rousseau 2002) by contrast does address causes. It predicts that when the stock market value of the firm exceeds the replacement costs of assets, expansion is profitable by acquisition, as well as by organic growth. For large firms or plants the prediction is supported; the less productive are targets of takeovers (Jovanovic and Rousseau 2002; Lichtenberg et al. 1987; Siegel and Simons 2006).

Smaller firms are typically not quoted on stock markets. Their equity is less liquid and information about assets and prospects typically less readily available. Consequently they are unlikely to be targets if performing poorly. Only if they both want to sell and have tangible or intangible assets that acquirers want, will they be bought. Dahlstrand

² When a large firm can reduce cost or increase demand by acquiring a small one with a horizontal merger, in the Salant (1983) framework it is far less likely to be privately unprofitable than when two large firms are involved. The reaction function of the ‘insiders’ will not shift because of the takeover in the same way. That is, for any given output of outsiders, merged insiders will NOT reduce their output, because there are no infra-marginal losses to each other to internalize.

(2000, p. 176) reports that in Sweden most technology-intensive SMEs are eventually acquired and elsewhere in Europe, multinationals are on the look out for such suitable small purchases. Hence the opposite relationship between productivity and takeover chances is expected for small businesses compared with large³.

Foreign acquirers appear to look for relatively productive firms, perhaps even more so than domestic buyers. Entry to a foreign market is closely akin to moving into new products or processes. Each of these activities can benefit from buying in resources. In the UK, firms involved in mergers and takeovers have relatively high productivity (Harris and Li 2007). UK (manufacturing) plants that are acquired by foreign owned firms are more productive. Griffith et al (2004) also find that foreign acquired establishments are more productive than those bought by domestically owned firms.

Small firms might be open to being acquired or even seek it if they feel that they can be benefited from support for future growth (Cosh et al. 1996). Fast growing SMEs in particular are positively inclined towards being bought up (Cosh and Hughes 1994). Small firms may even try to initiate takeovers by larger counterparts, according to Ravenscraft and Scherer (1987) for three main motives. These are, solving management succession problems, converting personal stock to more liquid forms of assets and gaining better access to financial assets. Seller-initiated takeovers are rarely triggered by financial failure. But targets are likely to offer themselves when they are cash poor and acquirers' lack 'intrapreneurship'.

If firms headquartered in core regions do have readier access to finance, or agglomeration there triggers more intense local competition, then SMEs in the core would more likely be taken over at all levels of productivity. More would be known about them by potential predators if information attenuates with distance. Greater competition for assets by expanding enterprises would boost their chances of being bought out.

SME acquisition can provide 'intrapreneurship' for larger companies, reducing the costs of negotiating contracts, or facilitating foreign MNE entry into new national

³ This is what McGuckin and Nguyen (1995) found for small plants.

markets. These can be seen as vertical mergers. A large company with the marketing facilities for a small enterprise's output would involve the downstream acquiring the upstream firm. Conversely the national firms with marketing outlets already established, and perhaps selling some foreign MNE products already, might be bought by the larger upstream business. When the upstream producer has market power but the downstream producer exercises no monopsony, a merger of the stages raises output, lowers price and increase profits (Greenhut and Ohta 1976). With a vertically separated industry structure, the upstream firm (MLT Research, say) holds back output below the perfectly competitive level in order to maintain prices. The downstream business (Gen-Probe, say) reduces output by more and raises price higher than with a competitive upstream supplier because its input costs are higher. A merger lowers the input costs to the downstream process and so expands output, with market power. After the merger total profits are greater than for the separate firms before⁴. Therefore if loss of independence does not require too high a price in compensation, there should be an incentive to merge.

To summarise, the main elements of the merger or takeover model are the arguments of a demand function for SME ownership and control. But if an SME is acquired then agreement must have been reached on the price. The previous owners were willing to sell. Influences on the supply side of the market, such as access to finance, age of owner or tax demands, in principle may be substituted for price in the takeover demand function to create a takeover reduced form.

Acquisition and exit

Empirical evidence about the impact of mergers or acquisition on the probability of subsequent closure is mixed. Ownership change increases the probability of survival according to McGuckin and Nguyen (2001, p. 743). This effect increases with a plant's size and its (relative) productivity; acquired plants are less likely to subsequently close if they are more productive (Nguyen and Ollinger 2006).

⁴ Gen-Probe described the acquisition of MLT Research as 'accretive' (PRNewswire 2003). This means that the price/earnings ratio of the acquired business is less than that of the acquiring company, Gen-Probe. Consequently the acquiring enterprise is effectively increasing its Earnings Per Share (because it now has more shares and it paid less for them compared with its own share price).

There is also some evidence that acquisitions increase output (rather than encourage exit) (Leigh and North 1978b in Healey 1981, p. 396; Leigh and North 1978). But ownership change can raise the chances of exit, particularly when acquirers from outside the region are involved (Smith 1979). Harris and Hassaszadeh (2002, p. 314) find that ownership change strongly reduces the chances of plant survival. Plants acquired by foreign-owned companies after 1979 were more likely to close by 1995. After allowing an interval of 5 years between takeover and possible exit, targets were more likely to fail than plants that did not change ownership in Bernard and Jensen's (2007) study as well. Exit after a number of years suggests that takeover itself does not trigger closure. An indirect effect may be at work here, with poor performance by the new owners, unable to understand the business, eventually requiring closure of the enterprise.

Exit is ultimately a decision not to invest. So long as capital equipment is usable and variable costs are covered, an SME will stay in business. When capital must be replaced, management must calculate whether the return will be adequate. At this point a former SME that has become part of a larger enterprise may be more likely to be kept in business, because of now greater capital availability, or less likely, because of asset synergies elsewhere in the organisation. Of particular interest here is whether the location of the SME influences the decision, as it would if competition were more intense in some places, or if finance was less accessible.

Relocation

Acquisition and relocation has received less attention in the literature, but, independently of mergers, migrating US firms were more dynamic, measured by employment growth, than those that did not relocate (Nakosteen and Zimmer 1987). In response to rising wage costs, Belgian (international) relocation is most profitable for firms that have restructured, invested more in the recent past, operate in sectors with significant economies of scale and belong to a multinational group (Coucke et al. 2007). Downsizing firms are more capital-intensive than relocating firms (factor substitution matters more for them), while exiting firms are less profitable, smaller, younger, and more labour-intensive than downsizing or relocating firms.

A relocation model represents management of an enterprise in location i continually compare the costs and revenues, after the costs of moving, that might obtain in alternative locations j, k, l , and compute the present value of expected profits in each place (π_j, π_k, π_l) . Any change in relative prices between locations could in principle trigger a move (migration from region i to region j , M_{ij} , if $\pi_i < \pi_j$). In the vertical merger case considered above, profits increase with the takeover in all locations. But they may be disproportionately higher in some places than others. New management might find that the transport costs (T) of the intermediate product can be significantly reduced, because of the greater volume of production and trade between the two plants after the merger, if the acquired plant moved closer. On the other hand, the upstream firm may pay lower wages (w) than the downstream acquiring firm, and migration might push up wage costs. Possibly site rentals (r) are lower in the acquiring firm's region and this could provide a motive for migration, if the transactions costs (z) of the move could be covered.

$$\pi_i = \pi_i(w_i, r_i, T_i) \quad \pi_j = \pi_j(w_j, r_j, T_j)$$

Where F is acquisition of the firm in location i ,

$\delta T_j / \delta F < \delta T_i / \delta F$ in the case discussed above, so $\delta \pi_j / \delta F > \delta \pi_i / \delta F$ and if

$\delta \pi_j / \delta F - z > \delta \pi_i / \delta F$, $M_{ij} = 1$,

otherwise $M_{ij} = 0$.

In a comparative static analysis, a variable or parameter must change to disrupt the initial equilibrium. The product life cycle suggests a story, independent of acquisition. In the first innovative stage, the firm needs to be close to centres where ideas and opportunities are generated, despite the high costs of location, in order to modify the infant product or process appropriately (Audretsch and Feldman 1996). The metaphor indicates that the variable 'company age' should be included in the locational profit function, but only for particular types of genuinely innovative businesses. Once the product and processes are standardised, the firm can shift to lower rent and wage locations⁵.

⁵ High rents and the product life cycle may account for the export of SMEs by London.

Because movement is an investment decision, the benefits depend upon the discount rate (which must be added to the locational profit function), or planning horizon, of the potential migrant firm. To the extent that larger firms have longer planning horizons and lower costs of capital than small, a larger firm is more likely to consider migration than a smaller. A large firm taking over a smaller will apply the lower discount rate to the new assets and increase the probability of a move.

The transactions costs of mobility (z) could also be influenced by the organisation of the enterprise. A firm run by an owner-manager with family commitments to a place could find transactions costs of mobility higher than those of an otherwise identical business with salaried career managers and active institutional shareholders.

Predictions

We can formulate the following three basic relationships for firm i on the basis of the foregoing (where ‘prod’ is productivity and ‘Pr’, probability) as;

$$\begin{matrix} + & + & - & + & - & + \\ \text{Pr}(\text{Takeover}_i) = f(\text{Prod}_i, \text{Core}, \text{Periphery}, \text{Age}_i, \text{Core}*\text{prod}_i, \text{Periphery}*\text{prod}_i) \end{matrix}$$

$$\begin{matrix} - & ? & + & - & - & - & + \\ \text{Pr}(\text{Exit}_i) = g(\text{Prod}_i, \text{Takeover}, \text{Core}, \text{Periphery}, \text{Age}_i, \text{Core}*\text{Takeover}_i, \text{Periphery}*\text{Takeover}_i) \end{matrix}$$

$$\begin{matrix} ? & + & + & - & - & - & + \\ \text{Pr}(\text{Reloc}_i) = h(\text{Prod}_i, \text{Takeover}_i, \text{Core}, \text{Periphery}, \text{Age}_i, \text{Core}*\text{Takeover}_i, \text{Periphery}*\text{Takeover}_i) \end{matrix}$$

This model can be elaborated to generate the following predictions;

1. When larger firms are looking for acquisitions to offset their inadequate intrapreneurship, they create a demand for the more productive and innovative SMEs; their targets are more productive than the average.

2. Agglomeration triggers more intense local competition and better information flows in core regions and therefore a stronger demand to acquire SMEs than in the periphery. SMEs in the core are more likely to be taken over at all levels of productivity, whereas in peripheral locations only the most productive will be bought.

3. Information about an SME is likely to be a function of age, because firms need to build up a track record. The performance of the very young will be unknown to potential acquirers, so they will not be targets.
4. Sole proprietors typically provide the least publicly accessible information. Consequently they are least likely to be subject to takeovers. For partnerships the more fragmented ownership may reduce the chances of accepting or agreeing a takeover (relative to sole proprietors). Companies generally supply more information of interest to potential acquirers, boosting their acquisition chances.
5. Takeovers are an investment decision, an element of which may well be closure or relocation to take advantage of synergies with the acquiring firm's assets. Takeovers therefore should increase the chance for SMEs moving regions or even exiting. A caveat is that capital or other input rationing, or simply more expensive capital, could be handicapping the SME. Then acquisition could reduce chances of exit with injections of capital or other support.
6. If acquiring firms are more probably located in core regions of the economy, and there are complementarities to be exploited by proximity, after a takeover there will be a tendency for acquired firms in the periphery to relocate out of peripheral regions to the core or simply to close.
7. More productive firms are less likely to close because of competitive pressures but there is no reason why they should be more or less likely to relocate.
8. Stronger competitive pressures in core regions increase the likelihood of exit relative to more peripheral locations. This effect may dampen the productivity effect of exit in peripheral regions, where less productive firms have higher chances of survival.
9. More personal forms of business organisation, such as sole proprietorships, are less likely to move regions than less personal forms.

10. Firms changing from innovative to standardised products or processes are more likely to move, which corporate age may predict.

3 Data

The data for testing these predictions in the present study is the Office for National Statistics' (ONS) Business Structure Database (BSD). The BSD is a version of Inter Departmental Business Register (IDBR) that contains information on the changes to a firm's ownership and structure. The IDBR's coverage is limited by voluntary registration for firms below the VAT registration threshold and the exclusion of employers whose employees are below the income tax threshold. Businesses with a turnover above the threshold are not required to register if they trade exclusively in exempt goods⁶. If both the criteria concerning VAT and PAYE are not met then the firms are excluded from the Register (ONS 2007). Hence the data set will probably not include the smallest businesses (measured both by employment and turnover) and some non-profit organisations⁷.

The data is structured in two levels, local units and enterprises. We use observations at the enterprise level of the data. An enterprise can consist of either a group of local units or a single local unit⁸. We assume that the enterprise is the production unit of the firm. For large firms with multiple plants, perhaps all producing a different good, or alternatively producing components assembled into a single product, this might be problematic. However the vast majority of SMEs are single unit enterprises, so the enterprise is also the local unit of production for most of our observations⁹.

SMEs are defined as enterprises registered with fewer than 250 employees and turnover less than £22.8m in 2004 (see Office of Public Sector Information 2004).

⁶ For a list of exempt goods see HMRC (2007).

⁷ Of all SMEs in the UK around two-thirds are registered for VAT and around 80 percent of those with employees, increasing with the age of the firm (Institute for Employment Studies 2006).

⁸ For a fuller description see Criscuolo et al (2003). Turnover data is not available at the local unit level.

⁹ In the rare case where units are spread over different regions we will only measure the SME's registered location according to the enterprise level data. Therefore we will miss any SME dynamics that occur at the local unit level but this is only a very minor consideration, given the few SME observations with multiple units.

The sectors (UK SIC 1992) of public administration and defence; compulsory social security, education, health and social work, private households with employed persons and extra - territorial organisations and bodies have been excluded from the study. We have also removed SME observations in sectors with fewer than 50 cases, measured at the 2 and 3 digit SIC 92 level¹⁰. To identify UK region of SME registration, we link the post code to the National Statistics Postcode Directory (NSPD) (February 2007 version¹¹).

We have restricted the sample to include only firms that are registered either as companies, sole proprietors or partnerships; excluding public corporations, central government bodies, local authorities and non-profit making bodies. Non-private sector observations have been removed, because the market process under consideration only concerns private firms.

For the definition of takeover there is a choice from three categories of ownership change in the BSD (ONS 2006a). These are;

- 1) a 'pure' change of ownership such as occurs when an owner manager retires, selling the business to a successor
- 2) a 'merger', when for instance two enterprises integrate entirely and lose their identities, and
- 3) a 'takeover' when two enterprises integrate entirely, but one enterprise retains their identity, by which we understand, 'controls the combined operation'¹². In the present paper the analysis is restricted to the third category.

With the above definitions and exclusions the 2004 sample of British SMEs consists of just under 2 million observations, with at least one employee and positive turnover.

¹⁰ To enable us to use employment and turnover data we have also removed a few observations that have either missing or zero values for these two variables in year 2004.

¹¹ See <http://www.statistics.gov.uk/geography/nspd.asp> for more information. The link was imperfect because a minority of SMEs had errors in their postcode data. We were therefore obliged to drop a few observations where postcode matches could not be made. SMEs registered in the Isle of Man and Channel Islands were also omitted.

¹² By 'identity', BSD appear to mean the possession of a unique registration number rather than a legal identity.

Productivity and Profitability

Productivity is a proxy for the profitability of each firm. In a competitive industry, profitability depends on the efficiency term of the production function (A). If firms in the same industry have similar capital-labour ratios and bought in components (because for example facing similar factor prices) then relative labour productivity and employment will reflect relative efficiency ratios.

We assume each firm has a Cobb-Douglas production function in which Q is output, K capital, L labour and B materials and bought in products, and α , β and γ are the respective output elasticities of factor inputs. Then because K/L and B/L will be constants within an industry, K/L and B/L will be equal to the industry average and cancel out in a relative productivity index. Risk, say, might differ between industry so that input ratios also vary, which is a reason to calculate the productivity measure at the industry level, rather than absolutely.

For a firm;

$$A = (Q/L) (K/L)^{-\alpha} (B/L)^{-\gamma} L^{\alpha+\gamma+1-\beta}$$

For an industry;

$$A^* = (Q/L)^* (K/L)^{-\alpha^*} (B/L)^{-\gamma^*} L^{\alpha+\gamma+1-\gamma^*}$$

Relative efficiency and profitability is then;

$$A/A^* = ((Q/L)/(Q/L)^*)(L/L^*)^{\alpha+\gamma+1-\beta}$$

Therefore following (McGuckin and Nguyen 1995) we compute relative labour productivity $(Q/L)/(Q/L)^*$ (\equiv RLP); normalising labour productivity across industries. This operation removes the effect of different industry-level prices. It also controls for other industry-specific effects. For example widespread part-time working in the retail sector should partly be accounted for when labour productivity within this sector is compared across industries.

An RLP greater than one indicates that a firm has above industry average productivity. Industries are measured at the 3 digit level¹³. The industry relative

¹³ To maximise observations within each industry, the estimates of productivity includes SMEs located in Northern Ireland but the analysis does not.

transformation is repeated for the employment term of the productivity index $((L/L^*)^{\alpha+\gamma+1-\beta})$.

4 Descriptive Statistics

The first stage of this analysis is to investigate the link between productivity and the probability of takeover. A takeover can have a two-way association with productivity. Firstly, productivity and profitability are attributes that acquirers seek in a target. Secondly, takeovers can lead to an improvement in productivity (perhaps after an initial period of bedding-in that may temporarily hinder performance). To isolate a single chain of causation we separate the cause from the effect of productivity by measuring productivity in the year (2004) preceding the takeover (2005). Other firm characteristics may also be affected by a takeover so we measure all SME characteristics in the preceding period as well.

Also important is the geographical information about an SME. Tests of predictions 5 and 6, that takeover triggers a change in the location of the target firm, require locational measures both before and after the event.

Tabulation of the SME takeover activity and relocation data is instructive. Table 1 below shows the proportion of registered takeovers in the data by quartiles of the productivity distribution. SMEs in the highest quartile of productivity have the highest proportion of takeovers (0.91 percent). This is over one third greater than for the entire sample.

Table 1 - Takeover by Productivity

Quartile of RLP	Proportion of takeovers
1 st quartile	0.63%
2 nd quartile	0.54%
3 rd quartile	0.55%
4 th quartile	0.91%
Total	0.66%

Source: ONS, authors' own calculations

Sample size 1,897,288

Table 2, below, shows the proportion of takeovers by age of the SME. Without controlling for any other factors, SMEs between 10 to 19 years old have the highest proportion of takeovers (0.81 percent). The youngest firms are least likely to be taken over.

Table 2 - Takeover by Age

Age (years)	Takeover
0 to 1	0.45%
2 to 4	0.57%
5 to 9	0.72%
10 to 19	0.81%
20 plus	0.67%
All ages	0.66%

Source: ONS, authors' own calculations

Sample size 1,897,288

To examine the spatial distribution of takeovers, we create three different locations within Great Britain, on the basis of GVA per capita data (see tables A1a and 1b). The first is a 'core' region of the South East and London, with the highest output per head. The 'mid-periphery' contains the regions of East England, East Midlands, South West, West Midlands and Scotland, with intermediate range outputs per head. Lastly the 'periphery' contains Wales, North East, North West and Yorkshire and the Humber, with the lowest regional productivity. Using these definitions, Table 3 shows that the highest proportion of SMEs subject to takeovers is in the 'core' (0.89 percent) and the lowest in the 'periphery' (0.53 percent).

Table 3 - Takeover by Location

Location	Takeover	Total	Proportion of takeovers
Core	5,557	621,520	0.89%
Mid-periphery	4,488	807,875	0.56%
Periphery	2,459	467,893	0.53%
Total	12,504	1,897,288	0.66%

Source: ONS, authors' own calculations

Table 4 shows about 23 percent of SMEs exited in 2006, a much larger proportion than the one and a half percent that changed location between regions. But empirical analysis of entry and exit indicates that firms exiting will be of below average productivity (Disney et al. 2003) and, as will be shown later, relocating firms are associated with higher productivity.

The 'core' account for around one third of the 1.9 million SME sample and achieves the largest proportion exiting (24.6 percent) (prediction 8). The 'core' also has the largest proportion relocating regions (2.3 percent), whereas the smallest proportion of SMEs (0.9 percent) relocate from the periphery.

Table 4 - SME exits and relocations by region

	Location (2004)			Total
	Core	Mid-periphery	Periphery	
No exit or relocation	454,562	619,999	358,396	1,432,957
Change region (2006)	14,225	9,910	4,255	28,390
Proportion changing region (2006)	2.29%	1.23%	0.91%	1.50%
Exit (2006)	152,733	177,966	105,242	435,941
Proportion exiting (2006)	24.6%	22.0%	22.5%	23.0%
Net importer* (2006)	-2,611	2,092	409	
Net imports as a % of 2004 total	-0.42%	0.26%	0.09%	
Total (2004)	621,520	807,875	467,893	1,897,288

*(Moving into location minus moving out of location). This column does not balance as firms may relocate to N. Ire., Channel Islands, IoM (not shown)

Source: ONS, authors' own calculations

Regions both import and export small and medium firms. The 'core' location is a net exporter of SMEs to the other two locations, losing just under 0.5 percent of SMEs. The 'mid-periphery' and 'periphery' gain from relocations by 0.3 percent and 0.1 percent respectively.

Table 5 shows exits and relocations for SMEs taken-over in the preceding year (in 2005). The proportion changing regions is much larger (3.7 percent) than the 1.5 percent relocating of all SMEs (regardless of whether they were taken-over). It seems that takeovers are linked with a greater chance of inter-regional relocation - consistent with prediction 3. The ‘core’ has the most and highest proportion of SME takeover-driven relocations (3.9 percent) and also experienced net losses of SMEs one year after takeover. The ‘periphery’ and mid-periphery’ appear to gain in terms of takeover-relocations.

Exit proportions conditional upon takeovers are also higher for all three locations. The ‘core’ has again the highest proportion (27.9 percent), followed by the ‘mid-periphery’ (24.0 percent) and then the ‘periphery’ (22.1 percent).

Table 5 - Exits and relocations (2006) by region of SMEs taken-over in 2005

	Location (2004)			Total
	Core	Mid-periphery	Periphery	
No exit or relocation	3,791	3,243	1,833	8,867
Change region (2006)	215	170	82	467
Proportion changing region (2006)	3.87%	3.79%	3.33%	3.73%
Exit (2006)	1,551	1,075	544	3,170
Proportion exiting (2006)	27.9%	24.0%	22.1%	25.4%
Net importer* (2006)	-	+	+	
Net imports as a % of 2004 total	-	+	+	
Total (2004)	5,557	4,488	2,459	12,504

*(Moving into location minus moving out of location). This column does not balance as firms may relocate to N. Ire., Channel Islands, IoM (not shown)

- / + values removed to avoid disclosure (count of less than 10)

Source: ONS, authors’ own calculations

The ‘core’ loses most SMEs, both from relocation and exit, exactly the opposite of prediction 6. For the core’s losses to be sustainable, new firm formation also must be much higher in London and the South East than elsewhere in Great Britain - as it is. In contrast start ups are much less abundant in the periphery.

5 Multivariate Analysis

Descriptive statistics are less informative of the economic process of concern here than multivariate analysis. We therefore specify below the empirical model that allows tests of the predictions about the determinants of SME takeovers and their consequences.

Takeovers

Where Pr is probability, $Y_t = 1$ if takeover has taken place in year t (2005) and $\Phi(\cdot)$ is the distribution function;

$$\Pr(Y_t=1) = \Phi(\beta_0 + \beta_1 \ln(RLP_{t-1}) + \beta_2 \text{Entity}_{t-1} + \beta_3 \text{Age}_{t-1} + \beta_4 \text{Industry}_{t-1} + \beta_5 \text{Location}_{t-1} + \beta_6 \ln(\text{rsize}^E)_{t-1} + \beta_7 \text{Structure}_{t-1} + \beta_8 \text{Location}_{t-1} \cdot \ln(RLP_{t-1})) \quad (1)$$

In addition to the two productivity variables (RLP and rsize^E), ‘Entity’ measures whether a firm is registered as a sole proprietor (omitted case), partnership or company. ‘Location’ identifies whether the SME is located in the ‘core’, mid-periphery or periphery of Great Britain. ‘Structure’ controls for SMEs that may have multiple local units and is measured as the natural log of the number of local units.

Prediction 1 is that there is demand for the more productive and innovative SMEs ($\beta_1 > 0$) - targets are more productive than the average. This implies also that $\beta_6 > 0$. β_8 tests whether high productivity firms in the periphery are more prone to takeover; prediction 2.

Prediction 3 is that the market value of innovative SMEs only becomes apparent when they have accumulated a track record, and therefore so does the chances of takeover ($\beta_3 > 0$). Prediction 4 concerns β_2 ; sole proprietors and partners are less likely to be taken-over, and companies more likely.

Exits

Where $Z = \text{exit}_{t+1,j}$ is the type of exit (no exit (0), change region (1) and inactive (2))

$$\Pr(Z_i = j) = \frac{e^{\gamma_j' \mathbf{X}_i}}{\sum_{k=0}^2 e^{\gamma_k' \mathbf{X}_i}}, \quad j = 0, 1, 2 \quad (2)$$

and

$$\begin{aligned} \gamma_j' \mathbf{X}_i = & \gamma_1 \text{Takeover}_t + \gamma_2 \ln(\text{RLP}_{t-1}) + \gamma_3 \text{Entity}_{t-1} + \gamma_4 \text{Age}_{t-1} + \gamma_5 \text{Industry}_{t-1} + \\ & \gamma_6 \text{Location}_{t-1} + \gamma_7 \ln(\text{rsize}_{t-1}^E) + \gamma_8 \text{Structure}_{t-1} + \gamma_9 (\text{Location}_{t-1} \cdot \ln(\text{RLP}_{t-1})) + \\ & \gamma_{10} (\text{Takeover}_t \cdot \text{Location}_{t-1}) \end{aligned}$$

Prediction 5 is that the probabilities of exit and relocation increase if previously subject to a takeover, $\gamma_{1,1,2} > 0$. Prediction 6 is that these conditional probabilities are higher in peripheral regions; the coefficients on the interaction term for peripheral locations are positive ($\gamma_{10,1}$ and $\gamma_{10,2} > 0$). Also we test whether more productive SMEs in the periphery are more likely to relocate ($\gamma_{9,1} > 0$). Prediction 7 is $\gamma_{2,2} < 0$, and this requires also that $\gamma_{7,2} < 0$. Prediction 9 $\gamma_{3,1} > 0$, sole proprietors are less likely to exit or relocate than companies. Prediction 10 $\gamma_{4,1} < 0$, older firms with long standardised products are less likely to relocate. Prediction 8, that core SMEs are more likely to close, concerns $\gamma_{6,2}$. Prediction 9 is that smaller firms are more likely to exit $\gamma_{7,2} < 0$.

Measurement and Estimation

We measure the effects of an SME's characteristics on the likelihood of triggering a takeover (a binary variable) using maximum likelihood probit regression with (Huber-White) robust standard errors¹⁴. The impact of takeover on an SME's likelihood of subsequently exiting or relocating is estimated with multinomial logistic regression with (Huber-White) robust standard errors (and exit or relocation as the categorical dependent variable). To allow the use of the same independent variables as in equation 1 from $t-1$ but also to include the previous dependent variable (takeover)¹⁵, we require a recursive simultaneous equation model (Greene 2003, pp. 715-716). Potential endogeneity can be ignored with maximum-likelihood estimation; unlike

¹⁴ Takeovers are a rare event, especially for those involving small firms. In order to estimate rare events, a large sample size is needed if the resulting estimates are not to be biased (King and Zeng 2001). Our samples are over 1.6 million observations sufficiently large not to require a rare event estimator.

¹⁵ We also add takeover-location interactions to identify any differential effects between periphery and core locations.

with OLS, we do not use sample moments that do not converge on the required parameters in the presence of simultaneity.

Multinomial logistic regression is preferred to the probit counterpart because of the greater ease of computation. This is important when using very large samples (Long and Freese 2006). We use the most common observation (no change in region or exit) as our base dependent variable in the multinomial regressions. Therefore the coefficients on the independent variables will reflect the relationship between no change in the firm and a change in location or exit.

‘Age’ is measured in 2004 and is a set of dummy variables grouping ages together¹⁶. The groups are; up to 2 years, (omitted case), 2 to 4 years, 5 to 9 years, 10 to 19 years and 20 years and over^{17 18}. Our size variable captures the scale of the firm relative to the average SME size within the firm’s 3 digit industry and is measured in a similar way to RLP (see earlier) with the natural log of relative employment.

Summary statistics are in table A2 (see appendix). The model equations are estimated both on the (Great Britain) full SME sample and a sample without the primary and real estate activities sectors. We remove the primary sector because the data might be less accurate and in any case it is likely to be an atypical. Real estate activities are omitted following the recommendation of Daffin and Lau (2002).

¹⁶ A disproportionate number of firms in the IDBR are recorded as born in 1973. This is perhaps when the data was first collected.

¹⁷ Introducing dummies for a variable that can be estimated continuously is inefficient, but in view of the very large sample size we do not need to be concerned about the reduction in the degrees of freedom.

¹⁸ Measured age is not strictly the true age of the firm. It is the age when the enterprise enters the IDBR. An enterprise might have been trading for a number of years below the VAT threshold, and not electing to register, prior to crossing the VAT threshold.

6 Results: Takeovers

The estimated takeover equations are shown in table 6. In equations 1 and 2 both the productivity measure and its square are significant and positive; after controlling for factors such as the age, size and industry of the SME, the probability of takeover increases with the SME's (relative) productivity, in accordance with prediction 1¹⁹.

Table 6 – SME Takeover probits

Variable	Dep var Takeover [1]	Dep var Takeovers [2]
	SME Sample	SME without primary sector & real estate activities
Ln(RLP)	0.0897***	0.0931***
Ln(RLP)^2	0.0206***	0.022***
Ln(local unit)	-0.151***	-0.144***
ln(remp)	0.209***	0.215***
ln(remp)^2	0.00448**	0.00385**
Age 2 to 4	0.086***	0.106***
Age 5 to 9	0.129***	0.157***
Age 10 to 19	0.132***	0.161***
20+ years	0.0903***	0.109***
Company	0.96***	0.93***
Partnership	-0.107***	-0.0887**
Mid-periphery	-0.0863***	-0.0853***
Periphery	-0.103***	-0.0982***
Mid-periphery*ln(RLP)	0.00287	0.00086
Periphery*ln(RLP)	0.0207**	0.0207**
<i>Industry controls</i>		
N	1,897,288	1,676,588
Pseudo R ²	0.15	0.15
Log-likelihood	-63,810	-56,103

Legend: * p<0.1; ** p<0.05; *** p<0.01

NB constants removed

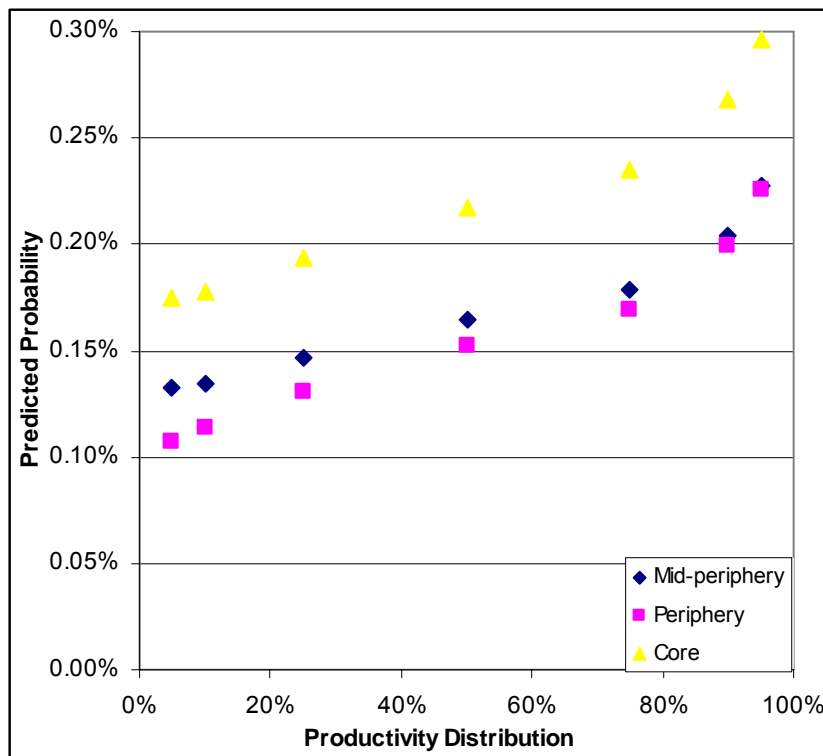
The dummies for both locations are statistically significant and negative. This suggests SMEs located outside the 'core' (London and the South East - the omitted region), are less likely to be taken over. However, peripheral locations appear to have statistically significant interactions with productivity. In figure 1 we have computed the predicted probabilities at the sample average²⁰ of the full sample (equation 1's

¹⁹ The (McFadden's) pseudo r-squared statistics indicate a poor 'goodness' of fit for each model. A low explanatory power of such models is fairly common for this type of takeover estimation in the literature (see Alcalde and Espitia 2003; Palepu 1986; Powell 1997).

²⁰ Where multiplicative dummies are used we have not used the computed means but the product of the two mean values of the variables.

estimates), including only those variables that are statistically significant at the 90 percent confidence interval. We compute the probabilities for each location’s SMEs across a range of values for productivity to allow the full effects of the location-productivity variables to be appreciated. These predicted probabilities show the differences between locations’ probabilities of takeover across productivity, after controlling for variables such as sector, age and size.

Figure 1 – Predicted Probability of Takeover by Location and Productivity



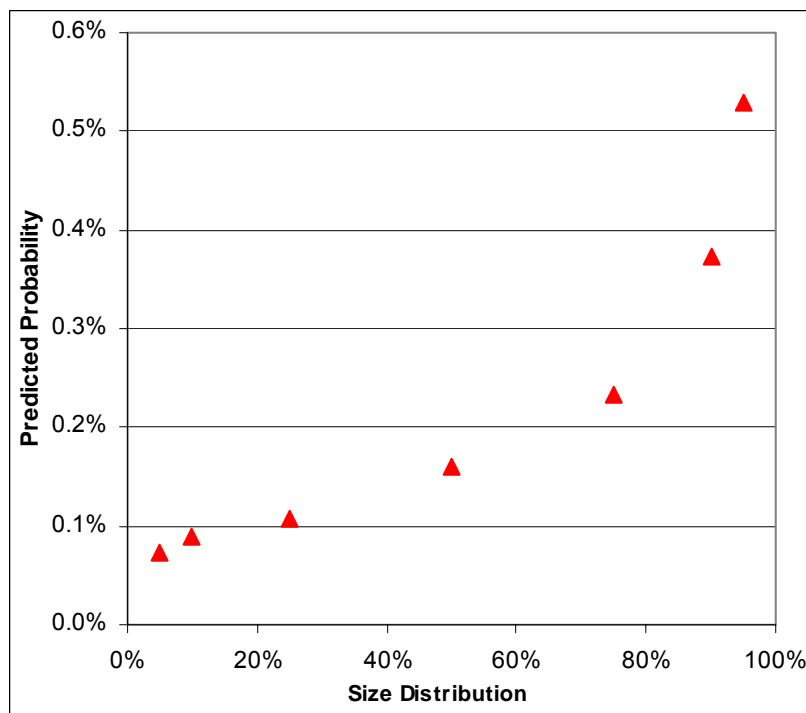
Source: ONS, authors’ own calculations
 NB Estimated at the sample average using only variables that are significant at 90 percent.
 The actual values are shown in table A3

The already-discussed positive relationship with productivity and the predicted probability of takeover, consistent with a search for synergies and compensating for intrapreneurship shortages (prediction 1), is obvious, but the location variations are instructive as well. Across the entire range of productivity shown, SMEs in the ‘core’ have the highest probability of acquisition, statistically significantly different from both the other locations. This result is consistent with a greater intensity of competition or readier access to finance in the core – prediction 2. The ‘mid-periphery’ has the next highest probability, but there is evidence to suggest that this

might be surpassed by SMEs in the periphery at the very high end of the productivity spectrum.

Turning to the role of size in acquisition chances, relatively larger SMEs have an increased chance they will be acquired. This is shown by the positive and significant coefficients in both equations 1 and 2 in table 6. However another variable may also pick up some of the effects of size (the number of plants - $\ln(\text{local units})$), and this is significant and negative. In figure 2 we show the predicted probability of takeover with the relative size distribution from the full sample estimates (equation 1). It confirms the positive (and increasing) relationship of size with probability of takeover.

Figure 2 – Predicted probability of takeover by size



Source: ONS, authors' own calculations

NB Estimated at the sample average using only variables that are significant at 90 percent.

In table 6 equations 1 and 2, the coefficients on the age variables indicate up to 20 years older SMEs are more likely to be acquired. The predicted probabilities of takeover are shown for each age category in table 7. SMEs aged 10 to 19 years have the highest probability, closely followed by those aged 5 to 9 years. The youngest age

category (0 to 1 year) is found to have the lowest probability of takeover, lower than those 20 years or older (prediction 2).

Table 7 – Predicted probability of takeover by age

Age (years)	Predicted probability
Under 2	0.124%
Age 2 to 4	0.164%
Age 5 to 9	0.189%
Age 10 to 19	0.190%
20 years and over	0.167%

Source: ONS, authors' own calculations

NB Estimated at the sample average using only variables that are significant at 90 percent

Table 8 shows the effects of business status on the probability of takeover. Partnerships have the lowest predicted probability (0.02 percent) and then sole proprietors (0.03 percent). Companies are most likely to be taken over (0.73 percent). These findings are consistent with prediction 4.

Table 8 – Predicted probability of takeover by business status

Business Status	Predicted Probability	Marginal Effect
Sole prop.	0.034%	-
Company	0.734%	0.700%
Partnership	0.023%	-0.011%

Source: ONS, authors' own calculations

NB Estimated at the sample average using only variables that are significant at 90 percent

7 Results: Exit

Takeovers stimulate both increased chances of an SME changing region and of exiting altogether (Table 9 equation 1). This is also found in equation 2 (without the primary sector and real estate activities). But interpretation of takeover variables must allow for the interactions with the location effects. Table 10 shows the predicted probability of SMEs changing region or exiting with takeovers, using coefficients from the first equation of table 9 at the sample averages. Takeovers increase both the probabilities of an SME changing region and exiting. The table also demonstrates that the smallest marginal effect for a takeover on the probability of changing region is for the 'core' (1.0 percent). The largest marginal effect is for the 'mid-periphery' location

(1.9 percent) closely followed by the ‘periphery’ (1.7 percent). However, the overall probabilities are small across all locations.

Table 9 – Multinomial logistic exit regression results

Variable	[1]		[2]	
	Full GB Sample		GB Sample without primary sector and real estate activities	
	Region relocation	Exit	Region relocation	Exit
Takeover	0.399***	0.522***	0.415***	0.562***
Ln(RLP)	0.0441***	-0.0954***	0.0392***	-0.11***
Ln(RLP)^2	0.0267***	0.00528***	0.0251***	0.00254***
Age 2 to 4	0.057***	0.0936***	0.0815***	0.112***
Age 5 to 9	-0.185***	-0.296***	-0.174***	-0.307***
Age 10 to 19	-0.521***	-0.801***	-0.516***	-0.784***
Age 20+ years	-0.911***	-1.12***	-0.884***	-1.03***
Ln(local unit)	0.232***	-0.124***	0.254***	-0.109***
Ln(remper)	0.0236***	-0.146***	0.0202***	-0.165***
Ln(remper)^2	-0.0157***	-0.00669***	-0.0168***	-0.0084***
Company	0.466***	-0.216***	0.466***	-0.201***
Partnership	-0.252***	-0.0845***	-0.24***	-0.0367***
Mid-periphery	-0.391***	-0.0931***	-0.382***	-0.0922***
Periphery	-0.664***	-0.0728***	-0.654***	-0.0595***
Mid-periphery*Ln(RLP)	0.0458***	0.0102**	0.0583***	0.00797*
Periphery*Ln(RLP)	0.0761***	0.0186***	0.0774***	0.0218***
Mid-periphery*Takeover	0.471***	-0.0379	0.475***	-0.051
Periphery*Takeover	0.575***	-0.207***	0.586***	-0.198***
<i>Industry controls</i>				
N	1,897,288		1,676,588	
Pseudo R ²	0.05		0.04	
Log-likelihood	-1,105,134		-1,009,002	

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed

Table 10 - Predicted probabilities and marginal effects of location and takeover on exit and relocation

Location	Region relocation			Exit		
	No takeover	takeover	Marginal effect of takeover	No takeover	Takeover	Marginal effect of takeover
Core	2.1%	3.1%	1.0%	22.8%	33.3%	10.4%
Mid-periphery	1.4%	3.2%	1.9%	21.1%	31.1%	10.0%
Periphery	1.0%	2.7%	1.7%	21.4%	27.2%	5.8%

Source: ONS, authors’ own calculations

NB Estimated at the sample average using only variables that are significant at 90 percent

Predicted probabilities of exiting are much higher than for relocation. The chance of exit, regardless of takeover, is highest for the ‘core’. Takeover increases the probability of subsequent exit for all locations. The marginal effect of takeover is

greater for exits than it is for relocations for all three of the locations. It is greatest for the 'core' (10.4 percent), closely followed by the 'mid-periphery' (10.0 percent). Our 'peripheral' location has the smallest marginal effect of takeover on exit (5.8 percent).

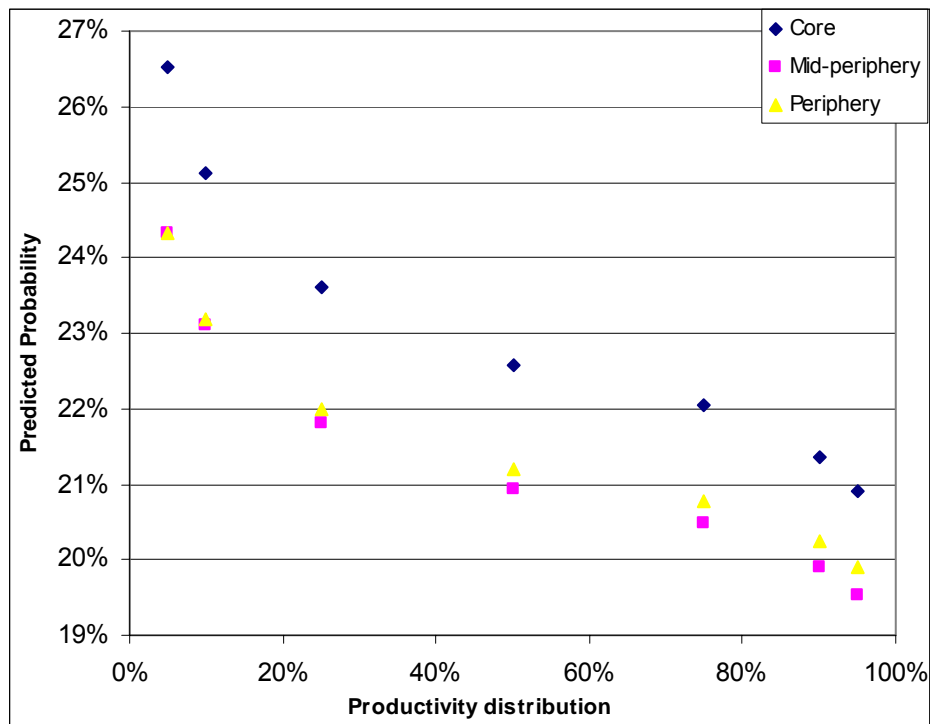
The positive marginal effect of takeover on both relocation and exit is consistent with prediction 5, suggestive that this is to take advantage of the synergies with the acquiring firm's assets. The higher marginal effects of takeover for more peripheral locations to relocate regions is consistent with prediction 6, but the lower marginal effects of exit resulting from takeovers is not.

Effects of productivity

Figure 3 shows the predicted probabilities at the sample averages for an SME exit in or by $t+1$ from our first equation. Consistent with the notion of competitive pressures, the higher the productivity, the lower is the resulting probability of exit. At all the levels of productivity shown, the 'core' location has the highest predicted probability of exit, independently of factors such as age, size and sector. Our other two locations ('mid-periphery' and 'periphery') have lower but similar probabilities of exit.

Productivity positively impacts upon an SME's probability of changing regions in both equations in table 9 (although the effect is quite small - especially when compared to the effect of productivity on takeover chances).

Figure 3 - SME exit probability by location and productivity



Source: ONS, authors' own calculations
The actual values are shown in table A4

Size

In both equations 1 and 2, size exercises a positive but decreasing effect over whether an SME relocates to another region. This is shown both by relative employment and by the number of plants. For exits, size appears to have a significant and negative (increasing) impact across both equations with both measures. The effect of relative size on exit is consistent with production at an inefficient scale, or with more limited finance access, increasing the chances of exit.

In table 11 we show the predicted probability of each of our demographic events by the age of the firm. The highest chance of an SME changing region is at age 2 to 4 years, closely followed by those aged under 2 years. The lowest probability is found for those in the oldest age category of 20 years and over. It appears that generally as SMEs age they are less likely to change regions. Similarly, this pattern is matched by SME exits. The highest probability is for those aged 2 to 4 years, when nearly a third are liable to exit. This then falls to around 12 percent for the oldest age category. The highest probability of exit by the youngest firms is suggestive of the effects of inexperience, poor judgement or inadequate skills.

Table 11 - Predicted probability of region relocation and exit by age

Age (Years in 2004)	Region relocation	Exit
Under 2	1.99%	29.59%
Age 2 to 4	2.10%	31.58%
Age 5 to 9	1.66%	23.82%
Age 10 to 19	1.19%	15.87%
20 years and over	0.81%	12.06%

Source: ONS, authors' own calculations

NB Estimated at the sample average using only variables that are significant at 90

The effects of business status are not very different between our two samples in equations 1 and 2 in table 9. In table 12 we show the predicted probabilities. Companies have the highest likelihood of relocating (1.9 percent), followed by sole proprietors (1.2 percent), and then partnerships (1.0 percent). With respect to exits, we find that sole proprietors are most likely to exit (24.0 percent), followed by partnerships (22.5 percent) and then companies (20.3 percent). That companies have a much higher predicted probability of relocating regions is consistent with the role of more personal forms of business organisation in prediction 9.

Table 12 - Predicted probability of exit and change region by business status

Business status	Predicted probability of region relocation	Predicted probability of exit
Sole prop.	1.23%	24.0%
Company	1.94%	20.3%
Partnership	0.96%	22.5%

Source: ONS, authors' own calculations

NB Estimated at the sample average using only variables that are significant at 90

8 Conclusion

More productive small firms are more likely to be acquired, consistent with larger firms attempting to compensate for lack of internally generated innovation, and contrary to the experience of large firm takeovers. They are also more likely to be acquired if they are located in the core region (London and the South East). Behind this finding may be readier access to finance in the core, or agglomeration there

triggering more intense local competition. An SME has a better chance of being bought if it has a substantial successful performance over 5 to 20 years.

A year after takeover, SMEs are more likely to exit, regardless of whether they are located in a peripheral location or the core, by between 6 and 10 percentage points. Acquired SMEs more probably relocate regionally but this effect is broadly similar for firms in the core and in the periphery. We show that the impact is small in terms of SME numbers. Regions receive post-merger companies as well as lose them. On the other hand, small numbers may conceal the unusual importance for regional development of SMEs that migrate from the regions as a consequence of acquisition.

On balance though the evidence that periphery development is constrained by selective takeovers, and closure or relocation of highly productive and dynamic small firms, is not strong. The comparison with the core suggests more fundamental is the birth and death rate of SMEs.

Appendix

Table A1a – Output per head by region

GVA per head (2004)		GVA per hour worked (2004)		GVA per filled job (2004)	
Wales	79.1	Northern Ireland*	81.9	Northern Ireland*	85.8
North East	79.9	Wales	90.7	Wales	89.7
Northern Ireland*	80.2	Yorkshire & Humber	91.4	Yorkshire & Humber	90.2
Yorkshire & Humber	88.8	North West	92.5	North West	91.4
North West	88.9	North East	93.6	North East	92.2
West Midlands	91.2	West Midlands	94.0	South West	92.8
East Midlands	91.5	South West	95.1	West Midlands	94.6
South West	92.9	Scotland	98.1	Scotland	96.8
Scotland	96.2	East Midlands	98.5	East Midlands	97.5
East	108.7	East	101.2	East	100.9
South East	116.1	South East	105.5	South East	104.2
London	132.1	London	118.8	London	124.7
UK	100	UK	100	UK	100

Source: (ONS 2006b)

NB *Northern Ireland not included in the analysis

Table A1b – Location classifications

Core	Mid-Periphery	Periphery
South East	East	Wales
London	East Midlands	North East
	South West	Yorkshire & Humber
	West Midlands	North West
	Scotland	

Table A2 – Takeover summary statistics

Variable	Full GB Sample		GB Sample without primary sector and real estate activities	
	Mean	Std. Dev.	Mean	Std. Dev.
Takeover (dependent variable)	0.0066	0.0809	0.0065	0.0804
Ln(RLP)	-0.5353	0.9715	-0.5152	0.9320
Ln(RLP)^2	1.2303	2.9819	1.1341	2.8206
Ln(local unit)	0.0228	0.1634	0.0242	0.1679
ln(remper)	-0.6400	0.9463	-0.6761	0.9644
ln(remper)^2	1.3051	1.5043	1.3870	1.5389
Age 2 to 4	0.2479	0.4318	0.2616	0.4395
Age 5 to 9	0.2242	0.4171	0.2270	0.4189
Age 10 to 19	0.2365	0.4249	0.2393	0.4267
20+ years	0.1587	0.3654	0.1315	0.3379
Company	0.5101	0.4999	0.5326	0.4989
Partnership	0.1780	0.3825	0.1536	0.3605
Mid-periphery	0.4258	0.4945	0.4150	0.4927
Periphery	0.2466	0.4310	0.2422	0.4284
N	1,897,288		1,676,588	

Source: ONS, authors' own calculations

Table A3 - Predicted Probabilities of takeover by Location and Productivity

Location	Productivity distribution						
	5%	10%	25%	50%	75%	90%	95%
Core	0.175%	0.178%	0.194%	0.217%	0.235%	0.268%	0.297%
Mid-periphery	0.132%	0.134%	0.147%	0.165%	0.179%	0.204%	0.227%
Periphery	0.107%	0.113%	0.130%	0.153%	0.169%	0.199%	0.226%

NB Estimated at the sample average

Source: ONS, authors' own calculations

Table A4 - SME exit predicted probability and productivity by location

Location (2004)	Productivity distribution						
	5%	10%	25%	50%	75%	90%	95%
Core	26.5%	25.1%	23.6%	22.6%	22.0%	21.4%	20.9%
Mid-periphery	24.3%	23.1%	21.8%	20.9%	20.5%	19.9%	19.5%
Periphery	24.3%	23.2%	22.0%	21.2%	20.8%	20.3%	19.9%

NB Estimated at the sample average

Source: ONS, authors' own calculations

Table A5 - SME regional relocation predicted probability and productivity by location

Location (2004)	Productivity distribution						
	5%	10%	25%	50%	75%	90%	95%
Core	2.21%	2.13%	2.09%	2.10%	2.12%	2.17%	2.22%
Mid-periphery	1.36%	1.35%	1.37%	1.41%	1.45%	1.51%	1.56%
Periphery	0.97%	0.98%	1.02%	1.07%	1.10%	1.17%	1.22%

NB Estimated at the sample average

Source: ONS, authors' own calculations

References

- Alcalde, N. and Espitia, M. 2003. The Characteristics of Takeover Targets: The Spanish Experience 1991-1997. *Journal of Management and Governance* 7, pp. 1-26.
- Audretsch, D. B. and Feldman, M. P. 1996. Innovative clusters and the industry life cycle. *Review of Industrial Organization* 11(2), pp. 253-273.
- Baumol, W. J. 2004. Entrepreneurial Enterprises, Large Established Firms and Other Components of the Free-Market Growth Machine. *Small Business Economics* 23(1), pp. 9-21.
- Bernard, A. B. and Jensen, J. B. 2007. Firm Structure, Multinationals and Manufacturing Plant Deaths. *The Review of Economics and Statistics* 89(2), pp. 193-204.
- Bougheas, S. et al. 2006. Access to external finance: Theory and evidence on the impact of monetary policy and firm-specific characteristics. *Journal of Banking & Finance* 30(1), pp. 199-227.
- Caves, R. E. 1998. Industrial Organization and New Findings on the Turnover and Mobility of Firms. *Journal of Economic Literature* 36(4), pp. 1947-1982.
- Cosh, A. and Hughes, A. 1994. Acquisition Activity in the Small Business Sector. In: Hughes, A. and Storey, D.J. eds. *Finance and the Small Firm*. Routledge.
- Cosh, A. et al. 1996. Innovation in UK SMEs: Causes and the Consequences for Firm Failure and Acquisition. *ESRC Centre for Business Research - Working Papers*.
- Coucke, K. et al. 2007. Employee Layoff under Different Modes of Restructuring: Exit, Downsizing or Relocation. *Industrial and Corporate Change* 16(2), pp. 161-182.
- Criscuolo, C. et al. 2003. Building the evidence base for productivity policy using business data linking. *Economic Trends* 600, pp. 39-51.
- Daffin, C. and Lau, E. 2002. Labour Productivity Measures from the Annual Business Inquiry. *Economic Trends* No. 589, pp. 54-64.
- Dahlstrand, A. L. 2000. Large firm acquisitions, spin-offs and links in the development of regional clusters of technology intensive SMEs. In: Keeble, D. and Wilkinson, F. eds. *High-Technology Clusters, Networking and Collective Learning in Europe*. Aldershot, Ashgate, pp. 156-181.
- Davidson, C. and Ferrett, B. 2007. Mergers in Multidimensional Competition. *Economica* 74(296), pp. 695-712.
- Disney, R. et al. 2003. Restructuring and productivity growth in UK manufacturing. *The Economic Journal* 113(489), pp. 666-694.

- Foreman-Peck, J. 1995. *Smith & Nephew in the Health Care Industry*. Edward Elgar Publishing.
- Fraser, S. 2005. *Finance for Small and Medium Sized Enterprises: A Report on the 2004 UK Survey of SME Finances*. Centre for Small and Medium-Sized Enterprises.
- GKN. 2008. *GKN History* [Online]. Available at: <http://www.gknplc.com/groupOverview/History.asp> [Accessed: March 2008].
- Greene, W. H. 2003. *Econometric Analysis*. 5th [international] ed. Upper Saddle River, N.J.: Prentice Hall.
- Greenhut, M. L. and Ohta, H. 1976. Related Market Conditions and Interindustrial Mergers. *The American Economic Review* 66(3), pp. 267-277.
- Griffith, R. et al. 2004. Foreign Ownership and Productivity: New Evidence from the Service Sector and the R&D Lab. *Oxford Review of Economic Policy* 20(3), pp. 440-456.
- Gugler, K. et al. 2003. The effects of mergers: an international comparison. *International Journal of Industrial Organization* 21, pp. 625-653.
- Harris, R. and Hassaszadeh, P. 2002. The impact of ownership changes and age effects on plant exits in UK manufacturing, 1974-1995. *Economics Letters* 75(3), pp. 309-317.
- Harris, R. and Li, Q. 2007. Firm level empirical study of the contribution of exporting to UK productivity growth. *Report submitted to UKTI*.
- Healey, M. J. 1981. Locational Adjustment and the Characteristics of Manufacturing Plants. *Transactions of the Institute of British Geographers* 6(4), pp. 394-412.
- HMRC. 2007. *What is VATable?* [Online]. Available at: http://customs.hmrc.gov.uk/channelsPortalWebApp/downloadFile?contentID=HMCE_CL_001225 [Accessed: January 2007].
- Institute for Employment Studies 2006. *Annual Survey of Small Businesses: UK 2005*.
- Jovanovic, B. and Rousseau, P. L. 2002. The Q-Theory of Mergers. *The American Economic Review* 92(2), pp. 198-204.
- Julian Hodge Bank. 2008. *Man who built his own bank* [Online]. Available at: <http://www.julianhodgebank.com/group/sirjulianhodge.asp> [Accessed: March 2008].
- King, G. and Zeng, L. 2001. Logistic Regression in Rare Events Data. *Political Analysis* 9(2), pp. 137-163.
- Leigh, R. and North, D. J. 1978. Regional aspects of acquisition activity in British manufacturing industry. *Regional Studies* 12, pp. 227-245.

- Lichtenberg, F. R. et al. 1987. Productivity and Changes in Ownership of Manufacturing Plants. *Brookings Papers on Economic Activity* 1987(3), pp. 643-683.
- Long, J. S. and Freese, J. 2006. *Regression Models for Categorical Dependent Variables Using Stata*. 2nd ed. College Station, Tex. : StataCorp LP.
- McGuckin, R. H. and Nguyen, S. V. 1995. On Productivity and Plant Ownership Change: New Evidence from the Longitudinal Research Database. *The RAND Journal of Economics* 26(2), pp. 257-276.
- McGuckin, R. H. and Nguyen, S. V. 2001. The impact of ownership changes: a view from labor markets. *International Journal of Industrial Organization* 19(5), pp. 739-762.
- Molecular Light Technology. 2008. *Molecular Light Technology* [Online]. Available at: <http://www.mltresearch.com/index.htm> [Accessed: March 2008].
- Nakosteen, R. A. and Zimmer, M. A. 1987. Determinants of Regional Migration by Manufacturing Firms. *Economic Inquiry* 25(2), pp. 351-362.
- News Wales. 2002. *Goodbye Bank of Wales* [Online]. Available at: <http://www.newswales.co.uk/index.php?section=Business&F=1&id=6010> [Accessed: March 2008].
- Nguyen, S. V. and Ollinger, M. 2006. Mergers and Acquisitions and Productivity in the U.S. Meat Products Industries: Evidence from the Micro Data. *American Journal of Agricultural Economics* 88(3), pp. 606-616.
- Office of Public Sector Information. 2004. *The Companies Act 1985 (Accounts of Small and Medium-Sized Enterprises and Audit Exemption) (Amendment) Regulations 2004* [Online]. Available at: <http://www.opsi.gov.uk/si/si2004/20040016.htm> [Accessed: November].
- ONS 2006a. *Business Structure Database User Guide*.
- ONS. 2006b. *Productivity measures by region* [Online]. Available at: http://www.statistics.gov.uk/notices/prod_measures_region_30Jan06.asp [Accessed: March 2008].
- ONS. 2007. *Guide to the IDBR* [Online]. Available at: <http://www.statistics.gov.uk/CCI/nugget.asp?ID=195> [Accessed: January 2007].
- Palepu, K. G. 1986. Predicting takeover targets : A methodological and empirical analysis. *Journal of Accounting and Economics* 8(1), pp. 3-35.
- Powell, R. G. 1997. Modelling Takeover Likelihood. *Journal of Business Finance & Accounting* 24, pp. 1009-1030.

PRNewswire. 2003. *Gen-Probe Announces Acquisition of Molecular Light Technology Limited* [Online]. Available at: <http://www.prnewswire.co.uk/cgi/news/release?id=106571> [Accessed: March 2008].

Ravenscraft, D. J. and Scherer, F. M. 1987. *Mergers, Sell-Offs, and Economic Efficiency*. Washington, D.C. : Brookings Institution.

Salant, S. W. et al. 1983. Losses from Horizontal Merger: The Effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium. *The Quarterly Journal of Economics* 98(2), pp. 185-199.

Siegel, D. S. and Simons, K. L. 2006. *Assessing the Effects of Mergers and Acquisitions on Firm Performance, Plant Productivity, and Workers: New Evidence from Matched Employer-Employee Data*. Rensselaer Polytechnic Institute, Department of Economics.

Smith, I. 1979. The effect of external takeovers on manufacturing employment change in the Northern region between 1963 and 1973. *Regional Studies* 13(5), pp. 421-437.

Stiglitz, J. E. and Weiss, A. 1981. Credit Rationing in Markets with Imperfect Information. *The American Economic Review* 71(3), pp. 393-410.

WAG. 2008. *Annual Population Survey unemployment rates, Welsh local authorities* [Online]. Available at: http://www.statswales.wales.gov.uk/ReportFolders/reportfolders.aspx?IF_ActivePath=P,3,14,19 [Accessed: March 2008].

Wilson, R. 2004. *Business Finance*. Institute of Directors.