How SME Takeover Targets Affect Regional Productivity

By

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A Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy of Cardiff University

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Abstract

Small and medium size enterprises (SMEs) account for around half of private sector output and employment in Britain. Peripheral region economies, such as Wales, are even more focussed on SMEs. This thesis uses a new data set (BSD) of nearly all British firms that allows the study of small businesses in a spatial context, with particular attention to the market for SME control. The aim is to understand whether this market contributes to the productivity gap between core (London and the South East) and peripheral regions in Britain. It might do so if larger firms attempted to compensate for a lack of internally generated innovation by acquiring and absorbing productive small enterprises. Regular culling of top performing small firms in the periphery by 'outside' businesses could then stunt a region's capacity for indigenous development. On the other hand, acquisition by larger firms (perhaps from the core) may enable SMEs to improve their performance and thereby enhance a region's economy. In fact contrary to the experience of large firms, more productive small businesses have a higher likelihood of being acquired - although there is a lower rate of takeovers more generally in peripheral regions than in London and the South East. Takeovers also increase the chances of SMEs exiting, but this effect is stronger for the core region as well. Takeovers raise productivity after acquisition but by less, or even with deleterious effects, for the most productive SMEs. Combining the rate of takeovers with their effect on exits and performance, the overall, net beneficial impact on regional productivity from the targets of SME acquisitions is slightly larger in the core than in the periphery. This is due to the differential rate of takeovers between locations. Rather than regarding the effects on SMEs from acquisitions as harmful to periphery regions, policy makers should attempt to understand why takeovers are less frequent there, and should consider ways of improving the operation of the market for small businesses, especially in the periphery.

Acknowledgments

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Acronyms

ABI – Annual Business Inquiry

ARD – Annual Respondents Database

BIS – Department for Business, Innovation and Skills

BSD – Business Structure Database

DiD – Differences-in-Differences

FDI – Foreign direct investment

FTSE – Financial Times Stock Exchange

GOR – Government office region

GVA – Gross value-added

IDBR - Inter-Departmental Business Register

IMR – Inverse Mills ratio

LU – Local unit

LP – Labour productivity

M&As – Mergers and acquisitions

ML – Maximum-likelihood

OLS – Ordinary least squares

ONS - Office for National Statistics

PAYE – Pay as you earn

R&D – Research and development

RLP – Relative labour productivity

RU - Reporting unit

SIC - Standard Industrial Classification

SME – Small and medium-sized enterprises

TFP – Total factor productivity

VAT - Value-added tax

VML – Virtual Microdata Laboratory

WAG - Welsh Assembly Government

Chapter 1 – Introduction

Do takeovers of small and medium sized businesses (SMEs) strip peripheral regions and economies of their income and employment generation potential? Former Welsh MP Adam Price believed this was happening in Wales. Companies from outside Wales supposedly were buying successful indigenous enterprises and then shutting them down (The Western Mail 31st July 2002). Adam Price's anxiety may be warranted because SMEs are the basis for regional development, the seed corn for future large firms – if they grow rapidly and survive. The creation and growth of SMEs are important for raising the productivity of the economy, both by entry of more productive firms, and through the competitive process, the 'productive churn' of the economy, where the more productive firms increase their market share at the expense of the less productive (Disney et al. 2003). So regular culling of top performing small firms could stunt a region's capacity for indigenous development.

Why might such takeovers be a real possibility? Larger firms often seek to renew their vitality by absorbing the ideas and entrepreneurship of high performing small enterprises – hunting for 'intrapreneurship' (Baumol 2004). Large pharmaceutical companies sometimes absorb small biotech enterprises that have made technical breakthroughs that eluded their own more rigid organisations (Allansdottir et al. 2002). Outside pharmaceuticals an example is Smith & Nephew, a FTSE 100 company formerly 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).

How could there be regional asymmetries in such a takeover process? The New Economic Geography has formalised possible spatial consequences of agglomeration economies, based on models of imperfect competition and economies of scale. Under plausible conditions more heavily populated regions attract larger more productive firms, creating and sustaining regional divergences in income and productivity. A takeover process, where acquiring firms are located or headquartered in the higher income core region, and targets are innovative, high productivity SMEs based in the lower productivity periphery could well be part of such a process.

On the other hand, competition for SME assets could boost performance, and the more intense the competition, the stronger the performance of surviving SMEs. For example, 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 its 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; PR Newswire 2003). This SME (vertical) takeover story was a happy one for the company, which could operate with more resources, and for Wales. At first sight it counts against the adverse view of takeovers. The experience is consistent with a benevolent market for SME corporate control, rather than one that creates underdevelopment of peripheral regions. A proviso however is that MLT eventually lost its research function to the Californian buyer.

If the competition for SME assets is helpful for resource allocation, peripheral economies with lower densities of firms in often spatially limited markets could be at a disadvantage simply because the competition for ownership and control of SMEs is relatively weaker. Information is likely to be both relatively scarce and costly to obtain for younger, smaller firms. This can result in market failure (via adverse selection) and a reduced rate of market activity, similar to that described by Akerloff (1970). Within the market for small firms there are likely to be both 'cherries' and 'lemons'. With limited information, buyers are unlikely to be sure whether they are acquiring a 'lemon' or a 'cherry' and so may offer an average price of the two. For the owners of 'cherries' this price is not acceptable and so they do not sell. In peripheral areas this could be particularly acute due to information flows there and relatively fewer formal or informal networks in these areas (Allinson et al. 2007).

This thesis looks at the possible regional element of SME takeovers, comparing core and peripheral regions. In the introduction the background to the 'regional problem' is outlined, the spatial differences in productivity are described, as is the regional distribution of large and small firms. Then the steps necessary to create a coherent

theory capable of testing the regional takeover hypotheses are described, before the process of testing and quantifying them are summarised.

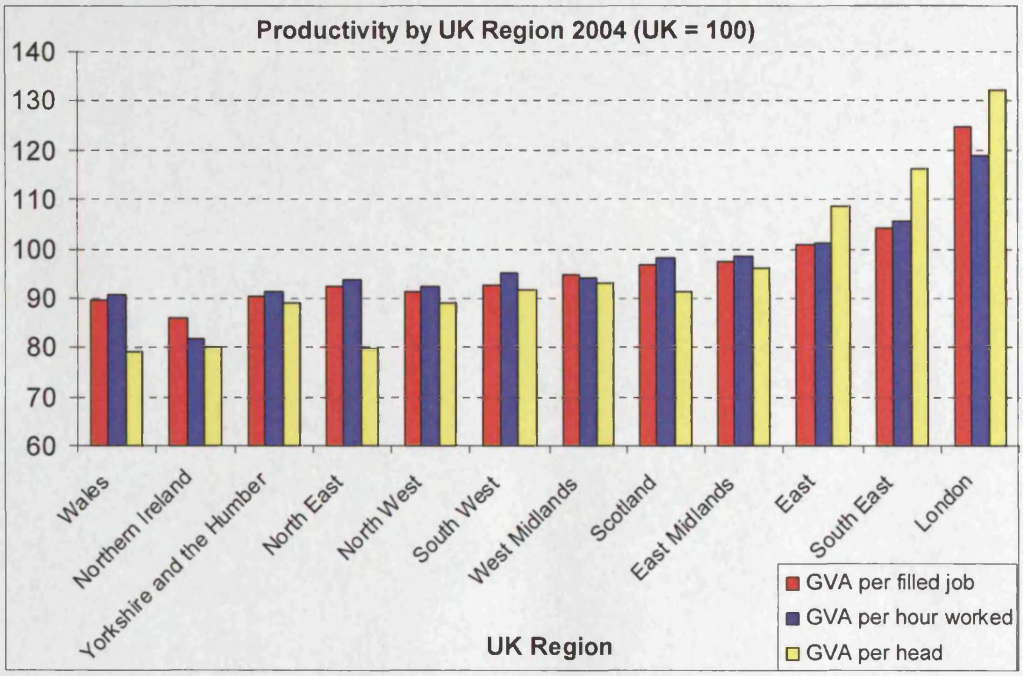
1.1 Productivity differences in the UK

In 2001, Wales, Northern Ireland and the North East were recognised by the Treasury as being the UK's poorest regions, according to regional GDP per capita figures for 1999 (HM Treasury 2001). These regions all registered levels that were around 40 per cent below that of London[1]. More recent evidence with aggregate productivity shows these regions still have relatively low levels of productivity according to two measures; aggregate productivity with gross value added (GVA) per filled job and GVA per hour worked (see figure 1.1). For the measures of GVA per filled job and GVA per hour worked, Wales (around 90 percent for both) is second lowest to Northern Ireland (around 85 percent and 80 percent, respectively)[2]. These measures also show similarly low performance for Yorkshire and the Humber, the North East and North West of England.

[1] The aggregate statistics do not include the effects of regional prices. UK regional differences of consumer prices, using national weights, shows that London (around 110 percent of UK average) has the highest consumer prices and that Wales has one of the lowest (around 95 percent of UK average) (Wingfield et al. 2005). However, this alone does not explain the entire gap in GVA per head between Wales and London.

[2] The difference between GVA per filled job or per hour worked and the per head measure suggests that the factors of unemployment and labour market inactivity can make quite a difference to the level of productivity for Wales. For other regions such as London, the South East and East, the inter-region commuting is perhaps more important; GVA is generated in a given region but employees reside in another.

Figure 1.1 - Productivity by region



Source: ONS (2006b)

Figure 1.1 shows that wide regional productivity differences exist across the UK. The core regions - London and the South East - have much higher levels of output worker compared to more peripheral ones such as Wales, Northern Ireland, the North East and Yorkshire and the Humber.

1.2 The business context of the UK

Nearly all businesses in the UK are SMEs (BIS 2006). SMEs are also an important source of employment and output for each UK region. For the UK as a whole, SMEs account for nearly 59 percent (or 43 percent for SMEs with employees) of total employment (BIS 2006). Regionally, a lot of variation exists; SMEs only account for 46.8 percent of employment in London – a core region. For Wales, a region of particular interest to this thesis and more importantly a peripheral one, SMEs account for over three-quarters of employment (77 percent), this is only second to another peripheral region; Northern Ireland (81 percent) (BIS 2006). The regional contribution of output by SMEs is similar to employment. Wales (62 percent) is again only second to Northern Ireland (80 percent) (BIS 2006).

Peripheral regions, such as Wales, are sparsely headquartered with very large firms. Core regions; London (and to a lesser degree the South East) is the most likely location of company headquarters for firms with 500 plus employees in the UK. Table 1.1 shows that London has around 15.6 percent of all businesses registered there within the UK but around 21.1 percent of all very large firms[3] . Combined with the South East, nearly 40 percent of very large firms in the UK are registered there. By contrast, a peripheral region such as Wales has around 4 percent of all businesses registered there but only 2.4 percent of firms with 500 plus employees.

Table 1.1 – Large firms in selected UK regions, 2005

Region	Number of firms	Percentage of firms in UK	Number of firms with 500+ employees*	Percentage of firms with 500+ employees in UK
London	675,795	15.6	620	21.1
South East	729,545	16.8	500	17.0
Wales	175,460	4.0	70	2.4
UK	4,342,045	100	2,940	100

Source: Adapted from BIS (2006)
*Numbers are approximate due to the aggregation of rounded numbers

Another indication of a firm's size is whether it is listed on the stock exchange. In doing so may also enable companies to access capital cheaply for business acquisitions. A regional dominance of listed firms may also indicate the likely location of SME acquirers. Wales, in particular, has relatively few firms listed on the stock exchange. London dominates the number of listed firms on the stock exchange. Around half of firms registered on the London Stock Exchange in November 2003 from Great Britain were in London[4]. This rises to nearly 60 percent when the South East is included. By contrast, Wales has around 1 percent, the lowest out of all British regions. Other peripheral regions, such as the North East, Yorkshire and the Humber, North West all have around 6 percent (Klagge and Martin 2005). In relation to the stock of VAT registered businesses, London and Scotland are both over-represented on the financial markets. The peripheral regions of Wales and the North West have the lowest percentages out of all the British regions of their VAT-registered

[3] BIS (2006) define enterprises (used interchangeably here with businesses or firms) as; '*a legal unit, person or group of people producing goods or services under their own control and with their own legal identity. A branch or office of a larger organisation is not in itself a business*'.
[4] These figures are now a little dated but it is unlikely that the regionally distribution of firms has changed much over time.

businesses listed (Klagge and Martin 2005). An alternative method of measuring size for listed companies is market capitalisation. The average market capitalization of businesses registered in London and the South East, the core location in the UK, in late-2003 was £0.9 billion but only around £0.1 billion in the North West and Wales (Klagge and Martin 2005)[5].

It is apparent therefore that peripheral regions' economies, with lower productivity, are relatively more dependent on SMEs than core regions. The number and proportion of listed firms on stock exchanges, the size of these firms and the number of large firms altogether are all higher in core regions. For Wales, a peripheral region, further evidence suggests the productivity differential between SMEs and larger enterprises is greater than the UK average (Foreman-Peck et al. 2006, p. 309 Table 2). This suggests that at least some of productivity gap between core and peripheral regions is within the SME sector.

1.3 Overview

There are three theoretical elements in the regional SME takeover model of this thesis that must be distinguished. The first is the market for ownership and control of enterprises, the second is how the operation of this market might differ between SMEs and large firms and the third is the spatial dimension of the market.

The market for ownership and control determines takeover chances and the likely characteristics of acquired firms. The next set of relationships determines what happens to the target enterprise after acquisition. This element involves the chances of acquired businesses being stripped of assets and closed down, and the effects of takeover on survivors' productivity and therefore profitability.

Q-theory (Jovanovic and Rousseau 2002) predicts a inverse relationship between the chances of takeover and productivity. The relationship with regards to takeovers and exit chances is potentially ambiguous. In the case of a 'white knight' acquisition, a target short of liquidity may be saved from bankruptcy; reducing the chances of exit.

[5] These data are before the more recent falls in the stock market, so all firms are now likely to be valued far lower. More recent estimates show that Wales, out of all the GB regions, has the least number of firms listed on the stock exchange with a value of over £1 billion (David 2008).

But more likely the predator merges the targets assets with its own group and the independent existence of the acquired firm is ended, producing a positive relationship; takeover boosts exit chances. If the market works well, acquired firms that remain open achieve higher productivity and profitability under the new regime. However, acquirer ignorance and incompetence could accomplish the opposite, discussed below.

SMEs differ from large firms. Information, the costs of funds and general resource availability, coupled sometimes with family ownership, may mean the market for ownership and control of SME could work rather differently. On the supply side, SMEs are typically not publicly quoted or have shares that are not widely held so they cannot be sold against the wishes of management. On the demand side, a higher cost of finance for small firms, caused by information problems due to their size and the higher chance of failure, increases their discount rate (Cowling 2007). This reduces their valuation of future profits relative to that of a large firm with a lower cost of capital. Consequently this thesis contends that productivity would positively predict takeover for SMEs, the opposite of Q-theory.

As far as the other relationships are concerned there might be more questions about the acquirer's decisions, given that they are unable to stimulate innovation themselves. So they may lower productivity and profitability after acquiring the SME target, assuming they have not closed it. On the other hand the acquirer will certainly boost its own productivity and profitability so that the sum for the two firms is greater than the parts - assuming the market works.

Turning now to the spatial dimension of the market for SME ownership and control, peripheral regions differ in a number of ways from the core. The New Economic Geography (NEG) provides a framework to explain spatial differences in income levels and core-periphery outcomes (see for example Krugman 1991b; Krugman and Venables 1995). Thicker markets and agglomeration enhance the profitability of core locations in NEG models so that relocation to such regions is attractive for many

enterprises (Baldwin and Okubo 2006)[6]. Therefore after takeovers, there are incentives to move and employ the assets of a newly acquired, productive firm in the core. Financial and political power and information also may be stronger in the core and this might have spatial economic implications. Large companies, more probably interested in acquisitions, are likely to be headquartered in the core.

The impact of the SME market on regional development not only depends on the type of firms that are acquired but also on the effects of takeover. NEG suggests probable adverse distributional consequences for periphery regions, even though the overall impact on the national economy is beneficial. After takeover, an enterprise may be stripped of its assets and closed, or its headquarters functions may be integrated with the acquiring firm, and the target operated as a branch plant, or investment may be pumped in to improve performance.

The above theory of the regional market for SME ownership may alter the described relationships above. Unlike large publicly quoted firms, more productive small businesses are more likely to be acquired. Whether the acquisition targets subsequently improve in productivity relative to what they would have done, or whether they cease trading after takeover when they would not otherwise, could have an impact on regional economic development, and productivity differentials, harmful or beneficial. The effects interact with the process of selecting targets. Low productivity selection and subsequent closure would boost productivity. High productivity selection in the first relationship and closure could lower productivity[7]. The overall effect depends also on the benefits of the takeover to the acquirer. In order to favour the NEG centripetal hypothesis (and perhaps not unreasonably) acquirers are assumed to be located outside the periphery, in the core.

[6] This also is consistent with a sorting effect, where highest productivity firms move to the core and lowest move to the periphery.

[7] This ignores the dynamic that acquisition may generate capital that may enable an entrepreneur to generate a further start-up. For this to have any effects on the welfare or productivity of the region would imply that start-up occur in the same region where the acquired firm operated. To incorporate this requires data that contains businesses and takeovers that can be linked to entrepreneurs and their activity following a departure from a firm. This is not available in the UK.

1.4 Structure

I begin with the first the literature survey (chapter 2) that explains why firms, especially small ones, are acquired. The theory addresses both the profitability of acquirers (the demand side) and the incentives for owners to sell (the supply side).

The second literature chapter (3) concerns the effects of acquisition. This involves how takeovers both affect the likelihood of a firm closing - exiting - and impact on performance.

Chapter four is a review of the relevant theory and literature that explains spatial productivity within new economic geography models and how core-periphery equilibrium may occur, consistent with regional productivity data in Great Britain. Within this context, takeovers - especially those involving small firms - are explored in terms of the types of firms involved, where they are located and what their effects are likely to be.

Chapter 5 introduces the framework and model which are used to estimate both the determinants of SME takeovers and the impact of these acquisitions on the regions in which the targets are located. A number of hypotheses are then formed which relate to the acquisition of SMEs and their regional productivity effects. These are then tested in the subsequent empirical chapters.

The sixth chapter discusses the data used in the thesis. It defines the variables and provides some summary statistics of the main variables used in the analysis. The dataset, the Business Structure Database (BSD), is newly complied by the ONS and can only be accessed via their Virtual Microdata Laboratory[8]. It allows takeovers to be identified using a similar definition to that of Singh's (1971) seminal work.

[8] The data enables analysis to be conducted at a regional or sector level. However, it uses the standard industry classification (in this instance the 1992 SIC version) which emerging industries, by definition, are usually not yet defined suitably in. This is not a problem here as I am most interested in the aggregate effects of takeovers and not their processes within certain sub-sectors.

The seventh chapter is the first of four empirical analyses that use the BSD. It estimates equation 1, above, concerning the productivity and other characteristics of acquired small firms.

The second empirical chapter (8) looks at some of the consequences of takeover: exit and relocation; equation 2. If acquisitions of small firms have differential effects depending on the location, then the rate of takeover-exits (and –relocations) is likely to vary by area. This is explored by considering the effects of acquisitions on the chances of exit and relocation one year after takeover.

The third empirical chapter (9) concerns the last equation (3); the productivity performance effect of SME acquisitions. This looks at what, if any, effect acquisitions have on small firm employment and productivity and if this varies by regional location.

The last empirical chapter (10) estimates the total effect of SME takeover targets on regional productivity. This brings together the three equations; using the estimates from the previous chapters of takeover effects on chances of exit and productivity to produce an aggregate impact, weighting firms so that the relative importance of larger SMEs on regional economies is accounted for.

The final chapter (11) brings all the findings together and suggests appropriate policy responses. I begin by discussing the theory and literature relating to takeovers and why small firms are acquired.

Chapter 2 - The Motivation for SME Takeovers

2.1 Introduction

Why takeovers may occur at the micro-economic level is discussed in this chapter. It involves both the sources of demand, especially for productive small firms, and also the supply side - why these firms might accept takeover. Traditional theory of takeovers focuses on the effects on market power of profit-seeking acquiring businesses. Given their size - and hence generally small market shares - it is likely that SMEs are bought mainly for other reasons. Grounds for small business takeovers are explored, developing established models that look at M&As more generally.

Almost all firms are likely to start off small, perhaps as micros (with employment of between 1 and 9), growing into larger firms if they survive. Some medium[9] sized firms are believed to fail to grow into larger firms because of takeover by larger companies (Dunne and Hughes 1994). Small firm constraints such as finance and management are also suggested reasons why high-tech UK SMEs fail to become 'international players' and instead sell out to larger firms (Cosh and Hughes 1994, p. 285).

Merger or acquisition are possible solutions to financial and other growth barriers for firms (Mason and Harrison 2006). Larger businesses may provide smaller firms resources to aid their development or enable owners to cash-in on their equity. Therefore any form of M&A might be attractive for SME owners.

Small firms are particularly vulnerable to problems caused by asymmetries of information. The available information about a firm is likely to be a function of size and perhaps also age. Akerloff (1970) illustrates how markets can fail due to a paucity of information. In the context of businesses, this means that agents trying to find out more about a firm are unlikely to be able to assess a business adequately. This has implications for takeover and finance separately, the latter also potentially affecting the former. If potential acquirers know very little about young, small firms, it is likely

[9] Medium here is considered to be a lot larger than the definition used within own study but the premise remains the same.

this will be reflected by a limited demand for these firms. Also finance might be restricted, offered at a higher rate or both.

The section begins by establishing that SMEs are unlikely to be publicly quoted and that takeovers in the main will be 'friendly'. The types and determinants of M&As are then discussed. The types of takeover include horizontal and vertical. Determinants include complementarities, R&D and the relationship with productivity. The demand effect of finance is also discussed. The review then turns to the supply of SMEs in the market of their corporate control. This includes issues of small firm management succession, converting personal stock, capital gains and entrepreneurial recycling and access to finance.

The empirical evidence discussed in this review is mainly qualitative in nature, similar to the other issues discussed (e.g. whether targets are more productive and whether takeovers are beneficial – see next chapter for the latter). It is more appropriate to discuss the direction of any relationship between studies rather than their size as there is no consensus in the literature on many of the issues discussed. The scale of the effects between studies is also expected to vary because of the different time periods, types of firms and countries examined. As the review focuses on studies of all sizes of firms and plants, any important differences in findings across the studies will be highlighted, especially those that may suggest differences between the large and small firm sectors. This should help to illuminate the market for SME ownership.

Important differences exist between large firms and SMEs that must be highlighted from the outset.

2.2 SMEs, non-public quotation and 'friendly' takeovers

This review concerns SMEs and does not address any of the issues that directly relates to large firms. Very little is known about the acquisition activity in the small firm sector (Small Business Research Centre 1992). Most studies of the causes and effects of M&As tend to look at larger, listed firms. Cosh and Hughes (1994) found that,

because of data and methodological problems, smaller businesses are neglected in the M&A literature. Since they wrote fifteen years ago, the situation has changed little.

Most small firms are assumed to be the target of takeovers and not the acquirer. This does not mean that small firms never engage in buying other firms but this thesis, along with much of the literature (discussed below), assumes smaller firms are the targets, being acquired by (relatively) larger ones. This is also the definition that Singh (1971) uses in his seminal work. Some theory does not allow acquirers and the acquired to be disentangled, for example, Cournot models (discussed below) look at the sum of profits from the two newly merged firms. Therefore, generally the literature on acquirer's performance is primarily about large firms and so is considered beyond the scope of the thesis. However, it can be assumed that on average acquirers gain from takeovers, or are at least made no worse-off by them, otherwise they would have no incentive to engage in such activity. This is discussed more below with the effects of mergers on market power.

The takeover literature contains much research that looks at the impact of takeovers on large firms uses event studies to measure the effects, or more specifically stock returns (for a review see Caves 1989). This literature is also not relevant as it can be safely assumed that almost all SMEs are not publicly quoted; most are likely to be very small – micros. Also, the main interest of this thesis is the effects that takeovers may have on regional economies, particularly productivity and, to a lesser degree, employment (see next chapter).

Acquirers may also have incentives to purchase privately held businesses relative to publicly listed ones. Evidence finds that acquirers of private firms perform better than if they purchase a public one (Capron and Shen 2007). This is because of a discount in the acquisition price. Relative to a public firm, the market for a private firm is likely to have few potential acquirers and so the price may not be driven-up in such a way as acquisitions within public markets[10]. This is caused by the lesser availability of information of potential targets. Information asymmetry can also induce a private firm discount, similar to that described by Akerloff (1970). The uncertainty of returns

[10] The cost of capital might also be higher for non-quoted firms, this may also reduce the selling price.

from a potential target may drive the price down within the market for privately held firms. This could lead to the breakdown of the market. However, acquirer's might be enticed into the market if they have private information, reflected in their valuation of the target[11].

Another implication of SMEs not being publicly listed companies is that takeovers can be considered to be mostly voluntary rather than hostile. With publicly listed firms, differences are identified between the targets of voluntary and involuntary takeovers (Singh 1971) and also between 'friendly' and 'hostile' acquisitions (Powell 1997). If the manager generally owns the equity, or at least is the majority shareholder of the firm, buyouts need to be agreed with the owner-manager or require their permission to contact shareholders.

A final implication of assuming the vast majority of SMEs are not publicly quoted is a restricted supply of equity-based finance - a potentially important source of finance for large firms. This and other financial implications for SMEs are discussed later in the review. To understand why SMEs are acquired and why other firms may want to engage in such activity, I next discuss the determinants and types of M&As.

2.3 Types and Determinants of Takeovers

Acquisitions are motivated by a potential acquirer expecting to gain a higher rate of return or valuing differently a (discounted) future profit stream than the present owners. The former could occur from the new owners believing they can run the firm more successfully, improving its performance after acquisition. The latter may occur if expectations differ between the present owners and potential acquirer, similar to what occurs in publicly quoted firms and stockholder's expectations[12]. This divergence of expectations between buyers and sellers may result in takeover (Hughes et al. 1980). This may stem from differing present valuations of the same future profit stream. This can occur from differing access to finance between firms. A lower discount rate may result from accessing cheaper credit at a lower interest rate; this

[11] Conditions exist when acquiring a publicly quoted firm might be more profitable otherwise all transactions of this kind would only involve privately owned firms (see Capron and Shen 2007, p. 897).
[12] It is also possible that with voluntary takeovers, both parties are of the same opinion that new owners can generate higher returns.

would allow for two different valuations of the same expected future profit stream. If evidence shows that finance is cheaper, or more available, for larger firms, this may create demand for smaller firms. Larger firms may then find bargains among highly productive small firms, but not among the productive large (Caves 1998). Perhaps with larger firms it is the relatively poor performers that are more likely to be acquired, allowing better management to utilise their capital more productively (Jovanovic and Rousseau 2002). This could also result in asset stripping; removing or absorbing the assets of the acquired firm and putting them to a more productive use.

The growth potential of a firm may also help to match firms with an acquirer. Firms with the potential for growth but lacking the ability due to inadequate resources or liquidity constraints may be matched in the market with a larger firm that can offer the resources for the firm to expand and grow. This is sometimes referred to as growth-resource imbalance and has been investigated in quite a few studies (Alcalde and Espitia 2003; Barnes 1999; Palepu 1986; Powell 1997).

Market power and costs will have an impact upon profits, depending upon the type of M&A. The three broad categories of M&As are horizontal, vertical and conglomerate. The first two are most relevant to the market for control of SMEs[13]. However, it is likely that market power is much less of a consideration in the acquisition of SMEs. There is likely to be a degree of market power that exists between different sized firms and it is possible that some small firms have some degree of market power, especially if they operate in specialist or local markets. However, the extent of this and the incentive for larger firms to acquire SME due to market power are likely to be limited. It is more likely that the acquisition is undertaken because the target could be a serious rival once it has grown more or due to the technology or assets (including intangibles) it possesses (Gilbert and Newbery 1982). Therefore looking at horizontal

[13] Conglomerate M&As are when two firms merge, or a firm is taken-over, but they operate within unrelated markets. This is not likely to affect either the market power or efficiency of the firms. Therefore sales, price, output and profits are likely to be unchanged. There is little incentive, particularly with SME, for acquisition. Therefore there is less reason to expect market power or cost efficiencies to change a result of mergers with firms in unrelated markets. Diversification is perhaps one of the most compelling reasons for such takeovers. However, it is not clear how much protection from industry or cyclical risk an acquirer may receive by investing in a small firm that is in an unrelated market.

and vertical M&As, next I consider the incentives for firms to acquire small firms and concentrate on their effects on costs and complementarities.

2.3.1 Horizontal M&As

Quantity setting competition models

Horizontal M&As involve the coming together of two firms in the same industry. These can be modelled with Cournot and Stackelberg models. As acquisitions involve small firms it is highly likely that they are not wholly concerned with market power. SMEs are unlikely to have any significant market share and acquisitions on this premise are more likely to involve targeting those firms that may have the potential to become competitors. Also, if the concern with takeovers is within the context of New Economic Geography (NEG) models (introduced in chapter 4), the assumptions of perfect competition may not apply. However, either way, analysis that only concerns the incentives for firms to merge solely due to the effects on market power, such as Cournot models (for example, see Salant et al. 1983), do not apply here. It is more likely that they will affect costs and so this section concentrates on only the relevant application of horizontal M&As in Cournot-type models. As the market power of small firms is assumed to be minimal, it is likely that the potential profits that the following models suggest will only be strengthened as most assume a degree of market power which tends to reduce the profitability of mergers and takeovers.

Another key trait to this area of literature is that mergers and takeovers can display losses to the firms involved but yet be profitable to those that are not engaged in the activity. This is not a satisfactory result. First, it provides a disincentive to acquire others firms. Second, it is in the firm's interests for its competitors to merge. These two outcomes are not desirable with the classical assumptions that firms merge to increase their profits and this, at least weakly, may cause losses to other firms. Therefore any model that is tractable for the SME market should not also have these side-effects.

Mergers are more likely to be profitable (for merging firms) if they also result in some form of cost advantage. In an extension to the literature concerning Cournot models (and therefore the effects on market power), Fauli-Oller (2002) uses constant marginal costs but allows them to vary between firms. With this specification,

mergers are profitable if the relative size of merging firms is quite different and the possibility of cost savings is high. This is because the model allows production to be transferred away from the high cost producer. An extreme case is when the high cost producer is shutdown post-merger.

Extending the ideas of Fauli-Oller (2002), it is possible that large and small firms may have differing costs, where small dynamic firms are efficient and low cost. Firms with lower marginal costs in a standard Cournot set-up produce a larger proportion of total output. It is not possible to model low cost firms as the small entity simultaneously within a standard Cournot model[14]. Therefore this particular set-up – a horizontal merger with quantity-setting - is not consistent with small, efficient businesses being taken-over; the premise of this thesis. This last extension by Fauli-Oller is also not very applicable as it implies that high cost firms are ultimately shut to the benefit of the larger, acquiring firms. The line of enquiry for this thesis is more concerned with whether smaller, more productive firms, and hence low cost producers, are targeted and then perhaps shut. Therefore it is perhaps more likely that SMEs are acquired because they have assets that lower the costs of production for large firms. I return to this later when I look at vertical mergers.

Horizontal mergers are unlikely to be symmetrical. Acquired firms are small and, concentrating on takeovers, then implicitly the acquiring firm is likely to be larger. A way this can be modelled is by postulating a leader (large firm) and follower (small firm), as in a Stackelberg leadership model of quantity setting (not simultaneously as in Cournot models).

The Stackelberg approach is perhaps a more realistic setting for the SME hypothesis. Within the model it can be shown that mergers are profitable if leaders are assumed to be the acquirers and SMEs are the followers (Huck et al. 2001). The new merged firm produces the same quantity as the leading firm prior to the acquisition and the follower effectively disappears. The benefit from a merger occurs from a sufficient price increase, resulting in the (integrated) follower's value exceeding that if it was not acquired. Mergers are profitable despite the acquisition not resulting in an

[14] This model, assuming that smaller firms are more efficient, does not assume economies of scale exist – inconsistent with models of New Economic Geography, introduced later in this thesis.

increase in the size of the dominant firm (measured by quantity). The new composite firm produces the same quantity as before but the price increases, compensating for the losses from the decrease in the joint quantity of production[15]. Mergers between two leaders or two followers (perhaps small firms) can also be profitable if the cost schedules are sufficiently convex - they display diseconomies of scale (Heywood and McGinty 2007).

However, in Stackelberg leadership without diseconomies of scale (convex costs), a free-rider type problem occurs (as it does in most other horizontal merger models) – firms not merging experience a positive effect in their profits. Although it is still profitable to engage in acquisitions, it is also advantageous not to, as profits still increase. This free-riding result is removed if both diseconomies of scale and leadership industrial structure are included (Heywood and McGinty 2008). This is because one possible outcome of the merger is for the post-merger price to fall, penalising outsiders (Heywood and McGinty 2008).

Perhaps more relevant for SMEs is when the acquired firm does not 'disappear' or become fully integrated to the firms but acts as a subsidiary of the acquirer. This is demonstrated within a Cournot type set-up with linear costs (Huck et al. 2004). This turns the set-up into a partial Stackelberg, with effectively a 'partial Stackelberg leader' and a 'partial Stackelberg follower'. The new headquarters of the integrated firm dictates the timing of decisions. This occurs as the information within the newly merged firm is assumed to travel more swiftly, without barriers and act as a commitment device on the acquired's output level, unlike when they are competitors. Firms pre-merger act according to a Cournot set-up but subsequently act according to Stackelberg agents post-merger. More generally, the results of this model are also relevant and consistent with the general assumptions of M&A activity in that mergers are only profitable for those engaged in the acquisition and not all other firms. This is important as it is an outcome that is observed to occur for both the firms involved and those outside of the acquisition or merger.

[15] The incentives for two dominant firms or two subordinate firms to merge are limited unless the former join to create a single dominant firm (similar to a Cournot set-up result).

Another relevant extension of the quantity setting models for the acquisition of SMEs is a two-game set-up, where firms first compete on R&D and then on quantity in the product market (Davidson and Ferrett 2007). Investment in R&D is assumed to help in the private process of production, reducing the marginal cost of production without any spill-overs. The incentives for mergers result from R&D complementarities that can ultimately aid production. Large synergies in R&D increase the incentive to merge. The gains from R&D can overcome any potential losses from the merger, as found in the original quantity setting models (e.g. Salant et al. 1983). Two stages are assumed: first firms choose how much to invest in process R&D, and second, compete in product markets by choosing how much output to produce. In Cournot competition, R&D and the market power result have the opposite effects for the gains and losses to insiders and outsiders. For merging firms, the more R&D complementarities, the larger are the gains to insiders and therefore the losses to outsiders. An important and attractive feature of this model is that profitable mergers are not the result of market power or reliant on a leader-follower structure. In a quantity setting model, this outcome of profitable mergers; driven by R&D complementarities, is an attractive one for the acquisition of SMEs.

Price setting models and Bertrand competition

All of the models introduced so far have analysed the effects of horizontal mergers based around quantity setting competition. Quantity-setting models could be considered more of a long term decision and perhaps of more relevance, especially in the short-run, are models that allow for price-setting competition instead.

When price is used as the strategic variable mergers are profitable for insiders (Deneckere and Davidson 1985). However, this model does not remove all of the unusual features of horizontal mergers with quantity setting models. If outsiders still gain the most from mergers, this does not explain why mergers occur. Firms are better off being an outsider, even with price setting models.

Bertrand competition has also been applied to the Davidson and Ferrett (2007) model where firms compete on both R&D and product markets. In this model it is uncertain whether outsiders lose out from a merger with this form of competition as it depends on the degree of R&D complementarity within the merger. However, competition in

both R&D and product markets do result in outsiders not benefiting more than insiders, unlike other Bertrand set-ups. With this model it is optimal to be involved in a merger, providing a motivation for them to occur rather than a firm opting to be an outsider where formerly the profits were higher.

In summary, models with more complex set-ups than the standard Cournot quantity setting models are more relevant to the acquisitions of SMEs. These show that mergers are profitable for those firms directly involved; a more plausible representation of reality. An example of such a model is one that has a dominant and follower set-up. However, some of the assumptions of these models are sometimes questionable such as diseconomies of scale. These may not apply, at least at the SME scale[16]. They also result in profits for those that do not merge; an undesirable outcome. Non-merging firms are not found to benefit if mergers yield R&D complementarities. This suggests that acquirers and small firms that are acquired may be made better-off by takeover. This is possibly the most realistic and plausible result for small firms that arises from this area of literature. It suggests that small firms are involved in horizontal acquisition as they are able to offer their acquirer assets, perhaps intangible ones, such as R&D.

Next I look at an alternative form of acquisition – vertical M&As.

2.3.2 Vertical M&As

When a large firm acquires an upstream firm (backward integration), the latter's sales disappear. If no effects on market power occur or costs are obtained by the upstream acquisition, this will not affect the final product's price, or the sales and profits of the acquirer. Profits are simply the sum of the two firms prior to the acquisition. However, if the acquisition improves the efficiency of the downstream firm, it may result in a lower price and an increase in output (Hughes et al. 1980). This could result in an increase in profits, providing an incentive to engage in such activity and therefore a realistic scenario for explaining M&A activity.

[16] Also, they are not fully consistent with NEG models – see chapter 4.

Vertical M&As involving SMEs may provide a useful way for larger companies to reduce their costs. Perhaps the SME is of some use to the acquirer if they have a complementarity such as R&D, as observed in the quantity setting models (where acquiring firms is a profitable activity even above their effects on market power). Improving the efficiency of the acquirer as a result of the acquisition may increase the profitability of a merger for acquirers thereby providing a rationale for M&As to be initiated, removing the incentive for other firms not to engage in such activity. For vertical M&As, it can be shown that acquirers and the acquired can be made better off by takeover.

2.4 Intangibles and Complementarities

The previous theory has suggested that most of the benefits from merger are likely to occur from enhancements to the supply side of the firm (as opposed to effects on demand due to market power). The benefits from M&As may stem from R&D complementarities (as modelled in Davidson and Ferrett 2007) or reductions in the marginal costs of production (used in Heywood and McGinty 2007, 2008; Perry and Porter 1985) through other intangible assets.

Intangibles are increasingly being seen in economics as key to both regional (see chapter 4's NEG review) and business level performance:

'*The use of intangible assets (which can be defined as knowledge embodied in intellectual assets, such as R&D and proprietary know-how, intellectual property, workforce skills, world-class supply networks and brands) is recognized as a key (some say the key) driver of enterprise performance and thus ultimately aggregate productivity and growth.*' (Harris 2008, p. 16)

There are two main ways such assets can be accumulated in firms. The first is by internal investment and the second is to obtain it from an external source such as firm acquisition (Hall 1988). There is a recent growing literature that view M&As as a means to transfer and obtain new technology or assets such as management, (Ahuja and Katila 2001; Cassiman et al. 2005; Cloodt et al. 2006; Colombo et al. 2006; Hussinger 2010; Lehto and Lehtoranta 2004). This is pertinent for the acquisition of SMEs, as takeovers are a means to allow externals (this can be external to the market the region, or even the country e.g. FDI) to acquire assets, technology, human capital or R&D from firms (Howells 1990). Takeovers can also improve the technological

performance of the acquiring firm (Ahuja and Katila 2001). Thus multinationals (or other external firms to the region perhaps) are on the lookout for such suitable small purchases (Dahlstrand 2000, p. 176).

Complementarities between the acquired and acquirer may yield economies of scope and scale. Efficiencies from joint production with other goods or services or synergy-combined production can result in a reduction in average costs, increasing profits. Corporate level synergies creating value are said to include technology, capital, R&D, competing manufacturing, after sales support and marketing (Cassiman et al. 2005; Chapman and Edmond 2000; Tecce, 1986 in Colombo et al. 2006, p. 1166; Granstrand and Sjolander 1990; Yavitz and Newman, 1982 in Harrison et al. 1991, p. 175). These can all help to produce synergies via '*specialized complementary assets*' (Colombo et al. 2006, p. 1166).

For example, with vertical M&As, a large company with the marketing expertise for a small enterprise's output would involve the downstream acquiring the upstream firm. However, for this to be a profitable action it requires the acquisition to improve the efficiency of the downstream firm[17]. Conversely, national firms with marketing outlets already established, and perhaps selling some foreign MNE products, might be bought by the larger upstream business.

The degree of 'relatedness' matters between the acquirer and acquired (e.g. Singh and Montgomery 1987). Relatedness in technology increases R&D efficiency (and the opposite is also true), which is likely to result in an improvement in overall performance. The degree of technological relatedness is especially important with the acquisitions of SMEs (Hussinger 2010). This is due to the advantage of insiders. Acquirers inside the technology's industry or product market of the target are likely to be more aware or have access to more information on the (potential) value of a target (Capron and Shen 2007; Shen and Reuer 2005), especially SMEs (Howells 1990). This helps to overcome the standard (lack of) information problems associated with acquiring SMEs. However, moderate levels of relatedness are found to be most optimum (Ahuja and Katila 2001; Cloodt et al. 2006), as competing firms are judged

[17] Alternatively, the upstream firm may have market power. However, given that the upstream firm is assumed to be an SME in this example, the firm is small and likely to have limited market power.

to accrue too few technology gains from mergers (Cassiman et al. 2005). M&As not related to technology can be harmful on the innovativeness as they are considered to be 'disruptive' (Cloodt et al. 2006).

Differences between firms may also be attractive, especially for low R&D intensity acquirers (Harrison et al. 1991). A reduction of internal R&D by acquirers might result in high R&D firms being targeted by firms that lack 'intrapreneurship' (Baumol 2004). Firms may seek more dynamic, entrepreneurial and smaller firms for acquisition. Acquisitions may serve as a substitute for in-house innovation and R&D (Blonigen and Taylor, 2000, in Dessyllas and Hughes 2005, p. 1; Hitt et al in Harrison et al. 1991, p. 179). More inventive capabilities of SMEs relative to larger firms mean that the former often become attractive to larger firms (Alvarez and Barney 2001). Empirical evidence also suggests that innovative, fast-growing businesses are more likely to be bid targets (Cosh and Hughes, 2003 in Cosh et al. 1996; Mason and Harrison 2006) and for small privately owned firms, patents increase the chance of foreign M&A (Ali-Yrkko et al. 2005)[18] [19].

Therefore intangibles (such as R&D expertise) are likely to be what acquirers seek. This may improve the profitability of takeover for the acquirer, target, or both. For example, most technology-intensive SMEs in Sweden have been found to be eventually acquired (Dahlstrand 2000, p. 176). But these intangibles are also likely to make a difference to firm performance (hence their ultimate desirability). Therefore targets under such a motivation are also likely to be highly productive.

2.5 Implications for Productivity

The previous sections have indicated that for acquisitions to be profitable, they are likely to involve firms that can offer a cost advantage or R&D complementarity. These are likely to be a type of synergistic merger and imply that targets are likely to be better performing and provide additional value to the acquiring firm. This may

[18] This might be due to the disclosure of information being made available to the wider market that exposes the firm to an increased chance of foreign takeover, as domestic M&As are not found to be associated with patents. However, this finding may still apply for larger distances or cross-region M&As. This suggests that there might be different processes between cross-border and intra-national takeovers. This is not explored in this review.

[19] I discuss in more detail the characteristics of firms that actually are engaged in takeovers later.

imply that suitors target the relatively more productive firm or plants to complement the acquirers existing assets. Acquiring, larger, firms might then be better positioned to exploit these assets, perhaps with the aid of its own resources such as finance. Therefore for smaller firms, more productive ones are targeted where acquirers can offer resources, such as finance described above, to aid the development of an already successful, perhaps innovative rich or R&D intensive, firm (Caves 1998).

The theory that productive small firms are the target of acquisitions, due to their R&D or other attractive assets, suggests that the motivations for acquisitions of large and small businesses may vary, similar to that documented for plants[20] (McGuckin and Nguyen 1995). For larger firms, takeovers may target poor performing units with a view to improving performance. Consistent with this is the theory of 'disciplinary mergers' (Nguyen and Ollinger 2002). This can be also referred to as the neoclassical view of M&As. The return to acquiring a relatively poor performing firm is making more efficient and profitable use of the target's assets, rectifying present performance for an expected future profit. Poor performance may also lead to a lower price compared to what an acquirer values the target once operating more efficiently, stimulating demand for the under-performing firm. A firm that is believed by acquirers not to have its productivity and future returns rectifiable will not be demanded or ultimately acquired. This market mechanism is disciplinary because the threat of it may provide an added incentive for managers to maximise the returns of the business or they could be replaced by others that will. This theory assumes a divergence of ownership and management that is less prevalent in the small firm sector.

An extension to this, the Q-theory of takeovers (Jovanovic and Rousseau 2002) implies that acquisitions can act as a means of transferring capital to better management or projects. When the stock market value of the firm exceeds the replacement costs of assets, expansion by acquisition, as well as by organic growth, is profitable. High-Q firms are assumed to then acquire low-Q firms. Smaller firms are typically not quoted on stock markets. Their equity is less liquid and information

[20] Many theories come from areas of industrial economics that are not just concerned with firms but also differences in the performance of plants within firms. These are still relevant to SMEs as the mechanisms within the market for corporate control are considered to be similar.

about assets and prospects typically less readily available. Consequently they are unlikely to be targets if performing poorly.

A further extension to this is 'matching' in a more general sense. This is when a target firm's productivity is low, or at a level below the suitor's judgement of its potential, a takeover is more likely to occur. Acquirers seek to buy a firm if it believes that the present owner is causing the target to under-perform. Efficiency can be improved post-acquisition with new owners installed, yielding a higher return on the investment (Lichtenberg et al. 1987). This is similar to the matching models used in some areas of Labour Economics. Matching is random, so a 'bad match' can occur between a firm or plant and its management, generating a low productivity outcome. The assumption here is the independence between 'good' and 'bad' outcomes – in reality it is possible for some owners to always have inefficient outcomes. Therefore acquisitions are assumed to be a market mechanism that helps produce a more efficient outcome, where firms are ultimately matched with appropriate managers. Takeovers here are assumed to be an important process of an efficient market given managers and firms are more able to match with them[21].

A development of this model that applies more directly to small businesses takeovers is described by Holmes and Schmitz (1995, 1996). They introduce a quality of match characteristic between the business and manager. Successes not only depend on the match but also on the quality of the business. The quality of the match and business are important for business turnover; low quality matches end in failure but businesses that are sold tend to be of a high quality – perhaps exhibiting high productivity.

Alternatively, productivity may act as a signal to potential acquirers. Low productivity may be a sign of inherent problems within the target firm (Wheelock and Wilson 2000). If productivity acts as a signal, acquirers will seek more productive firms and takeovers involving firms with low productivity would not be observed. This theory would apply to both large and small firms alike. However, it is perhaps particularly relevant for small firms, where information might be opaque and any

[21] Despite the role that takeovers may have in matching managers and firms, equilibrium can exist with firms that have similar technology to other firms but have productivity below the average level of the industry. This is because there are (transaction) costs in purchasing firms. In this market there is also incomplete information on the true level of productivity of plants.

signs or signals of a small firm's quality, potential or assets it posses might be acted on by acquisition[22].

2.5.1 Takeover-Productivity Relationship: Empirical Evidence

The above theory suggests that there are a few reasons why a negative relationship between productivity and chances of takeover are found in the empirical literature. However, most of these apply more to large firms and for smaller firms it might be the case that this relationship is positive. This section reviews studies that report on the relationship of ex ante productivity and M&As, highlighting any variation by size[23].

Productivity has a positive effect upon the probability of being acquired according to many studies (Harris and Li 2007; Harris and Robinson 2002; McGuckin and Nguyen 1995; Nguyen and Ollinger 2002; Tsagkanos et al. 2006). This relationship is also found to be robust across (relative) labour productivity, with both value added and turnover output measures, and total factor productivity (TFP) all using a sample of plants that are mostly less than 250 employees (McGuckin and Nguyen 1995).

A negative relationship with productivity and the probability of domestic takeover is also found in a few studies (Lichtenberg et al. 1987; Maksimovic and Phillips 2001; Siegel and Simons 2006). However, a couple of these studies (Lichtenberg et al. 1987; Siegel and Simons 2006) both use datasets that contain a high proportion of large plants or firms. This is suggestive of the differing effects larger firms or plants may have on the relationship of productivity and takeover.

A productivity-takeover relationship that varies with size is reported in the literature but this does appear to vary between studies. The inclusion of a size-productivity

[22] As well as varying by size, the productivity-takeover relationship may alter across different sectors. Harris and Robinson (2002, p. 563) provide a theory why this might be the case. They cite Vernon's (1966) Product Life Cycle theory to imply firms in more mature industries, with lower growth rates and less competition, are more likely to exhibit the acquisition-productivity relationship suggested by neoclassical theory – lower productivity yields a higher probability of acquisition. The purpose of the acquisition is to improve the management and technology, increasing productivity and also profitability, similar to the scenario laid out for larger firms above. For newer industries, the reverse is assumed to be true – more efficient firms are targeted as they may have better prospects for future growth and a higher expected future profit stream.

[23] I include studies that look at establishments or plant acquisition.

interaction, with a sample dominated with plants of less than 250 employees, finds the productivity-takeover relationship increases with size (Nguyen and Ollinger 2002). However, the reverse has also been found. Takeovers are associated with plants with above average productivity but reversed for large, 250 plus employees, plants (McGuckin and Nguyen 1995). These findings suggest the productivity-takeover relationship might be different for the SME sector (firms with less than 250 employees) and large firms. If so, this would suggest that different processes are at work for large and small firm acquisitions.

Productivity (when measured as TFP) can also act as a proxy for profits[24]. Small but profitable companies are typically found to be takeover targets (Ravenscraft and Scherer 1987b, 1989). The smaller the firm targeted, the more profitable it is relative to its industry. In another study looking at both privately and publicly traded firms, acquired firms are found to have profits above their industry average (Matsusaka 1993). Private firm targets are also found to be even more profitable than their public counterparts, even accounting for size differences. For small private companies at least, it is found that acquirers appear to purchase the 'stars'.

2.5.2 Takeover threat and the 'Ashenfelter dip'

An issue for takeover analysis, as identified by Lichtenberg (1992), is that the mere threat may lead to a change in productivity. This effect could bias (upwards or downwards) estimates of the impact of takeovers. Firms that anticipate takeover may alter their performance. If takeover is a form of 'treatment' for the acquired firm, then any ex ante effect of takeover is the same as the 'Ashenfelter dip' (Ashenfelter 1978). The 'Ashenfelter dip' was observed when training programmes were assessed in terms of their affect of earnings. It was observed that people's earnings fell prior to enrolling on a training course. As the extra human capital was assumed to add to future earnings, estimates were over-estimated due to the negative effect of the course on earnings prior to the actual event. Therefore an observation of prior performance might be affected by a takeover in the future.

[24] A positive relationship between profits and productivity is found in theoretical models such as those in Bailey and Schultz (1990) and Allen, Faulhaber and MacKinlay (1989) both in McGuckin and Nguyen (1995, p. 273). Profitability might be due to a monopoly position but the ability to charge a 'high' price would still come out as a high measure of productivity assuming revenue product is used as output.

Perhaps for larger firms, where acquisitions require a lot of resources and organisation, takeovers are likely to be drawn out affairs that have effects on the acquired firm prior to the actual formality of the acquisition. For SMEs, acquisitions are unlikely to be so drawn-out and an ex ante effect of takeovers on performance is much less likely.

The threat of takeover may perhaps have the reverse effect of a 'dip' in performance; instead rising just prior to being acquired. No effect such as the 'Ashenfelter dip' or alternatively a rise in performance is found in any of the existing literature. Perhaps the only evidence that may pertain to this is by Siegel and Simons (2006). They estimate a plant's productivity both prior and following an M&A for 7 years. No effect like the 'Ashenfelter dip' is found. However, they do find that lower productivity plants are more likely to be subject to M&A and that the productivity of these plants falls in each of the 7 years until the year of acquisition.

2.6 Other SME characteristics that determine demand for acquisition

The market for small firms is particularly vulnerable to problems caused by asymmetries of information (Akerlof 1970), which may affect the demand side of the market[25]. Potential acquirers might not be aware or be able to access small firms if little information exists or is costly to obtain. Less information is likely to be available of relatively smaller and newer or younger firms. Therefore it is likely that relatively smaller and younger firms will be demanded less and exhibit lower chances of acquisition. Also, the smallest firms, if known about, may be unwanted because they are perhaps least likely to make any impact on the acquirer's business.

However, as firms size increase, it is likely the assets and their value do too. This would increase the transaction costs to the acquirer. Absorption or disruption costs might also be a factor if a firm is acquiring to add to their existing business (Alcalde and Espitia 2003; Barnes 1999; Cloodt et al. 2006; Powell 1997). The ability to assimilate a relatively smaller target is likely to be easier for an acquirer. Therefore

[25] Information asymmetry may also affect the supply side, as small firms might not be aware or have knowledge of potential acquirers.

the transaction and absorptions costs involved in acquiring another firm suggest a possible negative relationship between the target's size and the probability of takeover. The larger the firm, the larger the resources or bid is required to complete the transaction. Therefore the effect of size on the likelihood of acquisition might be non-linear, at least in terms of the demand side of the market.

Empirically (which captures the intersection of both the demand and supply for small firms), the smaller the size of the firm the higher the likelihood of being acquired (Alcalde and Espitia 2003; Palepu 1986; Wheelock and Wilson 2000). It is likely that these results are caused by the inclusion of very large firms but also exclusion of the smallest businesses. The opposite has also been found in a few studies (Cosh et al. 1996; McGuckin and Nguyen 1995; Nguyen and Ollinger 2002; Tsagkanos et al. 2006), where the larger the firm or plant the higher chance of acquisition. Relatively smaller targets are also found to increase the post-acquisition performance of the acquirer (Ahuja and Katila 2001). In a separate study of small businesses (Cosh and Hughes 1994), when firm size approaches medium this increases the percentage of firms that have received an approach but this decreases as the firm size increases beyond this size[26]. This evidence is consistent with a non-linear relationship of size on the chances of being acquired.

Age may not only reflect the amount of information that is available about a firm (affecting the demand side) but may also act as a form of proxy for its management experience (Wheelock and Wilson 2000). The managers and owners of older firms might be more able, or experienced, to resist takeover (Chaaban et al. 2005) – an element more related to the supply side of the market for small businesses[27]. The expectation is that younger, perhaps relatively inexperienced, managers are more likely to be taken-over. However, as suggested earlier in this review, good management could be an asset that acquirers seek in small firms and so inexperienced ones might not reflect this.

Empirically, age is found to have a negative relationship with M&A (Chaaban et al. 2005; Wheelock and Wilson 2000); older firms have a lower probability of takeover.

[26] This does not control for other factors.
[27] The supply side of the market is explored more in the next section.

This has also been found in the UK SME sector (Cosh et al. 1996). However, acquirers may also target firms with '*accumulated experience*', confirmed with empirical evidence (Tsagkanos et al. 2006, p. 187). Older firms have also been found to be more likely to receive an approach from larger companies relative to newer firms, not controlling for other factors (Cosh and Hughes 1994). An interpretation of this last finding is that more is known (in the public domain) about older firms and they are therefore more likely to be acquired.

Degree of ownership concentration may also be relevant for the demand of SMEs. In order for a small firm to sell, there needs to be agreement by its owner(s). It might be easier to negotiate (a lower price might be accepted) with a sole trader than a company and also a partnership, given the potential number of owners these forms of business structure can imply. Therefore demand might be lower for those companies with a more diverse ownership structure. For comparison, offers for public firms, with a diverse ownership structure, may result in an offer with a larger premium, to satisfy all owners or equity holders (Grossman and Hart, 1980 in Alcalde and Espitia 2003, p. 7). Empirically, for publicly quoted firms, the greater degree of ownership concentration, higher is the probability of takeover (Alcalde and Espitia 2003).

2.7 Cost of finance and the demand effect for SMEs

The effects of the availability and the price of finance may have a demand effect within the market for the corporate control of SMEs. If larger, older firms are able to acquire finance at a lower rate than smaller, younger firms, the same stream of discounted future profits will be valued differently. One source of the lower cost of capital for larger firms is diversification of risk and the impact on default chances. If a small firm is unlucky (an adverse shock occurs) it goes bankrupt. A similar shock to a large firm might be absorbed because it has the other divisions or projects that it can spread the losses against. Since this is the market expectation, it faces a lower cost of capital.

Information opaqueness of younger, smaller firms may also give rise to different interest rates between firms[28]. These vary the discount rates used to calculate future

[28] This is explored more in the next section.

values. A lower interest rate obtained by larger firms increases the present value of future profits relative to one calculated by small firms with a higher interest rate. Given that the value of a firm is the expected present value of future profits, a small and large firm's divergence in valuation may produce a price for the SME that both firms consider to be a fair value; one that is greater than the small firm's estimate of future profits but lower than the acquirer's.

Access to the stock market (and changes between years) may also affect small firm takeovers, despite most SMEs not being quoted. This is due to a couple of reasons: changes in business activity and access to capital - at least for large firms (Melicher et al. 1983). First, a rising stock market will reflect a greater amount of business activity and greater optimism over future economic growth. A rising market may yield investments in other firms (including SMEs) to be more profitable; increasing their rate of return. Second, a buoyant stock market can increase the market value of acquiring (large) firms. This can lead to easier access of funds, at least for listed firms, to be able to undertake acquisitions which may include those of small businesses. Existing empirical evidence from the UK suggests that acquisitions are pro-cyclical and increase during economic upturns (Bhattacharjee et al. 2009). Stock markets also affect both the number and value of mergers and takeovers (Clarke and Ioannidis 1996)[29].

2.8 Supply in the market for the corporate control of SMEs

In this section I consider why SMEs might be available for, or even initiate[30], takeovers. The supply of SMEs is potentially quite large. There are always businesses looking to be acquired as an ongoing concern. A simple internet search provides numerous websites that list tens of thousands of live small business that are put up for sale by their owners. Around a quarter of UK SMEs expect a transfer or closure of their business, and within 5 years this is 18 percent (Wiseman et al. 2005). Similar proportions of SMEs in the UK are also found to be available for sale or full ownership transfer (Institute for Employment Studies 2006a, b). However, just

[29] Clarke and Ioannidis (1996) use real stock market prices. Their results differ in both the method and results from previous evidence by Melicher et al. (1983), Geroski (1984) and Guerard (1989).
[30] In a study of Scottish manufacturers from the mid 1960s to the 1970s, few acquirer-initiated takeovers were found (Ashcroft and Love 1993).

because businesses are for sale or they anticipate one in the future, does not mean that they will actually be acquired. It is only where the demand (discussed previously) meets the supply that an acquisition will occur.

Attitudes and expectation of M&As appear to vary with the type of firm. Firms not anticipating growth are much more likely to anticipate a full ownership transfer or the closure of their business (Institute for Employment Studies 2006a). However, seller initiated takeovers are rarely caused by financial failure (Ravenscraft and Scherer 1987b) and fast growing SMEs are more open to M&A and have a more positive attitude towards them (Cosh and Hughes 1994; Small Business Research Centre 1992). Small and micro firms are also found to be more likely to favour, or at least less likely to be unfavourable to, acquisitions relative to larger and medium sized firms (Cosh and Hughes 1994; Small Business Research Centre 1992).

Small firms may seek acquisition to attain benefits that aid future growth (Cosh and Hughes 1994; Cosh et al. 1996). '*...small young firms very often find merger the solution to problems they are otherwise unable to satisfactorily to meet*' (Penrose 1980, p. 164). For example, some forms of knowledge or intangibles that they are unable to obtain by themselves: a firm that is a specialist in innovation (e.g. invests highly in R&D) but with a weak product market position, it could be advantageous for both parties to transfer technology information (Singh and Montgomery 1987).

Acquisition by a larger firm may improve access to finance as well as '*gaining access to the networks and infrastructure which large firms offer*' (BIS 2008, p. 48). These benefits to takeover might make them open to acquisition, as these services might be available from larger counterparts and therefore improve their chances of continued success. Much of this theory is related to the reason why acquirers may target firms, but now in the reverse as acquirers have some form of assets or knowhow.

Sellers are likely to try and initiate takeovers for a mixture of three main motives according to Ravenscraft and Scherer (1987b). These are: solving management succession problems, converting personal stock to more liquid forms of assets and gaining better access to financial assets. Next I look at each of these in turn.

2.8.1 Management succession

Compared to larger firms, management succession is considered an important issue for smaller firms (Cosh and Hughes 1994). Impending retirement and other management succession issues are a commonly cited reasons why firms might want to be acquired (Cosh and Hughes 1994; Ravenscraft and Scherer 1987b). The supply of firms for M&As may depend upon the death or retirement of owner-managers or their desire and ability to pass the business on to another family member - dynastic urges. The potential magnitude of this problem could be quite large given that around two-thirds of all SMEs in the UK are family owned (Institute for Employment Studies 2006a). The option or opportunity to sell a firm may alleviate the problem of succession. IES (2006a) find around a fifth of all SMEs intend to sell upon retirement versus a ¼ for those who intend passing on the business.

2.8.2 Converting Personal Stock, Capital Gains and Entrepreneurial Recycling

A small firm sale might be due to the desire of the owner-manager to realise the value of the business and reinvest in a new entrepreneurial project (Cosh and Hughes 1994) - entrepreneurial recycling. Nearly two-thirds of the owners of (successful or unsuccessful) businesses that close continue as business owners; these are known as serial entrepreneurs (Stokes and Blackburn 2001). Having a successful exit from a firm via a sale is found to have a positive relationship with choosing to be a '*renascent entrepreneur*'(Stam et al. 2008).

Some entrepreneurs gain reward from having an impact or from the challenge of starting a business, as opposed to acquiring the wealth that a successful business can generate (Ryan 2000 and Fraone 1999, both in Stokes and Blackburn 2001, pp. 46-47). This motivates a serial entrepreneur to then leave, or perhaps sell off, a firm once successfully up and running, to invest their efforts in starting all over again.

Takeovers are potentially an important and positive 'exit' route for some small firm owners and also for the development of a small firms (Cosh and Hughes 1994). Entrepreneurial recycling and the ability to transfer a small business could generate a process of building up successful and productive firms only to then sell, to generate equity to start all over again or allow the abdication of control. This phenomenon could generate some of the supply-side in the market for ownership and control of

successful, may be productive, firms. However, beyond general closure, the potential scale of serial entrepreneurs that are linked with takeover-exits is unknown.

2.8.3 Access to finance and financial assets

Problems in securing finance can be a constraint on growth and perhaps undermine some firm's achievement of their potential (Small Business Research Centre 1992). A possible remedy is for firms to seek a takeover to help resolve the issue and obtain growth finance (BIS 2008).

Evidence shows that for target-initiated takeovers, the most common reason was to enable firms to access extra capital that otherwise they were either unwilling or unable to obtain (Ashcroft and Love 1993)[31]. Many firms find finance hard to obtain (but whether this difficulty is unjustified is another matter). Around a quarter of firms find access to finance difficult (Wilson 2004). If one combines those firms who had difficulty obtaining some or all of the finance required with those who were unable to obtain finance, a fifth of businesses had problems accessing finance (Institute for Employment Studies 2006a, p. 138). More important for firms is if they are denied credit outright. Seven percent of firms have a finance request denied and this is even higher for smaller firms (Wilson 2004). A significant proportion of firms are discouraged from even applying because of the expectation of denial, but this includes those that might not be creditworthy (Levenson and Willard 2000). Using denials of small business loan applications, Levenson and Willard find some firms, especially small ones, request debt finance at the prevailing interest rate but are denied for reasons other than creditworthiness.

Finance can be particularly hard to obtain for small firms. Overdraft costs fall as firm size increases, and so does the frequency with which firms report difficultly accessing finance (Fraser 2005; Wilson 2004). 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). Access to finance for new capital is also difficult for small firms, particularly start-ups (Levenson and Willard 2000). Younger firms encounter more difficulties (Binks and

[31] A study of Scottish manufacturers from the mid 1960s to the 1970s.

Ennew 1996; Moore 1994) and the proportion of firms unable to obtain credit declines as firms age (Institute for Employment Studies 2006a). Business seeking to grow (relative to ones not seeking to grow) are also found to experience problems accessing finance (BIS 2008).

Why do some firms find it difficult to obtain finance, particularly small ones? A perfectly functioning capital market allocates finance to any project if it has a positive expected net present value from the investment. Firms presenting an unprofitable investment proposal, one with a low or negative expected rate of return, are rightly denied credit. These firms will always register as having insufficient funding or being refused capital. The refusal of finance is not necessarily a sign of market failure. If lenders of finance are unable to judge projects that are worthy investments because of information problems then this is a potential form of market failure.

2.8.4 Asymmetry of information and credit rationing

An asymmetry of information between lenders and borrowers can result in credit rationing within the market for loanable funds (Stiglitz and Weiss 1981). Information asymmetries in credit markets occur when borrowers have more information about the probability of default on a loan, relative to the lender. Lenders are effectively unable to judge whether borrowers are 'good' or 'bad'[32]. In the extreme case, the lender may have no knowledge of the type of borrower. An option for the lender is to compensate by increasing the interest rate. Increasing the rate may also encourage borrowers to act more riskily (moral hazard) and they may apply for credit with more risky projects. Poor investments are assumed to 'drive-out' good investments for bank lending via adverse selection. The increase in the attractiveness of riskier investments increases the risk of default of a loan, decreasing the bank's expected profits. Therefore instead of lenders altering the interest rate, they choose to not offer the 'equilibrium supply of funds'. Constraints are placed on the supply of loanable funds offered by lenders. Excess demand does not increase the price of loans (the interest rate), preventing the perfectly competitive market outcome. The equilibrium outcome has applicants with an identical risk profile to existing borrowers but the former do not receive a loan or the full amount demanded, even if they are prepared to pay a higher interest rate. This

[32] 'Good' here means that they repay any loan or overdraft in full and do not default. 'Bad' is the converse case.

outcome does not affect the degree of risk taken by applicants, providing an incentive for lenders to ration credit instead of changing the interest rate.

Costly information means that decisions are based on limited data, which makes it hard for lenders to assess applicants for credit. Therefore credit rationing is likely to be more acute and prevalent with SME finance, assuming that only debt finance is available[33].

Alternatively, theory suggests that the free market interest rate is actually too low. An equilibrium is possible with an oversupply of loanable funds, in excess of the 'socially efficient' level (de Meza and Webb 1987). By allowing the mean return on prospects to vary across firms, the marginal project that obtains finance has the lowest probability of being successful, whereas in Stiglitz and Weiss' (1981) it has the highest probability. An increase in the interest rate is required above the free market level to restore it to the socially efficient level. This occurs as low quality investments or projects 'free-ride' on good quality ones. Asymmetric information causes good prospects to draw in the bad ones and consequently too much investment is made at the prevailing interest rate. This can also be compounded by '*unrealistic optimism*' about poor performing projects (de Meza 2002). Even if these effects do not occur, the experience of agents lending to start-ups and small businesses may also make such lenders proficient in their abilities to provide funds to those who are the least risk of defaulting (de Meza and Southey 1996). This may reduce the extent of credit rationing in the supply of loanable finds for small firms.

In summary, the theory of credit rationing suggests over-lending is just as likely, or rather; a lack of consensus exists. Empirically, bank debt is the most common source of finance for SMEs and many small firms are not refused credit outright (de Meza 2002). The theory of credit rationing also suggests that the lending institutions do not pass on an increase in the interest rate. If lending institutions do not allow the cost of borrowing to rise, rationing credit instead, this will generate a degree of interest rate '*stickiness*'. Interest rate 'stickiness' in the loans markets is found in both the US (Berger and Udell 1992) and the UK (Cowling 2007). However, evidence on secured

[33] I have not discussed this caveat within de Meza and Webb (1987) but this is a fairly realistic assumption for the SMEs sector given their relative preference for forms of non-equity sources of finance.

and committed loans[34] suggests that this is not due to credit rationing but alternative reasons causing loan rates to be 'sticky' (Cowling 2007).

In general, empirical evidence of credit rationing is not found. However, credit problems caused by information deficiencies may exist (Berger and Udell 1992) even for SMEs that are able to pledge collateral and signal that they are 'good' borrowers (Cowling 2007).

2.8.5 Collateral

The pledging of collateral against credit can be a way of trying to overcome the finance problems caused by information asymmetries such as credit rationing. There are three roles of collateral according to Storey (1996). These are: it limits lenders losses if borrowers default; acts as an incentive for borrowers to commit; and a signal to lenders that borrowers will not default and that the investment will be a success.

The last point may overcome the asymmetry of information problems and subsequent potential market failure within the small business lending market. 'Good' borrowers are assumed to be willing to put up collateral against a loan because they believe they are a low risk at defaulting and subsequently losing their assets. Whereas 'bad', or high risk, borrowers will be less willing, knowing they may lose their pledged assets. This behaviour may reveal, or act as a signal to, a firm's true nature. This could result in a lower interest rate or, importantly with respect to credit rationing, a supply of loanable funds being offered to those who offer collateral versus those who are unwilling.

Firms might be required to use collateral but may not have enough asset value to cover the loan (Besanko and Thankor, 1987 in Cowling 2007, p. 3) nor have suitable assets to fully pledge a loan against. For example, small firms with very few tangible assets (but perhaps rich in intangibles) may suffer from this. In this scenario, a 'good' borrower may still be rationed.

[34] A commitment loan is here is when a lender agrees to extend credit at the borrower's request.

Empirical evidence finds small firms that offer collateral to obtain debt finance results in a five times increased chance of securing long-term finance, as collateral acts as a sign of commitment to the lender (Michaelas et al. 1999). However, there is also evidence that finds 'bad' borrowers are actually associated with pledging collateral (Leeth and Scott, 1989, Berger and Udell, 1990, 1995, Booth, 1992, and Ono and Uesegi, 2005 all in Berger et al. 2006, p. 6). These apparently contradictory findings can be perhaps explained. Initially the value of collateral decreases the cost of loans (Burke and Hanley 2006). However, higher levels of collateral by wealthier individuals can still create moral hazard through reduced effort (Burke et al. 2000) or more risk-taking (Stiglitz and Weiss 1981). This then induces a greater lending margin to be requested and a convex U-shaped relationship between interest rate margins and collateral (Burke and Hanley 2006).

Firms without suitable assets that they can pledge may offer personal collateral. A low re-sale value for a firm can mean that owners may opt to use the private assets of the owners (Binks and Ennew 1996). A large proportion of firms are found to use personal collateral and it is suggested that this is because the value of any existing assets of a firm may be hard to assess (McKillop and Barton 1995), with personal collateral most likely to be used by younger firms - peaking at three to five years (Avery et al. 1998). The majority of small business loans are found to have some form of personal commitment (including personal assets and personal guarantees), both in terms of value and frequency. Avery et al also find that there is no consistent relationship between personal commitment and owner wealth; just because an owner may have access to more money does not necessarily translate into a firm using personal commitments. Perhaps this is driven more on a needs basis and therefore if a firm has few business assets this is likely to result in more reliance on an owner's personal commitment to a loan.

2.8.6 Venture Capital

The constraints on the small firm to obtain debt finance may suggest that it would be more suitable for the small firm to approach equity or venture capital markets. Traditional forms of lending are considered to be of little relevance for the most innovative SMEs (OECD 2006), resulting in firms requiring or even seeking more equity-based sources of finance such as risk capital (Mason and Harrison 1994).

Therefore, for high growth firms, equity investments are considered to be the most appropriate type of finance (BIS 2008, p. 28). This is because more standard forms of finance, such bank or debt finance, are assessed on the value of a firm's assets and not on the future potential value (return) of the business (Rowlands 2009). Therefore firms that rely more on intangibles, and perhaps perform highly because of them, will struggle to obtain sufficient secured finance sources due to the nature of their assets. Evidence also confirms this, as firms at an early stage of development, seeking small amounts of risk capital is particularly problematic (Murphy et al. 2004).

The ability to secure growth capital is also inhibited by information problems in both the supply and demand for such finance. For potential providers, it is difficult to access possible investment opportunities and suitable firms. On the demand side, investors are considered to lack a track record in this type of funding. This makes it risky for investors and so they require higher rates of return, which results in higher interest rates for firms (Rowlands 2009). Growth capital is also considered to be expensive to set-up and manage which also compounds the cost for the firm.

Venture capital might also be difficult to obtain but for those that do secure funding, it may result in a takeover or acquisition anyway. Informal venture capital in the UK does not usually involve sufficiently large injections of capital to gain ownership of the firm; most investors are only minority shareholders (Mason and Harrison 1994). Only in the rare cases of investment groups forming and investing are they more likely to acquire majority control. Therefore only in a minority of cases the entrepreneur loses absolute control to investors. However, over half of informal venture capital investors expect to exit between 3 and 5 years after investment and the most frequently cited method of exit was via a sale, merger with another company or flotation (Mason and Harrison 1994)[35].

Exits from successful firms by investors, potentially through takeover, is an important process to allow funds to be recycled. It may also potentially produce a supply of successful businesses being (externally) sold, similar to entrepreneurial recycling – described above. Without this, it is likely that venture capital markets and business

[35] This differs to the US where more often exit occurs by a sale to insiders.

angel finance will be reduced and perhaps so would start-ups. However, the scale of firms in need for growth finance or venture capital is not great. In the Rowlands Review (2009), it is estimated that only around 5,000 firms are viable business ventures or opportunities for growth capital across the whole of the UK.

2.9 Conclusions

If highly productive SMEs are acquired by large firms, this may be detrimental for economic development. Conversely, takeovers may boost the performance of acquired firms. To understand the possible direction of effect from small firm acquisitions have, it is essential to understand what determines acquisition in the market for control of SMEs.

Prospective profits determine M&As, but what types can hope to be profitable? This was explored first through the two main forms of acquisition of SMEs: horizontal and vertical. For SMEs, horizontal mergers with quantity setting (Cournot) models are most profitable, and therefore more likely to occur, when they produce cost efficiencies. Alternatively, the greater R&D complementarities between the two merging firms, the larger are the gains from merger. However, quantity-setting models could be considered more of a long term decision and perhaps of more relevance, especially in the short-run, are models that allow for price-setting instead.

In price-setting (Bertrand) forms of competition, SME acquisitions are likely to be most profitable (and therefore most likely to occur) when firms compete in both product and R&D markets. It might be the case that SMEs are more dynamic but also more R&D intensive, at least in terms of their successes. If so, it might be profitable for larger firms to acquire these small, R&D intensive, dynamic firms as they may produce cost reductions. Large firms may then compensate for their lack of 'intrapreneurship' by acquiring SMEs.

Vertical acquisition of SMEs might be also profitable when they reduce costs. In addition, the acquisition of SMEs can be profitable via synergies, reducing the cost of the acquirer or improving its R&D – similar to the processes that make horizontal mergers profitable. The inclusion of more complex, but perhaps more realistic,

features to M&As generates profitable mergers and a rationale for why they occur. These features are also relevant to SME acquisitions.

Profitable M&As that involve small firms would appear to rely on them generating cost efficiencies or some R&D advantage for the acquirer. It is therefore likely that the assets that might be generating these are also making the firm perform productively. This in turn, if observed in isolation, may signal that the firm is not a 'lemon' and is worth acquiring. A positive relationship between productivity and the chances of takeover is perhaps unique for small firms. For larger firms, theory suggests less productive firms are targeted where the return is to rectify poor performance (e.g. the Q-theory of mergers). It is not obvious that this is the case for smaller firms.

The empirical evidence concerning this relationship is limited with regard to its coverage on SMEs but smaller targets (including plants), unlike relatively large ones, do tend to be more productive. This could be a consequence of the large-small firm borrowing interest rate differential. A large firm may value a given expected profit stream more highly than a small one.

Also on the demand side, less information is likely to be available the smaller and newer the firm. This suggests younger and smaller firms are less likely to be acquired. However, within the SME sector, firms are likely to be generally both smaller and younger. Empirically, age is found to have a negative relationship with M&A. Size in general also has a negative effect, perhaps due to transaction and absorption costs, but with smaller firms it is reversed.

On the supply side, SMEs might accept a takeover approach because of problems with management succession or because the owner wants to withdraw equity. Another reason includes difficulties raising finance. Firms that provide the least information to lenders are the most likely to be under-supplied with credit. These firms are likely to include small and new enterprises. More significant problems in accessing finance might be evident for those businesses seeking small amounts of risk capital, for example, SMEs that are small or at an early stage of development. However, it may also be the case that firms unable to obtain capital are actually bad risks

I have discussed possible reasons why small firms might be acquired both in terms of their relative desirability to acquirers and also on the supply side, and what large firms can offer. However, for takeovers to have any effect on economies, it is necessary to understand not only why takeovers may occur but what the effects are. This is discussed in the next chapter.

Chapter 3 – The Theory of Acquisition Effects

3.1 Introduction

This chapter addresses the theory of what happens after a firm has been acquired, the main strands of which concern enterprise closure or exit, and enterprise performance. These acquisition effects determine the impact of SME takeover targets on (regional) economies. A tendency to dissolve the firm or relocate it and move the assets of the acquired SME might depress regional productivity. Alternatively, the acquisition of a small firm may alter its performance. If the productivity of the target after takeover increases by less than it would otherwise have done, or even falls, (regional) economies may suffer. Conversely, acquisitions may provide SMEs with resources that enable them to grow and become more productive, with beneficial effects on aggregate productivity.

The market for corporate control of large, publicly quoted companies has been analysed a great deal. But very little literature considers directly the performance after acquisition of small, privately held firms (Hughes 1989). This chapter discusses various theories as to whether SME takeovers result in performance improving or reducing, and the firm relocating or exiting. Empirical evidence is also presented on whether takeovers affect subsequent productivity, profits, employment and the probability of exit or relocation.

3.2 Takeovers and improved performance

The theory of takeovers and subsequent target performance is partially covered in the discussion of why acquirers may purchase small firms in chapter 2. First, the theory of 'bad' managers or matches is relevant, where takeovers are part of the market economy that efficiently matches them (Lichtenberg et al. 1987). Therefore takeovers act as a force to rectify inefficient activity (Hirschman in Lichtenberg 1992, p. 42). However, if matches are somewhat random, profitability may not increase and takeovers might not improve performance (Bernard and Jensen 2007).

Second, more relevant for higher performing firms, is an element of synergy, where the new owners believe they can improve performance further. This may aid the

productivity of the acquirer and the acquired, jointly increasing their profits if both continue to operate. Synergies may occur when a firm is successful and innovation rich but is unable to grow, perhaps because cash poor. Acquisition by a larger firm may allow the acquired to fulfil its potential and grow, providing value to the buyer with an increased future value of profits.

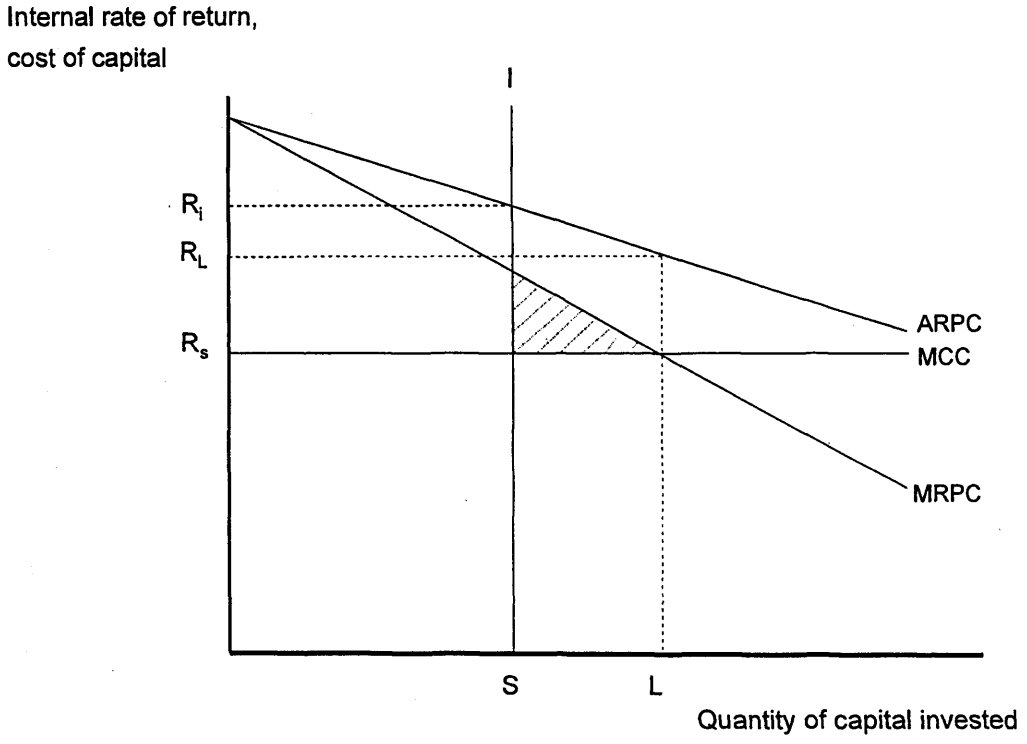
Linked to this idea is the suggestion that larger firms may acquire small, successful firms, as speculative investments (Ravenscraft and Scherer 1987b). Once the small firm has grown and their value increased, the owners may then look to sell-off the firm, profiting from their initial investment. This motive would be consistent with acquirers targeting small successful firms to grow them and improve their performance further.

Another advantage for a small firm of being acquired by a large counterpart is the latter's better access to, or lower cost of, finance. Small firms are more likely to be constrained in their access to finance – as discussed in the previous chapter. The effects of having better access to finance can be shown with the model below from Ravenscraft and Scherer (1987b).

In figure 3.1 the horizontal axis measures the quantity of capital and the vertical axis the cost of capital and the internal rate of return. Both the average and marginal product of capital schedules (ARPC and MRPC, respectively) are downward sloping. This reflects that as the firm obtains more capital, less rewarding projects are financed. If the firm has access to an elastic external capital market it faces the marginal cost of capital (MCC), offering a cost of capital of R_S. An elastic supply of capital might not be available for small, privately held firms. If not, then it is more likely that firms will face an inelastic constraint that is generated by either internally generated funds or limited bank credit. This is shown by SI curve. This restriction on the small firm means that they can only obtain funds up to point S and the average return to capital will be R_i. If after an acquisition, the larger firm is able to offer the small firm an elastic supply of capital, any amount along the MCC schedule is possible. The new optimum amount of capital is increased to L - where the marginal revenue product of capital schedule (MRPC) intersects the MCC schedule. The

average return then also drops from R_i to R_L. This results in an efficiency gain equivalent to the shaded triangle area.

Figure 3.1 - Capital allocation with elastic capital markets and capital rationing



Source: Ravenscraft and Scherer (1987b, p. 112).

This analysis on restrictions of finance implies gaining extra funds reduces the average return but increases its size. If previously capital constrained, the firm would have been restricted on its investments and projects. With more resources, more investment can be undertaken. This implies that although the firm is able to invest in more projects and presumably grow, it is perhaps no longer as productive. For a given level of inputs the return is lower as it is now able to invest in positive but lower yielding projects. Hence the possibility of a lower level of productivity or profitability post-acquisition but an increase in the size or scale of the firm (Ravenscraft and Scherer 1989).

Alternatively, a finance injection from a large acquiring firm may improve productivity. Extra finance may allow firms to invest more in capital. This may result in a more optimal factor mix, enhancing productivity. By allowing the firm to use

more capital, the firm may choose to substitute labour for capital – capital deepening. This substitution may increase LP but may not affect TFP, depending on the size of any relative increase in output. Instead a firm may increase output with the same capital-labour ratio but increasing both capital and labour. This is capital widening. If the relative increase in output is the same as the increase in inputs, then this would have no effect upon TFP or LP.

Capital cost savings and an increased supply elasticity of capital of belonging to a larger firm are found in case studies to be one of the most important advantages of being acquired (Ravenscraft and Scherer 1987b). However, no restrictions in the growth of small profitable firms that are not acquired are found. This is consistent with either firms managing to obtain growth capital regardless of whether the firm was an attractive prospect or that they were not really constrained. In a different study, the majority of the acquired reported that it was either easier, or cheaper, to obtain 'investment funds' after acquisition (Ashcroft and Love 1993, p. 81). This is attributed either to obtaining funds from a larger firm, or suppliers of finance now being more prepared to offer capital. Of those that used the extra funds, it is the better performing firms that benefit the most. This is suggestive that the better-performing firms are more capital-constrained hindering their future growth and development but can benefit from larger firms with their better access to finance.

Larger businesses may offer small firms other advantages. Concerned with alliances, Alvarez and Barney (2001, p. 139) list distribution, manufacturing, marketing and other organisational resources that might all be valuable to an SME that a larger firm can offer it[36], all which result in an improved performance. Acquisition by large firms may cause '*a technology exploitation potential for the small firm*' (Granstrand and Sjolander 1990, p. 383). However, the effect of acquisition on the target's performance may depend on the firm's pre-takeover level of performance. Already productive firms may benefit the most from being acquired as they are considered to have the 'absorptive capacity' required to assimilate the changes in a positive way (Girma 2005; Lapan and Bardhan 1973). Therefore it might be that higher productivity firms are more likely to improve performance after acquisition.

[36] This is discussed in more detail in the previous chapter.

Next I describe why takeovers may potentially result in a fall in performance or exit.

3.3 Takeovers and a fall in performance or exit

To aid the understanding of why acquisitions may result in a fall in performance or exit it is perhaps important to return to the conclusions of why a firm is acquired in the first place. Acquisitions due to technology or innovation may mean that the acquirer has no further use of the target. Acquisitions of more productive SMEs may allow firms to obtain new assets or technological processes that can be absorbed by the acquirer, making up for their own lack of 'intrapreneurship' (Baumol 2004). Once the acquiring firm has obtained the technical process or learned about it, a tendency might be for the new owner to under invest in the SME (Alvarez and Barney 2001). In some cases this could mean the small firm is dissolved. The value of the firm might be less than the sum of its parts, assets or expertise, especially once synergies with the acquirer have been considered. This can be thought of as 'technological asset-stripping' (Smith 1979).

Alternatively, an SME might close as the acquirer seeks to remove a competitor (Mason and Harrison 2006). This may reduce capacity within an industry and increase the acquirer's profit share. This is discussed in the previous chapter with the effects of mergers on profits. However, consistent with previous, it is unlikely that an SME has any significant market share. It is more likely that the acquisition is undertaken because the target could be a serious rival once it has grown more or due to the technology or assets (including intangibles) it possesses (Gilbert and Newbery 1982). Incentives exist for incumbent firms to restrict entry (or perhaps prevent further success and growth of small successful firms) due to the potential effect on market power – the reverse process of the Cournot models earlier. Empirically, this has also been found - firms that posses technologies are of high value to incumbents, deterring entry (Grimpe and Hussinger 2008).

New owners may have all the best intentions to keep the new firm but unforeseen problems brought on by the acquisition harm its performance. 'Bedding-in' problems may mean that performance suffers post-acquisition. This is an inverse case of the

'bad' match hypothesis, where previously the managers formed a 'good' match but upon takeover the new 'match' is bad. A degree of uncertainty around the profitability of any new match between the owner and firm or plant can ultimately lead to an increased chance of exit (Bernard and Jensen 2007). The realisation of a lower level of profitability than anticipated may take time, prolonging the survival of the firm until it is divested or ultimately closed. Alternatively, adjustment costs and the process of 'bedding-in' may just delay the effects of performance increasing. Depending on the time scale, no improvement in performance may be observed. Impatience or the unwillingness to accept a period of poor performance may also increase the chances divestment or ultimate exit.

The costs of acquisition, including any transaction or adjustment costs, may result in the total cost of the transaction exceeding what the acquirer can afford or initially budgeted for. The possibility of a 'winner's curse' in competitive bidder for a company has been raised to explain why acquisitions subsequently seem to be so unprofitable in the market for corporate control of large, publicly quoted, companies (Roll 1986; Thaler 1988). This might also apply to small firm acquisitions. Over-paying for the firm could constrain further development because inadequate resources are left for development.

An acquiring firm may remove what ultimately made the firm productive and dynamic. If the acquired firm becomes subservient to the larger firm, eventually the acquired firm may adopt the processes of the larger firm that do not suit the small productive unit. This may hinder the acquired's performance as the firm eventually loses its autonomy and dynamism, as the new owners implement their own processes (Fothergill and Guy 1990). These problems may be particularly problematic if the newly acquired firm becomes a subsidiary of the large firm. This may create coordination problems and remove its autonomy (Ashcroft and Love 1993). These features may all result in a fall in performance.

Another reason why firms may suffer as a result of acquisition is simply bad luck (Ravenscraft and Scherer 1987b). A change in market conditions or tastes may turn what was once highly productive and profitable firm into an unprofitable one. Linked to the previous point, new owners might make the firm less able to cope with such

changes. Evidence from interviews with companies making acquisitions in the mid-1970s show expansions of targets are usually intended pre-acquisition, whereas closures are not (Leigh and North 1978). Exits made post-acquisition are more as a consequence of unforeseen or uncontrollable circumstances such as adverse economic conditions. Acquired firms may have problems that are not observable to potential buyers. Asymmetry of information between sellers and buyers may create a form of 'market for lemons' phenomenon but with buyers unaware of the potential problems their acquisition may have. These problems might hinder future performance that the new owners are unable to rectify. For small firms, asymmetries of information are likely to be inherent as they are unlisted and little public information is available, hence the potential problems in accessing finance.

The final reason why performance may suffer is over-optimism. Acquiring a highly productive small firm may make the new owners believe that they can not only continue the level of performance but also better it. Roll (1986) believes acquirers may overestimate their ability to improve acquired firm's performance. If performance is already at its peak, it might be that performance cannot be improved much further. This could be like another form of 'winner's curse' as it is hard to assess the true value and performance of small firms (Reur and Ragozzino 2007 in Capron and Shen 2007, p. 892). The uncertainty of post-acquisition performance of small firms is a possible way that firms try to obtain high returns (Ravenscraft and Scherer 1987b). Many investments of this type tend to fail but when a winner is backed it is possible to obtain very high returns, hence a positive expected return from this investment strategy. But on average, failure of the acquired firm is expected if acquirers' adopt this takeover motive.

3.4 Empirical Evidence

Consistent with much of the empirical evidence presented in the previous chapter, much of the evidence discussed below is qualitative. This is because with the evidence on the effects of takeovers there is no consensus and therefore the important issue here is the direction of the effects. This can then suggest whether takeovers, or at least their effect on targets, may have a beneficial or harmful effect on (regional)

economies. I begin with looking at the empirical evidence of the effects from takeovers on the likelihood of exit.

3.4.1 Exits

The empirical evidence, like the theory, is mixed with respect to the effect of takeovers on the probability of closure. Early evidence on the effects of acquisitions on the probability of exit suggests that acquisitions during the 1960s and 1970s accounted for a much smaller proportion of firm deaths relative to larger firms (Singh 1975, Kuehn 1975, Samuels and Chesher 1972 all in Hughes 1989, p. 146). This is mainly perhaps because acquisitions are less likely to occur within the small firm sector and their chances of failure are higher irrespective of takeover. However, a different process may still occur for takeovers and survival relative to large firms. Of studies only looking at small, unquoted companies, an annual merger exit rate of 2 to 3 percent is found for the 1960s and 1970s (Bolton 1971, 1972 and Boswell all in Hughes 1989, p. 147). It is not reported whether takeovers actually increases the firm's chances of exit.

At the plant level, ownership change increases the probability of survival (US food manufacturing, McGuckin et al, 1998 in McGuckin and Nguyen 2001, p. 743; also found in Nguyen et al. 1995). This is also found across the whole of US manufacturing (McGuckin and Nguyen 2001), where the chances of survival increases with a plant's size and its (relative) productivity. In another study, plants are less likely to be closed after takeover if they are also more productive (US meat product industry, Nguyen and Ollinger 2006). These last findings on productivity and size suggest differential effects for large and small plants, with the latter having an increased risk of exit after takeover. With productivity, the most productive are more likely to survive. However, it is not known what the effect of being small and productive has on the chances of exit after acquisition. Also these effects might be specific to a single industry (food production), sector (manufacturing), or plants that belong to a multi-unit firm. In the UK, ownership change of manufacturing plants increases the chances of exit (Harris and Hassaszadeh 2002), the opposite to previous findings.

In declining industries (UK textile and clothing 1967-72), SMEs with multiple plants are more likely to close if they have been recently acquired (Healey 1981). Despite this being found in an atypical industry where falling output has perverse effects, a short period occurs when the acquired are no more likely to be closed. The increased likelihood of closure is found only after 5-6 years after the acquisition (Healey 1982). This last finding implies that perhaps the time elapsed between acquisition and exit is important. Allowing for the possibility of up to 5 years between takeover and exit, an independent effect is also found for targets to be more likely to fail relative to plants not changing ownership (Bernard and Jensen 2007). However, this time lapse suggests that it was not the initial intention of the takeover to close the firm or plant; perhaps a different process to the takeover-exit one for small firms that I am most interested in.

3.4.2 Profits and productivity

The empirical evidence of the effects of takeovers on profits and productivity is also mixed in terms of the direction of effect. A few studies find negative or neutral effects on productivity or its growth due to acquisitions (Conyon et al. 2002b; Hanley and Zervos 2007). The former study finds suggestive evidence that acquisitions may actually erode any productivity advantage targets have relative to the average firm, although this is only found without controlling for any other variables.

Possible falls in productivity after acquisition might be offset by the gains made to the acquirer. Maksimovic and Phillips (2001) investigate whether newly acquired plants are in some form complementary to the new owner. This is consistent with falls in post-acquisition performance of the acquired due to the new owner now using the firm's assets at the target's expense. However, evidence for this effect was only found with the acquisition of less productive plants.

Many studies report a positive effect on productivity post-acquisition (Bertrand and Zitouna 2007; Lichtenberg 1992; Lichtenberg et al. 1987; Maksimovic and Phillips 2001; McGuckin and Nguyen 1995; Siegel and Simons 2006; Siegel et al. 2005) and higher productivity growth (Lichtenberg 1992; Lichtenberg et al. 1987; McGuckin and Nguyen 1995; Nguyen and Ollinger 2006). Most studies either concentrate on, or only include relatively large firms with targets also generally exhibiting lower initial

productivity. Increases in after acquisition productivity when it was previously low, indicate that takeovers can act to rectifying poor performance. The post-acquisition effect aids performance so that it converges to the average firm or plant (Bertrand and Zitouna 2007; Lichtenberg 1992; Lichtenberg et al. 1987; Schoar 2002; Siegel and Simons 2006; Siegel et al. 2005).

Despite increases in productivity post-acquisition, some plants are still found to have below average performance up to 7 years after takeover (Lichtenberg 1992; Lichtenberg et al. 1987). Takeovers may rectify poor performance, increasing productivity ex post but little evidence is consistent with takeovers improving already productive firms or plants, at least in the short-run. Over a longer time period, it is possible that post-acquisition productivity may increase sufficiently so that it overtakes the non-acquired. This is found in only one study, in the period of 5 to 9 years after the original acquisition (McGuckin and Nguyen 1995). Therefore acquisitions may improve the acquired firm's performance but not so they become more productive relative to competitors, at least in the short run.

A size variation of the post-acquisition effect on productivity growth is also confirmed (McGuckin and Nguyen 1995). Post-acquisition productivity growth declines with size. The largest non-acquired plants outperform taken-over ones. This size finding might be important for SMEs. It suggests I might find a positive post-acquisition productivity growth effect with SMEs.

Another feature of the post-acquisition effect is related to the attributes of the buyer. An increase in productivity is observed when the productivity of the acquirer is higher than that of the acquired plant and vice versa (Maksimovic and Phillips 2001). Therefore productivity may rise or fall after acquisition depending on the performance of the acquirer and not just that of the target.

The effect on profits is investigated next. Profits can be very difficult to measure as it usually depends on how firms report it. For small firms this can be particularly problematic, as very little data exists that provides profit information. Also with takeovers, it is very difficult to disentangle profits between the acquirer and the acquired firms once have they have merged. Changes in accounting and how profits

are subsequently reported between divisions of the firm can all contribute to the difficulties of trying to measure post-acquisition profits (Ashcroft and Love 1993). This is especially so when the acquired firm becomes a subsidiary of the acquirer. Despite these shortcomings, a few studies have managed to use data on profits. Falls, or non-positive changes, in the profitability and profits post-acquisition are found (Ashcroft and Love 1993; Dickerson et al. 1997; Ravenscraft and Scherer 1987a, b, 1989).

A post-acquisition size-profitability effect is also found. The decline in profitability after acquisition is greater for small firms. Larger businesses increase profitability in the fourth and fifth years after initial decreases in first three years (Cosh and Hughes 1994). However, this evidence is inconsistent with the findings about productivity above and also with those of Gugler et al (2003) about smaller firm mergers, where profitability is more likely to increase after acquisition. Cycle effects may explain some of these differences, as they are likely to vary between studies and are not controlled for in the former one.

3.4.3 Employment

If performance improves after acquisition then employment might increase. General improvements in post-acquisition performance may result in both an increase in output and the demand for inputs such as employment. However, the reverse might also be true. Alternatively, after acquisition productivity improvements might be caused by a reduction in inputs (labour), or factor substitution e.g. capital for labour via capital deepening. Decreases in employment accompanied by an increase in sales, might be a consequence of finance constraints. Takeover may allow the target to invest and achieve a better mix of inputs, allowing the firm to become more capital-intensive, increasing its efficiency with a change in the capital-labour ratio (Ashcroft and Love 1993). Alternatively, extra investment may lead to capital widening, increasing employment.

For larger, less productive firms, a common theory of how takeovers can affect employment is that it is a chance to 'renege' on employment contracts (e.g. Conyon et al. 2002a). This results in acquisitions reducing employment, restoring employment to more 'optimum' levels. This is confirmed with some of the empirical evidence (Siegel

and Simons 2006; Siegel et al. 2005). Alternatively, changes in ownership may 'stem' any fall in employment rather than result in mass redundancies or large sudden falls decreases. Empirical evidence of the poor ex ante performance of manufacturing plants confirms this (Lichtenberg et al. 1987). For large firms, differences exist between firms in continental Europe and USA. The post-acquisition effect is found to have adverse affects for employment in the former but not the latter (Gugler and Yurtoglu 2004).

The effects for large firms can be considered atypical for SMEs where they are perhaps less likely to have hoarded labour or be targeted if performing poorly. I am most concerned about the after acquisition effects of small, productive firms. Comparisons between different types of firms has found reductions in labour is more likely for large and public companies and better employment prospects might be expected for smaller private businesses that are acquired (Ashcroft and Love 1992). Perhaps acquirers are more likely to be sought out and complementary to the needs of the small firm e.g. via finance and available resources. Alternatively, the chances of 'raiders' might be greater for small firms as it is perhaps easier and cheaper to make a smaller workforce redundant. Acquirers can perhaps relocate or deregister the business, obtaining it assets.

The evidence suggests that a separate effect does occur for smaller firms. Increases in employment are at their greatest for smaller, single plant enterprises, when taken-over by a larger firm (Green and Cromley 1982). Other evidence including all sizes of manufacturing plants also finds a positive relationship with post-acquisition employment (and wages) (McGuckin and Nguyen 2001; Nguyen et al. 1995)[37].

The type of employment that is left after acquisition may vary too. The acquisition of some small firms might be to obtain certain assets such as a high performing management team. An acquired firm could be stripped of this after acquisition. However, there are a large number of cases where high growth firms have been

[37] However, when acquisition is observed at the firm level and the effects are aggregated, employment increases are not found (Nguyen et al. 1995). This is less relevant here as it relates to multi-plant firms that are less likely within the SME sector.

acquired but continued to operate with the original team in place with management roles (BIS 2008, p. 48).

The effects on employment may also depend on the type of acquisition. For private firms, as are most SMEs, takeovers are more likely to be 'friendly'. The effects of these may differ from hostile takeovers. These might involve firm restructuring after takeover and then decreases employment. The empirical evidence finds both 'hostile' and 'friendly' takeovers are associated with falls in labour demand (Conyon et al. 2001, 2002a). However, hostile takeovers are linked with immediate falls in both output and employment, attributed to firm divestment, perhaps more relevant to the acquisition of larger firms.

Another study separates acquisition and classifies them into: a change in ownership without integration ('simple sale'), assets of acquired are taken without the work force ('assets only') and combining acquirer and acquired or at least partial absorption ('merger') (Brown and Medoff 1987)[38]. A 'simple sale' led to a small increase in employment, an 'assets only' sale resulted in a small decrease and a 'merger' no significant effect is found. All of these have potential implications for the acquisition of SMEs. If acquirer's seek targets only for their assets then this may result in negative consequences for the target's employment.

It is possible that differences of the effects on employment and productivity from takeover, especially those involving large firms acquiring small ones, may have a temporal or cyclical element which is not fully explored in the literature. When the stock market is increasing takeovers may increase subsequent labour productivity for all but the larger or most productive SMEs. A rising stock market may provide acquirers with more resources to invest in acquired SMEs, helping to improve the performance of most acquired small firms. This could result in the small firm achieving a more optimal factor input mix for production, as discussed above. During a downturn in the stock market, acquirers may not be valued as highly and therefore be limited in their resources that they can obtain to invest in their acquisitions. They

[38] This study does not distinguish between 'hostile' and 'friendly' takeovers nor include the smallest of firms. These results are also sensitive to the year of acquisition.

are perhaps more likely to drain the acquired or under-invest in it; reducing its performance. So it is possible that these relationships may also vary across time.

3.5 Conclusions

Takeovers can affect the chances of a firm closing, or, if it survives, its performance. Either outcome on sufficient scale may well affect economies, perhaps even regional ones. On the one hand, larger firms may provide extra resources such as finance that could enhance the performance of acquired SMEs. On the other hand, stripping an SME of its innovative assets could lower performance or even trigger closure. Bedding-in problems of the new owners, a mismatch between firm and owner, or a lack of prior information on the purchase, could all also explain possible falls in performance after acquisition.

After takeover, increases and decreases of both productivity and employment are found in the empirical literature. For low productivity and smaller targets, takeovers increase subsequent performance. Very little evidence suggests that they help to improve already productive targets, even for small firms or plants.

The effect of takeovers on exits is also not conclusive in the literature. For smaller targets, evidence suggests an increased chance of exit but higher productivity may reduce this likelihood. It is not known what the effect is on both smaller and more productive firms. Also, it is possible that differences of the effects on employment and productivity from takeover, especially those involving large firms acquiring small ones, may have a temporal or cyclical element.

The next chapter discusses the potential for any spatial variation in the market for small firms and what the possible effects of these takeovers are.

Chapter 4 - Spatial Economic Activity and Takeovers

4.1 Introduction

Having surveyed and synthesised the relevant takeover literature in the preceding two chapters, the thesis now goes on to consider the spatial dimension of the market for small firms. This chapter sets the background conditions in which the subsequent regional theory of small firm takeovers can be applied to. The review introduces the theory of why income and productivity may differ by location and the creation of core and peripheral regions. The different characteristics and processes in these regions may have implications for the mechanism of the market for small firms (as described in the preceding two chapters); both the acquisitions motivations and their effects.

I begin by discussing the theory of spatial income and productivity disparities.

4.2 Regional Income and Productivity Disparities

The neoclassical growth model applied to national economies, and therefore to regional economies, predicts conditional convergence (Barro and Sala-i-Martin 1995; Mankiw et al. 1992). That is, regions with the same savings rates, depreciation rates, production functions and exogenous rates of technical progress and population growth will converge to the same levels of incomes and productivity. Persistent regional productivity gaps therefore must be due to the failure of one or more of these conditions - though predicted rates of convergence are very slow (around 2 percent per annum for European regions for instance (Barro and Sala-i-Martin 1995, p. 400)).

An obvious shortcoming of this neoclassical model is that the technical progress assumed to drive long run economic growth, and therefore determining long run productivity gaps, is fixed outside the model. Hence considerable attention has been devoted to endogenising technical progress (Lucas 1988; Romer 1986, 1990). In these models the convergence prediction can be overturned, because the diminishing returns of the neoclassical model on which it depends are in effect abolished by investment in R&D or some other form of innovation. In these endogenous growth models a country or region that gets ahead, stays ahead, indeed probably with a widening productivity gap. Because these models have been developed to explain macroeconomic

performance they typically lack the explicit spatial dimension essential for regional analysis. This deficiency is remedied by the New Economic Geography.

New economic geography (NEG) models offer an insight into why certain regions, such as Wales, are persistently economically disadvantaged. Agglomeration and clustering may create persistent differences in the levels and growth of regional productivity. This theory, does not explicitly address the role of firms, but assumes labour and production to be mobile. If the factors of production move, then so must firms and their assets. Not only will enterprises relocate but those in regions benefiting most from agglomeration will multiply and grow in contrast to those of other regions. The assets of small firms are much easier to transfer and they also provide a significant potential expansion for a (regional) economy. Takeovers are a mechanism that enables production to be transfer between firms, and if these businesses are located in different regions (core and periphery), acquisitions will contribute to the divergence that NEG seeks to explain. Takeovers are also likely to affect subsequent performance (see chapter 3). The effects of takeovers on small firms exits and performance, jointly dictate whether SME acquisition is beneficial to regional economies.

4.3 New Economic Geography

This section introduces new economic geography and applications to the UK's regional disparities of productivity. It then discusses how the theory applies to firms, particularly SMEs, and the possible relation to acquisition activity in this sector.

It is a well established fact that geographically peripheral UK regions, such as Wales, have a productivity gap or at least a GVA per head gap, relative to that of the UK average (e.g. see ONS 2006b). Here a peripheral region is one that is distant from the highest income and productivity regions of the UK: London and the South East. These last two regions can be thought of as the core regions of the UK.

Recent growth theory, in the form of NEG, provides a framework that can help to explain these spatial differences in income and productivity and including the process by which core-periphery outcomes may occur (see for example Krugman 1991b;

Krugman and Venables 1995). Much of the insight from NEG models has developed out of New Trade Theory, which assumes product differentiation, monopolistic competition and increasing returns to scale; so unit costs are reduced when production increases. Therefore, instead of spreading a number of plants across a region or country, the concentration of production is advantageous to the firm.

Clustering of production reduces costs of production via economies of scale (both external and internal – as the market becomes bigger), contributing to regionally diverging incomes. Alternative forms of economies of scale are stressed by different authors (Martin 1999) but there are two broad sources (Armstrong and Taylor 2000). First, localisation economies arise from geographical concentration of plants and producers within the same industry. This includes transfer or linkage economies. Also, specialisation might be beneficial along with an access to a pool of skilled labour, local knowledge spill-overs and specialist suppliers and business services. These all provide advantages to production in close proximity (Fujita and Thisse 1996). Some of these features may help to increase intangibles such as innovation and R&D within a locality. Ideas, information and knowledge may all transfer more freely between firms when they are in close proximity; for example, by workers changing jobs between local firms. Information flows attenuate with distance so that further away locations benefit less from this process.

Second, agglomeration economies provide benefits from the clustering of firms, but not necessarily within the same industry. Such economies may stem from facilities and services provided to all industries. They include a pool of workers with different skills and transport facilities. The aspects of localisation and agglomeration economies might be reinforcing; clustering may attract highly skilled workers, who in turn may increase innovation. This can raise the growth rate of a core location. Core regions are attractive to workers as, if they lose their job, it is likely that other opportunities will arise without the need to relocate (Krugman 1991a). Krugman also indicates that this has implications for start-ups, where failures in the core mean there are always fall-back jobs in the locality.

The co-location of production is also desirable due to the size of markets served. As it is more advantageous (more profitable) to produce closer to the market (due to

reduced transport costs), wherever possible, there is an added incentive for firms to produce in the core. This can equally apply to low technology sectors, which have also been shown to be localised. The benefits of concentrated production therefore do not only apply to production in high tech sectors (Krugman 1991a).

Agglomeration (or dispersion) comes about from the magnitude of transport costs and the degree of labour mobility. The movement of labour allows the reallocation of economic activities to move across regions and potentially create core-periphery equilibriums. Thus, higher immobility of labour helps create centrifugal pressures. However, product differentiation allows for many similar products to remain in the market, even if produced at different costs, as consumers have preferences over or between similar goods. This ensures that some production remains in the periphery and that it all does not migrate to the core.

A decline in transport costs can also affect a core-periphery outcome across regions (Krugman and Venables 1995). Lower transport costs results in higher (positive) agglomeration effects and the possibility to produce in core regions increases, as goods can be moved out. However, as transport costs continue to fall, it is possible for income differences to lower and the periphery may gain as production can be undertaken in the least cost regions. In part, it is the size of the transport costs that cause the existence and the size of core-periphery outcomes and either diverging or converging incomes.

Costs, or centrifugal forces (Krugman 1998), also make production in the core more costly. Diseconomies of scale, such as congestion and competition for land and labour, can increase factor input prices – all costs of agglomeration. The higher costs of operation within the core provide incentives for firms to move out and redistribute economic activity; a 'trickle-down' effect. This could create a demand for firms outside of core areas to help enable a firm to reduce it production costs by moving some of it production. More peripheral locations may benefit from this. However, for the largest and most productive regions, it is probable that the benefits of being concentrated are high and that spill-overs outweigh agglomeration costs for most firms. This is likely to be the case for London and the South East, where it has been documented that services tend to migrate to the South East of England but that

manufacturing tends to migrate the other way (Krugman 1991a). Therefore small firms that may benefit from better information flows may improve performance and profitability when located in core locations. This will create an external demand for firms that currently operate outside of it, an incentive to relocate or both.

The incentives for firms to operate in close proximity is found empirically where population density effects (controlling for human and physical capital differences) have a significantly positive relationship with output per worker in both the US (Ciccone and Hall 1996 in Rice and Venables 2003, p. 679) and in Europe (Ciccone 2002 in Rice and Venables 2003, p. 679).

Therefore agglomeration and clustering may create persistent differences in the levels and growth of regional productivity, as observed within the UK. As concentration has a positive effect on productivity due to agglomeration economies, this leads to the centralisation of production to core regions and the attraction of more innovative, knowledge intensive, intangible rich firms that helps to keep core areas ahead of more peripheral ones. The core may also draw capital and resources from other areas so peripheral locations lose out. Acquisitions could contribute to this, allowing ownership, assets and production to and be moved to the core.

The movement of knowledge and intangibles, as described by NEG models are likely to involve firms, perhaps especially small ones. The benefits of a core location may aid the chances of some start-ups and help enable them to grow. But there are also likely to be many competing forces. In less favourable locations, such as the periphery, the chances for growth might be less and therefore survival might be more difficult. Countering these, there might be fewer start-ups and less competing forces aiding the chances of survival. However, the main concern of this thesis with NEG theory is to address the interaction of core and peripheral locations and the transfer of resource between them.

At the regional level, an SME relocating away from a region has the same effect as a firm death (assuming the exiting entrepreneur does not create a new start-up). It results in a loss of a local productive unit and source of employment but it is likely that the process is quite different from firm exits. However, regions also receive

SMEs. Spatial feedback processes may reinforce core-periphery disparities or ameliorate them – convergence or divergence is possible.

Regional disparities in the expected rates of return may generate incentives for a firm to relocate (Twomey and Taylor 1985). Costs of production, including transport, and revenues are likely to vary over space so profits might be maximised in an alternative location. A tendency for the concentration and localisation of plants and firms may also exist, as NEG models suggest, perhaps to benefit from external economies (Barriosa et al. 2005). The 'pull' of different regions could be a function of their size, which therefore would also identify core regions. Relocations to those regions, perhaps as a consequence of takeover, would enable firms to take advantage of agglomeration economies[39].

Other benefits that core regions may provide are closeness to 'producer services'. Due to the nature of clustering, it is likely that in the core a greater supply of business services exist. Proximity to business services and finance can aid information flows and perhaps improve the firm's access to these services (Holl 2004). This too may increase the rate of takeovers in the core, as the information flows enable more opportunities to be known about, relative to the periphery.

Incentives for firms to relocate away from core regions may also exist. Increased clustering and a higher density of firms can cause congestion costs. Competition for resources and inputs can also result in higher unit costs, particularly for land rent. These push factors out of core locations mean that firm relocations can act as a mechanism of redistributing economic growth towards the periphery (van Dijk and Pellenbarg 2000). However, in core regions higher wages are found to have no effect on plant relocations (Holl 2004), but in another empirical study, labour 'availability' (which is likely to result in relatively lower wages) is significant in explaining a region's differing level of firm relocations (Twomey and Taylor 1985).

In a model similar to those used in NEG with monopolistic competition, firms relocate to the largest regions, which is increasingly attractive for businesses with

[39] Firms that choose not to set-up locally also appear to be more affected by agglomeration economies and their proximity to major urban centres (Figueiredo et al. 2002).

higher productivity and vice versa (Baldwin and Okubo 2006). The more productive firms have an increased likelihood of benefiting from greater agglomeration forces. This is consistent with the idea that more productive firms have a greater absorptive capacity and the gains that can be made from operating in the core are greater for already productive firms. For less productive firms, perhaps being able to reduce costs by operating in the periphery is the attraction; hence low productivity firm's draw to more peripheral locations.

NEG theory outlines how regional income levels and growth rate may differ. It is likely that takeovers, including those of SMEs, play a part in this process where the core attracts production at expense of the periphery, if most acquirers are assumed to be located in the former. How is productivity in peripheral regions affected by SME acquisitions? Is productivity in the periphery pulled down by the exit through acquisition of high productivity indigenous small businesses? Or is it the case the new owners are able to inject resources into the firm, improving its performance and benefiting the region?

First it is necessary to understand any spatial disparities in SME takeovers and if so what types of are involved.

4.4 The Spatial Element to the Market for SMEs

A central concern of this investigation is small firm takeovers and the difference in the intensity of, and perhaps the motivation for, acquisitions between the regions of the UK. Intangibles (including knowledge in R&D intellectual property, skills of the work force etc) are deemed to be key to driving both regional (via knowledge spillovers) and enterprise performance (Harris 2008). These intangibles can also help to explain why takeovers occur. They are likely to be desirable to acquirers because they enhance a competitive advantage providing higher productivity and profits (as discussed in chapter 2). As returns are greater in the core, this could result in firms located there acquiring assets and firms in the periphery, so that they can obtain maximum return from their acquisition. The assets in the target location are either relatively cheaper or not available in the acquirer's home location. Foreign or external takeovers when the acquirer has a desire to obtain or access valuable assets can be

called '*asset-seeking FDI*' (Wesson 1999).

Takeovers might also be a product of agglomeration. NEG theory suggests that competition and a greater proximity of firms in core locations might increase the probability of takeover there, as well as a facilitating the absorption of new productive resources. Alternatively, takeovers might be a reaction to agglomeration costs. The acquisition of established units outside of core locations may enable the transfer of production to lower cost regions such as those in the periphery.

Larger firms with closer links to capital markets are more likely to be based in core areas relative to the periphery; this may create a market of corporate control that shifts the ownership of the most promising SMEs from the periphery. If the price of finance also varies between regions; lower in the core due to its proximity to capital markets for instance (see below), this may exaggerate the effect, further stimulating the demand of larger firms in the core for SMEs, especially those based in the periphery.

One of the key variables that may affect the location of targets, in relation to the acquirer, is information. According to NEG theory, one of the advantages of being located close to other firms is the improved flow of information between agents and firms. Information on privately owned and unlisted firms is likely to be a function of distance. The further away are potential targets and acquirers the less is likely to be known about the former. This effect, on its own, could result in the acquisition of SMEs being only a regional event. It is more costly to try and obtain information on firms that are either not listed or further away. Distant acquirers have to devote more resources to seek out '*suitable non-quoted takeover targets*' (Ashcroft et al. 1994, p. 172). If acquisitions are all local, and the acquirers gain from the process, the effect on the target may suggest whether acquiring small firms is beneficial to regional economies. Gains to acquirers and also to the target, on average, will result in benefits from SME takeovers.

The location of a potential target will be more important if the purpose of the acquisition is to extend the geographical coverage of the acquirer outside of its home region. NEG theory suggests that congestion and competition for resource might make some forms of production cheaper outside of core regions and therefore firms

located there may target firms in the periphery for these reasons. This would involve a deliberate regional bias for takeover targets (Fothergill and Guy 1990). Acquisitions that are either for expansion or diversification may result in targets that are further away (Ashcroft et al. 1994), for example, foreign direct investment.

The spatial element to why some SMEs might be open to an acquisition approach, the supply of the market for small firms, is explored next. This focuses on differential access to finance.

4.5 Spatial Variation in the Supply to the Market for Small Firms: Finance

Do supply conditions differ between the peripheral regions of the UK and the core? If peripheral regions have a greater tendency to sell, especially more productive SMEs, then perhaps they may exit through being acquired. This could potentially have deleterious effects on regional productivity. The most common reason for target-initiated takeovers is to enable firms to access extra capital, especially for acquisitions by regional external firms (Hayter 1981 in Ashcroft and Love 1993, p. 81). This suggests that if there is a location element to finance, where constrained firms look for an external injection, this would have differential effects in the supply of small firm between locations.

Within a developed economy with an efficient financial system, mobile capital may be expected to find profitable investment opportunities regardless of location. Therefore if a firm is unable to obtain finance, perhaps there is an issue with its risk-return profile. But what if proximity to the financial sector perhaps has a greater effect than an investment's risk or return profile? If a worthy potential investment were without finance, this would represent a failure in the financial market. On the other hand asymmetries of information are perhaps most acute for those who are geographically remote from finance providers – consistent with NEG theories of how information flows.

4.5.1 Relationship-lending

Distance affects relations, and 'relationship-lending' may enable SMEs to access

finance with greater ease, reducing the desire for acquisition. The process involves a firm developing a working relationship with a lending institution. As the lending agent learns about the firm, it is assumed to gain soft, private information on the type of borrower the firm is, reducing the asymmetry of information between the two agents. Much of the information a lending institution can gain from a firm is with existing lending arrangements but this element makes relationships somewhat endogenous. If a firm is able to obtain finance, then the firm may not be subject to credit rationing. Ideally a firm may need to establish some form of relationship prior to approaching a lending institution for funds. This can happen through the provision of other services, such as existing deposit accounts. Another way that this may happen is via informal networks. Agents within lending institutions might get to know or learn about firm owners who are looking for funds. Informal financial intermediaries may help to 'connect' borrowers and lenders and play a significant role in accessing finance (Garmaise and Moskowitz 2003). NEG models suggest that mechanisms that allow information to flow between agents are more pronounced in core areas relative to the periphery. This may improve small firms' access to finance in the core relative to the periphery.

The local discretion of managers is found to be important with regards to SME finance (McKillop and Barton 1995) and a relationship with a bank leads to a lower (perceived) constraint by the firm (Binks and Ennew 1996). Other research suggests that a pre-existing relationship is important in the decision on whether to extend credit but the duration is not (Cole 1998). But other evidence does suggest that as the relationship lengthens with a bank, an increase in credit is found (Berger and Udell 1998; Petersen and Rajan 1994).

A number of studies also investigate both the supply and price of credit[40]. The results of these studies are mixed in terms of whether relationships ease credit rationing or information problems with small firms. Relationship strength with banks, measured in length and duration, is found to result in a reduced interest rate (Berger and Udell 1998) and a longer, or stronger, relationship as measured by extending lines of credit or granting new ones can cause this (Berger and Udell 1995). Evidence also exists to

[40] Strictly defined, credit rationing has been identified in theoretical models resulting in a reduced supply of loanable funds and not an increase in the cost of credit.

suggest the opposite - relationship-lending does little in relation to obtaining cheaper credit when measuring relationship strength as a continuous measure (Petersen and Rajan 1994).

Closeness of the firm and lending institution could also be literal; geographical distance may matter. Lending institutions may have more information on SMEs that are geographically closer, ceteris paribus. Given that more lending institutions and other forms of capital are likely to be more common in core areas, this may indicate the potential for differential access to finance between core and peripheral areas. Empirical evidence on the correlation between distance from the bank and the price of loans does not support the theory of relationship lending (Petersen and Rajan 2002). Small firms further away from banks in Belgium may actually obtain a loan at a lower interest rate[41] (Degryse and Ongena 2005). The advent of banking away from traditional branch methods to more electronic forms, increasing the distance between lending institutions and borrowers, actually increased the availability of credit to firms (Petersen and Rajan 2002).

Findings on the effects of relationship lending on both the price and supply of credit must be treated with some caution; not all firms are going to be 'good' borrowers. If information is obtained over time that reveals to lenders a firm is a higher than average borrowing risk, then they are unlikely to be extended credit or offer it at a lower rate.

4.5.2 Collateral

The ability to pledge assets as collateral may help to reduce potential problems in the supply of finance. The value of personal assets, such as property, is likely to vary between core and peripheral regions, according to NEG models. Competition for resources and inputs in the core are likely to result in higher land rent and property values. These assets could be used to access finance and affect the supply of small firms.

[41] This result implies the costs of adverse selection, caused by having customers further away, does not increase relative to spatial discrimination (the loan rate decreases as the distance increases between the bank and firms increases to entice customers from further away) and transport costs for the firms to get to the branch, as the distance increases between the lender and borrower.

The regional distribution of start-ups is not found to be affected by housing wealth, a form of personal collateral. However, it is an explanatory variable for VAT deregistration (other things being equal) (Robson 1996). Housing wealth can be used as collateral in order for firms to obtain new lines of credit that can ultimately help to prevent closure due to financial constraints (at least in the short-run). Similarly, Holtz-Eakin et al (1994) find that an increase in personal liquid assets (in the form of inheritance) increases the chance that a sole proprietor entrepreneur will continue in the future. Also, a change in the value of collateral is also found to affect a firms' debt capacity, where a negative change in the value of collateral has an adverse affect (Gan 2007). Therefore the size (and change in value) of personal assets are probably linked to the likelihood of a firm, entrepreneur, or both, exiting.

Given that changes to asset or collateral values has an effect upon debt capacity (Gan 2007), it might be that firm owners located in regions where house prices have risen considerably over the last decade, - in core regions London and the South East - are able to obtain larger supplies of credit, secured against their own increased personal wealth. Therefore in regions where house prices have not increased as much, are generally lower or both, owners of firms in these areas will have less capacity to acquire debt and so perhaps incur a financial constraint sooner. In relatively more deprived areas it might be the case that not only is their own property worth less but there is perhaps an increased chance of not even owning their residence. This may also have potential impacts on firm owners in these regions and their access to an adequate supply of finance.

4.5.3 Equity markets

Firms that are most remote from finance providers could be most at risk from being unable to secure credit. The same may also be true for equity-finance, where information problems might create market failure. If investors are only aware of potential investments in their immediate area it is likely that firms located further away from investors and markets may go without finance. Centralised equity markets mostly deal with large international stocks (Huggins et al. 2003). A centralised financial market system may not allow small 'relational' investments, particularly in regions that are more remote from the markets. In relation to the stock of VAT registered businesses, London and Scotland are both over-represented on the financial

markets and only Scotland and the South East have regional market capitalisations greater than GDP. By contrast, Wales has the lowest proportion of its VAT-registered businesses listed out of all the GB regions (Klagge and Martin 2005). This suggests the existence of regional equity gaps in places that are peripheral to central financial markets. International comparisons show that Germany differs with a more widely spread venture capital market and more regional balanced distribution of investment (Klagge and Martin 2005).

The evidence above might only be partially or not at all a result of demand-side problems. Less suitable investment opportunities might exist within some regions. However, venture capitalists are mainly based where the demand is greatest for it, e.g. London and the South East, and some of this could be a symptom of a highly centralised system (Klagge and Martin 2005). Having a local supply of venture capital may reinforce any existing demand for this type of finance. In an area with no, or a limited, supply of venture capital, the low supply may reinforce the limited demand, leaving regions with a low supply, low demand equilibrium, reinforcing each other. However, as outlined above, with an efficient financial system, capital should find profitable investment opportunities and therefore if there is a demand for venture capital, then a supply is likely to be available.

More likely is that firms may not reveal their true demand for finance as they might be unaware of the sorts of finance that are available. Small firms might have insufficient information, or resources to obtain such information, to secure additional finance. This may also vary by region with the existence of regional differences in the cost of obtaining information on borrowing and the rates of (McKillop and Barton 1995, p. 243). Part of this might be explained by regional variations in skills, and perhaps, small business experience.

Overall, little evidence relates location and the likelihood of incurring binding credit constraints. Peripheral regions are also no more likely to be in need finance or have difficulty in accessing it. As a sort of proxy for the core-periphery, no UK north-south divide is found with regards to reporting finance as a problem for expansion (Moore 1994). Concerning SMEs' ability to obtain finance or the full amount requested, not controlling for any differences between firms within the regions of the UK, analysis

shows no real differences between those located a peripheral region, Wales (12 percent), or the UK more generally (14 percent) (Wiseman et al. 2005). With respect to gaining access to finance without difficulty, SMEs in the peripheral region of Wales (83 percent) are also found to be slightly higher than the UK average (79 percent) (Institute for Employment Studies 2006a).

Despite finding a general lack of evidence to suggest that SMEs have difficulties in accessing general finance – especially debt, in his own recent literature review, Rowlands (2009, p. 62) concludes that there is a bias with investment capital provision for SMEs towards the regions of London and the South East. It is likely this is symptomatic of problems in both the supply and demand for such funding.

I next investigate whether there is any spatial variation or bias in the acquisition activity of firms.

4.6 Spatial Evidence of Acquirers and Targets

Evidence suggests that, intra-nationally, firms from the most economically active and prosperous areas are found to conduct a disproportionate amount of acquisitions but targets are much less regionally concentrated (Böckerman and Lehto 2006). Similar proportions of firms in core and peripheral locations (such as Wales) expect a transfer or closure of their business[42] (Wiseman et al. 2005). Likewise for the sale or full ownership transfer (Institute for Employment Studies 2006a, b). With British manufacturing in the 1970s, acquiring firms were also found to be much more likely to be from the South-East but with much less concentration with regards to the location of the acquired (Leigh and North 1978). This is consistent with other findings that indicate that smaller unquoted firm's vulnerability to takeover has increased with corporate control converging on the South East (Ashcroft et al. 1994). Further evidence shows the movement of corporate control of small firms from peripheral areas of Europe to large firms based in more core-like areas where the financial centres are located (Chapman and Edmond 2000). This may also translate to intra-country firm movement and control between core and peripheral areas, where acquirers are based in the former and the acquired in the latter.

[42] These are descriptive statistics and do not control for any other characteristics.

The empirical evidence also suggests that intra-regional acquisitions are not the only type (Ashcroft et al. 1994; Böckerman and Lehto 2006; Leigh and North 1978). However, a strong bias of acquisitions exists that involve targets close to the acquirer's headquarters. This is particularly so in the largest metropolitan areas (Green 1990) where M&A activity declines with distance (Green and Cromley 1984). NEG theory suggests that competitive pressures are likely to increase the amount of M&As within large agglomerations. This is also found in the empirical evidence; large cities or locations with a large density of firms have a higher correlation with the number of takeovers either initiated by firms or the number of firms acquired within the area (Green 1990; Rodriguez-Pose and Zademach 2003). Combining both the size of regions and distance in a form of gravity model, takeovers in the UK are found to have a positive relationship with the former and negative one with the latter (Ashcroft et al. 1994).

4.6.1 Spatial Evidence of Acquirers and Targets: Firm Attributes

The propensity to conduct extra- or intra-regional acquisitions is found to be linked to the acquirer's size. Small acquirers are much more intra-regional, consolidating their existing positions, whereas larger firms are more likely to be extra-regional (Böckerman and Lehto 2006; Leigh and North 1978). Larger firms, who may have better access to financial resources, are more able to target smaller unquoted firms in more distant locations (e.g. the periphery) (Ashcroft and Love 1992). The size of the acquirer also affects the required attributes of potential targets. Leigh and North (1978) find regions with large companies seek efficient, small firms to help enable future expansion. Further afield acquisitions are similarly found to be of well-performing (profitable) targets and those with fixed assets (Böckerman and Lehto 2006).

Following the NEG theory that there is an external demand for firms then studies that look at foreign acquisition are instructive. In a number of these studies, foreign suitors are also found to acquire more productive plants or firms (Griffith et al. 2004; Hanley and Zervos 2007; Harris and Robinson 2002; Salis 2008), this is commonly termed as 'cherry-picking'. However, evidence also suggests the opposite with foreign acquisitions in Sweden of firms with more than 50 employees (Karpaty 2007).

4.6 Acquisition Effects

This final section investigates the potential spatial effects of takeovers. Acquisitions are potentially an important mechanism by which economic activity can change between regions (Green 1990). NEG models suggest a mechanism by which takeovers may contribute to the concentration of economic activity. Takeovers can reinforce core- periphery divergence (Green and McNaughton, 1989 and Aliberti and Green, 1999 both in Böckerman and Lehto 2006, p. 850; Brouwer et al. 2004) and weaken peripheral locations (Ashcroft and Love 1993), with external takeovers concentrating economic activity within core regions (Holl 2004; Rodriguez-Pose and Zademach 2003). This could stem from their effects on performance, on exits or on relocation away from the region, if acquirers are located in core regions. The overall impact could be a Potential Pareto Improvement but there might be a tendency for the periphery to lose out from SME takeovers and for the core regions to gain.

An example of an SME takeover having a negative effect on a peripheral region is Albion Concrete Products. This firm was based at Llangadog in Dyfed, Wales and manufactured a variety of concrete products. Albion Concrete Products was purchased by the Hanson group (headquartered in Maidenhead, South East England) in July 1999. However, three years after being taken over the company was reported to be threatened with closure (The Western Mail 31st July 2002). Eventually Hanson group reportedly sold the company (to a builders' merchant), moving all work from Llangadog to another plant in Derby. Upon Hanson's exit, Albion Concrete Products had 37 jobs, around half the number in 1999 when they first bought it. This event did not go unnoticed and was commented on by a former local MP, Adam Price;

'*It's a devastating blow and it's part of a pattern of predatory takeovers where externally owned companies come into rural areas and buy up successful indigenous companies in order to close them down and maximise their own position in the marketplace*' (The Western Mail 31st July 2002).

Alternatively, the loss of decision-making powers via external takeovers may result in increased production and productivity for periphery regions (Leigh and North 1978). It may allow the transfusion of new production methods and knowledge to permeate its way to the periphery. Information flows within a firm that is spatially disparate may allow ideas to spread out from the core. Or resources could be invested in

peripheral acquisitions that then improve performance. This may also increase the general productivity of the national economy. Takeovers are a mechanism that can release resources and put them to a more efficient use. Therefore resources that are removed from a given area perhaps can be put to a more efficient use in an alternative area. Cheaper resources and lower demand for production inputs may mean that production is more profitable in a peripheral location. Takeovers may allow production to move to other plants that are located outside of the core.

With the movement of productive firms away from the periphery, this could generate a form of '*technological leakage*' (Howells and Charles, 1989 in Howells 1990, p. 509); the economic benefits are not seen where the (original) development occurred. Patterns in the movement of corporate control may turn core areas into head office and control regions due to its domination of the market for corporate control (Ashcroft et al. 1994; Leigh and North 1978). This can result in the relocation of key decisions and not just relocation of functions (Green and Mcnaughton, 1989 and Aliberti and Green, 1999 both in Böckerman and Lehto 2006, p. 850). Such a process may also have detrimental side-effects on regional indigenous sources of growth and productivity including entrepreneurship, start-ups and innovation (Rodriguez-Pose and Zademach 2003). This could further widen growth differentials between core and peripheral areas. In the extreme, there might be no production in the original region or perhaps just turning the firm into a production unit, instead of an important R&D facility with associated spill-overs and high occupational jobs and pay.

The effect of regional or foreign acquisitions is likely to depend on the purpose of the acquisition. FDI, like some regional takeovers, could be a mechanism to gain a foothold in a given location. The target would enable the acquirer to have a local outlet for accessing different geographical markets. If the reason is for new market access, then the target is likely to have an increased chance of survival, perhaps even benefiting from the resources (such as finance) of the acquirer. However, even with such a motivation for takeover, new foreign or external owners are likely to be more alien to local market conditions. This may lead to an increased chance of 'bedding-in' problems, relative to domestic or local acquisitions.

Alternatively, the external firm may value the assets more highly than potential local acquirers as foreign owners might be better placed to divest the firm by breaking employment contracts and removing productive capacity- or for other reasons (Chapman 2003).

Firms or plants that are more remote from their headquarters might be more difficult to control and manage due to the geographical dislocation, thereby increasing the likelihood of closure (Healey 1981). Therefore external acquisitions might increase the chances of exit relative to domestic ones. Alternatively, if the purpose of the takeover is to acquire human assets or R&D, then the target might be more vulnerable to exit and a fall in performance, perhaps as a consequence of 'intrapreneurship' hunting.

Little evidence exists on the effects of takeovers in the periphery and the differences relative to the core. The limited (and now dated) evidence suggests no consistent evidence of regional patterns of expansion or closure after acquisition (Leigh and North 1978). This is important given the degree of acquisition activity that is concentrated in London and the South East. It suggests that expansion is perhaps not at the expense of peripheral regions. For manufacturing plants in a peripheral UK region, external ownership changes are found to increase the chance of closure (Smith 1979). Similarly in the UK iron foundry industry, acquired small independent firms have a higher probability of closure, particularly within peripheral areas (Smith and Taylor 1983). The relevance of these results may be restricted to the period in which they were obtained – a cyclical element to exit chances may exist. Even in faster growing, technology-intensive industries, takeovers result in the exit of plants that are peripheral to the main enterprise (Chapman and Edmond 2000).

Foreign takeovers are also an instructive area of research for the effects of external acquisition. The empirical evidence of foreign acquisitions contains studies with mostly positive effects on productivity or growth (Bertrand and Zitouna 2007; Conyon et al. 2002b; Girma and Görg 2007; Griffith et al. 2004; Piscitello and Rabbiosi 2005). Indeed, some studies find that the acquired improve more relative to

domestic acquisitions (Bertrand and Zitouna 2007; Conyon et al. 2002b)[43] and even more if initial productivity is lower, at least within the office machinery and data processing equipment sector (Girma and Görg 2007). This last finding suggests that the effect of (foreign) acquisition on the target may depend on the firm's pre-takeover level of performance.

For the highest efficiency and greatest return on the asset, a requirement might be for '*direct physical or economic contact*' (Wesson 1999, p. 2). For FDI this implies that acquirers move into the new location, but for inter-regional small firm investments or acquisitions, it might be optimal to move the assets to the acquirer's location, internalising the assets of the acquired. The returns to this action might be a function of the target firm's size. Smaller targets could be of more benefit with their intangibles than the rationalisation and improved performance that may occur with larger targets (Piscitello and Rabbiosi 2005). Consistent with this, relatively smaller targets are found to increase the post-acquisition performance of the acquirer (Ahuja and Katila 2001).

For firms to be able to benefit from takeover they may require a certain absorptive capacity. UK evidence of this is confirmed with foreign acquisitions, where productivity increases more for those that are initially more productive (Girma 2005). However, Findlay (1978) believes there is an externality to FDI, such as foreign acquisitions, that increases with the gap between available technologies. This externality might be demonstrated by gaps in productivity and suggests that less productive firms are more likely to gain from external takeover, as they benefit from a more advanced region's knowhow and production techniques. This process is consistent with neoclassical theories of (regional) economic growth, where knowledge can spread within firms reducing productivity gaps.

Some empirical evidence of foreign acquisitions also finds that they can cause a fall (Hanley and Zervos 2007; Harris and Robinson 2002), no improvement (Salis 2008), or improvements in productivity only a few years after acquisition (Karpaty 2007). These latter findings are perhaps consistent with 'bedding-in' problems and

[43] Bertrand and Zitouna (2007) find this only for the cross-border acquisition of French firms where the acquirers are outside of the EU.

adjustment costs of acquisition. It is then perhaps the timing after the acquisition that may produce some of these different results but the 'controversy' still exists on whether foreign acquisitions produce productivity gains (Hanley and Zervos 2007).

If some acquired firms are targeted for their (intangible) assets, or 'intrapreneurship' hunting occurs, there could be negative effects of foreign acquisitions. If so, this is also consistent with evidence that plants acquired by the foreign-owned firms have a much higher chance of subsequent exit (Harris and Hassaszadeh 2002).

Despite the conflicting evidence on the effects of foreign takeovers on productivity, a growing consensus is emerging that acknowledges the important role that acquisitions may have on the '*evolution of the space economy*' (Chapman 2003, p. 310). However, takeovers seem equally likely to either increase or decrease the target's performance after acquisition.

4.6.1 Other spatial consequences of takeovers: entrepreneurial recycling

'Successful' exits may be harmful to regions as they could move productive capacity between regions. Incentives to produce in core regions may mean that this process contributes to the transfer of resources and production from the periphery to the core. Therefore, despite being an efficient market process and exits being a 'success' in aggregate, for the region that loses a source of indigenous growth from small productive firms, it could be a failure and a welfare loss.

At a spatial level, entrepreneurial recycling (also explored in chapter 2) may result in a net gain for the periphery, especially if investment or the acquirer is from the core and production and the productive capacity remain in the original region after acquisition. However, if productivity falls or the firm is dissolved with the assets moving out, it is unlikely that the periphery will gain from such a process. In this instance, perhaps at best, a neutral effect occurs where productive capacity is initially lost but is eventually returned once the former owner starts up a new firm – and at a similar scale to their firm sale. The neutral effect relies on the assumption that funds are invested back into the original region. However, the effect for a regional economy also depends on where the acquirer is based, as if local, it could act as a transfer of production between firms without having many consequences for the periphery.

Only limited evidence on this exists. People are more likely to become serial entrepreneurs in urban (rather than rural) locations due to the respective opportunities that exist there (Van Gelderen 1999; Wagner and Sternberg 2004; Arenius and De Clercq 2005; Kolvereid and Isaksen 2006 all in Stam et al. 2008, p. 499). Applying these limited findings to context of the core-periphery suggests that if serial entrepreneurship occurs, it is perhaps more likely in core areas rather than peripheral ones.

4.7 Conclusions

The review of NEG in relation to the spatial dimensions of SME takeovers provides some possible regional effects. That economics may operate across space is often over looked (Martin 1999), especially in terms of acquisitions. Implicitly, the spatial dimension assumes that there is a concern is not just with efficient outcomes but also with (spatially) equitable ones. The distribution of the gains between regions (and persons) matters as well as ensuring that the national aggregate is maximised. How an economy is organised spatially can also have a critical effect on economic functions and how agents may operate.

Agglomeration economies of core areas will benefit businesses. This may incentivise firms to relocate or transfer assets to be used more efficiently there and result in greater clustering of firms. However, over time, enterprises may require different aspects of a region and perhaps the increased cost of the core may help to move production to outside regions. It is possible that takeovers may help to concentrate economic activity, as more firm headquarters are based in the core. Synergies might mean that close proximity is also desirable. More large firms located in the core may stimulate a process of businesses from there acquiring productive SMEs firms in more peripheral areas. Firms located in core areas are also more likely to engage in takeover activity due to the increased competitive pressures there.

New economic geography growth theory also suggests reasons why the processes of takeovers may have a regional element, contributing to the movement of resources and production to the core from the periphery. If highly productive SMEs in the

periphery are acquired by large core firms, this may be detrimental to the economic development of the periphery. Conversely, takeovers may boost the performance of acquired firms.

Finance might be restricted, offered at a higher rate or both for smaller firms. Being located further from significant capital markets may compound this problem for SMEs in the periphery, although there is very limited evidence in support of this hypothesis. Limited local capital markets might be a possible reason for a lack of relatively successful firms in peripheral regions; a lack of equity investment can lead to an outside takeover. Acquirers' may also have access to national and international capital markets from which small, regional firms are excluded.

Some of the negative aspects of acquisitions also might be increased with external takeovers. No evidence exists specifically related to SMEs or the differences between regions. Despite this, empirical evidence of foreign takeovers suggests possible increases in productivity, or for those acquisitions where productivity does fall, bedding-in problems might exist; as performance picks up after a few years. External takeovers may therefore equally help or hinder acquired firms.

The effect of takeovers on regional economies is the sum of the effects on the acquirers and the acquired. If the acquirers are assumed always to benefit from acquisitions, then it is the location of these firms that matter. NEG models and empirical evidence on where large firms are location suggest that they are more likely to be located in the core. Given the potentially greater returns that businesses operating (or assets used) in the core, this may generate an external demand for businesses currently located in the periphery. Takeovers may enable firms in core locations to obtain and transfer assets, innovations and R&D that can perhaps be made better use of within these regions.

The transfer of resource from the periphery to the core might be an efficient outcome – and a Potential Pareto Improvement (PPI)[44] - but in terms of the spatial or interpersonal distributions, it might not be an equitable one. The periphery may lose

[44] A net gain after the winners compensates the losers.

out while the core gains, owners of capital may win at the expense of the workforce or both.

Next I present a model with some hypotheses about the market for small firms and its effects, including those on spatial economies. This is derived from the preceding areas of theory and literature.

Chapter 5 – The Model

This chapter distils from the preceding three to produce the framework and model which are used to estimate both the determinants of SME takeovers and the impact of these acquisitions on the regions in which the targets are located. Parameter restrictions are discussed particularly in cases where behaviour may differ between SMEs and large firms, and the vital spatial element to be modelled is clearly distinguished. The chapter also outlines the estimation problems for the system that must be addressed.

I begin by outlining the system in general terms, before offering some empirical hypotheses and then specifying specific functional relations.

5.1 Model Summary

There are three central elements of the model. The first is the market for ownership and control of enterprises and why this may be different for small firms. The second is the operation of this market and how it may subsequently affect the performance of targets. The third is the spatial dimension of the market, and in particular the possible regional disparities consequent upon the market's functioning.

The market for ownership and control determines takeover chances and the likely characteristics of acquired firms. For large publicly quoted firms, Q-theory suggests that less productive firms are more likely to be acquired (Jovanovic and Rousseau 2002). On the supply side, all publicly quoted firms are available for takeover if a 'fair' price is paid that reflects the present value of future profits. On the demand side, targeting less productive businesses could constitute a good investment for predators, particularly when funds are relatively cheap. In this instance, the sign on productivity in a model estimating the chances of takeover is expected to be negative. However, for SMEs, their attractiveness might be their assets (tangible or intangible), perhaps noticed due to their high performance. Larger firms may seek such firms to perhaps to aid further their development; productivity would positively predict takeover. However, less information is likely to be available the smaller and newer the firm. This suggests younger and smaller firms are relatively less likely to be acquired.

The next set of relationships determines what happens to the target enterprise after acquisition. Prospective buyers may value a firm more highly if they can strip out saleable assets. The predator may merge the target's assets with its own group and the independent existence of the acquired firm is ended. Here a model looking at the effects of takeovers on the chances of exit would be positive; acquisition increases the likelihood of the firm no longer existing. Stripping out assets from an acquisition could also reduce the performance of an acquired firm, if it continues to operate. This would imply that takeovers have a negative effect on post-acquisition performance.

However, a target short of liquidity may be saved from bankruptcy, reducing the chances of exit. This would reduce the chances of exit after takeover. Prospective buyers may value a firm more than the present owners if they believe they have a good chance of improving performance. The market for corporate control potentially corrects excessively low productivity performance by acquisition. This has implications for post-acquisition performance, implying that takeovers may improve it, especially if less productive.

Given the above summary, the effects of takeovers on the chances of an SME exiting and its post-acquisition performance are ambiguous.

Turning now to the spatial dimension of the market for SME ownership and control, a 'new economic geography' (NEG) framework is used. The concentration of production and markets is advantageous to the firm, favouring densely populated, high income regions over sparsely populated, low income areas. There are considered to be incentives to move and employ the assets of a newly acquired, productive firm in the core. Financial and political power and information may be stronger in the core and this might have spatial economic implications. Large companies are likely to be headquartered in the core. Possibly the price or availability of finance may decrease with proximity from the financial centre, if information attenuates with distance.

These factors might allow more takeovers of high productivity but financially straitened smaller companies in the periphery by large companies in the core. Or, for reasons of inadequate information (over and above those just relating to size and age)

and heightened competition in the core, the opposite could be the case, where more firms in the core are acquired.

The impact of the SME market on regional development not only depends on the type of firms that are acquired but also on the effects of takeover. NEG suggests probable adverse distributional consequences for periphery regions, even though the overall impact on the national economy may be beneficial. After takeover, an enterprise may be stripped of its assets and closed, its headquarters functions may be integrated with the acquiring firm, and the target operated as a branch plant, or investment may be pumped in to improve performance.

The above theory of the regional market for SME ownership may alter the previously described takeover relationships. Unlike large publicly quoted firms, more productive small businesses are more likely to be acquired. Whether the acquisition targets subsequently improve in productivity relative to what they would have done, or whether they cease trading after takeover when they would not otherwise, could have an impact on regional economic development, and productivity differentials. This could be harmful or beneficial to regional, peripheral, economies. The effects interact with the process of selecting targets. Low productivity selection and subsequent closure would boost regional productivity. High productivity selection and closure could lower regional productivity.

The overall effect depends also on the benefits of the takeover to the acquirer. The acquirer may boost its own productivity and profitability so that the sum of the two firms (acquirer and target) is greater than the parts - assuming the market works. In order to favour the NEG centrifugal hypothesis (and perhaps not unreasonably) acquirers are assumed to be located outside the periphery, in the core; the location of proportionately more large firms.

It should be noted that the spatial effect is a distributional one. All takeovers are assumed to be Potential Pareto Improvements (PPI) and yet there might be a tendency for the periphery to lose out from SME takeovers and for the core regions to gain. This is because the PPI criterion is only that there is a net gain after the winners compensated the losers, even though such compensation in practice might not be

made. Indeed if PPI from SME takeovers did impact adversely on the periphery, regional aid as compensation would be justified.

5.2 Hypotheses

From the outlined theory a number of hypotheses can be tested concerning SME takeover, exit and relocation, performance after takeover and regional productivity. These are:

5.2.1 Takeover hypotheses

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 the more productive will be bought.

3. Information about an SME is likely to be a function of age and size. The performance of the very young and small will be relatively less known to potential acquirers, so they will not be targets.

From these hypothesis and the availability of variables in the data set, the following relationship is formulated for firm i as;

$$Pr(Takeover_i) = f(\overset{+}{Prod_i}, \overset{+}{Core}, \overset{-}{Periphery}, \overset{+}{Age_i}, \overset{+}{Size_i}, \overset{-}{Core*prod_i}, \overset{+}{Periphery*prod_i})$$

Where 'prod' is productivity and 'Pr' probability.

5.2.2 Exit and relocation hypotheses

4. Takeovers are an investment decision, an element of which might be relocation or closure to take advantage of synergies with the acquiring firm's assets.

Where this is the case, takeovers increase the chance for SMEs relocating or exiting. A caveat to this is input rationing, such as capital (due to its cost relative to larger firms), could be a handicap to the SME. In this situation, acquisition may reduce chances of exit and result in injections of capital or other support.

5. Acquiring firms are more probably located in core regions of the economy, as more company headquarters are located there. If there are complementarities to be exploited by proximity, after a takeover a tendency may exist for acquired firms in the periphery to close or relocate to take advantage of this.

From these hypotheses, the following relationships can be formulated for firm i (where 'prod' is productivity and 'Pr', probability) as;

$$Pr(Exit_{it+1} \mid Relocation_{it+1}) = g(\overset{?}{Takeover_{it}}, \overset{-}{Core_{it-1}*Takeover_{it}}, \overset{+}{Periphery_{it-1}*Takeover_{it}}, \overset{+}{Prod_{it-1}*Takeover_{it}})$$

5.2.3 After acquisition performance hypotheses

6. Takeovers may provide new resources that aid small firms in improving their productivity and expanding their size. Alternatively, acquisitions may strip SMEs of their dynamism and result in decreases in performance.

7. The possible negative effect of takeovers might be more pronounced for SMEs located in the periphery relative to those in the core, as owners move resources, assets or expertise out of the former.

8. The more productive acquired firms may lose what ultimately made them a high performer, resulting in a loss of performance, especially for productivity, consistent with 'intrapreneurship' hunting by acquirers.

From these hypotheses, the following relationships can be formulated for firm i (where 'prod' is productivity and 'Pr'probability) as;

$$\text{Performance}_i = f(\overset{?}{\text{Takeover}_i}, \overset{-}{\text{Periphery}_i*\text{Takeover}_i}, \overset{+}{\text{Core}_i*\text{Takeover}_i}, \overset{-}{\text{Prod}_i*\text{Takeover}_i})$$

5.3 Method

The three equations above can be used to estimate the effect from targets of SME takeovers on regional productivity, the assumption of extra-regional acquisition. Given that I am unable to assess the effects on acquiring firms (and where they are located) this allows a partial assessment of whether SME takeovers (including their effects on acquirers) contribute to the core-periphery productivity gap.

More formally, the three lines of investigation are:

$$Pr(T_{it}) = f(prod_{it-1}, size_{it-1}, location_{it-1}, age_{it-1}, industry_{it-1}) \quad (1a)$$

$$Pr(X_{it+1}) = g(T_{it}, size_{it-1}, prod_{it-1}, industry_{it-1}, location_{it-1}, age_{it-1}) \quad (2a)$$

$$Prod_{it+1} = h(T_{it}, size_{it-1}, prod_{it-1}, industry_{it-1}, location_{it-1}, age_{it-1}) \quad (3a)$$

Where Pr is probability, T is takeover and X is exit, the t subscripts denote dates and i indexes firms.

The impact of SME takeovers on productivity depends upon the marginal effect of takeovers on productivity ($\Delta Prod / \Delta T$) and the probability of a firm being acquired Pr(T). If either of these vary by firm size, then it is not appropriate to multiply the average effect by the number of firms to obtain the aggregate result. The simple approach of ignoring size effects assumes the smallest SMEs have the same contribution to aggregate productivity as an SME with 249 employees. If both the chances of takeover and its impact vary by size, then using the average figures ignores the possibility that large acquired SMEs disproportionately influence the total impact.

To include the effects of firm size and takeover in the performance model (equation 3), equation 4 posits that the productivity performance (prod) of firm i is affected by takeover (T), an interaction of takeover and employment (T.E) and some other unspecified factors (Z);

$$\ln(Prod_{it+1}) = \alpha_1 T_{it} + \alpha_2 T_{it}.E_{i\,t-1} + \alpha_3 Z_{it-1} + u_i \quad (4)$$

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If there is a size effect of takeovers for SMEs, $\alpha_2 \neq 0$, and α_1 will reflect the size invariant impact of takeovers but will not capture the full effect of takeovers on productivity. This is;

$\Delta \ln(Prod) / \Delta T = \alpha_1 + \alpha_2 E_{i\,t-1}$

To obtain the total impact, the marginal effect of takeovers on performance ($\Delta\ln(Prod) / \Delta T$) is estimated for every acquired SME, providing a predicted effect of acquisition on its performance. Then, both the chances of takeover and its effect must be weighted to reflect the fact that larger SMEs contribute more to the economy. In short, the aggregate effect of SME takeovers on periphery productivity is the individual firm's chances of takeover multiplied by the productivity impact of takeovers, times the firm's weight or contribution to aggregate productivity within the SME sector, summed across all firms indexed by i;

$$\sum \Pr(T_t)_i .(\Delta Prod / \Delta T)_{it+1} .W_{it-1} \qquad (5)$$

where $W_{i\,t-1}$ is the SMEs' share of periphery employment, $E_{i\,t-1} / \sum E_{i\,t-1}$.

Equation 5 measures only the direct impact of takeovers on productivity, assuming that all acquired SMEs survive. But an additional consideration is that SME exits after takeover may affect productivity. The aggregate effect of SME exits because of takeover depends upon the probability of takeover and the marginal effect of takeovers on the probability of exit. As with the impact of takeover on performance, if size affects the probability of takeover or the takeover-exit effect then it is not possible to estimate the aggregate effect from the sample means. Larger acquired SMEs have a greater impact on the aggregate than the average and the total effect must reflect their importance.

The probability of takeover is the same as in (5) and the effect of takeovers on exit can be calculated from equation 2a. This is analogous to the productivity equation above; the inclusion of takeover-size interactions can capture any possible size-varying effects (equation 6 below);

$$Pr(X_{it+1}) = \beta_1 T_{it} + \beta_2 T_{it}.E_{it-1} + \beta_3 Z_{it-1} + v_i \qquad (6)$$

$$\Delta X / \Delta T = \beta_1 + \beta_2.E_{it-1} \qquad (6a)$$

From 6 and 6a it is apparent that the effect of takeovers on the probability of exit includes $\beta_2.E_{it-1}$ if exit chances vary by firm size ($\beta_2 \neq 0$).

The effect of takeover on exit also depends on the productivity of firms. If takeover-exits involve firms that are less productive than the average then their departure boosts the overall level of productivity. Therefore a measure of the impact of SME closures consequent upon takeover must include their productivity relative to the (weighted) average level of productivity.

In summary, the effect of takeover-exits on periphery productivity is the product of a periphery SME's individual probability of takeover, the marginal effect of takeover on its probability of exit, the SME's differential productivity and its employment weight summed across all firms, or;

$$\sum Pr(T)_{it}.(\Delta X / \Delta T)_{i\,t+1}.((Prod_{i\,t-1} - \overline{Prod}_{t-1}) / \overline{Prod}_{t-1}).W_{i\,t-1} \qquad (7)$$

where $\overline{Prod}_{t-1}$ is the (weighted) average of productivity across all firms at time t-1.

Subtracting (7) from the productivity impact (5) of takeovers yields the total productivity effect (excluding any on acquirers)[45];

[45] For ease of computation, takeover-relocation effects are ignored here because they are found to be infrequent.

$$\sum [(Pr(T)_{it} . (\Delta Prod / \Delta T)_{it+1} . W_{it-1}) -$$

$$(Pr(T)_{it} . (\Delta X / \Delta T)_{it+1} . ((Prod_{it-1} - \overline{Prod}_{t-1}) / \overline{Prod}_{t-1}) . W_{it-1})] \quad (8)$$

Any impact on the acquiring business is irrelevant to the periphery region because, by assumption, it occurs elsewhere. At the very least, this expression allows the productivity effects from targeted SMEs to be measured[46].

5.4 Estimation overview

Unbiased estimates of the parameters needed to calculate the impact of takeovers require that the disturbance terms (u_i) in the stochastic versions of the model, the equations below, be uncorrelated with the explanatory variables, if single equation estimation is used. Where T is probability of takeover, P is productivity and X is probability of exit;

$T = f(P, u_1) \ldots \quad (1)$

$X = g(T, u_2) \ldots \quad (2)$

$P = h(T, u_3) \ldots \quad (3)$

If unobserved bad management or luck reduce the chances of takeover and increase the likelihood of exit, then $E(u_1,u_2) < 0$. Single equation estimation of g' requires that $E(T, u_2) = 0$. Failure to take into account the disturbance correlation of the exit and takeover equation means that T will be unduly low when X is high because of the disturbance term, so the effect of takeover on exit will be overestimated by single equation methods. Bivariate probit estimation controls for T and u_2 actually being negatively correlated. Potential endogeneity of takeover in the exit equation can be ignored in the bivariate probit estimation, in contrast to linear simultaneous equations (Greene 1998, p. 295)[47].

[46] Equation (8) is a base weighted (Laspeyres) index and, if the market works well, may understate the impact of takeovers. Takeovers might enhance SME employment (but alternatively they may shed jobs) and more productive SMEs are likely to increase their market share (but again, takeovers can be mismanaged and market share lost).

[47] Bivariate probit estimation requires maximising the log-likelihood instead of using the sample moments.

Higher productivity may be both a cause and an effect of takeover in equations (1) and (3), thereby correlating the disturbance terms and the explanatory variables. Assuming both structural parameters are positive, the simultaneous relationship implies that takeovers will be high when u_3 is large and that productivity will be high when u_1 is large; $E(T, u_3) \neq 0$ and $E(P, u_1) \neq 0$. An unobserved favourable shift in demand (large u_1) might increase the chances of takeover and through equation (3) also improve productivity. But through equation 1 this higher productivity (P) may then be associated with the large u_1.

The difference-in-difference method, comparing productivity before and after takeover, treating enterprises not taken over as controls for those that are, goes some way to addressing this problem (Meyer 1995). Where P1 is the productivity prior to acquisition of enterprises that are taken over, and P2 the productivity after takeover, P3 the productivity of non-acquired firm at the same time as P1, and P4 their productivity at the same time as P3, the 'average treatment effect' is (P2-P1) - (P4-P3); the difference between the productivity increase of those taken over and those not. Enterprises with large (or small) u_i before and after the takeover year would lose such effects by the differencing and focusing on the increase in P rather than the level.

However, the appropriateness of the control depends on the absence of selection of the takeover target; enterprises taken over would not otherwise have increased their productivity by more than those not acquired. Some of those not acquired cease trading over the period considered for the productivity performance, and these are likely to have been the least productive. Some of the taken over firms were closed but not necessarily the least productive, if their assets when integrated provided a boost to the purchaser's business. If firms that would have increased productivity by less tend to exit then survivors will be more productive regardless of whether or not they have been taken over. This selection process implies that $E(u_2, u_3) > 0$. A Heckman (1979) estimation procedure is therefore combined with the difference-in-differences to control for the possible bias in equation 3, with in effect equation 2 as the selector[48].

[48] Actually, the inverse, survival rather than exit.

The method outlined captures the total effects on (regional) aggregate productivity from the targets of small firm takeovers. It concentrates on the levels of productivity and does not identify the potential loss to (productivity) growth in an economy.

I begin the empirical work by estimating the acquisition of SMEs. Before this, I will describe the chosen data set.

Chapter 6 – Data

6.1 Introduction

Obtaining data for the study of SMEs is typically more problematic than for large firms. This chapter therefore describes the data requirements for the analysis of SMEs, takeovers and productivity.

One of the principal contributions of this thesis is to analyse the Business Structure Database. This is a form of the Inter Departmental Business Register (IDBR) - a comprehensive database of UK businesses – which is available for researchers with the addition of firm demographic identifiers that allow mergers and takeovers to be identified, even for small businesses (unlike data bases created from the ARD for instance). A brief description of the data and the constraints of working with this data set are discussed. Finally, I describe the data sample, define and provide some descriptive statistics of the variables used in the analysis within the subsequent chapters.

To enable the analysis of SMEs I require a dataset that includes small firms. Region identifiers are required so that I can conduct regional analysis or identify regional trends. Also I require estimates of productivity. Ideally productivity is measured as total factor productivity (TFP). This requires variables such as capital and intermediate goods to either be available or to be computable. If these are not available, then at the very least I require a measure of input such as employment and an output measure, like turnover, to estimate labour productivity (LP).

I begin with a discussion of the Business Structure Database (BSD).

6.2 The Inter Departmental Business Register (IDBR) and Business Structure Database (BSD)

6.2.1 IDBR Overview

The chosen dataset is a version of the IDBR. It covers 98 percent of economic activity in the UK (Barnes and Martin 2002), containing around 2 million observations that include all but the very smallest of firms. It is a representative data set of nearly the

entire businesses population across all sectors in the UK - it is not a sample survey. The comprehensiveness of the data means that the IDBR is used as the sampling frame for ONS business surveys (Evans and Welpton 2009).

The data set will not include the smallest businesses according to both employment and turnover[49] (and some non-profit organisations). 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 goods[50]. If both the criteria concerning VAT and PAYE are not met then firms are excluded from the Register (ONS 2007a). More specifically, businesses are included if they pay wages of over £100 per week to an employee (minimum level for PAYE scheme to be used) but have insufficient turnover to register for VAT, and vice versa (Evans and Welpton 2009). It is possible for companies to come in and out of the Register in consecutive years if they do not meet the above criteria between years.

The trade-off for the extensive coverage of the data set is that it is very narrow, it contains very few variables. It contains the following variables:

- Address
- Industry classification (industrial/economic activity)
- Employment
- Turnover
- Legal Status (company, sole proprietor, partnership, public corporation/nationalised body, local authority or non-profit body)
- Enterprise Group links

The BSD is a version of the IDBR, with the same variables apart from firm demographic identifiers are included in the former. These identify whether production has been redistributed within the firm, transfers between firms, or the entire firm has been transferred. Using a similar data source (ARD – for a description see Appendix),

[49] In the UK around two-thirds of all SMEs are registered for VAT and around 80 percent of those with employees, increasing with the age of the firm (Institute for Employment Studies 2006a).
[50] For a list of exempt goods see HMRC (2007).

ownership changes have also recently been identified (Harris 2009) using a similar methodology to the one employed in the BSD[51]. However, no current data dataset apart from the BSD allows for the identification of SME takeovers on a sufficient scale to enable them to be analysed[52].

6.2.2 Working with VML Data

The IDBR/BSD is kept and maintained by the ONS. Business datasets such as this are considered to be confidential and access to it is restricted. There are constraints in how the data is accessed and how it can be used. ONS has created a secure environment that allows researchers to access the data, known as the Virtual Microdata Laboratory (VML). The VML is a research facility at ONS that allows access to their data in a secure environment (ONS 2008b). The VML can be accessed from all ONS sites; Newport, Titchfield and London, and now also in remote labs based in Belfast and Glasgow.

To enable access to confidential and sensitive data, procedures and audits are in place to ensure that only non-disclosive analyses are taken out of the VML. Access to outside sources is not permitted unless they have been cleared by ONS. Any output from the laboratory also needs to be cleared. For output to be cleared, values must be backed-up with observations of 10 or more. As all output (including preliminary estimates) needs to be checked, unofficially, this puts a limit on the quantity of output that is feasible for researchers to withdraw from the laboratory in a single visit.

Researchers are also dependent upon the computational power and capacity that is provided by ONS. The datasets can easily get very large and although the available memory to researchers is reasonable, it is not always sufficient to enable all the statistical techniques that might be desirable. The computational power coupled with the size of data samples also means that some statistical techniques are quite time consuming. The time and memory limits and restrictions to outside sources mean that statistical techniques that are relatively straightforward (relative to if the dataset could

[51] Harris' uses the ultimate ownership reference codes along with foreign ownership identifiers to register foreign ownership changes. This is not possible for SMEs as much of the data concerning foreign ownership is missing.

[52] It is highly likely that the acquisitions of small firms may not appear on many of the existing published sources such as ONS (2009c).

be accessed outside of the laboratory) are favoured.

6.2.3 Firm structure in the BSD

The BSD structures firms in three levels: local units, enterprises, and enterprise groups. An enterprise can consist of either a group of local units or a single local unit. The definitions for each of these are[53]:

Local Unit;

'*The local unit is an enterprise or part thereof (e.g. a workshop, factory, warehouse, office, mine or depot) situated in a geographically identified place. At or from this place economic activity is carried out for which – save for certain exceptions – one or more persons work (even if only part-time) for one and the same enterprise.*' (ONS 2006a, p. 7)

Enterprise;

'*The enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit.*' (ONS 2006a, p. 7)

Enterprise Group;

'*An enterprise group is an association of enterprises bound together by legal and/or financial links. A group of enterprises can have more than one decision-making centre, especially for policy on production, sales and profits. It may centralise certain aspects of financial management and taxation. It constitutes an economic entity which is empowered to make choices, particularly concerning the units which it comprises.*' (ONS 2006a, p. 7)

To aid the understating of these different structures, diagrams are used to show example companies. The first firm (figure 6.1) is contained within a holding company (Firm A&B holding). This would be identified as the Enterprise Group. Within this

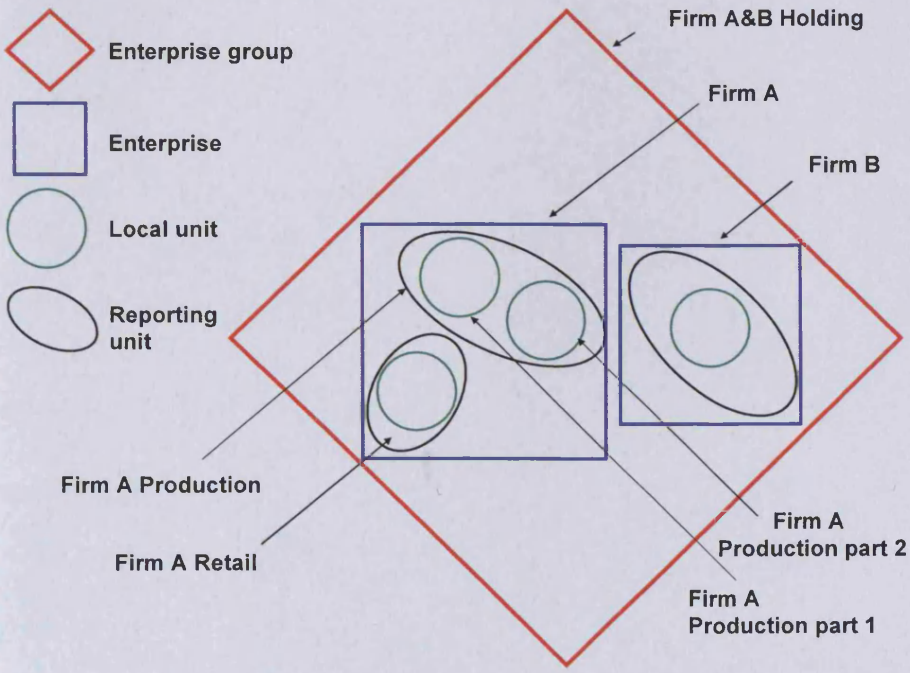
[53] For an alternative description see Criscuolo et al (2003).

holding company two firms exist, A and B. These are identified separately at the enterprise level. Below firm A's enterprise level are local units. These can be production or retail units. This is not the only set-up for a firm; many different permutations may exist depending on how the firm reports its business.

The set-up of firm B in figure 6.1 is more straightforward. It is connected to A in that it is part of the same holding firm, identified at the enterprise group level. However, it only has one local unit.

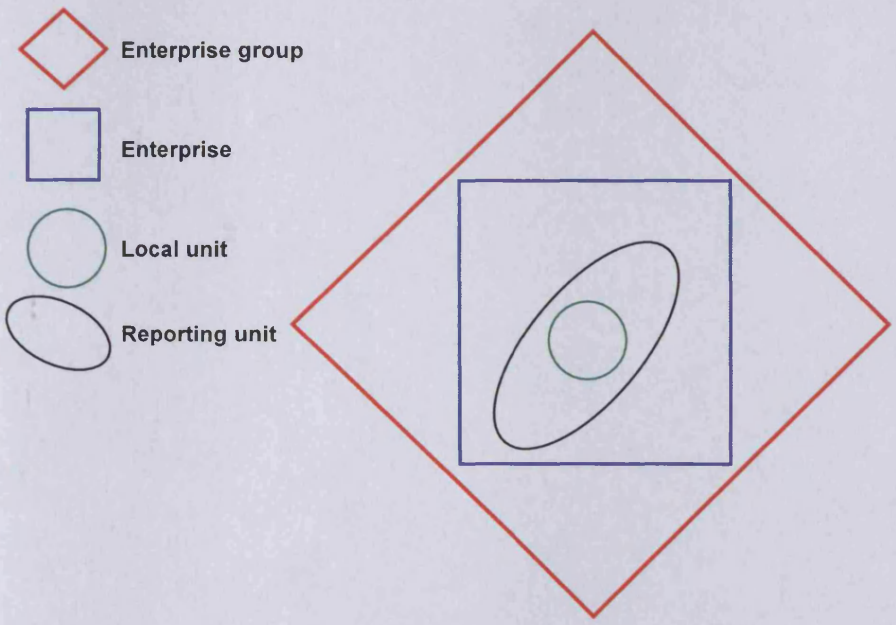
When looking at economic activity by region with micro data, it is perhaps most meaningful to measure this at the local unit level, as each local unit might be in a different region. The enterprise might be registered in region Z but production parts 1 and 2 might be in regions X and Y, respectively. It would be wrong to then measure all of Firm A's production at location Z when it has occurred in two other regions. For Firm B, I do not have the same problem, all production and activity of the firm is conducted within the same unit within the one location.

Figure 6.1 - Structure of Firm A and B



The simplest set-up a firm within the data set is shown in figure 6.2. Firm C only has a single enterprise and local unit within the enterprise group. This 'independent' set-up is likely to be the most common one for the SME sector. Most SMEs are likely to have only one local unit, so activity can be identified and correctly attributed to one location. In the rare case where units are spread over different regions, I will only measure the SME's registered location according to the enterprise level data. The local unit information will be ignored.

Figure 6.2 - Structure of Firm C



A further problem with having different levels of the firm is the coverage of data. The level of detail varies by each level. Firms are not obliged to report information at the local unit, for example, turnover information is not available at the local level. Given this and that I am measuring SMEs at the enterprise level, I will miss any SME dynamics that occur at the local unit level but this is considered to be only in a few exceptional cases.

In figures 6.1 and 6.2, I also show an as yet undefined unit; the reporting unit. The reporting unit is not relevant for the BSD data - it is only used in the sample data sets such as the Annual Respondents Database (ARD - see appendix). The reporting unit is either a single or group of local units. In the latter case, the firm chooses to report

local units collectively instead of separately reporting each one. With use of the ARD, the reporting unit is commonly used as the unit of analysis as it is the most disaggregated level of the firm that has the most data coverage[54].

6.2.4 Enterprises and Local Units

From the figures and descriptions, it can be surmised that within the BSD there are effectively two levels of the firm that can be used. The first is the enterprise level, where both turnover and employment are reported. The second is the local unit where only employment is reported. As information is limited at the local unit, one option is to apportion turnover between the enterprise's local units via their employment share. This form of *pro rata* method is used to obtain values of turnover for local units by Harris (2002). The implication of this approach is that all local units within an enterprise would have the same turnover per employee. This is problematic if I use such a variable as a proxy for productivity (see discussion below), unlike Harris (2002).

Local units can be in different locations to where their enterprise is located. However, for SMEs, the IDBR reports that 98 percent of enterprises only have one local unit, so the enterprise is equivalent to the local unit in the vast majority of instances[55]. Single site enterprises also account for the largest proportion of employment (Evans and Welpton 2009, p. 73). Given that the lowest level of the firm that production is undertaken is the local unit, it is considered that this is the most economically meaningful unit (Harris 2002).

The local unit is not necessarily the more economically meaningful measure. Given that I am interested in the productivity of firms and not plants, at least for the analysis, it is important to consider what activities may occur at different plants for multi-site firms. A firm may specialise in different production in different plants and this

[54] Analysis with reporting units can be a problem as the number of local units that belong to it can change over time (either at the discretion of the firm or by closures and creations of new local units), so a discontinuity over time can occur for analysis at this level. Local units within the reporting unit can also be in different locations.

[55] An alternative way of looking at this is by asking how many local units are equivalent to the enterprise. Using the same data I find that nearly 93 percent of all local units are equivalent to the enterprise - around 7 percent of all local units are part of a multi-local unit enterprise (same proportions for enterprises in Wales).

specialisation may contribute to the productivity of the firm[56]. However, the availability of data and the fact that most SMEs are unlikely to have multiple plants due to their size, I consider the most suitable level for the analysis of SMEs is the enterprise level.

6.3 Estimating Productivity

This thesis is concerned with the productivity of SMEs. Data is required that enables an estimate of SME productivity to be produced. For TFP to be estimated, the amount of capital used in each firm's production needs to be included. However, this is not available in the BSD.

An alternative method could be to obtain capital stock estimates from another data source, such as the ARD (see appendix for a description), which samples firms. In the ARD, the capital stock is estimated with capital expenditure data despite the initial capital stock being unknown. For most large or medium sized firms, the initial capital stock does not matter as long as it is sufficiently far back in the past due to the assumed depreciation. A capital stock that is imputed when a firm is first observed is discounted sufficiently so that it is not influential on the current level of capital. However, the same rate of depreciation is used for all firms, across all sectors. In reality it is unlikely that the capital stock, across very different sectors, is so homogeneous that a universal depreciation rate can be used.

As the level of initial capital stock is unknown, all entrants within an industry are assumed to have the same average initial capital stock obtained from the industry's total. This technique and assumption is perhaps most troublesome for the analysis of SMEs. This sector is very dynamic; many exits and entrants occur each year. This means that when SMEs enter, all firms in the same industry will have very similar capital stocks for many years. The effect of this would be reduced if SMEs survived for many years, enabling the depreciation rate to reduce the importance of the

[56] For example, a firm that manufactures cars is unlikely to produce all the required parts in the same plant. One plant may produce wheels, one the body work and the engine in another. Virtually no market for car engines exists; the singular productivity of any of these plants is not very helpful for inter-industry comparisons. Interest lies in the productivity of the car firm where a market for output exists. Different car firms may also configure their production of components differently between plants. Therefore what I am most interested in is the lowest level that marketable goods and services are produced.

assumed initial stock level. Over time, a firm's own reported capital expenditure is used to derive its own unique level of capital.

Another problem with obtaining variables in general from the ARD is that most SMEs are not reported between years in the ARD due to sampling – unlike in the BSD. Therefore capital expenditure is unlikely to be observed in most years for small firms in the ARD. Also, as a consequence of the high level of entry (and exit), SMEs have the highest risk of failing or exiting in their first few years. For the BSD sample, over half of all enterprises are less than 10 years old, and over a third are 4 years or younger. Therefore it is likely that many SME exits will be observed with very similar estimated capital stock levels due to the initial rate that is provided. Therefore the reliability of capital stock estimates for the SME sector, where available, is likely to be much worse than for large or medium firms with survive for more periods. In summary, the estimates of SME capital stocks are likely to have very large errors relative to the actual amount of capital employed.

The problems with estimating the capital stock, particularly for SMEs, means that an estimate of TFP is considered neither robust nor suitable for the small firm sector. Instead an alternative measure of productivity; LP is used[57]. Attention now turns to the measurement of output, turnover and gross value added (GVA).

6.3.1 Turnover versus GVA

Two methods to measure the output of a firm can be used. The first measure is turnover and it is simply a measure of the value of goods and services sold by the firm. This is available in the BSD[58]. An alternative measure of output is GVA and this is the difference between turnover and the cost of raw materials and other intermediate inputs that are used in the production process. This is not available in the BSD[59].

[57] In a previous study with estimates of both LP and some alternative productivity measures, a high correlation between them is found (Foster et al. 1998).
[58] This is not imputed, unlike for small firms in the Annual Business Inquiry (Evans and Welpton 2009), which is then used to produce the ARD variables.
[59] GVA is available in the ARD, as the value of intermediate inputs is collected in the ABI survey. However, similar arguments to those regarding capital apply here as values belonging to the smallest firms will not be observed each year due to sampling methods. GVA measures can also produce negative productivity estimates. Annual GVA can be negative in the data if the value of intermediate inputs is greater than the firm's turnover in a given year. In the rare cases where this occurs, it is not

Failure to account for intermediate inputs when estimating productivity can be problematic. For example, if a firm buys some iron for £500 and then sells this on reshaped and in smaller parts for a total of £750 then it will register as having £750 turnover but its GVA will be £250 as it will net out the £500 originally spent on raw materials. The real value that the firm has produced is only £250 and not the £750. Similarly, outsourcing; '... *substitution of primary factors of production, including labour, for intermediate inputs*' (OECD 2001, p. 42), might have the same effect. Effectively, outsourcing is when a firm uses an outside source to provide a service for the firm. Services that are commonly outsourced include accounting, catering and maintenance of computer systems. This matters for measuring productivity as firms that outsource more will have fewer employees but will still be paying for the inputs of their business via alternative means such as contracted services. For example, in 1989 when Kodak outsourced its computer services to IBM, the latter hired around 300 former employees of Kodak and Chrysler reportedly bought around 70 percent of its parts from external suppliers in 1999 (Brickley et al. 2007). Therefore firms that outsource more of their functions might be estimated to be more productive if bought in services are also not fully accounted for with intermediate inputs.

The aggregation of data is also an issue between the output measures. McGuckin and Nguyen (1995) consider GVA more appropriate for aggregate measures, as it avoids double-counting. For analysis at finer levels, e.g. the firm level, '*gross output should reflect the theoretical output*' (McGuckin and Nguyen 1995, p. 262) and is considered satisfactory.

6.4 Cross-section versus panel estimation

The BSD contains a very large number of firms. The size of the sample means that I am unable to use it as a standard panel when using the majority of industrial sectors. Due to its size, it is best treated as a cross-section.

Another option with the BSD is to create a random sub-sample from each year to allow the creation of a panel. The selected firms in the original sub-sample are

possible to use the logarithm of productivity, a common transformation. It is for this reason that Oulton (1998) proceeds with sales data when analysing UK LP.

followed across time. A problem with this is the requirement for the sample to be representative across time. To achieve this, random samples of all entrants would need to be added to the sample from each year that the sample spans, increasing the complexity of the construction of the sample.

Alternatively, the smallest firms could be removed from the estimation. Firms with employment of one are a significant proportion of my sample, as the descriptive statistics later in this chapter show. As well as being a significant proportion of the sample, there are a large number of takeovers within this group of firms. This indicates that the takeover process described in the literature review may occur for the very smallest of firms, so omitting them for computational ease may remove important information from the dataset. This may also have implications for estimating the impact of the (regional) effect of SME takeovers. Therefore by truncating the sample to exclude the smallest firms I would have to add more qualifications to estimate the aggregate effect. This would not answer the aim of the thesis which is to access the effects of SME takeovers on regional productivity.

To create a panel of firms deflators are required. Panel estimation compares firms both across time and in a cross section. To control for the changing value of money, the real values are required. This means output needs to be deflated to account for inflation. Not accounting for inflation will incorrectly result in more recent estimates of productivity being higher than previous years even without any real changes to the firm[60]. The effects of inflation are also likely to vary by sector. For the manufacturing sector deflators exist that relate to the SIC 3 and 4 digit level.

The equivalent deflators for the service sectors of the economy, and all other non-manufacturing industries, are not so readily available as it is quite difficult to measure and compare the prices of the service sector output (Paton et al. 2004). Some deflators are available for the service sectors, currently published by ONS (2008a). The Services Producer Price Index (SPPI) is available for 33 industry-level indices. This is approximately equivalent to the number of service sectors when measured at 2-digit UK SIC 1992 but is well short of those when measured at the more desirable less

[60] The opposite occurs with deflation.

aggregated levels of industry and they do not cover all non-manufacturing business areas, e.g. the primary sector and some other service sectors. Also, the exact identification of the appropriate SPPI for each industry is difficult in many instances as the coverage of SPPI are not totally in line with the SIC classifications[61].

The lack of non-manufacturing sector deflators, along with the problems of estimating the capital stock, has probably dictated what methods and sectors have been used in all previous empirical work using UK data. The vast majority of research uses the manufacturing sector or a specific industry within it (e.g. Disney et al. 2003; Harris 2002, 2006; Harris and Hassaszadeh 2002; Harris and Robinson 2002). A limited number of studies include the non-manufacturing sector. One method is to pool both the manufacturing and non-manufacturing sectors and use the data set as a cross section (e.g. Boddy et al. 2005; UWE 2006). Another option is to look at individual industries of non-manufacturing sectors. Using plant or firm level data from only a single industry reduces the problem of inflation, allowing firms and plants to be compared across time; like with panel data analysis. This is underpinned by the assumption that within a single industry, similar factor prices occur (Paton et al. 2004). In two single sector studies of the productivity and its growth (Paton et al. 2004; Paton and Williams 2007), the Consumer Price Index series for a specific sector is used to deflate output[62]. This implies that all firms in a given year have their output deflated by the same rate. The results are robust to the choice of deflator used, but this is for a single industry only and the method is not appropriate for cross-sector analysis. The only work that has extensively made use of non-manufacturing sectors of the economy over time in a panel is by Harris and Li (2007; 2008). They make use of the SPPI indices for deflating service industries. As indices are only available at the 2-digit industry level, this is the level that they are able to deflate output[63].

I use the data as an annual cross-section of the data. To measure performance across

[61] An added complication arises if GVA is used as the measure of output. Intermediate inputs will also need to be deflated and appropriate deflators will also be required across all sectors for these inputs. Again, the availability of such data is limited.

[62] Paton and Williams also show in their appendix the effects of using Recreation and Cultural Services (CPI series D7F1) as the deflator.

[63] Harris and Li (2007; 2008) use a weighted sample of firms form Financial Analysis Made Easy (FAME), that is only a fraction of the total population of firms. They obtain their weights from the ARD according to total output.

time with measures such as productivity that use output and will require controls so that some of the industry-wide inflationary effects can be captured. This could be achieved with the use of industry variables when performance is a dependent variable, or a relative measure of performance (i.e. performance of a firm relative to the industry average) if performance is an independent variable.

One of major implications of using a cross-section instead of a panel is that unobserved firm characteristics cannot be controlled (Greene 2003). Within a panel, using a fixed effect estimator, unobserved characteristics of firms can be controlled, assuming that they do not alter with time. Another drawback from not using a panel is that I am unable to include any temporal effects. For example, with acquisitions the propensity might vary depending on changes of the stock market or the macroeconomic environment.

6.5 Sample and variable definitions

I have restricted the SME[64] sample to include only active firms that are registered either as companies, sole proprietors or partnerships; excluding public corporations, central government bodies, local authorities and non-profit making bodies. The sectors according to 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. Non-private sector observations have also been removed because the market process under consideration only concerns private firms and different mechanisms may occur for non-private sector firms.

To enable the use of employment and turnover data, I have also removed a small number of observations that either have missing or zero values for these two variables in 2004. The resulting sample of SMEs contains firms with between 1 and 249

[64] 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). Alternatively I could have made use of a more relative concept for SMEs. A relatively small enterprise in the agricultural sector might be a quite different size from a relatively small one in the manufacturing sector. However, I choose to use the absolute measure for two related reasons. Firstly, for simplicity; it is easy to explain why an enterprise is defined as an SME across both sectors and time. The second reason is that I have made use of the legal definition of SMEs, commonly used by other UK studies. This allows possible comparisons to be made with them.

employees[65] and positive turnover in 2004.

In the BSD nearly 400,000 enterprises exist with only one employee. The Small Business Service Statistics (table 1 in BIS 2006) show that the UK has in excess of 3 million enterprises with no employees out of the total 4.3 million in the UK. The total number of firms in the BIS (2006) source is derived from both the IDBR and the LFS, by analysing self employment information. There, one-employee businesses are classed as being no employee firms and one working proprietor. However, working proprietors do not count as being self-employed in the methodology as they are still officially employees of the company. For my dataset, I only find a very small fraction of firms are registered with zero employees. The vast majority of firms in my data sample are single employee enterprises and probably self-employed owner-manager firms. The main reason why I do not capture all the small businesses according to BIS (2006) is that they are not registered for VAT or do not need to run a PAYE scheme and are therefore not originally in the IDBR. Therefore I do not observe all of the very smallest firms as no large UK data set currently exists that include these firms.

6.5.1 Merging data

Additional requirements of the data mean some merging occurs from the original BSD sample. The first merge involves obtaining more detailed geographic information concerning the SMEs. The second merge is obtaining demographic information independent from the other characteristics of the firm.

The 2004 BSD only contains postcode data; it does not have region identifiers. To identify the region where the SME is currently registered, I link the postcode to the National Statistics Postcode Directory (NSPD) (February 2007 version)[66]. I expect to lose a few observations when matching BSD with the NSPD for a few reasons. First, inaccuracies in the BSD's postcode data do not allow an exact match with the NSPD. This is perhaps caused by inaccuracies of inputting the data. Second, firms may have a new postcode that is not recognised in the version of NSPD. This can occur when a firm becomes large enough for it to have its own new postcode. Alternatively, if a

[65] Employment is measured as the total number of paid full and part time workers at the Enterprise, plus any working proprietors.
[66] See http://www.statistics.gov.uk/geography/nspd.asp for more information.

firm moves to a brand new building, this will also result in a new and potentially unrecognised postcode. However, I have used a postal code database that is newer than the BSD data. This will result in the inclusion of all new postcodes for enterprises in 2004[67]. Looking at the enterprises with missing geographic information, it appears that many are due to errors in the entry of the postcode information. The enterprises with missing geographic information equates to just less than 1 percent of my SME sample. I drop the few observations where postcode matches are not made. SMEs registered in the Isle of Man and Channel Islands are also omitted.

A change in corporate control of the firm is likely to change certain aspects of the firm. I am interested in what characteristics SMEs have prior to being acquired – the characteristics of the firms need to be observed independently from takeover. To do this I merge consecutive years of the BSD data using the unique enterprise reference number. Takeovers can then be observed one period after the firm's characteristics are measured. Unfortunately the process of merging is not perfect. I include firms that have no link between the year t (2004) and t+1 (2005). If a firm 'exits' the dataset between these years, it is kept in the sample but does not register a takeover. This is important as the process identified by Disney et al (2003) indicates that firms that exit tend to be less productive. Excluding subsequently exiting enterprises biases the productivity estimates, as more productive firms would be selected – a form of sample selection bias. This does not occur within my sample.

6.6 Definition of Variables

6.6.1 Productivity

As I am unable to include capital, I do not estimate TFP but LP. Ultimately what I require is a measure that can be computed so that it reflects the true level of productivity. Christiansen and Haveman (1980: p.3 in Paton et al. 2004, p. 5) assert '*although [these* (labour)*] productivity measures ... have serious weaknesses, the picture of productivity change which they yield is not greatly different from that of more complete measures.*' However, it is likely that the level of LP is quite varied

[67] The reverse to this may also be possible; unused postcodes for two years are removed from the database. Therefore it is possible that enterprises that exit during 2004 create an unused postcode for the next two years resulting in it not being included in the NSPB data source.

across the different sectors of the economy. Evidence in Griffith et al (2004, p. 445) shows;

'In 2001, the average British worker in production industries produced just under £40,000 worth of goods, while the average British worker in hotels and restaurants and other services produced on average less than half this amount. In wholesale and retail trade, the average value of services produced per worker was £24,000.'

These variations can make comparisons across different sectors of the economy quite difficult[68]. This suggests that a gross analysis of all SMEs in the private sector using a simple estimate of LP using turnover is unlikely to be very meaningful as each sector and industry are likely to have very different input compositions. Sectors with high capital-labour ratios will have very different estimates relative to sectors that are in more labour intensive industries, as reflected in the results of Griffith et al (2004).

The possible options to make the analysis more insightful are first, to undertake analysis across all industrial classifications, estimating productivity relative to other firms in their own industry. This method removes any industry specific factors, a motivating factor for its use by Griffith et al (2004). Second, one could estimate each industry separately so that different sectors are not pooled together. This is used in a few studies discussed above. This last solution is not very suitable to the investigation as I am concerned with cross-sector effects that might have a location element. Instead I choose the former option, to estimate relative labour productivity (RLP) of just the SME sector, using turnover as the measure of output and employment as the measure of labour. Employment is measured as the total number of paid full and part time workers at the Enterprise, plus any working proprietors - owners directly involved in the business (ONS 2007b)[69] [70].

[68] This has been documented by Baumol and Wolff (1984).
[69] This is usually 0 for a company, 1 for a sole proprietor or 2 for a partnership (ONS 2007b).
[70] To account for the quality of labour, Paton et al (2004) present a method of accounting for some degree of the heterogeneity of labour, such as age, education and hours worked. With BSD such decompositions cannot be used because the data only covers total employment for the firm, not even identifying the proportion of part-time employment. A lack of information on part-time employment is another reason to use a relative concept of productivity (and employment size). It aids comparisons across sectors by removing the industry-specific factors, which in this case might be the rough proportions of part-time employment used; some industries might have a much higher intensity of part-time labour than others.

Following McGuckin and Nguyen (1995), I compute RLP; normalising LP across industries. A figure greater than one will indicate greater than the average productivity and a value of less than unity will indicate productivity less than the industry average;

$$RLP_{ij} = LP_{ij} / ALP_j$$

or

$$\ln(RLP_{ij}) = \ln(LP_{ij}) - \ln(ALP_j)$$

Where i is each firm and j is each industry, LP is labour productivity, ALP is average labour productivity. I measure industry at the 3-digit level of the UK SIC 1992 classification. To improve the robustness of observations within each industry, small industries are removed. Industries with less than 50 cases, measured at the 3-digit SIC 92 level, are omitted. This helps to ensure that a single firm's LP is not overly influential within the overall industry average level. To maximise observations within each industry, the estimates of productivity includes SMEs located in Northern Ireland but the analysis does not. The Financial intermediation sector is included despite recording turnover data that is considered to be '*not available on a comparable basis*' (BIS 2006). I interpret this as meaning that turnover can be used within a relative measure, such as RLP where LP comparisons (using turnover data) are only within industry. Effectively controls for industry are being used within the productivity measure, capturing the inconsistencies that occur within the sector.

6.6.2 Takeover definition

To enable demographic events to be identified within the BSD, simplifications are made of the type of events that occur. The advantage is that it results in a new data set that includes changes of ownership and structural changes of all firms from the IDBR. This should enable all M&As of SMEs to be identified. The disadvantage is that I am imposing uniformity on M&As, perhaps an oversimplification of the different processes that can occur.

For takeovers, the definition can be chosen from three categories of ownership change that relate to all business[71] in the BSD (ONS 2006a)[72]. These are;

1) a 'pure change of ownership' such as 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 I understand, 'controls the combined operation'.

By 'identity', BSD appear to mean the possession of a unique registration number at the enterprise group level - the red squares in figures 6.1 and 6.2. As all of these changes apply to the enterprise group level, it is still possible to identify all firms that have been subject to these changes at the enterprise level – the blue squares in figures 6.1 and 6.2. They do not result in the enterprise reference automatically 'exiting' the Register[73]. Therefore employment and turnover are continued to be reported even once the firm is acquired[74].

A limitation with these variables is that they are binary. This means that I am only able to identify if an enterprise is subject to any of the above and not how many times in a given year. It is unlikely that SMEs are repeatedly acquired in the same year but ultimately I am unable to identify if this is actually occurs. Another problem, linked with the simplification, is that the event might be a mixture of these categories. Another limitation for the second and third definition is that I am unable to identify the other merging or acquiring firm(s).

In the analysis presented, I make use of the third category – 'takeover'. This is a similar definition to the seminal work of Singh (1971). All three categories are significant for SMEs. However, for the process I am most interested in, the 'takeover' category appears to be the most appropriate. This definition implies that the SME is

[71] It includes takeovers of SMEs by SMEs but also those by non-SMEs.
[72] ONS follow the guidance that is provided by Eurostat (2003).
[73] They can be the cause of a firm to subsequently exit but this is something different and I try to estimate this in a later chapter.
[74] These concerns have been raised with ONS and I have been reassured that these figures belong to the acquired firm - at least in the short run. In the longer term, it is perhaps more likely that the employment and turnover of the acquired firm is less able to be identified.

the target and it can be implied that it is acquired by a larger firm than itself (this could be a relatively larger SME or a large business)[75], hence the continuation of the acquiring enterprise's identity.

The data I use to identify takeovers may not be suitable for the analysis of large firms. The data records a demographic event for the firm but this may not be correct due to the complexity of M&As. The data simplifies many events to enable them to be recorded. However, with large, complex firm structures, the data may not accurately represent what really occurs. Part of the problem is that I have made use of a very specific event – a takeover. For smaller firms, I assume that the degree of simplification of demographic events is not a problem as this sector has a quite straightforward firm structure (e.g. firm C in figure 6.2 above). But the type of event is likely to be less accurately captured for larger firms.

In the large firm sector, not only are M&As more complex, but the whole process of acquisition and assimilation might take more time. For example, an acquired large firm with many local units might continue to operate under its former name whilst it gradually re-organises and is restructured. Within the data, the event might be recorded with a delay, as the units that continue to operate under the old ownership will not register as experiencing a demographic event until after they have actually changed ownership fully.

The takeover variable is certainly not perfect and liable to be subject to some error. It perhaps does not pick-up all takeovers and for those it does, there is a chance that they are incorrectly labelled. One method that can be used to control for this measurement error is to instrument for takeover. Given the limited number of variables that I can use, I am unable to instrument for this. However, it is likely that the degree of error is random, reducing the need to instrument for measurement error[76].

Earlier it is stated that the takeover variable - and the dataset more generally - is unable to identify acquiring firms and therefore it is not possible to identify a match

[75] It assumed that large firms acquire small ones and not the other way round.
[76] When using takeover as a dependent variable, any errors of measurement still give unbiased estimates of the parameters and their variances. However, the estimated variances will be larger than in the case without errors (Gujarati 2003).

between the acquirer and the acquired. It is not possible to identify what the characteristics of acquiring firms are.

Measuring the total effect of acquisitions requires estimates on what happens to the acquired (e.g. exit, relocation, change in performance) and the effect on performance to the acquirer. In cases of asset stripping, the resources are not lost, more transferred from one firm to another. Therefore measuring the exit or change in performance of the acquired firm does not provide the full estimate of the effect as this also needs to include the change in performance of the acquirer which may result from the newly acquired assets. This is not possible with the data. It could be assumed that the effects of takeovers for acquirers is positive, at least on average, consistent with the theory of takeovers presented in the theory chapters. If acquisitions do not result in a positive change in productivity or profits, then rationally no takeovers would occur. Therefore without an estimate, it is possible to generate a plausible assumption of the direction of the effect from takeover to the acquired.

If it can be assumed that acquisitions are beneficial to acquirers and if it is found that the effects on acquisition targets from takeovers is to boost productivity, then it can be inferred that the total effect is positive. However, any relative defences between locations cannot be judged as it is not possible to identify the relative scale of the (assumed) positive effects on acquirers. If the effects from acquisition on targets are negative, then it is unknown what the total effect of SME acquisitions are as the scale of the (assumed) positive effects on acquirers is unidentified.

Similarly, without knowing the location of acquirers (and where those gains accrue), it is not possible to look at the relative gains (or losses) due to acquiring SMEs. The NEG theory and empirical evidence suggests that most large firms are located in the core area. NEG theory also suggests that there are incentives or processes that may mean that some takeovers are between locations, with most large acquirers based in the core. It is therefore probable that some acquisitions are between the core and periphery but this cannot be tested here. It is also not possible to estimate the relative gains or losses between locations as this also requires an estimation of the performance effects on acquirers as well as their location.

Therefore only an assessment of the total impact on regional productivity from the targets of small firm acquisition can be estimated.

6.6.3 Exits

Measuring firm exits is problematic as it can depend on how the data is compiled. In the UK, a major source on small business stems from VAT records. It is therefore possible to lose a firm and conclude it has 'exited' if it is no longer 'VATable'. This can happen if the firm has fallen below a given threshold size or it operates within sectors that are exempt from VAT. If an enterprise is below the threshold for more than one year in the IDBR, it is declared dead and if it creeps above the threshold in the future it is given a new enterprise reference number and treated as a new enterprise. As I am unable to identify this form of 'exit' from the data, I simply have to be mindful that some of the exits I subsequently record might be due to firms falling below the relevant size thresholds for inclusion. Like many empirical studies, it is likely that when measuring an exit from the data it is an economic one that is trying to be explained.

In an economic sense, exits occur when the revenue of a firm is inadequate to cover costs, and credit is exhausted. If the price a firm receives is less than its average total cost; the firm is generating no normal profit, then in the medium - to long-term, the firm will exit. Here exit means a firm disappears from the market. Firms may exit a market but survive as a business entity by transferring production to an alternative market. A significant share of 'exits' accord with this in Dunne et al (2005). More recent concern with productivity has implied an exit involves a cease in production.

A legal exit is not necessarily associated with firm failure, losses and inefficiency. A legal exit may occur for many reasons. For example, when a firm changes its name or ownership but continues production in the same market. Only one-third of businesses are judged to have closed under circumstances that the owners' termed as unsuccessful (Headd 2003). For small firms, exit might be a sign of success; managing to cash-in their assets for more liquid forms of capital. A limited distinction exists within the industrial organisation literature of the negative aspects of small firm failure and exits (Bates 2005). Empirically, bankruptcy-exits are found to

be different from other forms of exit[77] (Schary 1991). Therefore closure does not necessarily mean failure for all firms.

Small business exits are also linked to entrepreneurial exits. Entrepreneurial exit might be particularly relevant for small firm dynamics, where the prospects of the firm are more entwined with the owner. Business owners or entrepreneurs may choose alternative employment. Seemingly successful and productive firms may also exit due the firm owner or entrepreneur choosing to voluntarily exit due to personal or non-business reasons (Everett and Watson 1998). For example, small firms and entrepreneurs may exit or discontinue due to succession problems[78].

Effectively owners or entrepreneurs can continue, sell-up, liquidate (voluntarily) or be declared bankrupt. This thesis is most interested in firm exits and the loss of a productive unit. I do not consider exits that may relate to entrepreneurs but acknowledge that some firm exits might be caused by these reasons.

It is important that I only count an exit when it is an economic exit. I deem this to mean when a business is no longer producing valuable output or not using any resources. I identify an exit when a firm is no longer registered, registered as inactive, or is no longer registering any positive turnover or employment in the dataset[79]. If a firm keeps trading but is sold, changes its name or moves production to an alternative market, this does not result in deregistration and so is not identified as an exit. Exits (and takeover events) are identified using the unique reference number for the firm. This does not relate to the name of the unit. If a firm ceases to be eligible for VAT or PAYE then this reference number becomes obsolete and the firm exits the register and therefore my sample.

6.6.4 Size and structure

[77] Bankruptcies can be weakly explained by the firm's characteristics but not other exits such as mergers and voluntary liquidations. However, this comes with a caveat of being found within a declining industry that may generate some perverse results.
[78] Exits are found to increase with the age of a firm when this is connected with the retirement age of the owner-manager (Martin et al. 2002; Santarelli and Lotti 2005).
[79] Over time firms will change their turnover and employment. I do not omit firms if they grow to become non-SMEs. SMEs are measured according to their status in 2004 or, in my alternative sample, 2001.

Employment is the total number of paid full and part time workers including any working proprietors. I also use the structure of the firm and this can also be thought of as a measure of scale. This is the number of local units within the enterprise. It is measured as the logarithm of the number of local units. The entity of the firm is also captured, whether a firm is registered as a sole proprietor, partnership or company[80].

6.6.5 Location and age

The Government Office Regions (GOR) is used to identify the region of firms. I also create three different locations within Great Britain on the basis of GVA per capita data (see tables A6.1 and A6.2 in the appendix). The first is the 'core' location, 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 ranking for output per head. Lastly, the 'periphery' contains Wales, North East, North West and Yorkshire and the Humber. These are the British regions with the lowest rank for GVA per capita.

6.6.6 Relocation

Relocation is identified when the SME is no longer registered in its originally recorded region (GOR) but is still active and has not exited, as defined above. It is assumed that the whole firm (including its employees – although these may not be the same ones) move to the new location. In the case of takeover-relocations, it might be the case that the firm's name changes but it can still be identified as the firm is not tracked by its name.

6.6.7 Age

Age is not a continuous variable but a set of dummy variables grouping ages together. This is because the birth of the firm is not captured in the IDBR as a pure continuous variable as many firms (around 7 percent) appear to be born in 1973, perhaps when the data was first collected. In the proceeding years hardly any births exist; in 1974 less than 1 percent of firms are born, gradually increasing in more recent years[81].

[80] The 'company' variable is unable to distinguish between whether is a privately or publicly limited company due to limitations of the data.
[81] It is only around 2001 that my sample has a birth rate equivalent to that recorded in 1973.

The age groups are measured in 2004 and consist of 0 to 1 years, 2 to 4 years, 5 to 9 years, 10 to 19 years and 20 years plus. Normally having dummies for a variable that can be estimated continuously is quite inefficient. Given that I have a very large sample size, I am not concerned about the increase in the degrees of freedom[82]. The recorded age is not strictly the real age of the firm. The age recorded is calculated from when the enterprise enters the IDBR and not when it first comes into existence. It can be the case that an enterprise trades for a number of years below the VAT threshold and does not elect to voluntarily register. Therefore the variable derived from birth year is not strictly capturing the age of the firm. However, I use this variable as a proxy for the enterprise's 'true' age.

6.6.8 Industry

Industry is measured at the 2-digit group level according to the UK SIC 1992. It consists of 49 different sectors, spanning the primary sector, manufacturing and service industries.

There is no distinction between new emerging industries and sectors. However, part of the takeover process might involve the acquisition of high performance ventures of which some firm might be shaken out of the market if they were to continue independently. This is consistent with previously cited theory, where firms in more mature industries, with lower growth rates and less competition, are more likely to be acquired if they have lower productivity but the reverse for firms in newer industries (Vernon, 1966 in Harris and Robinson 2002, p. 563). One of the main problems in trying to identify new and emerging industries are, by their very definition, usually not defined suitably in SIC codes (version 1992 used here) as their definition is yet to be fully established. This means that most dynamic and new sectors are unable to be suitably identified, masked by older industries.

Although I am partially interested in this 'shake-out' process, it is the aggregate effect of takeovers and its effect on regional economies that is the motivation of this thesis. Analysis of a single, perhaps small, sector will not provide much insight to this, more

[82] In theory I could have estimated separate dummies for nearly all of the ages, but still I do need to take into consideration the number of dependent observations when I measure rare events such as takeovers.

fulfilling only in an industrial economics focus of takeovers. Although a significant issue for takeovers, this is perhaps beyond the scope of this thesis.

6.7 Final Sample and SME Summary Statistics

The data used is a cross-section of British SMEs from 2004. Once some exclusion restrictions are applied, it consists of just less than 1.9 million observations at the enterprise level. All of the observations have employment of at least one (including working proprietors) and positive turnover. Productivity is measured by RLP. The relative measure of productivity should capture industry differences in the intensiveness of intermediate goods and capital. Next I provide some descriptive statistics of the data set.

The table 6.1 below shows the percentage of registered takeovers in the data. There are around twelve and half thousand takeovers within the sample. This equates to 0.66 percent of SMEs.

Table 6.1 – SME Takeover by Productivity

Total no. of SMEs (2004)	Total no. of takeovers (in 2005) of 2004 sample	Acquired SMEs (in 2005) as percentage of SME sample (2004)
1,897,288	12,504	0.66%

Source: ONS

Table 6.2 shows the size distribution of firms within my SME sample. Over a third of my sample is made up of firms with only one employee. These are likely to be owner-managers. A further quarter of the sample is made up of firms with employment of two. Most of the sample, around 90 percent is made up of micro firms, those with employment of less than ten employees. Medium sized firms, those with 50 or more employees makes up around 1.5 percent of the sample.

Table 6.2 – SME Size Distribution

Employment	Frequency	Percentage of sample
1	682,235	36.0%
2	481,209	25.4%
3	198,272	10.5%
4	125,964	6.6%
5-9	232,137	12.2%
10-19	96,527	5.1%
20-49	54,868	2.9%
50-259	26,076	1.4%
Total	1,897,288	100%

Source: ONS

Despite the sample being primarily made up of micro businesses, takeovers (in 2005) occur across the entire size distribution. Table 6.3 shows takeovers across the size distribution of the SME sample. For single employee firms, over 2,500 takeovers were registered. This equates to a rate of around 0.4 percent but over a fifth of the total number of takeovers in my sample. Similarly for firms sized 2 to 4 employees, only around 0.4 percent of firms are acquired but this size band contributes over a quarter (26.5 percent) of the takeovers in my sample. Firms in the 10 to 49 employment size band contribute around another quarter of takeovers, with an incidence rate of 2.2 percent. The highest chances of takeover at 4.5 percent are for those in the medium sized category, 50 to 249 employees. This category contributes less than 10 percent of all the takeovers in my sample.

Firms with employment less than 5 contribute nearly half of my observed takeovers and micros; firms with employment less than 10, contribute nearly two-thirds of all the takeovers in my sample. The removal of the smallest firms would therefore remove information on the process of SME acquisitions and their potential effects on regional development. Due to the high absolute number of observed takeovers with small firms in my sample, I keep these businesses in all of the subsequent estimations.

Table 6.3 - SME Takeover incidence by size

Employment	Takeover	Percent of takeovers within size band	Percentage of takeover total	Total
1	2,611	0.38%	20.9%	682,235
2-4	3,311	0.41%	26.5%	805,445
5-9	2,120	0.91%	17.0%	232,137
10-49	3,294	2.18%	26.3%	151,395
50-249	1,168	4.48%	9.3%	26,076
Total	12,504	0.66%	100.0%	1,897,288

Source: ONS

To examine the spatial distribution of SMEs, I use the regions of Britain and create three different locations; the core, mid-periphery and periphery. The periphery has 467,893 SMEs (24.7 percent) of the total sample. Out of this, Wales has 85,661 SMEs (4.5 percent) of the sample. The mid periphery has 807,875 SMEs (42.6 percent) and the core 621,520 (32.8 percent) of the SME sample.

Table 6.4 - SME Location

Location (2004)	N	%
Periphery	467,893	24.7%
Wales	85,661	4.5%
N. East	50,117	2.6%
York. & Hum.	140,990	7.4%
N. West	191,125	10.1%
Mid-periphery	807,875	42.6%
W. Mid.	160,339	8.5%
E. Mid.	134,121	7.1%
S. West	185,228	9.8%
Scot.	131,365	6.9%
E. Eng.	196,822	10.4%
Core	621,520	32.8%
S. East	324,909	17.1%
London	296,611	15.6%
Total	1,897,288	100%

Source: ONS

The next table shows the age distribution of the sample. The youngest SMEs, those aged 0 to 1 year constitute around 13 percent of the sample. Around a quarter of the sample is aged between 2 and 4 years old. Over a fifth of the sample (22.4 percent) is aged between 5 and 9 years old. Therefore around 60 percent of the SME sample is less than 10 years old. Just under a quarter of the sample (23.7 percent) is aged 10 to

19 years and a further 16 percent is 20 years or older.

Table 6.5 – SME Age

Age (in 2004)	N	%
Age 0 to 1	251,667	13.3%
Age 2 to 4	470,247	24.8%
Age 5 to 9	425,463	22.4%
Age 10 to 19	448,731	23.7%
20+ years	301,180	15.9%
Total	1,897,288	100%

Source: ONS

Most SMEs in the sample are companies (either public or privately held); over 50 percent (967,787). Sole proprietors (591,858) make up the next significant proportion, over 31 percent of the sample and Partnerships (337,643) just fewer than 18 percent.

Table 6.6 – SME Firm Type

Firm type	N	%
Company	967,787	51.0%
Partnership	337,643	17.8%
Sole proprietor	591,858	31.2%
Total	1,897,288	100%

Source: ONS

Table 6.7 shows the frequency and percentage of SMEs in my sample by broad industry sector, according to the UK SIC 1992 classification. The largest broad sector in my sample is Real estate, renting and business activities at just under a third (30.1 percent) of my sample. Next is Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods at just under a fifth (20.4 percent) of my sample. The smallest sectors are Electricity, gas and water supply (0.02 percent) and Mining and quarrying (0.05 percent). The primary sectors of Agriculture, hunting and forestry and Fishing contribute around 7 percent of the total sample.

Table 6.7 – SMEs by Industry

Industry	Frequency	Percentage of sample
Agriculture, hunting and forestry	136,243	7.18%
Fishing	3,670	0.19%
Mining and quarrying	972	0.05%
Manufacturing	157,103	8.28%
Electricity, gas and water supply	430	0.02%
Construction	212,483	11.20%
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	386,126	20.35%
Hotels and restaurants	134,493	7.09%
Transport, storage and communication	82,171	4.33%
Financial intermediation	22,962	1.21%
Real estate, renting and business activities	609,385	32.12%
Other community, social & personal service activities	151,250	7.97%
Total	1,897,288	100%

Source: ONS

The table 6.8 (below) shows relocations and exits (in 2006) across the regions of Great Britain. Over 23 percent (around 440,000) of the total 2004 sample exit by 2006. Across the regions, the largest percentage of SMEs not surviving over the period 2004 to 2006 is London (26.4 percent) and the smallest is Wales (20.5 percent).

Only around 1.5 percent of SMEs locate to another region over the period 2004 to 2006. London has the largest percentage of SMEs relocating (2.9 percent) to another region, followed by the East of England and the South East (both 1.7 percent). Scotland has the smallest percentage of its SMEs relocating (0.4 percent), followed by Wales (0.8 percent or 643).

Table 6.8 - SME relocation and exit frequencies by region

Region (2004)	No relocation or exit (2006)	Relocating (2006)	% relocating (2006)	Exit (2006)	% exiting (2006)	Total (2004)
Wales	67,453	643	0.75%	17,565	20.5%	85,661
N. East	37,777	431	0.86%	11,909	23.8%	50,117
York. & Hum.	107,658	1,366	0.97%	31,966	22.7%	140,990
N. West	144,796	1,787	0.93%	44,542	23.3%	191,125
W. Mid.	122,789	1,830	1.14%	35,720	22.3%	160,339
E. Mid.	101,855	1,891	1.41%	30,375	22.6%	134,121
S. West	142,975	2,106	1.14%	40,147	21.7%	185,228
Scot.	101,316	575	0.44%	29,474	22.4%	131,365
E. Eng.	149,744	3,431	1.74%	43,647	22.2%	196,822
S. East	243,532	5,503	1.69%	75,874	23.4%	324,909
London	209,719	8,596	2.90%	78,296	26.4%	296,611
Total	**1,429,614**	**28,159**	**1.48%**	**439,515**	**23.2%**	**1,897,288**

Source: ONS

6.8 Limitations

The data set, with its very large sample, allows for the use of econometric methods to be used to explore the role of takeovers and productivity with small businesses. However, there are a number of limitations with the data, many of which have already been described, that are summarised here.

First, there are a limited number of variables that can be used to explore takeovers and their potential effects. This may result in some potentially interesting and useful relationships not being explored. For example, the role of capital in the production function and therefore productivity and how this is affected after acquisition. Second, there is no information available about the acquirers. Therefore I am not able to estimate the effects on the buyers of SMEs or include where they are located; core or periphery. It can be assumed that these firms are relatively larger, as it is unlikely that a relatively small business purchases a larger one. Third, I am unable to provide a full description of what has occurred when a takeover occurs. In part this is intentional, the data and methods will allow me to assess what on average occurs with takeovers; which SMEs are targeted and what the effects are. The literature (see previous chapters) has been used to try and illustrate reasons and explanations for what is expected and observed. I do not attempt to look at the qualitative aspects of small firm takeovers. The motivation is to assess the potential effects that SME takeovers have on regional productivity. Further insight could then be provided from follow-up

studies to try and understand why businesses are acquired with any possible differences across regions along with whether there are any differential effects across sectors (e.g. between new emerging industries and more established ones), but this is beyond the scope of this thesis.

However, analysis of the BSD enables small business takeovers to be identified and is an improvement on all existing data sources for this purpose. This means that the study presented is unique in showing the scale and analysing SME acquisitions in the Great Britain.

In the following chapters I will use this dataset and econometric methods to investigate: SME takeovers and their subsequent exit, relocation and performance effects. In the next chapter I investigate SME takeovers and identify what characteristics of SMEs are more likely to be associated with takeovers. Specifically, I will test whether more productive SMEs are more likely to be acquired and if this is affected by location.

Appendix

A6.1 The Annual Respondents Database

The more commonly used data set for firm level analysis is the Annual Respondents Database (ARD)[83]. The ARD has two types of coverage, 'selected' and 'unselected'. The 'selected' ARD has information that is obtained from the Annual Business Inquiry (ABI), a stratified sample survey based on the IDBR. The 'non-selected' firms have essentially the same information available as the IDBR above.

The survey enables much more information to be known about firms in the UK than the simple information available from the IDBR, e.g. capital expenditure and value of intermediate goods. Small firms are only sampled every few years to ease their administrative burden. This results in small firms not filling out the form every year. Therefore small firms are deliberately unobserved between years regardless of whether they are still actively trading or not. This makes it unsuitable for analysing small firms as they are sampled on a small scale and not consistently tracked across years.

[83] In studies using micro data, the ARD has been used to investigate topics such as the relationship between foreign ownership and productivity (Griffith et al. 2004), ownership effects at plant level and the effects on the probability of closure (Harris and Hassaszadeh 2002), comparing the performance of acquired UK plants by the foreign-owned sector with other comparable of plants (Harris and Robinson 2002) and the analysis of the contribution of 'internal' restructuring (changes in market share) and 'external' restructuring (exit and entry) to productivity growth in UK manufacturing (Disney et al. 2003).

A6.2 Tables

Table A6.1 – 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 A6.2 – Location classifications

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

Chapter 7 - SME Takeovers

7.1 Introduction

Chapter 2 discusses why it might be profitable for a larger firm to acquire a smaller firm. It also explains the supply conditions necessary for an SME takeover, and that jointly with expected profitability determine takeover chances. Profitability is likely to be closely linked with relative productivity, so are more productive SMEs more likely to be acquired and does this effect increase in more peripheral regions? In this chapter I investigate the characteristics of SMEs that are associated with takeover. Of particular interest is the relationship of productivity with the probability of takeover and regional heterogeneity.

Using the BSD data, I find more productive SMEs have a higher likelihood of acquisition – unlike the existing evidence for relatively larger firms. Firms located in the core regions of Britain are also more likely to be acquired at all levels of (relative) labour productivity. The productivity findings are consistent across two years of takeover; 2002 and 2005, at different points of the stock market trend.

The chapter begins with a set of hypotheses established from the literature review that are tested in the data. Measurement and estimations problems are then discussed before the presentation of descriptive statistics of SME takeovers. The final section tests the hypotheses with multivariate analysis.

7.2 Hypotheses

In the literature review a number of variables are discussed that may influence whether an SME might be taken-over. A number of hypotheses are formulated out of this literature. They are:

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 the more productive are more likely to be bought.

3. Information about an SME is likely to be a function of age and size. The performance of the very young and small will be relatively less known to potential acquirers, so they will not be targets.

From these hypothesis and the availability of variables in the data set, the following relationship is formulated for firm i as;

$$Pr(Takeover_i) = f(\overset{+}{Prod_i}, \overset{+}{Core}, \overset{-}{Periphery}, \overset{+}{Age_i}, \overset{+}{Size_i}, \overset{-}{Core*prod_i}, \overset{+}{Periphery*prod_i})$$

Where 'prod' is productivity and 'Pr', probability

7.3 Descriptive Statistics

The first stage of the analysis is to investigate the link between productivity and the probability of takeover. Descriptive statistics are instructive of the possible relationships within the data. Statistics are presented that look at the chances of takeover by productivity, age and then location[84].

Table 7.1 below shows the percentage of registered takeovers in the data by quartiles of the productivity distribution. SMEs in the top quartile of productivity have the highest percentage of takeovers (0.91 percent), significantly different from the overall

[84] For descriptives on SME takeover incidence by size see table 6.3 - chapter 6.

sample percentage of takeover at the 99 percent level. This is over one third greater than for the entire sample.

The next highest percentage of takeovers is within the lowest quartile of (relative) productivity (0.63 percent). This suggests a form of j-curve relationship between SME productivity and the chance of acquisition. The lowest probabilities are for small businesses with performance around the average; higher probabilities for those at each end of the productivity distribution, with the most production having the highest chances of takeover.

Table 7.1 - Takeover (2005) by Productivity

Quartile of RLP	Percent of takeovers within each quartile
1st quartile (top)	0.91%***
2nd quartile	0.55%***
3rd quartile	0.54%***
4th quartile (bottom)	0.63%**
Total	0.66%

Source: ONS, author's own calculations
Sample size 1,897,288
Legend: * p<0.1; ** p<0.05; *** p<0.01

Table 7.2, below, shows the percentage of takeovers by the age of the SME. Without controlling for any other factors, SMEs between 10 to 19 years old have the highest percentage of takeovers (0.81 percent). The youngest firms are least likely to be taken over. These are all statistically different from the average percentage of chances of takeover across the whole sample at the 99 percent level. Only those firms aged 20 years or more have a probability that, statistically, does not differ from the sample average.

Table 7.2 - Takeover (2005) by Age

Age (years)	Percent of takeovers within each age category
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, author's own calculations
Sample size 1,897,288
Legend: * p<0.1; ** p<0.05; *** p<0.01

To examine the spatial distribution of takeovers, I use the regions of Britain and create three different locations; the core, mid-periphery and periphery. Table 7.3 shows that all locations (including core-periphery variables) have a percentage of takeovers that are statistically different from the sample average at the 99 percent level, except for the South East and East England.

The highest percentage of SMEs subject to takeovers is in the 'core' (0.89 percent). Within the core, London has the highest percentage of takeovers (1.14 percent). The location with the next highest is the 'mid-periphery' (0.56 percent). Within this location the West Midlands has the highest percentage of takeovers (0.61 percent) and the South West the lowest (0.44 percent). The location with the lowest percentage is the 'periphery' (0.53 percent). Within this location, Wales is found to have the lowest percentage of takeovers (0.36 percent) and Yorkshire and Humberside the highest (0.59 percent).

Table 7.3 - Takeover (2005) by Location

Location 2004	Takeover freq.	Percent of takeovers within each location
Periphery	2,459	0.53%***
Wales	308	0.36%***
N. East	222	0.44%***
York. & Hum.	834	0.59%***
N. West	1,095	0.57%***
Mid-periphery	4,488	0.56%***
W. Mid.	974	0.61%**
E. Mid.	709	0.53%***
S. West	819	0.44%***
Scot.	741	0.56%***
E. Eng.	1,245	0.63%*
Core	5,557	0.89%***
S. East	2,174	0.67%
London	3,383	1.14%***
Total	12,504	0.66%

Source: ONS, author's own calculations
Legend: * p<0.1; ** p<0.05; *** p<0.01

7.4 Multivariate Estimation

An empirical model is specified that allows tests of the hypotheses about the determinants of SME takeovers. The model below shows the estimation equation, where Pr is probability, Y = 1 if takeover has occurred.

$$Pr(T_i) = \alpha_0 + \alpha_1 prod_i + \alpha_2 size_i + \alpha_3 location_i + \alpha_4 age_i + \alpha_5 industry_i + \alpha_6 Entity_i + \alpha_7 structure_i + \alpha_8\, prod_i * location_i + u_i \quad (1)$$

The dependent variable in this is a binary variable – whether an SME has been acquired or not. A linear probability model can be estimated with OLS. However, the linear probability model is not suitable for the analysis of most binary dependent variables, as the estimation does not constrain the resulting probability of a positive outcome (takeover) to be bounded within 0 and 1 (Greene 2003). Two common binary variable estimators are logistic and probit[85]. To estimate the probability of the categorical variable of takeover equalling one (in year t) a probit model is used with (Huber-White) robust standard errors to produce heteroskedastic-consistent standard errors[86]. The model is estimated with Stata version 9. Probit is chosen in preference to

[85] The choice of estimator between these two matters for this analysis because the tails differ between these two functions and the dependent variable is a rare event.
[86] In probit (and logit) models, heteroskedasticity causes problems to the conditional means and not just

the logistic form as the log-likelihood for former is slightly higher (less negative) when compared to the same model estimated via the latter (not shown)[87].

The descriptive statistics show that it is not common for an enterprise to be acquired. Modelling takeovers can be considered a form of rare event. Recent work on rare event studies (King and Zeng 2001) has shown that the resulting estimates of event probabilities can be too small with standard categorical regression methods. It is shown that;

'*logit analysis is suboptimal in finite samples of rare events data, leading to errors in the same direction as biases in the coefficients*' (King and Zeng 2001, p. 138).

A trade-off exists between the probability of rare events and the sample size but '*no sample size is large enough to evade finite sample problems if the events are sufficiently rare*' (King and Zeng 2001, p. 153). I have a very large sample and do not expect to suffer from bias caused by estimating a rare event. For robustness, I also estimate the model (below) by relogit (Tomz et al. 1999), comparing it to the logit and probit estimations. The results of this are shown in the appendix table A7.3. As expected, I do not find any qualitative differences between the models. However, all of the models under predict takeovers relative to the observed percentage of takeovers. The rare event logit performs better than the normal logit in terms of prediction but the probit model performs better than both of the logit models.

7.4.1 Simultaneity

Regressors may affect the dependent variable (takeover) but the latter may also affect the independent variable. First, productivity is an attribute acquirers perhaps seek in a target. Second, takeovers can lead to a change in productivity. Takeovers can have a two-way association with productivity, potentially causing simultaneity.

It is possible to specify the model as either;

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the conditional variances (Greene 2003). This can result in inconsistent coefficient estimates. Using a robust option to compute standard errors does not deal with this. An alternative solution is to use a heteroskedastic consistent probit estimator. For sensitivity, this is also estimated within Stata (hetprob) and little qualitative differences occur between the normal probit model and the heteroskedastic consistent estimator.

[87] As recommended by Cameron and Trivedi (2005).

T = f(Prod) or,

Prod = f(T)

A form of endogeneity is present and productivity might be correlated with the error term;

$$T_i = \alpha_0 x_i + \alpha_1 Prod_i + u_i \qquad (1a)$$

$$Prod_i = \gamma_0 x_i + \gamma_1 T_i + z_i \qquad (2a)$$

Solving for $Prod_i$ (assuming that $1 - \alpha_1\gamma_1 \neq 0$),

$Prod_i = (\gamma_0 + \gamma_1\alpha_0)/(1 - \alpha_1\gamma_1)x_i + 1/(1 - \alpha_1\gamma_1)z_i + \gamma_1/(1 - \alpha_1\gamma_1)u_i$

Assuming that x_i and z_i are uncorrelated with u_i, or $\rho_{xu} = \rho_{zu} = 0$;

$E(Prod_i u_i) = \gamma_1 / (1 - \alpha_1 \gamma_1)\, E(u_i u_i) \neq 0$

If estimated by OLS (ignoring that T is binary for now) then this can create inconsistent estimates. However, this ignores the temporal aspect. It is highly likely that the effect of takeover on productivity will only occur in subsequent periods;

$Prod_{t+n} = f(T_t)$

and prior productivity may influence subsequent takeover;

$T_t = f(Prod_{t-n})$

More formally;

$$T_{it} = \alpha_0 x_{it-n} + \alpha_1 Prod_{it-n} + u_{it} \qquad (1b)$$

$$Prod_{it+n} = \gamma_0 x_{it} + \gamma_1 T_{it} + z_{it+n} \qquad (2b)$$

So $(Prod_{it+n}\, u_{it}) = 0$

Similarly, other variables such as size and location could be affected by takeover. Intuition also exists on the meaning of these lagged values; how productive an SME is prior to takeover. The interest at this stage does not concern productivity during or after the takeover.

It is possible that the use of lagged variables, such as productivity, might not be independent of subsequent takeover for a few reasons. First, firms might be expecting to be bought or acquired; this might produce changes to pre-acquisition productivity, e.g. an 'Ashenfelter dip'. However, it might be just as likely that nothing changes until new owners are in place, even if the acquisition is expected. The literature review also documents that there is no effect such as the 'Ashenfelter dip', or alternatively a rise in performance pre-acquisition, found in any of the existing empirical studies.

Second, some acquisitions might be quite protracted affairs and not formally announced or registered in the data until after changes have occurred to the firm. This effect could also be due to a delay in the data recognising a change in ownership despite it already having an effect upon the firm's output or inputs, and therefore productivity. For an SME, these possibilities are reduced. For example, with a large company the trading name of a company (and therefore other facets of the firm) might not change for a number of years whilst the company is being restructured[88]. With smaller firms, the structure is simpler and they are unlikely to experience protracted changes in ownership.

Therefore all of the explanatory variables, such as productivity, size and location, are measured one period prior to takeover so that acquisition cannot affect these[89]. As explained above, for SMEs this is a reasonable assumption. Variables are measured in the year t-1 (2004) preceding takeover (2005). The interpretation of the variables is the same as productivity; they display the attributes of the firm that explain acquisition in a subsequent period.

7.4.2 Unobserved heterogeneity

Relevant regressors that are not included but correlated with an included one give rise to omitted variable bias. For causal interpretation of the model, relevant unobserved factors are particularly problematic. Unobserved components of the model that are

[88] This is partially explained in the data chapter (6) regarding the measurement of takeovers.
[89] Some of the variables may not change due to takeover, such as age, but these are also measured at time t-1.

correlated with existing regressors are known as unobserved heterogeneity (Verbeek 2008).

Firms are likely to differ in many aspects that are not observed. If unobserved variables are correlated with productivity, then the cause of takeovers may be driven by this unobserved factor and not productivity; for example, research and development (R) good management (M).

From equation 1 it is likely that;

$u_i = f(R, M, ...)$

but it is also likely that;

$Prod = f(R^+, M^+, ...)$

Estimation of 1 assumes u_i independent of other regressors (e.g. Prod). But the above indicates that the unobserved factors (R and M) are related to productivity. Therefore not controlling for these unobserved factors might, on one interpretation, upwardly bias the observed productivity effect on the probability of takeover[90]. It is likely that productivity will be caused by unobserved variables such as management and R&D success, among other factors, which are likely in themselves to increase the desirability of an acquisition. However, the choice of variables included is ultimately dictated by the data and whether it is available for at least the majority of the observed SMEs. I return to this issue in later chapters when investigating the effects of takeover on the subsequent exit and its effects on performance.

7.4.3 Estimated equation

The model below shows the estimation equation, where Pr is probability, $Y_t = 1$ if takeover has taken place in year t (2005) and $\Phi(.)$ is the distribution function;

$$Pr(Y_t=1) = \Phi(\alpha_0 + \alpha_1 \ln(RLP_{t-1}) + \alpha_2 Entity_{t-1} + \alpha_3 Age_{t-1} + \alpha_4 Industry_{t-1} +$$

[90] One method that can potentially reduce this are fixed effects within a panel. Fixed effects remove unobserved characteristics that do not change across time, i.e. time invariant components of u_i. However, the use of a panel is not possible with this sample of SMEs. Also, this does not resolve the problems if any of the characteristics are time variant. For example, R&D and management could change between years.

$\alpha_5 Location_{t-1} + \alpha_6 Employment_{t-1} + \alpha_7 Structure_{t-1} + \alpha_8 Location_{t-1} * \ln(RLP_{t-1}) +$
$\alpha_9 \ln(RLP_{t-1})^2 + \alpha_{10} Employment_{t-1}^2 + \alpha_{11} Employment_{t-1}^3 \alpha_{12} Employment_{t-1}^4 + u_i)$ (1c)

The productivity variables (lnRLP and ln(RLP)sq) allow for non-linearities in the productivity-takeover relationship. 'Employment' measures the effects of size on the chances of takeover and has polynomials ($Employment_{t-1}^2$, $Employment_{t-1}^3$ and $Employment_{t-1}^4$) to best fit for non-linearity in the relationship. 'Entity' measures whether a firm is registered as a sole proprietor (omitted case), partnership or company. 'Age' is measured in 2004 and is a set of dummy variables grouping ages together[91]. 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[92]. 'Industry' is a set of dummies (49 in total) for each 2-digit UK SIC 1992. 'Location' identifies whether the SME is located in the 'core' (omitted case), mid-periphery or periphery of Great Britain. 'Structure', controls for SMEs that may have multiple local units and is measured as the natural logarithm of the number of local units.

Hypothesis 1 is the demand for SME corporate control involves the more productive and innovative businesses ($\alpha_1>0$) - targets are more productive than the average. α_8 tests whether high productivity firms in the periphery are more prone to takeover; hypothesis 2. Hypothesis 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 ($\alpha_3>0$).

7.5 Results

The results from the takeover equations for the full sample are shown in table 7.4. The model equations are also estimated with a sample without the primary and real estate activities sectors (table 7.4). I remove the primary sector because the data might be less accurate and in any case it is likely to be atypical. Real estate activities are omitted following the recommendations of Daffin and Lau (2002) that measuring

[91] 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. A disproportionate number of firms in the BSD are recorded as born in 1973.

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

productivity but omitting capital may not be suitable for this sector. For brevity, the industry controls are not presented in any of the multivariate regressions as they are of lesser interest here. The majority of the industry effects are found to be significant.

The (McFadden's) pseudo r-squared statistics indicate a poor 'goodness' of fit for each model[93]. A low explanatory power of takeover models is fairly common for this type of estimation in the literature (see Alcalde and Espitia 2003; Palepu 1986; Powell 1997). In tables 7.4 and 7.5, both the productivity measure and its square are significant and positive. This indicates that 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 hypothesis 1.

[93] Pseudo R^2 statistics are only guide and are not deemed to be very reliable. It is also suggested that these should be removed from write-ups and reports (Sribney 1997b).

Table 7.4 – SME takeover (2005) probit results – full SME sample

Variable	Coefficient	Marginal effect	Mean value
Takeover (dependent variable)	-	-	0.0066
Ln(RLP)	0.0914***	0.000543	-0.5353
Ln(RLP)^2	0.0201***	0.000119	1.2303
Ln(local unit)	-0.1474***	-0.00088	0.0228
Employment	0.0433***	0.000257	5.2
Employment^2	-0.0007***	-4.09E-06	220.2
Employment^3	4.2E-06***	2.47E-08	27284.8
Employment^4	-8.3E-09***	-4.90E-11	4538466
Age 2 to 4	0.1099***	0.00071	0.2479
Age 5 to 9	0.1602***	0.001089	0.2242
Age 10 to 19	0.1593***	0.001076	0.2365
20+ years	0.1081***	0.000717	0.1587
Company	0.9621***	0.007216	0.5101
Partnership	-0.0704**	-0.00039	0.1780
Mid-periphery	-0.0858***	-0.0005	0.4258
Periphery	-0.1011***	-0.00056	0.2466
Mid-periphery*ln(RLP)	0.0024	1.44E-05	0.0066
Periphery*ln(RLP)	0.0196**	0.000117	-0.5353
Industry controls	Y		-
N	1,897,288		
Pseudo R^2	0.15		
Predicted takeover (at sample average)	0.00182		
Log-likelihood	-63,810		

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

Table 7.5 – SME takeover (2005) probit results – SME sample without primary sector and real estate activities

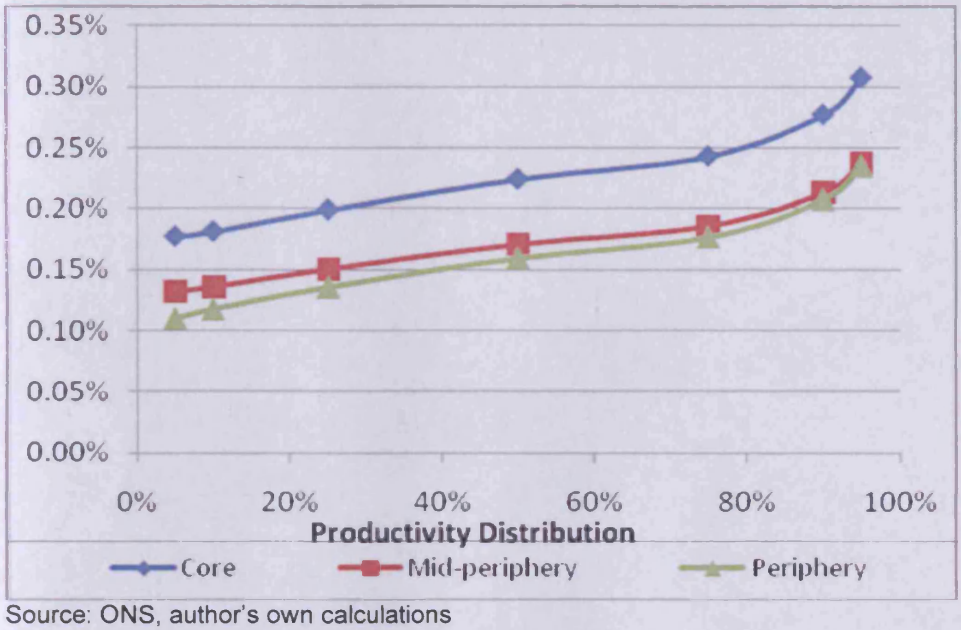
Variable	Coefficient	Marginal effect	Mean value
Takeover (dependent variable)	-	-	0.0065
Ln(RLP)	0.0952***	0.000625	-0.5152
Ln(RLP)^2	0.0214***	0.000141	1.1341
Ln(local unit)	-0.1360***	-0.00089	0.0242
Employment	0.0439***	0.000288	5.4395
Employment^2	-0.0007***	-4.60E-06	240.32
Employment^3	4.2E-06***	2.77E-08	29944.7
Employment^4	-8.4E-09***	-5.51E-11	5.E+06
Age 2 to 4	0.1340***	0.000971	0.2616
Age 5 to 9	0.1930***	0.001492	0.2270
Age 10 to 19	0.1910***	0.001462	0.2393
20+ years	0.1300***	0.000986	0.1315
Company	0.9310***	0.007154	0.5326
Partnership	-0.0503	-0.00031	0.1536
Mid-periphery	-0.0855***	-0.00055	0.4150
Periphery	-0.0973***	-0.0006	0.2422
Mid-periphery*ln(RLP)	-0.0005	-3.08E-06	-0.2260
Periphery*ln(RLP)	0.0190**	0.000125	-0.1317
Industry controls	Y		-
N	1,676,588		
Pseudo R^2	0.15		
Predicted takeover (at sample average)	0.208%		
Log-likelihood	-56,180		

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

The dummies for both locations are statistically significant and negative. This indicates that SMEs located outside the 'core' (London and the South East - the omitted location), are less likely to be taken over. However, peripheral locations appear to have statistically significant interactions with productivity. In figure 7.1 the predicted probabilities are computed at the sample averages[94] of the full sample's estimates. The probabilities are computed for each location 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.

[94] Where multiplicative dummies are used the computed means are not used but the product of the two mean values of the variables.

Figure 7.1 – Predicted Probability of Takeover by Location and Productivity



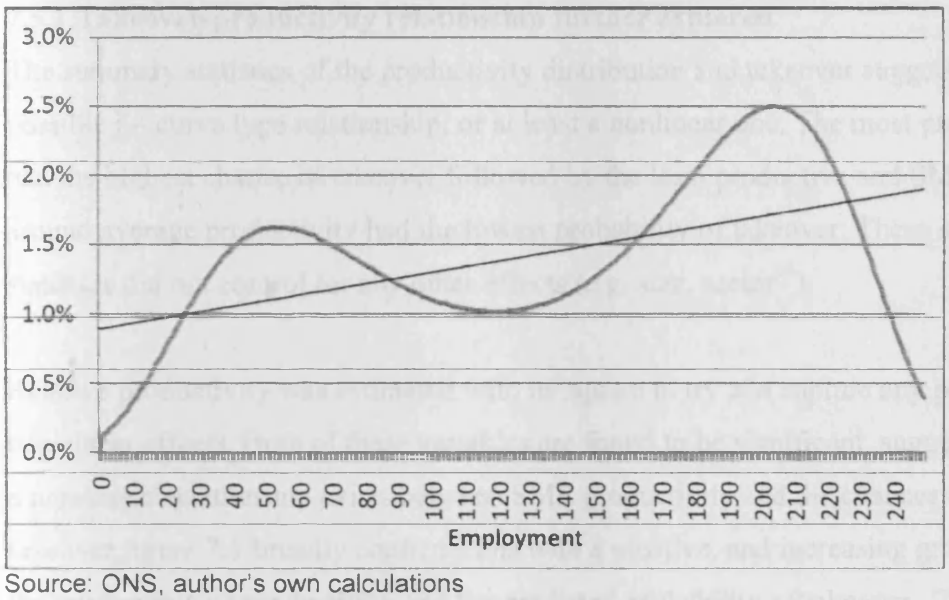
Source: ONS, author's own calculations
NB Estimated at the sample average
The values shown in table A7.2

The figure shows the already-discussed positive relationship with productivity and the predicted probability of takeover, consistent with a search for synergies and compensating for 'intrapreneurship' shortages (hypothesis 1) 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, 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 – hypothesis 2. The 'mid-periphery' has the next highest probability, but the evidence suggests that this might be surpassed by SMEs in the periphery at the very high end of the productivity distribution.

Turning to the role of size in acquisition chances, larger SMEs generally have an increased likelihood of acquisition – consistent with hypothesis 3. Employment has a positive and significant effect on the probability of takeover but this is not straightforward as polynomials of size are also significant and vary in sign. Figure 7.2 shows the predicted probability of takeover with the distribution of SME employment size from the full sample's estimates (table 7.4). The linear trend line confirms the generally positive relationship of size with probability of takeover. However, at the

top of the distribution, the chances of takeover fall and the highest likelihood of acquisition is for firms with around 200 employees with a 2.5 percent predicted probability. Perhaps beyond this size, the relative cost of absorption become so large that they put off some potential suitors, as fewer firms are of a sufficient size themselves to be able to acquire relatively larger SMEs. However, the results suggest that even the largest SMEs have a higher predicted probability of takeover than micros (businesses with employment of less than 10).

Figure 7.2 – Predicted probability of takeover by size



Source: ONS, author's own calculations
NB Estimated at the sample average

Another variable that may also pick up some of the effects of size is the number of plants - ln(local units). This variable is significant and negative indicating the more plants an SME has the less likely it is to be acquired.

The estimates in table 7.4 and 7.5 show age effects that are broadly consistent with older SMEs being more likely to be acquired. The predicted probabilities of takeover are shown for each age category in table 7.6. SMEs aged between 5 and 19 years have the highest probability (0.21 percent) of being acquired. The youngest age category (0 to 1 year) is found to have the lowest probability of takeover (0.13 percent), even lower than those aged 20 years or older (0.18 percent). This is consistent with hypothesis 3, that age (along with size) is a (positive) function of information on targets.

Table 7.6 – Predicted probability of takeover by age

Age (years)	Predicted probability	Marginal effects*
Under 2	0.127%	-
Age 2 to 4	0.181%	0.05%
Age 5 to 9	0.213%	0.09%
Age 10 to 19	0.212%	0.09%
20 years and over	0.180%	0.05%

Source: ONS, author's own calculations
NB Estimated at the sample average
*Relative to the base case – under 2 years

7.5.1 Takeover-productivity relationship further explored

The summary statistics of the productivity distribution and takeover suggest a possible j – curve type relationship, or at least a nonlinear one. The most productive had the highest chance of takeover followed by the least productive and SMEs with around average productivity had the lowest probability of takeover. These summary statistics did not control for any other effects (e.g. size, sector[95]).

Relative productivity was estimated with its square to try and capture any possible non-linear effects. Both of these variables are found to be significant, suggesting that a non-linear relationship exists between SME productivity and the chances of takeover figure 7.1 broadly confirms this with a positive, and increasing gradient with the relationship of productivity and the predicted probability of takeover. To further explore this, the model was estimated on the sample split by the productivity distribution: the bottom 25 percent of productivity, 25 to 50 percent of productivity, 50 to 75 percent of productivity and the top 75 percent. The results of these regressions are shown in table A7.4.

Looking across the 4 sets of results for the distribution, most of the relationships, at least qualitatively, remain as per the full sample. The main difference from the full sample results is that productivity is now insignificant except with the top quartile, where it is positive but decreasingly (the square of productivity is significant but small and negative). It is likely that by splitting the data by productivity, any significant variation in the probability of takeover occurs between the splits and now

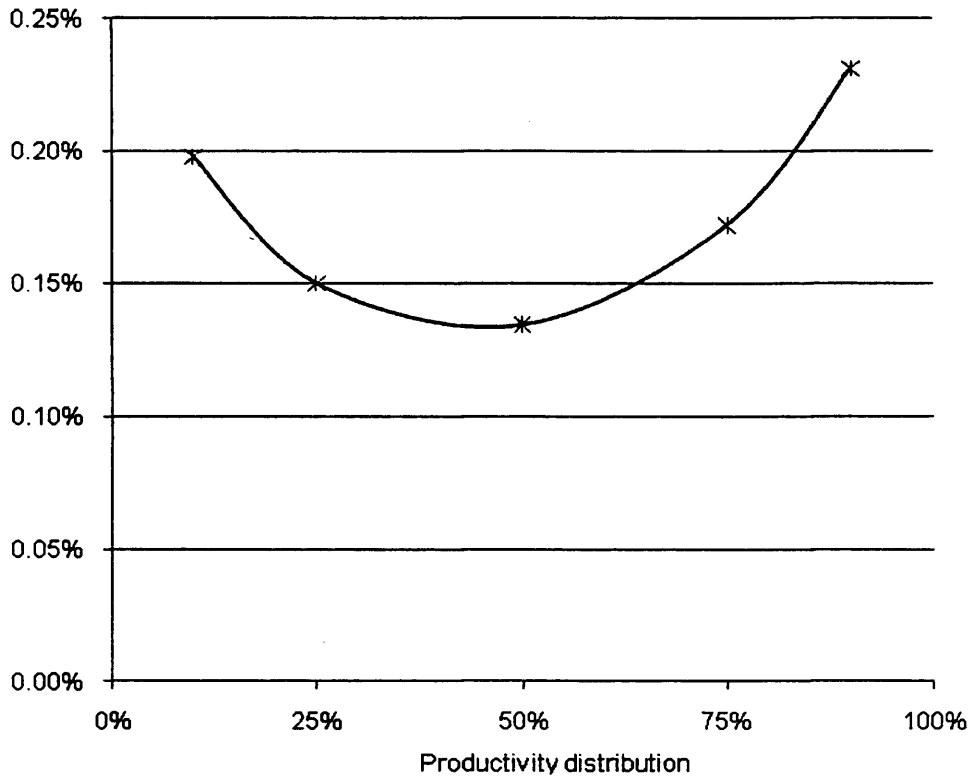
[95] Sector effects are controlled for in terms of productivity but not for its effect upon the probability of takeover.

may be reflected in the constants of the estimations. The estimates for the predicted takeover (taken at each sample's average) suggest this might be the case, as they appear to differ across the sample splits. The highest predicted probability at the sample average is at the top end of productivity, followed by the bottom end of the distribution. The middle two splits of the distribution have similar predicted probabilities of takeover but are lower than both the top and bottom ends.

The figure (7.3) below displays the predicted probabilities of takeover from the four models estimated across the productivity distribution. For the bottom three quartiles, the average values are plotted as productivity has no additional effect. However, for the top quartile, productivity does have an effect. To reflect this, values are computed with the different levels of productivity from the top quartile. Figure 7.3 has the resulting values plotted. The first three plotted values come from the bottom three quarters of the productivity distribution, with predicted probabilities estimated at each estimated sample's averages. The last two values come from the last model; the top of the distribution, but with varying levels of productivity now altering the predicted probability. The result is that the relationship of takeover with productivity now appears to be j-curved. SMEs with low productivity are more likely to be acquired than those with around average, but SMEs at the top end of productivity have the highest probability of being acquired.

For large firms, the literature suggests that less productive firms are targeted. For SMEs, the most productive have the highest chances of being acquired but those with low productivity are also an attractive investment, at least relative to median or average level SME performers.

Figure 7.3 - Predicted probability of takeover by productivity distribution



Source: ONS, author's own calculations
NB Estimated at the total sample averages. The plotted 10% point is from the 0-25 productivity distribution model, the plotted 25% (bottom) point is from 25-50% productivity distribution model, the 50% point is from the 50-75% productivity distribution model and the 75% and 90% plots are from the 75-100% (top) productivity distribution model.

7.5.2 Robustness – non-micros

Most of the sample is made up of micro firms (over 90 percent); businesses with less than 10 employees. A significant number of takeovers occur in this group. However, proportionately, more takeovers occur with relatively larger SMEs and they are also likely to contribute more (per firm) to regional productivity due to their scale. In this section I investigate the whether the SME takeover relationships found above are consistent with a sub-section of the SME sample which are relatively large; firms with employment of between 10 and 249.

The exact same model is used as before and the results of this are shown below in table 7.7. The mean values are likely to alter between the full SME sample and the non-micro one. This may alter the coefficients and marginal effects between the non-micro and full SME sample estimation. However, qualitatively, the results for the full sample are consistent with the non-micro sample. Relative labour productivity (and its square) is positive and significant. This indicates that relatively more productive non-

micro SMEs are more likely to be acquired and at an increasing rate – consistent with the full SME sample. Also, SMEs outside of the core are less likely to be acquired, even once I control for variables such as size and industry. However, the mid-periphery and periphery's interactions with productivity are significant but only at the 90 percent level.

One significant difference between the full SME sample and the non-micro one is that the age variables are now insignificant. This could be due to size. Larger firms are perhaps more likely to be well known and age has much less bearing on whether a potential acquirer has information on a target. Whereas for the smallest SMEs, the youngest are perhaps less likely to be known and for these firms, age is perhaps a better indicator of whether they are well known.

Table 7.7 – Non-micro SME takeover probit results

Variable	Coefficient	Marginal effect	Mean value
Takeover (dependent variable)	-	-	0.0251
Ln(RLP)	0.0726***	0.002969	-0.5110
Ln(RLP)^2	0.0149***	0.000608	1.1183
Ln(local unit)	-0.1329***	-0.00544	0.1876
Employment	0.0187***	0.000765	31.4855
Employment^2	-0.0002***	-8.60E-06	2261.1
Employment^3	9.8E-07***	4.00E-08	291196
Employment^4	-1.6E-09**	-6.44E-11	4.9E+07
Age 2 to 4	-0.0214	-0.00086	0.1106
Age 5 to 9	-0.0105	-0.00043	0.1666
Age 10 to 19	-0.0154	-0.00063	0.3368
20+ years	-0.0877***	-0.00348	0.3402
Company	0.8546***	0.023419	0.7764
Partnership	-0.0267	-0.00107	0.1542
Mid-periphery	-0.0480***	-0.00195	0.4356
Periphery	-0.0811***	-0.00319	0.2627
Mid-periphery*ln(RLP)	0.0258*	0.001057	-0.2396
Periphery*ln(RLP)	0.0333*	0.001362	-0.1526
Industry controls	Y		-
N	177,471		
Pseudo R^2	0.07		
Predicted takeover (at sample average)	0.0164		
Log-likelihood	-19,397		

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

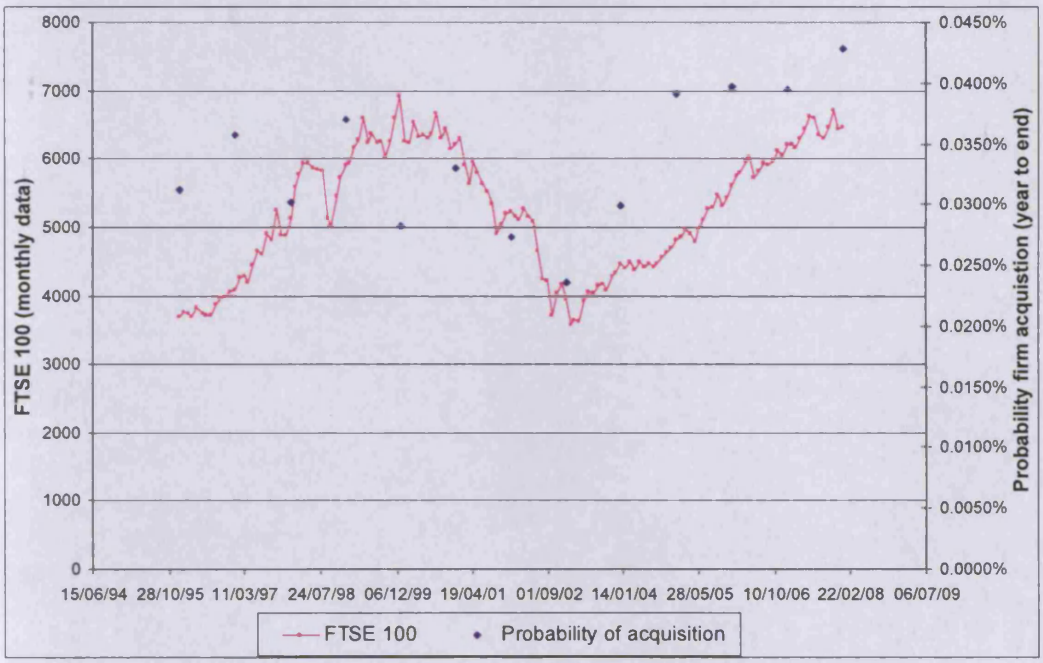
7.5.3 Takeover Results over Time

To investigate the relationships across time, another SME sample is obtained from a

different year and the same model as above is estimated. In chapter 6 it is explained why a panel has not been used. However, changes to macroeconomic variables or the stock market may affect the chances of acquisition. Despite most SMEs not being quoted, it is expected that changes in the stock market between years may still alter the number of small firm takeovers due to changes in business activity and access to capital - at least for large firms (Melicher et al. 1983). Both of which can lead to easier access of funds, at least for listed firms, to be able to undertake SME acquisitions.

Figure 7.4 shows the probability of takeover in the UK (including non-SME takeovers[96]) with FTSE data. It shows a broad relationship between the number of takeovers and the stock market, consistent with the existing empirical evidence.

Figure 7.4 - FTSE 100 and number of takeovers* 1995-2008



Data sources: Yahoo Finance (2009), BIS (2009), ONS (2009c)
NB *Includes non-SME takeovers

The previous results relate to 2004, identifying takeovers in 2005. An earlier sample from 2001, where takeovers are identified in 2002, is also used for comparison.

[96] The ONS aggregate data in figure 7.4 is different to the micro data used in the study. The aggregate data of takeovers counts far fewer takeovers than what is registered in their micro data. These are from different internal sources. VAT statistics of the total number of registered firms for each year are used to debase the frequency of takeovers and produce an annual probability of takeover.

The stock market is lower in 2002 than it is in 2005, according to the FTSE. Consistent with the theory and existing evidence, the number and percentage of SME takeovers in 2002 is lower than in 2005.

Table 7.8 (below) shows the summary statistics of both SME samples. About four percent fewer SMEs exist in the earlier sample (1.833m versus 1.897m). However, the 2004 sample has over 50 percent more takeovers identified in the data. This might be a reflection of a change in the business climate for 2002 versus 2005[97].

The average size of the firm in the 2004 sample is slightly smaller (5.2) than the 2001 sample (5.3). Other differences between the samples are that the 2004 sample has a 10 percent smaller average value for local units. The increased value signifies either that the sample has more multi-unit firms or multi-unit firms have more units in the 2001 sample. The 2004 sample has proportionately more very young SMEs aged 0 to 1 year, by around 20 percent. The 2004 sample also has relatively less sole proprietors by 13 percent and partnerships by 15 percent but more companies by 18 percent[98]. All other variables are roughly in the same proportions. The comparison between the samples of the industrial compositions across the two periods is not shown.

[97] It is possible that this could be a form of measurement error, where fewer takeovers are identified in the data.

[98] This change could be caused by a change in tax legalisation causing an incentive to become company directors instead of sole proprietors.

Table 7.8 - Takeover summary statistics 2001 and 2004 samples

Variable	Full 2004 GB Sample		Full 2001 SME Sample		2004 as a percentage of 2001
	Mean	Std. Dev.	Mean	Std. Dev.	
Takeover (dependent variable)	0.0066	0.0809	0.0042	0.0648	157%
Ln(RLP)	-0.5353	0.9715	-0.555	1.024	96%
Ln(local unit)	0.0228	0.1634	0.0252	0.1728	90%
Employment	5.18	13.90	5.28	13.94	98%
Age 0 to 1*	0.1327	-	0.1086	-	122%
Age 2 to 4	0.2479	0.4318	0.2631	0.4403	94%
Age 5 to 9	0.2242	0.4171	0.236	0.4246	95%
Age 10 to 19	0.2365	0.4249	0.2336	0.4231	101%
20+ years	0.1587	0.3654	0.1587	0.3654	100%
Sole proprietor*	0.3119	-	0.3583	-	87%
Company	0.5101	0.4999	0.4323	0.4954	118%
Partnership	0.178	0.3825	0.2094	0.4069	85%
Core*	0.3276	-	0.3251	-	101%
Mid-periphery	0.4258	0.4945	0.4282	0.4948	99%
Periphery	0.2466	0.431	0.2467	0.4311	100%
N	1,897,288		1,832,969		104%

*Omitted variable from dummy group
Source: ONS, author's own calculations

The probit takeover estimates from across the two time periods are compared next. The same estimation model is used for a full sample from both years and a sample that excludes the primary sector and real estate activities. Table 7.9 shows the resulting marginal effects for the period 2001. In general, the results are broadly the same between the samples; they also have a similar explanatory power as suggested by the pseudo-R^2. Importantly, no differences occur in the statistical significance or signs of the variables. Differences in the marginal effects exist across the samples but this is expected given fewer takeovers are observed in the 2001 sample.

SME productivity and its square are significant and positive in all of the samples indicating that (relative) productivity has a positive, and increasing, effect on the chances of being acquired across both of the periods.

The periphery and mid-periphery have negative marginal effects. Also for the periphery, a positive and significant interaction with productivity exists. This indicates that relative to the core region, SMEs have a lower chance of takeover but this difference in reduced as productivity increases for SMEs in the periphery.

The age variables are also significant in all of the models, indicating that older age groups have a higher chance of takeover relative to the youngest group (0 to 1 year). The ages between 5 and 19 years consistently have the largest marginal effects, indicating that these age groups have the highest chances of takeover.

The size variables are also consistent across the models; employment generally has a positive effect on the chances of takeover, but this relationship is not linear as the polynomials of size are significant.

In general, the results are consistent and robust across the two time periods.

Table 7.9 – Probit takeover (2002) results for 2001 SME sample

Variable	Coefficient	Marginal effect	Mean value
Takeover (dependent variable)	-	-	0.0042
Ln(RLP)	0.0837***	0.000136	-0.5550
Ln(RLP)^2	0.0154***	0.000025	1.3566
Ln(local unit)	-0.0491***	-0.000080	0.0252
Employment	0.0364***	0.000059	5.2763
Employment^2	-0.00053***	-0.000001	222.3
Employment^3	3.0E-06***	4.9E-09	27671.9
Employment^4	-5.9E-09***	-9.5E-12	4.6E+06
Age 2 to 4	0.152***	0.000280	0.2631
Age 5 to 9	0.279***	0.000595	0.2360
Age 10 to 19	0.298***	0.000651	0.2336
20+ years	0.208***	0.000435	0.1587
Company	1.47***	0.006494	0.4323
Partnership	0.234***	0.000486	0.2094
Mid-periphery	-0.0738***	-0.000118	0.4282
Periphery	-0.0869***	-0.000132	0.2467
Mid-periphery*ln(RLP)	0.0123	0.000020	-0.2459
Periphery*ln(RLP)	0.0262***	0.000043	-0.1489
Industry controls	Y		
N	1,832,969		
Pseudo R^2	0.19		
Predicted takeover (at sample average)	0.0454%		
Log-likelihood	-40,671		

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

7.6 Conclusions

This chapter provides further evidence to the existing but limited literature on SME takeovers. The analysis finds that on average and holding size, industry, age and

location constant, more productive SMEs are more likely to be acquired. This is consistent with larger firms attempting to compensate for a lack of internally generated innovation, and is contrary to the existing theory and evidence for large firm takeovers, such as the Q-theory of mergers.

The SME productivity-takeover relationship is not linear. The chances of a small firm being acquired increases with productivity and it is highest for the most productive. However, the least productive are more likely to be acquired than those with around average performance. This suggests that there is a j-curve relationship with productivity and the chances of SME acquisition. The fact that some lesser productive small firms have a higher chance of takeover than average is indicative of some of the more familiar effects of productivity on the likelihood of takeover associated with large firms. For lesser productive acquisitions, takeovers here perhaps reallocate resources to be put in a more efficient use. However, this could involve the dissolution of the firm or extra investment to try and rectify performance. For SMEs in general, the dominating effect with productivity is that the most productive are acquired, a relationship that is perhaps unique to small firms.

It is not possible to find out if acquisitions are undertaken by larger firms from the core, but the evidence does find that SMEs are more likely to be acquired if they are located in the core regions (London and the South East). A readier access to finance, agglomeration there triggering more intense local competition, the better information flows of possible targets in the core, or all three may be causes. These are all consistent with NEG theory. However, there is no evidence to suggest that the more productive small firms from the periphery are more likely to be acquired than those in the core. This result is not consistent with the process of transferring production away from the periphery to the core which NEG models would suggest may occur.

Better information on potential targets is also found to increase the chances of acquisition as both firm age and size have generally positive relationships with the probability of takeover.

These results are all consistent across two years of takeover; 2002 and 2005; at different points of the stock market cycle. The results also do not differ when the

smallest SMEs are removed from the sample.

The effects of takeovers on subsequent chances of relocation and exit or their post-performance are instructive of the possible effects targets of SME acquisitions may have on regional economies. Next I look at what happens once SMEs are acquired in terms of their chances of relocation or exit.

Appendix

A7.1 Large Firms

The Q-theory of mergers (Jovanovic and Rousseau 2002) and evidence pertaining to listed or large firms suggests that acquisitions are a channel for capital to flow to better firms. This means that the less productive firms are targeted, contrary to the findings within the SME sector. An obvious extension to the work here would be to try and replicate the findings for large firms with the data set used for this study. As explained in chapter 6, the data are not really suitable for identifying takeovers of large firms. Firm demographic events are very hard to classify and are increasingly so for larger businesses. Despite these restrictions of the data, an attempt is made to try and identify the direction of any productivity-takeover relationship with large firms. For the purposes of this analysis, large firms are classified as those with over 550 employees; a sample of 2700 enterprises[99]. Table A7.1 shows the results of regressing productivity measured in 2004 on takeover identified in 2005. No statistically significant relationship is found between productivity and takeover for large firms with either measure of productivity.

Table A7.1 - Probit Takeover Large Firm Results

Variable	Dep var Takeover Large firms only	Dep var Takeover Large firms only
Ln(RLP)	0.0567	-
Ln(LP)	-	0.0461
Industry controls	N	N
N	2,763	2,763
Pseudo R^2	0.00	0.00
Log-likelihood	-436	-436

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

The result for large firms is different from that for SMEs in Britain but it does not necessarily mean that no relationship between productivity and takeovers exists. It is likely that the 'takeover' event that is trying to be identified identity is either not captured for large firms or the effects of it are already included in the 'pre-acquisition' firm characteristics. If the latter is true then the post-acquisition effects might include

[99] This number of enterprises (deliberately) approximates the number of businesses listed on the London Stock Exchange.

Chapter 8 – Post-Acquisition Exits and Relocations

8.1 Introduction

The post-acquisition literature, reviewed in chapter 3, contains very little evidence on the acquisitions effects of small firms. It is not known what subsequently happens to acquired SMEs. This chapter investigates the likelihood of acquisition resulting in either exit or relocation from the small firm's original region.

Acquisitions can affect both the chances of survival and the location of production. The search for entrepreneurial assets in successful SMEs by acquirers might result in the most productive SMEs exiting the periphery after acquisition. If this occurs disproportionately in the periphery, this may contribute to explaining the productivity gap. However, at the regional level, a firm relocating away from a region has the same effect as a firm death. It results in a loss of a local productive unit and source of employment. However, it is likely that the process is quite different from firm exits. In an alternative scenario, the acquirer might want to move the acquired firm so that they are closer, instead of simply shutting it.

Multivariate analysis is used to explain SME exits and relocations. It shows that the acquisition of SMEs significantly increases their risk of exit or relocation. This is true for all regional locations but for exits, these are especially boosted by takeover in the core.

8.2 Hypotheses

From the literature review on exits and relocations, the following hypotheses concerning exits are tested;

4. Takeovers are an investment decision, an element of which might be relocation or closure to take advantage of synergies with the acquiring firm's assets. Where this is the case, takeovers increase the chance for SMEs relocating or exiting. A caveat to this is input rationing, such as capital (due to its cost relative to larger firms), could be a handicap to the SME. In this situation, acquisition may reduce chances of exit and result in injections of capital or other support.

Table A7.4 - Takeover probit estimates: productivity distribution

Variable	Fourth (bottom) quartile			Third quartile			Second quartile			First (top) quartile		
	Coefficient	Marginal effect	Mean value	Coefficient	Marginal effect	Mean value	Coefficient	Marginal effect	Mean value	Coefficient	Marginal effect	Mean value
Takeover (dependent variable)	-	-	0.0063	-	-	0.0054	-	-	0.0055	-	-	0.0091
Ln(RLP)	-0.0355	-0.00022	-1.80108	0.104	0.00051	-0.62665	-0.433	-0.00191	-0.20877	0.225***	0.001656	0.448904
Ln(RLP)^2	0.00038	2.37E-06	4.03027	-0.116	-0.00057	0.423955	-1.72	-0.00758	0.050733	-0.0163***	-0.00012	0.52926
Ln(local unit)	-0.128***	-0.0008	0.030202	-0.185***	-0.0009	0.024843	-0.122***	-0.00054	0.0141	-0.147***	-0.00108	0.021934
Employment	0.035***	0.00022	5.22522	0.0455***	0.000222	5.45845	0.05***	0.000221	4.56982	0.0437***	0.000322	5.43683
Employment^2	-0.0005***	-3.15E-06	218.171	-0.00079***	-3.87E-06	230.565	-0.00081***	-3.57E-06	168.612	-0.00069***	-5.12E-06	260.78
Employment^3	2.70E-06***	1.69E-08	26597	5.30E-06***	2.59E-08	28083.4	5.00E-06***	2.20E-08	20360.3	4.10E-06***	3.03E-08	33700.8
Employment^4	4.70E-09***	-2.98E-11	4.40E+06	-1.20E-08***	-5.66E-11	4.60E+06	-1.00E-08***	-4.47E-11	3.40E+06	-8.00E-09***	-5.88E-11	5.70E+06
Age 2 to 4	0.0826***	0.000557	0.212217	0.215***	0.001257	0.238363	0.0764***	0.000353	0.311241	0.0266	0.0002	0.229987
Age 5 to 9	0.124***	0.000863	0.215345	0.229***	0.001374	0.216615	0.145***	0.000725	0.230691	0.0863***	0.00068	0.234361
Age 10 to 19	0.108***	0.000731	0.280499	0.249***	0.001499	0.236001	0.141***	0.000711	0.189828	0.0799***	0.000626	0.240357
20+ years	0.0808**	0.000544	0.207364	0.19***	0.001138	0.152144	0.085**	0.000416	0.100973	0.0277	0.000209	0.175067
Company	0.867***	0.007457	0.45561	0.961***	0.006247	0.494414	1.09***	0.006221	0.530401	0.999***	0.008203	0.558595
Partnership	-0.137**	-0.00077	0.229761	0.0246	0.000123	0.186821	-0.0884	-0.00036	0.148111	-0.158*	-0.001	0.148501
Mid-periphery	-0.125***	-0.00077	0.445789	-0.0903	-0.00043	0.421674	-0.0197	-8.6E-05	0.41441	-0.0921***	-0.00067	0.421594
Periphery	-0.132***	-0.00076	0.258052	-0.118	-0.00053	0.249428	-0.0196	-8.5E-05	0.25172	-0.0787***	-0.00055	0.227839
Mid-periphery*ln(RLP)	-0.00956	-0.00006	-0.80328	-0.0108	-5.3E-05	-0.26121	0.235	0.001038	-0.08646	0.00283	2.09E-05	0.180471
Periphery*ln(RLP)	0.0162	0.000101	-0.45577	-0.0231	-0.00011	-0.15562	0.286	0.001262	-0.05343	-0.0201	-0.00015	0.094392
Industry controls	Y			Y			Y			Y		
N	458,493			489,464			468,155			479,931		
Pseudo R^2	0.14			0.16			0.15			0.15		
Predicted takeover (at sample average)	0.00198			0.0015			0.0013			0.0024		
Log-likelihood	-15,047			-13,945			-13,600			-20,959		

Legend: * p<0.1; ** p<0.05; *** p<0.01 NB constants removed. Quartiles are only approximate due to data rounding.
Source: ONS, author's own calculations

Chapter 8 – Post-Acquisition Exits and Relocations

8.1 Introduction

The post-acquisition literature, reviewed in chapter 3, contains very little evidence on the acquisitions effects of small firms. It is not known what subsequently happens to acquired SMEs. This chapter investigates the likelihood of acquisition resulting in either exit or relocation from the small firm's original region.

Acquisitions can affect both the chances of survival and the location of production. The search for entrepreneurial assets in successful SMEs by acquirers might result in the most productive SMEs exiting the periphery after acquisition. If this occurs disproportionately in the periphery, this may contribute to explaining the productivity gap. However, at the regional level, a firm relocating away from a region has the same effect as a firm death. It results in a loss of a local productive unit and source of employment. However, it is likely that the process is quite different from firm exits. In an alternative scenario, the acquirer might want to move the acquired firm so that they are closer, instead of simply shutting it.

Multivariate analysis is used to explain SME exits and relocations. It shows that the acquisition of SMEs significantly increases their risk of exit or relocation. This is true for all regional locations but for exits, these are especially boosted by takeover in the core.

8.2 Hypotheses

From the literature review on exits and relocations, the following hypotheses concerning exits are tested;

4. Takeovers are an investment decision, an element of which might be relocation or closure to take advantage of synergies with the acquiring firm's assets. Where this is the case, takeovers increase the chance for SMEs relocating or exiting. A caveat to this is input rationing, such as capital (due to its cost relative to larger firms), could be a handicap to the SME. In this situation, acquisition may reduce chances of exit and result in injections of capital or other support.

5. Acquiring firms are more probably located in core regions of the economy, as more company headquarters are located there. If there are complementarities to be exploited by proximity, after a takeover a tendency may exist for acquired firms in the periphery to close or relocate to take advantage of this.

From these hypotheses, the following relationships can be formulated for firm i, at time t (where 'prod' is productivity and 'Pr', probability) as;

$$Pr(Exit_{it+1} \mid Relocation_{it+1}) = g(\overset{?}{Takeover_{it}}, \overset{-}{Core_{it-1}*Takeover_{it}}, \overset{+}{Periphery_{it-1}*Takeover_{it}}, \overset{+}{Prod_{it-1}*Takeover_{it}})$$

8.3 Descriptive Statistics

Descriptive statistics are instructive of whether takeovers may cause SMEs to subsequently exit or relocate. The sample is of SMEs at t-1 (2004), with takeovers in year t (2005) and firm exits and relocations identified at time t+1 (2006). SME exits and relocations are measured just one year after their acquisition in order to strengthen the assumption that they are directly caused by the takeover and more likely to be motivated by the acquisition[100]. It is possible to look at exit a number of years after takeover, but as time passes, it is more likely that exit after takeover could be caused by other factors such as exogenous shocks. The other variables are the same as those used in the previous chapter and described in Chapter 6 - Data.

If takeovers have no effect on exit or relocation, then I expect a similar proportion of acquired SMEs to survive or not relocate as in the whole sample, assuming the same characteristics across the samples. Table 8.1 shows the percentage of exits and relocations for the total sample, acquired and non-acquired SMEs. Of the entire 2004 SME sample, over 20 percent exit by 2006 but only around 1.5 percent change region - relocate. The overall percentage of SMEs exiting is higher (by 3 percentage points) for those that are acquired and this is significant at the 99 percent level. Likewise for relocations, proportionately, a higher percentage of acquired SMEs relocate regions

[100] A firm may exit at any point from 2004 onwards. Firms may exit in 2005, if so, then takeover is not observed.

than non-acquired, by 2.2 percentage points (significant at 99 percent level), over double the latter's rate.

Table 8.1 – Exits and relocations in 2006 by takeover in 2005

	No takeover		Takeover		Difference	Total	
Event	Frequency	Percent	Frequency	Percent	Percentage points	Frequency	Percent
No exit/relocation	1,420,858	75.4%	8,756	70.0%	-5.4%***	1,429,614	75.4%
Relocation	27,699	1.5%	460	3.7%	2.2%***	28,159	1.5%
Exit	436,227	23.1%	3,288	26.3%	3.2%***	439,515	23.2%
Total	1,884,784	100%	12,504	100%		1,897,288	100%

Source: ONS, author's own calculations
Legend: * p<0.1; ** p<0.05; *** p<0.01

The next table (table 8.2) shows exits by region and for percentage for acquired SMEs. Despite the exit rate for acquired SMEs in total being higher and significant, two regions, the North East (-0.3 percent) and Yorkshire and Humberside (-0.5 percent), have exits at a lower percentage with their acquired SMEs but these are not statistically significant. All other regions have higher rates of exits for acquired SMEs but are not statistically significant, except for London (significant at the 99 percent level). However, the core and mid-periphery (significant at the 95 percent level) do have higher rates of exits for acquired SMEs that are statistically significant.

Table 8.2 – Exits in 2006 and takeovers in 2005 by region

Region (2004)	Total	Exit frequency	Percentage of exits out of total	Percentage of acquired exiting	Difference (percentage points)
Periphery	467,893	105,982	22.7%	23.1%	0.5%
Wales	85,661	17,565	20.5%	23.4%	2.9%
N. East	50,117	11,909	23.8%	23.4%	-0.3%
York. & Hum.	140,990	31,966	22.7%	22.2%	-0.5%
N. West	191,125	44,542	23.3%	23.7%	0.4%
Mid-periphery	807,875	179,363	22.2%	25.0%	2.8%**
W. Mid.	160,339	35,720	22.3%	26.7%	4.4%
E. Mid.	134,121	30,375	22.6%	24.5%	1.9%
S. West	185,228	40,147	21.7%	23.2%	1.5%
Scot.	131,365	29,474	22.4%	24.3%	1.9%
E. Eng.	196,822	43,647	22.2%	25.5%	3.3%
Core	621,520	154,170	24.8%	28.8%	4.0%***
S. East	324,909	75,874	23.4%	26.2%	2.9%
London	296,611	78,296	26.4%	30.4%	4.0%***
Total	1,897,288	439,515	23.2%	26.3%	3.1%***

Source: ONS, author's own calculations
Legend: * p<0.1; ** p<0.05; *** p<0.01

Knowing the destination of acquired and relocated SMEs is also desirable. However, due to the small number of firms involved it is not possible to separately report sample statistics where SMEs relocate after takeover by region or location.

This evidence suggests that in total, takeovers may increase the chances of exit one year after acquisition. This is also found to be true for the mid-periphery and the core locations but not for the periphery – it is statistically insignificant there. However, this does not control for variables such as the industry, size and the productivity of SMEs. These affect the likelihood of an SME being acquired and are also likely to affect the likelihood of surviving independently.

8.4 Multivariate Estimation of Exits and Relocations

This section uses multivariate methods to investigate whether takeovers increase the chances of exit, especially of the most productive, and if there is any regional heterogeneity. For regions, relocations can be just as important as it can result in the loss of a productive unit, potentially harming a region's productive capacity and perhaps even aggregate productivity. Therefore relocations also need to be modelled. It is not likely that a firm can relocate and exit – they are a mutually exclusive event, at least within this data. It is also likely that different processes drive each (not just

takeovers initiated ones). This suggests that a multinomial regression method should be used.

Multivariate analysis allows the identification of whether the effects of takeovers vary by location, whilst controlling for the effects of industry and size that may affect the takeover- exit and relocation relationship. To do this the location variables mid-periphery and periphery are used with the core as the omitted case.

Where Z = exit or relocation; j is the type of exit (no exit (0), change location (1) and inactive (2))

$$\Pr(Z_i = j) = \frac{e^{\beta'_j X_i}}{\sum_{k=0}^{2} e^{\beta'_k X_i}}, \quad j = 0,1,2 \qquad (1)$$

and

$$\beta'_j X_i = \beta_0 + \beta_1 Takeover_t + \beta_2 \ln(RLP_{t-1}) + \beta_3 Entity_{t-1} + \beta_4 Age_{t-1} + \beta_5 Industry_{t-1} + \beta_6 Location_{t-1} + \beta_7 Employment_{t-1} + \beta_8 Structure_{t-1} + \beta_9 (Employment_{t-1}.\ln(RLP_{t-1})) + \beta_{10}(Employment_{t-1} * Takeover_t) + \beta_{11}(Location_{t-1}.\ln(RLP_{t-1})) + \beta_{12}(Takeover_t.Location_{t-1}) + \beta_{13}(Takeover_t.\ln(RLP_{t-1})) + \beta_{14}(Takeover_t.\ln(RLP_{t-1}).Location_{t-1}) + v_i \qquad (2)$$

The hypotheses related to exits and relocations (presented at the beginning of this chapter) can now be specified with equation 2. Hypothesis 4 is that the probability of a firm exiting or relocating increases if it is previously subject to a takeover, $\beta_1 > 0$[101]. Hypothesis 5 is that these conditional probabilities are higher in peripheral regions; the coefficients on the interaction term for peripheral locations are positive ($\beta_{12} > 0$) and also increase with productivity ($\beta_{14} > 0$).

8.5 Results

The model is estimated on both the full SME sample and one without the primary sector and real estate activities. The results of this are presented in table 8.3. For

[101] Strictly, this is not the total effect of takeovers as this also needs to include the relevant interactions. These are not easy to include for exposition purposes but will be included when the effects are estimated.

brevity the industry controls are not displayed as they are of lesser interest here[102]. The pseudo R^2s provide an indication of the goodness-of-fit for both models. These are very low in both models, indicating it is perhaps a poor fitting model. However, pseudo R^2 statistics are only a guide and are not deemed to be very reliable (Sribney 1997b)[103]. A poorly fitting model is perhaps caused by the limited number of variables that I am able to use to try and explain firm exits and relocations.

Table 8.3 – Multinomial logistic relocation or exit (2006) regression results

	[1] Full GB Sample		[2] GB Sample without primary sector and real estate activities	
Variable	**Relocation**	**Exit**	**Relocation**	**Exit**
Takeover	1.530***	1.647***	1.582***	1.713***
Ln(RLP)	1.043***	0.918***	1.037***	0.906***
Ln(RLP)^2	1.027***	1.010***	1.025***	1.007***
Age 2 to 4	1.081***	1.076***	1.107***	1.094***
Age 5 to 9	0.852***	0.723***	0.862***	0.715***
Age 10 to 19	0.612***	0.440***	0.615***	0.446***
Age 20+ years	0.415***	0.320***	0.427***	0.346***
Ln(local unit)	1.520***	0.743***	1.564***	0.738***
Ln(local unit)^2	0.903***	1.093***	0.897**	1.099***
Employment	1.000	0.982***	1.000	0.981***
Employment^2	1.000	1.0001***	1.000	1.0001***
Takeover*employment	0.998	0.999	0.998	0.999
Employment*ln(RLP)	1.001***	1.001***	1.001***	1.001***
Company	1.613***	0.806***	1.611***	0.815***
Partnership	0.794***	0.882***	0.806***	0.918***
Mid-periphery	0.678***	0.911***	0.685***	0.912***
Periphery	0.518***	0.927***	0.524***	0.939***
Mid-periphery*ln(RLP)	1.043***	1.010**	1.056***	1.011**
Periphery*ln(RLP)	1.076***	1.017***	1.080***	1.025***
Mid-periphery*Takeover	1.631***	1.012	1.636***	1.003
Periphery*Takeover	1.808***	0.850***	1.770***	0.851**
Takeover*ln(RLP)	0.920*	0.932***	0.932	0.941**
Takeover*Periphery*ln(RLP)	0.994	1.024	0.906	0.998
Takeover*Mid-periphery*ln(RLP)	1.094	1.053	1.074	1.050
Industry controls	Y	Y	Y	Y
N	1,897,288		1,676,588	
Pseudo R^2	0.05		0.04	
Log-likelihood	-1,109,883		-1,013,199	

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed, relative risk ratios shown
Source: ONS, author's own calculations

[102] The majority of the industry effects are significant.
[103] It is also suggested that these should be removed from write-ups and reports (Sribney 1997b).

Effect of takeover

Takeover stimulates an increased chance of an SME exiting and relocation[104] in both samples. This is partially reflected by the statistically significant and positive relative risk ratios on the takeover variable for both relocation and exit. However, interpretations of the effect of takeover must also include the interactions with location and productivity.

To fully incorporate all of the takeover effects and interactions simultaneously, the predicted probabilities of exit and relocation are computed from the model. Table 8.4 shows the predicted probability of SMEs exiting and relocating by location and takeover. The probabilities are derived from the results in table 8.3 - estimates 1, using the sample averages except for location, takeover and their interactions.

When a takeover occurs this increases the probability of subsequent exit for all three locations; the marginal effect of takeover is positive. The effect is greatest for the core (10.6 percentage points), closely followed by the mid-periphery (9.8 percentage points). The peripheral location has the smallest marginal effect of takeover on exit (6.5 percentage points), but still positive. The chance of exit, regardless of takeover, is highest for the core.

Takeovers also have a positive effect on the chances of relocation. The marginal effect is higher for the mid-periphery and periphery (both 1.9 percentage points) than the core (1.2 percentage points). However, even with takeover, the probability is still quite low, at around 3 percent, very low compared to the exit probabilities.

[104] Relocation here means a movement between regions – consistent with earlier. However, an SME could move from one peripheral region to another and relocation is still registered here.

Table 8.4 - Predicted probabilities and marginal effects of location and takeover on exit and relocation

	Probability of relocation (2006)		Probability of exit (2006)	
Location	Predicted probability given takeover (2005)	Marginal effect of takeover (2005)	Predicted probability given takeover (2005)	Marginal effect of takeover (2005)
Core	3.23%	1.2%	33.12%	10.60%
Mid-periphery	3.32%	1.9%	30.63%	9.78%
Periphery	2.92%	1.9%	27.61%	6.54%

Source: ONS, authors' own calculations
NB Estimated at the sample average

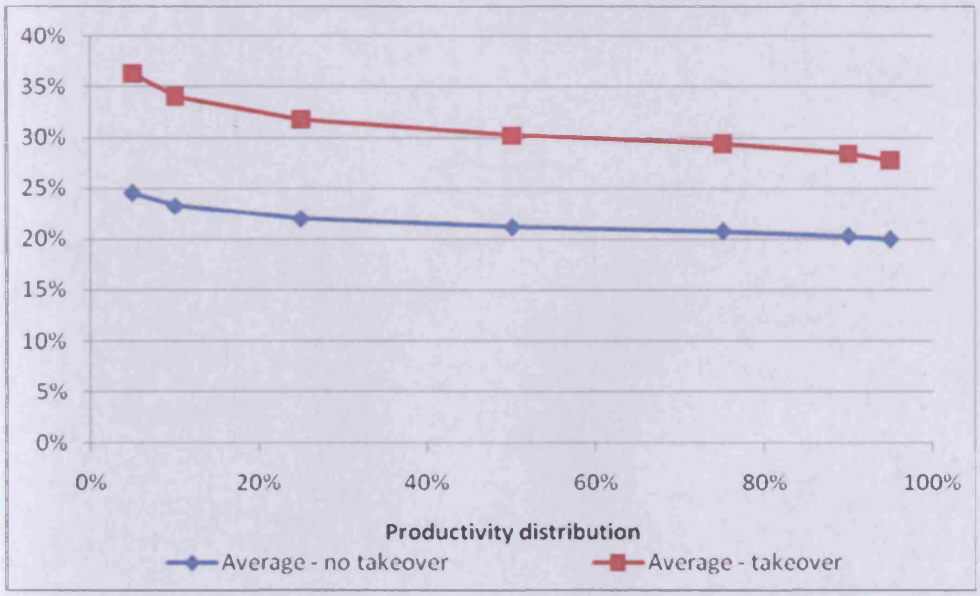
The positive marginal effect of takeover on exit and relocation are consistent with hypothesis 4. This suggests takeovers occur so that acquirers can take advantage of the synergies with the acquiring firm's assets. The lower marginal effect of takeover for SMEs from more peripheral locations to exit is not consistent with hypothesis 5. Despite being small, the higher probabilities for relocation in these locations are consistent with hypothesis 5.

Effect of productivity and takeover

Takeover is also interacted with productivity. To show the full effects of this, figure 8.1 shows the predicted probability of exit from the estimates of table 8.3 (and the sample averages) across distribution of SME productivity in the sample.

Higher productivity (moving up the distribution) reduces the probability of exit, regardless of takeover. The figure also shows that the marginal effect of takeover reduces as SMEs become more productive. Therefore being a more productive SME can reduce the chance of exit after takeover, but it does not eliminate it altogether as the predicted probability of exit is always higher for acquired SMEs than non-acquired.

Figure 8.1 - SME predicted probability of exit (2006) by productivity and takeover (2005)



Source: ONS, author's own calculations
NB Estimated at the sample average
The values are shown in table A8.1

The equivalent figure for relocation is not shown as its relationship with productivity, despite positive, does not vary much across the productivity distribution.

Takeover is also interacted with SME size (employment). This variable is not statistically significant for exits or relocations. This is consistent across both samples. This indicates that there is no size variation in the effect that takeovers have on either relocation or exit. This is investigated more with the analysis of only non-micro SMEs.

Other findings

The findings on SME employment suggest size has a negative effect on exit, shown by the relative risk ratio of less than one[105]. Therefore larger SMEs are less likely to exit. This is consistent with production at an inefficient scale or smaller firms having a more limited access to, or more expensive rate of finance. For relocations, size is statistically insignificant. This might be due to the cost of relocating increase with size

[105] The full effect of size should also include all of the interactions, such as those with takeover and productivity. However, these are either very small, statistically insignificant or both.

but so may do the potential returns to moving[106].

As SMEs age, they are generally less likely to exit or relocate, as indicated by the significant but less than one relative risk ratios in table 8.3. The highest probability of exit is for SMEs aged 2 to 4 years, as this age category has a relative risk ratio of more than one, when compared to the youngest SMEs (the omitted case). This general relationship is also consistent for relocations.

For exits, the fact that the youngest firms have the highest probability of exit is suggestive of the effects of inexperience, perhaps the development of a niche market, or both. For relocations, younger SMEs are more likely to move might be due to newer firms having fewer local links that may make relocation less costly. The youngest firms may also be in their most dynamic period. This might require different premises due to size constraints but it is not clear why this may involve a regional relocation. New locations might be more suitable to meet their changing needs during this period.

Differences between the samples

All of the effects described are (qualitatively) consistent across the two samples (with and without the primary sector and real estate activities) for exits and relocations. The only different results for exits are that a few of the takeover interactions are now statistically less significant (periphery-takeover and takeover-productivity). For relocation, the takeover-productivity interaction is insignificant in the reduced sample, having only been significant at the 90 percent level for the full sample.

8.5.1 Non-micro SMEs

I also re-estimate the multinomial exit-relocation model on only a sample of relatively larger SMEs; those with employment between 10 and 249, consistent with the takeover analysis. As relocations are extremely rare for non-micros, these are not

[106] The number of plants an SME has a positive relationship on the probability of relocating; another measure of SME size. However, this is more of a control here as multi plant firms are unlikely to relocate all sites, just the one where the enterprise is registered. Given this, it is perhaps easier to 'relocate' if a firm has multiple sites as this only involves relocation of the registered sites and not the entire firm.

estimated and a probit model of exits is estimated instead of the multinomial logistic model described above. The results of this are shown below in table 8.5.

The results indicate that, qualitatively, they are consistent with the full SME sample. Acquisitions still increase the chances of subsequent exit, indicated by the positive coefficient and marginal effect on the takeover variable. The marginal effect shows that it increases the probability of exit by nearly 9 percent but this does not include the interaction variables, of which the takeover-employment one is significantly different from zero. However, it is likely that the marginal effect of takeover on exit does not change much with the inclusion of the interactions due to their small (yet statistically significant) coefficients. Therefore the marginal effect of takeovers on exits reported above is comparable to that found in the full sample (see table 8.4).

Differences between the full SME and non-micro samples are that most of the interaction variables are now statistically insignificant relative to the full SME sample. However, these do not have a great effect on the magnitude of the variables of interest and so qualitatively the effects are considered to be the same in the two samples.

Table 8.5 – Non-micro SME exit (2006) probit results

Variable	Coefficient	Marginal effect	Mean value
Exit(dependent variable)	-	-	0.134
Takeover	0.3593***	0.0882	0.025
Ln(RLP)	-0.0565***	-0.0116	-0.511
Ln(RLP)^2	0.0097***	0.0020	1.118
Age 2 to 4	-0.2328***	-0.0427	0.111
Age 5 to 9	-0.5101***	-0.0851	0.167
Age 10 to 19	-0.6922***	-0.1249	0.337
Age 20+ years	-0.8733***	-0.1536	0.340
Ln(local unit)	-0.0969***	-0.0198	0.188
Ln(local unit)^2	0.0158*	0.0032	0.248
Employment	0.0013***	0.0003	31.5
Employment^2	-9.4E-07	-1.9E-07	2261.1
Takeover*employment	-0.0024***	-0.0005	1.089
Employment*ln(RLP)	0.0004***	0.0001	-15.48
Company	-0.1284***	-0.0273	0.776
Partnership	-0.1543***	-0.0296	0.154
Mid-periphery	-0.0642***	-0.0131	0.436
Periphery	-0.0698***	-0.0140	0.263
Mid-periphery*ln(RLP)	0.0083	0.0017	-0.240
Periphery*ln(RLP)	-0.0044	-0.0009	-0.153
Mid-periphery*Takeover	0.0064	0.0013	0.010
Periphery*Takeover	-0.0171	-0.0035	0.006
Takeover*ln(RLP)	-0.0422	-0.0086	-0.008
Takeover*Periphery*ln(RLP)	0.0312	0.0064	-0.002
Takeover*Mid-periphery*ln(RLP)	0.0156	0.0032	-0.004
Industry controls	Y		-
N		177,471	
Pseudo R^2	0.05		
Predicted exit (at sample average)	0.124		
Log-likelihood	-66,566		

Legend: * p<0.1; ** p<0.05; *** p<0.01
NB constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

8.5.2 Exit and takeovers: correlated errors

The errors in the exit equations, estimated above, could be correlated with the residuals from the takeover equations that have previously been estimated (see chapter 7). From theory, it is possible to suggest a few possible omitted variables that this could potentially apply to. For example, a good management team (M) or success in R&D (R). Both of which may increase the chances of takeover but reduce the chances of exit[107]. Consider the following models;

[107] This negative correlation may be unique for SMEs. For large firms it may be the reverse and that 'bad' management may stimulate takeover but (independently) also increase the chances of exit, creating a positive correlations of errors.

$$Pr(T_i) = \Phi(\alpha_0 + \alpha_1 prod_i + \alpha_2 size_i + \alpha_3 location_i + \alpha_4 age_i + \alpha_5 industry_i + u_i) \quad (3)$$

Where $u_i = f(R^+, M^+ \ldots)$

and

$$Pr(Z_i) = \Phi(\beta_0 + \beta_1 T_i + \beta_2 size_i + \beta_3 prod_i + \beta_4 industry_i + \beta_5 location_i + \beta_6 age_i + v_i) \quad (4)$$

Where $v_i = f(R^-, M^- \ldots)$

Here it is likely that the errors for models 3 and 4 (u_i and v_i, respectively) are correlated; $\rho_{uv} \neq 0$ and in this instance, less than zero. This suggests that the equations need to be estimated jointly to try and control for these unobserved effects that could be jointly determining takeover and exit - the two dependent variables.

The correct way to estimate this would be to use two separate probit models in a similar way as Seemingly Unrelated Regression. Seemingly Unrelated bivariate probit therefore allows for the independent variables in each equation to be different. However, I also require the dependent variable of equation 3, takeover, to be an independent variable in equation 4, to identify any possible effect takeover has on the chances of exit. This creates a recursive system that now also controls for the correlation of errors in both equations. The potential endogeneity of takeover in the exit equation can be ignored in the estimation, as unlike with OLS, the sample moments are not used; instead I am maximising the log-likelihood (Greene 2003, pp. 715-716).

The estimation of a (sequential) bivariate probit model does not allow for a multinomial dependent variable. Therefore I ignore relocations here as they are found to be so rare, especially with takeover.

The bivariate probit model estimating exits and takeovers is:

$$Pr\,[Z = 1, T = 1 \mid x_Z, x_T] = \Phi_2\,(x_Z'\alpha_Z + T\alpha_Z, x_T'\beta_T, \rho) \quad (5)$$

The bivariate probit model is estimated on the full SME sample and the sample of non-micro SMEs (see tables 8.6 and 8.7, respectively). The correlations of the errors (rho) between the exit and takeover models for both the samples are statistically

significant and different from zero, but not very large; around -0.15 to -0.16. This suggests that the models should be estimated jointly.

The marginal effects are more informative than the coefficients for this model. These are displayed for both the probabilities of exit and takeover, separately. The marginal effects for the bivariate probit model are considered to be more involved (Greene 1996, 1998) than the standard probit model. They differ as the former depends on the correlation coefficient and the results of the jointly estimated model (exit and takeover), requiring a bivariate normal distribution.

The takeover coefficients and marginal effects[108] for both the full sample and the non-micro SME samples are very similar to those shown in the standard probit models in the previous chapter. Both the variables' significance and magnitude are nearly identical. This is perhaps due to the relatively low value of rho in these models.

The takeover results are consistent with the standard probits already presented. Therefore these results are not fully discussed here[109]. The predicted probabilities for takeover (and exit) are also computed in tables 8.6 and 8.7. For the full SME sample, the predicted probability of takeover is 0.185 percent. This still under predicts takeovers relative to the observed probability (0.66 percent) and it is slightly below the predicted probability for the probit model in chapter 7 (0.186 percent). However, this is still a higher probability than those from the rare event logistic and standard logistic models[110]. This result should also control for some of the unobserved heterogeneity that the model in chapter 7 may have suffered from. The results here indicate that the standard takeover probit model does not suffer from much bias relative to the bivariate version.

Comparing the bivariate probit and multinomial logitistic exit results, across the vast majority of variables, the direction of relationship and statistical significance are

[108] Interpretation of the marginal effect is not straightforward across the variables due to the interactions. These should be included when assessing the full effect of a variable.
[109] For a full discussion of the takeover results please see chapter 7.
[110] For the non-micro SME sample, the predicted probability of takeover is the same as the standard probit (1.64 percent), again less than the observed probability of 2.51 percent.

consistent between the models[111]. Only the interaction variable of takeover with employment (which captures any potential variation that acquisition may have on the chances of exit by firm size) differs between the models, being significant (but small) in the bivariate model. Qualitatively, the results for the non-micro SMEs do not differ from both the bivariate probit model of all SMEs (table 8.6) and also the standard probit takeover and exit models of non-micro SMEs (see chapter 7 - table 7.7 and 8.5 above, respectively)[112].

[111] The coefficients vary between the bivariate and multinomial logistic regressions but this is mostly due to the different functions (normal and logistic respectively).
[112] The bivariate probit model of takeover and exit was also estimated on the sample without the primary and real estate sectors. This model also did not differ from its separate takeover and exit probits and the full sample bivariate model.

Table 8.6 – Bivariate probit of exit (2006) and takeover (2005)

Variable	Coefficient	Marginal effect	Mean value
Dependent variable exit			0.2317
Takeover	0.6727***	0.2397	0.0066
Ln(RLP)	-0.0533***	-0.0158	-0.53532
Ln(RLP)^2	0.0051***	0.0015	1.23034
Age 2 to 4	0.0417***	0.0124	0.247852
Age 5 to 9	-0.1927***	-0.0546	0.224248
Age 10 to 19	-0.4761***	-0.1265	0.236512
Age 20+ years	-0.6451***	-0.1569	0.158742
Ln(local unit)	-0.1562***	-0.0462	0.022771
Ln(local unit)^2	0.0495***	0.0146	0.027224
Employment	-0.0096***	-0.0028	5.18
Employment^2	0.0001***	1.5E-05	220.2
Takeover*employment	-0.0012***	-0.0004	0.115591
Employment*ln(RLP)	0.0005***	0.0001	-2.6012
Company	-0.1353***	-0.0400	0.51009
Partnership	-0.0771***	-0.0223	0.177961
Mid-periphery	-0.0481***	-0.0142	0.425805
Periphery	-0.0364***	-0.0107	0.246611
Mid-periphery*ln(RLP)	0.0049**	0.0014	-0.23745
Periphery*ln(RLP)	0.0088***	0.0026	-0.13971
Mid-periphery*Takeover	0.0173	0.0051	0.002365
Periphery*Takeover	-0.0738**	-0.0212	0.001296
Takeover*ln(RLP)	-0.0426***	-0.0126	-0.00225
Takeover*Periphery*ln(RLP)	0.0092	0.0027	-0.00049
Takeover*Mid-periphery*ln(RLP)	0.0252	0.0074	-0.00096
Industry controls		Y	
Predicted probability (exit=1)		0.2194	
Dependent variable takeover			0.0066
Ln(RLP)	0.0918***	5.4E-04	-0.5353
Ln(RLP)^2	0.0198***	1.2E-04	1.2303
Ln(local unit)	-0.1478***	-8.7E-04	0.0228
Employment	0.0424***	0.00025	5.1787
Employment^2	-0.0007***	-3.92E-06	220.2
Employment^3	3.96E-06***	2.34E-08	27284.8
Employment^4	-7.84E-09***	-4.63E-11	4.5E+06
Age 2 to 4	0.1109***	7.1E-04	0.2479
Age 5 to 9	0.1647***	1.1E-03	0.2242
Age 10 to 19	0.1674***	1.1E-03	0.2365
20+ years	0.1184***	7.9E-04	0.1587
Company	0.9655***	0.007218	0.5101
Partnership	-0.0689**	-3.83E-04	0.1780
Mid-periphery	-0.0877***	-5.10E-04	0.4258
Periphery	-0.1035***	-5.69E-04	0.2466
Mid-periphery*ln(RLP)	0.0025	1.49E-05	-0.2375
Periphery*ln(RLP)	0.0193**	1.14E-04	-0.1397
Industry controls		Y	
Predicted probability (takeover=1)		0.0019	
N		1,897,288	
ρ		-0.1514***	

Legend: * p<0.1; ** p<0.05; *** p<0.01 N.B. constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

Table 8.7 – Bivariate probit of exit (2006) and takeover (2005): non-micro SMEs

Variable	Coefficients	Marginal effect	Mean value
Dependent variable exit			0.134
Takeover	0.7309***	0.2088	0.0251
Ln(RLP)	-0.0583***	-0.0119	-0.5110
Ln(RLP)^2	0.0091***	0.0019	1.1183
Age 2 to 4	-0.2318***	-0.0427	0.1106
Age 5 to 9	-0.5091***	-0.0852	0.1666
Age 10 to 19	-0.6909***	-0.1249	0.3368
Age 20+ years	-0.8705***	-0.1534	0.3402
Ln(local unit)	-0.0943***	-0.0193	0.1876
Ln(local unit)^2	0.0160*	0.0033	0.2477
Employment	0.0011***	2.2E-04	31.4855
Employment^2	-3.2E-07	-6.5E-08	2261.1
Takeover*employment	-0.0027***	-5.4E-04	1.089
Employment*ln(RLP)	0.0004***	8.7E-05	-15.48
Company	-0.1342***	-0.0287	0.7764
Partnership	-0.1541***	-0.0297	0.1542
Mid-periphery	-0.0635***	-0.0130	0.4356
Periphery	-0.0687***	-0.0138	0.2627
Mid-periphery*ln(RLP)	0.0080	0.0016	-0.2396
Periphery*ln(RLP)	-0.0047	-0.0010	-0.1526
Mid-periphery*Takeover	0.0169	0.0035	0.0100
Periphery*Takeover	0.0005	9.4E-05	0.0056
Takeover*ln(RLP)	-0.0430	-0.0088	-0.0082
Takeover*Periphery*ln(RLP)	0.0244	0.0050	-0.0022
Takeover*Mid-periphery*ln(RLP)	0.0095	0.0019	-0.0036
Industry controls		Y	
Predicted probability (exit=1)		0.1242	
Dependent variable takeover			0.0251
Ln(RLP)	0.0720***	0.0029	-0.5110
Ln(RLP)^2	0.0144***	0.0006	1.1183
Ln(local unit)	-0.1328***	-0.0054	0.1876
Employment	0.0189***	0.0008	31.4855
Employment^2	-0.0002***	-8.7E-06	2261.1
Employment^3	9.9E-07***	4.0E-08	291196
Employment^4	-1.6E-09**	-6.5E-11	4.9E+07
Age 2 to 4	-0.0195	-0.0008	0.1106
Age 5 to 9	-0.0064	-0.0003	0.1666
Age 10 to 19	-0.0110	-0.0004	0.3368
20+ years	-0.0811**	-0.0032	0.3402
Company	0.8563***	0.0234	0.7764
Partnership	-0.0274	-0.0011	0.1542
Mid-periphery	-0.0488***	-0.0020	0.4356
Periphery	-0.0820***	-0.0032	0.2627
Mid-periphery*ln(RLP)	0.0263*	0.0011	-0.2396
Periphery*ln(RLP)	0.0331*	0.0014	-0.1526
Industry controls		Y	
Predicted probability (takeover=1)		0.0164	
N		177,471	
ρ		-0.1585***	

Legend: * p<0.1; ** p<0.05; *** p<0.01 N.B. constants removed. Marginal effects estimated at sample average.
Source: ONS, author's own calculations

The key variable of interest in the bivariate probit model is takeover when exit is the dependent variable. The effect of SME acquisition on subsequent exit is significant and positive but for its full effects, its interactions need to be included. This is done in table 8.8 where the predicted probability of exit given takeover and the marginal effect of takeover on exit are shown across the three locations.

Both the probability of exit given takeover and the marginal effect of takeovers (6.57 percent) are highest for SMEs located in the core. The mid-periphery has the next highest marginal effect of takeovers on exit (6.06 percent). The smallest marginal effect is for SMEs located in the periphery (3.36 percent). The relative ranking of the regions is consistent with the results with the multinomial logistic model earlier. However, the magnitude of the marginal effect is lower with the bivariate probit model by around 3 to 4 percentage points. Therefore not accounting for correlation in the errors over-predicts the effects of takeovers on the chances of an SME exiting. This is consistent with the negative value of rho and not accounting for unobserved effects that increase the probability of acquisition but reduce the likelihood of exit more generally.

Table 8.8 - Predicted probabilities and marginal effects of location and takeover on exit: bivariate probit

	Probability of exit (2006)	
Location	Predicted probability given takeover (2005)	Marginal effect of takeover (2005)
Core	30.61%	6.57%
Mid-periphery	28.61%	6.06%
Periphery	26.18%	3.36%

Source: ONS, authors' own calculations
NB Estimated at the sample average

8.6 Conclusion

The regional element of acquisition-exits and –relocations are explored with a large sample of SMEs. I look at the effects of takeover on the chances of exit and relocation.

Takeovers have significant effects on the probability of an SME exiting. One year after takeover, the probability of exit increases by between 3 and 7 percentage points, once the correlation of any unobserved variables between exits and takeovers are

included. This is consistent with takeovers being an investment decision, in which an element may be closure and the stripping of the small firm's assets to take advantage of synergies with the acquiring firm. However, the findings show that SME takeovers have a larger impact on the probability of exit for SMEs in the core relative to the periphery and mid-periphery. This is not consistent with hypothesis 5; the evidence does not suggest there is a greater tendency for acquired firms in the periphery to close or relocate.

Takeovers are also found to increase the chances of relocation by between 1 and 2 percentage points, consistent with the hypothesis that takeovers are an investment, utilising synergies with the acquiring firm's assets. However, small firm relocations are found to be very rare, only occurring for around 1.5 percent of SMEs, making SME takeover-relocations extremely infrequent. The findings for both relocations and exits are consistent with hypothesis 4; that takeovers are an investment decision, an element of which might be relocation or closure to take advantage of synergies with the acquiring firm's assets. The findings for exits are also consistent with the limited existing empirical evidence on small firm (and plant) acquisition-exits.

The positive effect of takeovers on the probability of exit, and to a lesser degree relocations, suggests that acquisitions may have a negative effect on regional productivity from the effects on the target firm (not including any possible effects on the acquirers or exiting entrepreneurs being able to form a new start-up), especially for the core. However, many small firms survive after takeover (at least after one year) and acquisitions may also they have an effect on performance. This is investigated in the next chapter.

Appendix

Table A8.1 - Predicted probability of exit by takeover and productivity

	Productivity distribution						
Location	5%	10%	25%	50%	75%	90%	95%
No takeover	24.6%	23.3%	22.0%	21.2%	20.8%	20.3%	20.0%
Takeover	36.3%	34.1%	31.8%	30.2%	29.4%	28.4%	27.8%
Marginal effect of takeover	11.7%	10.8%	9.7%	9.0%	8.6%	8.1%	7.8%

NB Estimated at the sample average
Source: ONS, author's own calculations

Chapter 9 – Post-Acquisition Performance

9.1 Introduction

The takeover literature finds that acquisitions can affect firm performance. However, it contains very little evidence about acquisition effects on small firms. It is not known what subsequently happens to acquired SMEs' performance. The present chapter addresses this gap in the literature.

With a detailed analysis, the performance in both employment and labour productivity, before and after takeovers, is explored. Thus the effect of acquisitions on SME performance can be estimated. The results show that the effects of takeover do not vary between regional locations, nor do they reduce employment or productivity for most SMEs. However, the acquisition of highly productive firms may result in a cut in their labour productivity. This last finding is consistent with acquirers searching for entrepreneurial or other intangible assets that they can absorb into their own business.

More generally; with performance not related to acquisitions, there are differences in the changes to SME productivity and employment between locations. The SMEs that are located in the core increase their labour productivity more than those in the periphery, whereas the reverse is found with employment. This finding may help to explain why there is a productivity gap between the core and periphery. SMEs in the periphery may add to employment more than their equivalent firms in the core, contributing to the periphery's lesser gains in labour productivity relative to the core.

This chapter begins by introducing the hypotheses and then tests them with regard to SME employment and productivity after acquisition.

9.2 Hypotheses

From the literature a number of testable, and sometimes competing, hypotheses arise concerning SME performance after takeover and regional productivity. These are:

6. Takeovers may provide new resources that aid small firms in improving their productivity and expanding their size. Alternatively, acquisitions may strip SMEs of their dynamism and result in decreases in performance.

7. The possible negative effect of takeovers might be more pronounced for SMEs located in the periphery relative to those in the core, as owners move resources, assets or expertise out of the former.

8. The more productive acquired firms may lose what ultimately made them a high performer, resulting in a loss of performance, especially for productivity, consistent with 'intrapreneurship' hunting by acquirers.

From these hypotheses, the following relationships can be formulated for firm i (where 'prod' is productivity and 'Pr', probability) as;

$$\text{Performance}_i = f(\overset{?}{\text{Takeover}_i}, \overset{-}{\text{Periphery}_i*\text{Takeover}_i}, \overset{+}{\text{Core}_i*\text{Takeover}_i}, \overset{-}{\text{Prod}_i*\text{Takeover}_i})$$

9.3 Measuring a change in performance

Takeovers can be modelled as a treatment effect (Cameron and Trivedi 2005). The effect of takeover can be measured by comparing the effect on an outcome variable (Y) both before and after acquisition. Following Cameron and Trivedi (2005, pp. 55-56), this can be done with the regression of;

$$Y_{it} = \gamma + KT_t + z_{it}, \qquad i = 1,\ldots,N,\ t = 0,1 \qquad (1)$$

where Y_{it} is performance at time t. $T_t = 1$ in period 1 when acquired and $T_t = 0$ in period 0 before it is taken-over. The difference in the means before and after the takeover confounds the causal effect of the takeover (K) and a time effect. However, the time effect can be identified from the non-takeover, control group. Differencing between these groups is known as differences-in-differences (DiD).

Following Meyer (1995) and Cameron and Trivedi's (2005) notation, the DiD equation is;

$$Y_{it}^{j} = \gamma + \gamma_1 T_t + \gamma^1 T^j + \mathrm{K} T_t^j + z_{it}^j, \qquad \mathrm{i} = 1,\ldots,\mathrm{N} \qquad \mathrm{t} = 0,1 \tag{2}$$

where j denotes whether the firm is acquired (or going to be at time t =1); $T^j = 1$ if j equals 1 and $T^j = 0$ otherwise, $T_t{}^j = 1$ if both j and t equal 1 and $Y_t{}^j = 0$ otherwise. z is an error term with a zero mean and constant variance[113].

For those that are subsequently taken-over (j =1), at time t = 0;

$$Y_{i0}^1 = \gamma + \gamma^1 T^1 + \mathrm{z}_{i0}^1$$

And at time t =1 (or after acquisition);

$$Y_{i1}^1 = \gamma + \gamma_1 + \gamma^1 T^1 + \mathrm{K} + \mathrm{z}_{i1}^1$$

The change in performance for this group is;

$$Y_{i1}^1 - Y_{i0}^1 = \gamma_1 + \mathrm{K} + \mathrm{z}_{i1}^1 - \mathrm{z}_{i0}^1 \tag{3}$$

Equivalently, for those not taken-over (j =0) performance at time t =0 and t =1 is;

$$Y_{i0}^0 = \gamma + \mathrm{z}_{i0}^0$$

and

$$Y_{i1}^0 = \gamma + \gamma_1 + \mathrm{z}_{i1}^0,$$ respectively.

The difference in performance for non-acquired firms is;

$$Y_{i1}^1 - Y_{i0}^0 = \gamma_1 + \mathrm{z}_{i1}^0 - \mathrm{z}_{i0}^0 \tag{4}$$

Ignoring takeovers, performance is affected by constants γ and γ_1 in the second period. Differencing against itself across time eliminates the first (fixed) effect. However, γ_1 (time effect) still remains and it is present in both the first-difference equations (3 and 4). Taking the differences between these two equations (the acquired and non-acquired) eliminates γ_1;

$$\left(Y_{i1}^1 - Y_{i0}^1\right) - \left(Y_{i1}^0 - Y_{i0}^0\right) = \mathrm{K} + \left(\mathrm{z}_{i1}^1 - \mathrm{z}_{i0}^1\right) - \left(\mathrm{z}_{i1}^0 - \mathrm{z}_{i0}^0\right) \tag{5}$$

[113] For simplicity, this model does not include covariates, although those that do not alter across time are captured in γ.

If the mean of the difference of the errors can be assumed to be zero[114], an unbiased estimate of K is obtained; the effect of takeover. This can be estimated by using OLS on equation 5.

The above is based on the assumption that observable characteristics of the treated and non-treatment group do not differ. Chapter 7 finds significant differences between acquired and non-acquired SMEs. Therefore these differences need to be controlled for, for example by including variables such as productivity, age, size and industry into a regression equation.

Performance (or growth) can be measured in a few different ways such as revenues or profits. Attempting to measure some of these can be difficult, especially with small firms (Cressy 2006). The reported value for these measures might not be wholly accurate as firms may have an incentive to under-report these figures to authorities to avoid taxation. Cressy suggests that more suitable measures for this purpose are employment or total assets. However, productivity is a particular variable of interest, and asset information is not available.

Both productivity and employment are used as the performance measures. Labour productivity (LP) is used as a performance measure along with employment as another. The latter measure may also be informative as, with the evidence on LP, it may reflect otherwise unmeasured changes in the intensity of capital (and other production inputs). For example, takeovers may result in an increase in productivity but reductions in employment are consistent with capital deepening. Alternatively, if takeovers result in no change in productivity, but rather an increase in employment, then this would be consistent with capital widening[115].

To measure real changes in productivity across time, price deflators are required. However, deflators are not available for all sectors. The change in nominal productivity is used and the effects of inflation are included in the summary statistics. A general price index could be used but this is captured in the common time effect (α_1) and is removed when differencing acquired and non-taken-over SMEs.

[114] This assumes the same error structure for acquired firms and non-acquired firms.
[115] This is also consistent with a reduction and an increase in x-inefficiency, respectively.

For multivariate analysis, controlling for industry effects will capture any common sector-wide inflation. The alternative measure of performance (employment) is simply measured as the number of employees and is not affected by inflation. However, in the case of employment, it is not possible to control for labour force quality changes in the data.

The firm effects of a takeover may take a considerable time to be realised (Bernard and Jensen 2007; Lichtenberg et al. 1987) and the timing of changes in performance may vary between firms (Ashcroft and Love 1993). The length of time it takes for performance to alter after an acquisition is likely to be more of an issue for larger, more complex, firms. However, longer post-acquisition periods make it more difficult to identify the takeover as the cause of any change in performance[116].

Due to data constraints, the effects of takeover over 2 or 5 years are examined depending on the sample period. This is done by using two different samples of firms. The original 2004 sample is utilised (with takeover measured in 2005) and another sample of SMEs from 2001 (with takeover measured in 2002). The earlier sample allows performance to be measured over a longer period. It also allows the results to be compared across different time periods.

9.4 Preliminary Analysis of Performance

The performance measures (productivity and employment) are compared before and after acquisition by region.

Performance across the periods is measured as the difference of the logarithm level of either productivity or employment between two periods[117]. The differences are computed separately for those SMEs that are acquired and not taken-over. The difference in the mean differences is then examined. This is effectively a naïve estimate of the DiD of takeovers. It does not control for any other factors such as inflation, industry or size. Also is does not control for selection. Performance after

[116] Using a longer time period could also increase the inflationary price effects.
[117] The change in performance is equivalent to the region's log growth rate; (LP_{t+n}/LP_{t-1}).

acquisition is only observed for SMEs that do survive, it is not observed for firms that exit during the period.

9.4.1 Labour productivity

Tables 9.1 to 9.3 show the DiD estimates (final column) of takeovers on productivity for the periods 2004-07, 2001 to 2007 and 2001 to 2004 respectively. On average, acquisitions have a positive effect on SME productivity for most regions in the periods 2004 to 2007 and 2001 to 2007. However, very few of these results are statistically significant.

In the first period, 2004 to 2007, Yorkshire and Humberside (0.181) and West Midlands (0.177) have the highest increases in productivity from takeovers (measured in 2005). These differences are also statistically significant. Other significant results are South West (0.126) and the South East (0.094). For the other regions, the change in productivity for acquired SMEs is not statistically different from those that are not acquired in the period 2004 to 2007.

For the longer post-acquisition period- 5 years (2002 to 2007) - the DiD of takeovers (measured in 2002) on productivity finds only significant results for Wales (0.159, at the 10 percent level), London (-0.088, at the 10 percent level) and the South East (-0.128)[118]. However, these last two regions have negative effects, indicating that takeovers in 2002 may have deleterious effects on SME productivity in core regions over the period 2001 to 2007.

The final period, 2001 to 2004 (with takeovers measured in 2002) table 9.3, shows that, in most regions, takeovers have possibly negative effects on average SME productivity. However, the only statistically significant effect is for acquired SMEs in the South East (-0.097). Takeovers of SMEs in all other regions have no significant effect on labour productivity over the period 2001 to 2004.

[118] The estimate for the South East (and to a lesser degree London) for the period 2001-07 is not consistent with the estimate for the period 2004-07 not only because it is over a shorter period, but critically, it uses a different year for takeovers – 2002 and 2005 respectively. This may be indicative of the differential effects of takeovers across the stock market trend, at least for these regions.

Table 9.1 – DiD estimate of SME takeovers in 2005 on labour productivity 2004-2007 by region

Region	Mean Difference of LP (2004-07) of non-acquired	Mean Difference of LP (2004-07) of acquired	Standard Errors of the Mean Difference of LP of acquired	DiD of takeovers on productivity (2004-07)
Wales	0.009	0.071	0.069	0.061
N. East	0.013	-0.009	0.094	-0.022
York. & Hum.	-0.001	0.179	0.044	0.181***
N. West	0.004	0.055	0.039	0.051
W. Mid.	-0.006	0.171	0.047	0.177***
E. Mid.	-0.011	-0.014	0.050	-0.003
S. West	-0.024	0.102	0.048	0.126***
Scot.	0.013	0.085	0.051	0.072
E. Eng.	-0.018	0.015	0.038	0.033
S. East	-0.066	0.029	0.029	0.094***
London	-0.018	-0.012	0.029	0.006

Source: ONS, author's own calculations
NB Takeover measured in 2005
Legend: * p<0.1; ** p<0.05; *** p<0.01

Table 9.2 – DiD estimate of SME takeovers in 2002 on labour productivity 2001-2007 by region

Region	Mean Difference of LP of non-acquired	Mean Difference of LP of acquired	Standard Errors of the Mean Difference of LP of acquired	DiD of takeovers on productivity
Wales	0.099	0.254	0.095	0.159*
N. East	0.119	0.145	0.107	0.038
York. & Hum.	0.086	0.014	0.060	-0.046
N. West	0.086	0.060	0.067	-0.007
W. Mid.	0.063	0.071	0.068	0.003
E. Mid.	0.061	0.164	0.062	0.101
S. West	0.043	0.095	0.067	0.028
Scot.	0.107	0.120	0.073	0.047
E. Eng.	0.040	0.054	0.059	-0.005
S. East	0.026	-0.081	0.047	-0.128***
London	0.019	-0.046	0.042	-0.088**

Source: ONS, author's own calculations
NB Takeover measured in 2002
Legend: * p<0.1; ** p<0.05; *** p<0.01

Table 9.3 – DiD estimate of SME takeovers in 2002 on labour productivity 2001-2004 by region

Region	Mean Difference of LP of non-acquired	Mean Difference of LP of acquired	Standard Errors of the Mean Difference of LP of acquired	DiD of takeovers on productivity
Wales	0.066	0.023	0.094	-0.071
N. East	0.087	0.193	0.092	0.101
York. & Hum.	0.072	-0.024	0.059	-0.083
N. West	0.060	-0.008	0.048	-0.056
W. Mid.	0.050	0.002	0.051	-0.048
E. Mid.	0.058	0.044	0.053	-0.009
S. West	0.048	0.071	0.057	0.014
Scot.	0.076	0.053	0.064	-0.011
E. Eng.	0.039	0.053	0.051	0.002
S. East	0.027	-0.060	0.036	-0.097***
London	0.018	-0.014	0.035	-0.048

Source: ONS, author's own calculations
NB Takeover measured in 2002
Legend: * p<0.1; ** p<0.05; *** p<0.01

9.4.2 Employment

The effect of takeovers on SME regional employment with DiDs is shown in tables 9.4 to 9.6 over the same periods as before: 2004 to 2007, 2001 to 2007 and 2001 to 2004, respectively. The effect of takeovers on SME employment appears to vary depending on the time period.

For the first period shown, 2004 to 2007, takeovers (in 2005) appear to reduce employment across all regions. However, very few of these effects are statistically significant. Only taken-over SMEs in Wales (-0.084) and East England (-0.067 percent) have an average change in employment that is significantly different (at 10 percent level) from non-acquired firms.

In the period 2001 to 2007 (with takeover now measured in 2002), the results appear to be a little more mixed: there are both negative and positive effects of takeovers. However, the only effects that are statistically significant are the positive results for Yorkshire and Humberside (0.129, at the 5 percent level), South East (0.144) and East England (0.083, at the 10 percent level).

For the final period, 2001 to 2004 (with takeovers over measured in 2002), despite

some negative results, the only significant ones are positive. Takeovers are found to significantly increase average SME employment in Yorkshire and Humberside (0.134), East England (0.101), London (0.088) and South East (0.158). For all other regions there is no significant effect of takeovers on average SME employment.

Table 9.4 – DiD estimate of SME takeovers in 2005 on employment 2004-2007 by region

Region	Mean Difference of emp. of non-acquired	Mean Difference of emp. of acquired	Standard Errors of the Mean Difference of emp. of acquired	DiD of takeovers on emp.
Wales	0.067	-0.017	0.043	-0.084**
N. East	0.083	0.025	0.051	-0.058
York. & Hum.	0.067	0.053	0.032	-0.014
N. West	0.065	0.044	0.027	-0.021
W. Mid.	0.049	0.011	0.029	-0.038
E. Mid.	0.060	0.013	0.032	-0.047
S. West	0.065	0.043	0.031	-0.022
Scot.	0.075	0.035	0.032	-0.041
E. Eng.	0.050	-0.017	0.029	-0.067**
S. East	0.045	0.025	0.020	-0.020
London	0.044	0.021	0.020	-0.022

Source: ONS, author's own calculations
NB Takeover measured in 2005
Legend: * p<0.1; ** p<0.05; *** p<0.01

Table 9.5 – DiD estimate of SME takeovers in 2002 on employment 2001-2007 by region

Region	Mean Difference of emp. of non-acquired	Mean Difference of emp. of acquired	Standard Errors of the Mean Difference of emp. of acquired	DiD of takeovers on emp.
Wales	0.071	-0.021	0.075	-0.092
N. East	0.095	-0.005	0.102	-0.100
York. & Hum.	0.082	0.211	0.060	0.129**
N. West	0.083	0.092	0.049	0.009
W. Mid.	0.070	0.052	0.048	-0.018
E. Mid.	0.082	0.012	0.050	-0.071
S. West	0.094	0.097	0.056	0.004
Scot.	0.078	-0.004	0.069	-0.082
E. Eng.	0.069	0.152	0.048	0.083*
S. East	0.076	0.220	0.038	0.144***
London	0.080	0.117	0.032	0.037

Source: ONS, author's own calculations
NB Takeover measured in 2002
Legend: * p<0.1; ** p<0.05; *** p<0.01

Table 9.6 – DiD estimate of SME takeovers in 2002 on employment 2001-2004 by region

Region	Mean Difference of emp. of non-acquired	Mean Difference of emp. of acquired	Standard Errors of the Mean Difference of emp. of acquired	DiD of takeovers on emp.
Wales	0.026	0.046	0.073	-0.027
N. East	0.044	0.046	0.058	-0.012
York. & Hum.	0.042	0.174	0.040	0.134***
N. West	0.043	0.066	0.035	0.032
W. Mid.	0.041	0.089	0.037	0.052
E. Mid.	0.044	0.028	0.040	-0.012
S. West	0.045	0.114	0.045	0.069
Scot.	0.023	0.028	0.050	-0.021
E. Eng.	0.041	0.137	0.036	0.101***
S. East	0.048	0.185	0.027	0.158***
London	0.055	0.112	0.023	0.088***

Source: ONS, author's own calculations
NB Takeover measured in 2002
Legend: * p<0.1; ** p<0.05; *** p<0.01

The results of the productivity and employment DiDs suggest a degree of regional and inter-temporal heterogeneity. Not all regions register a significant effect on employment or productivity from takeovers. For those that do, this preliminary analysis suggests the effects are not consistent between the periods.

In terms of the likely effects on the core-periphery productivity gap, the evidence does not suggest that takeovers in more peripheral regions reduce productivity there. For SMEs in London and the South East (both core regions) a negative acquisition effect on productivity is found for the period 2001 to 2007. This also occurs for the latter in 2001-04.

The lack of consistent findings with this method across both regions and time might be due to two problems. First, takeovers are a rare event, as documented in the previous chapter. Few observations involving acquired SMEs may increase the regional standard errors. This might be overcome with the use of the location variables: core, periphery and mid-periphery. Second, the analysis uses a simple DiD estimate of the effects of takeovers. It does not control for factors such as industry (including sector level inflation), age, initial productivity and size. Also, selection is not controlled for. These are all controlled for in the following sections.

9.5 Multivariate Estimation of Performance

The model below shows the performance estimation equation;

$$Y_{t-1}-Y_{t+n} = \gamma_1 + KTakeover_t + \gamma_2 \ln(RLP_{t-1}) + \gamma_3 Entity_{t-1} + \gamma_4 Age_{t-1} + \gamma_5 Industry_{t-1} + \gamma_6 Location_{t-1} + \gamma_7 Employment_{t-1} + \gamma_8 Structure_{t-1} + \gamma_9 Location_{t-1}*Takeover_t + \gamma_{10} \ln(RLP_{t-1})*Takeover_t + \gamma_{11} Employment_{t-1}*Takeover_t + z_i \quad (6)$$

where Y is either the logarithm of productivity or employment and all other variables are as specified in previous chapters. The dependent variable is the change of performance and the regressors are in levels.

Using the hypotheses from the beginning of the section, the following relationships can be tested using equation 6. Hypothesis 6 is that SME takeovers may either improve post-acquisition performance K>0 or hinder it K<0[119]. Hypothesis 7 is that the takeovers in the periphery are more detrimental to performance than those in the

[119] Strictly, this coefficient does not capture the total effect of takeovers; interactions need to be included but makes the exposition more complicated. The interactions are included in all subsequent calculations.

core ($\gamma_9<0$). Hypothesis 8, more productive acquired SMEs are more likely to be adversely affected by takeovers and suffer a deterioration of performance ($\gamma_{10}<0$); consistent with 'intrapreneurship' hunting.

Performance controls

The technique of DiDs controls for the initial level of performance. This is important when comparing productivity levels across different industries. The type of industry may also have an effect on the change in productivity between periods. This also has an effect on the likelihood of takeover. If takeover-intensive industries also have larger increases in performance, this change might be wrongly accredited to acquisitions. The inclusion of industry dummies will control for this as well as for any industry-wide changes, such as the use of new technology. Importantly this will also include inflation.

Nominal output is used in the productivity measure because of a lack of suitable industry-level deflators for the entire sample. Therefore it is possible that some of the change in productivity observed in the previous analysis is caused by industry-wide inflation.

The level of productivity relative to the industry average (RLP) is also controlled for. Absolute size (employment) is included for both the change in productivity and employment. A proportionate increase in employment can be very large for the smallest firms; a one-employer firm can increase its size by 100 percent by only adding an additional employee. An employer with 150 employees would need to increase employment by 150 workers to achieve the same rate of change.

Size may also have an effect on the change of productivity. Smaller firms might be more dynamic and may experience greater changes to their productivity. Therefore size is controlled for in both the employment and productivity performance estimations.

Takeover is also interacted with size to try and capture this effect and investigate whether there is any size heterogeneity in the takeover effect on performance. In

earlier chapters it has been documented that the sample mostly consists of very small firms. The inclusion of takeover interacted with size is used to capture any possible variation in the acquisition effect between the smallest and relatively larger SMEs.

9.5.1 Methodological problems

Methodological problems need to be considered before the multivariate analysis of performance after acquisition can be conducted.

Sample selection

Firm performance is measured across a number of years. For a firm to be included in the estimation it needs to exist both at the beginning period (t-1) and the end (t+n). As performance is measured a number of years after takeover, a significant proportion of SMEs will not be observed in the end period. Estimating model 6 in its current form will produce coefficients that are only representative of surviving SMEs and the estimated model may therefore be subject to sample selection bias.

Following Greene (2003) and Baum (2006), the equation of interest for firm i is;

$$Y_i = \gamma m_i + z_i \qquad (1a)$$

and selection is determined by;

$$X_i = \beta w_i + v_i \qquad (7)$$

where m and w are matrices of independent variables and X is exit, consistent with the previous chapter.

Y is only observed conditional on the outcome of X_i. If X_i is equal to zero; a firm has survived and performance is observed in subsequent periods. If X_i equals one then performance is not observed. This is the selection model[120].

Selection can be explained by a set of explanatory factors (w) that contain all m variables and some additional factors. These additional variables are the exclusion restriction, of which there should be at least one variable that helps to explain whether

[120] It is assumed that the error term in the selection equation (v) has a zero-conditioned mean, $E(wv) = 0$ impying that $E(mz) = 0$.

an observation is selected (survives) but does not relate to the outcome variable (performance).

A degree of correlation (ρ) between the errors z and v (including any omitted variables), gives rise to problems as the latter error is not observed but is related to x as shown. If both the errors are normally distributed with zero means, $E[z|v] = \rho v$, from (1a) it can be shown;

$$E[Y_i \mid w_i, v] = \gamma m_i + \rho v_i$$

v is not observed but X is related to it according to equation 7. Therefore;

$$E[Y_i \mid w_i, x_i] = \gamma m_i + \rho E[v_i \mid w_i, X_i]$$

The case of observability; the conditional expectation that $E[v_i \mid w_i, X_i]$ for $X_i = 0$, is λ_i, the Inverse Mill Ratio (IMR). This can be added to equation 1a;

$$E[Y_i \mid w_i, X_i = 0] = \gamma m_i + \rho \lambda_i(\beta w_i)$$

If the correlation between the errors is non-zero then estimates of the 1a will not be consistent unless the IMR is included as it includes the parameters, w_i, from above. Therefore the parameters that relate to whether a firm has survived needs to be included to account for the selection of not observing firm's performance for exits.

A selection model, as devised by Heckman (1979), can control for this selection bias. This involves estimating a selection model and transforming its estimates to be factored into the outcome model. Probit selection and outcome equations are jointly estimated with maximum-likelihood so that estimates of γ, ρ and β are obtained.

For a selection model to be effective, a unique variable is required in the selection equation which explains survival but not performance (Cameron and Trivedi 2005). Variables that explain the latter, and that are observed, are already included in the outcome part of the model.

Using the theory of the firm, it is difficult to suggest potential variables that are relevant to whether a firm survives but not related to a firm's performance. It is even more difficult to do this with the variables that are available within the present data set.

One option is to use the same regressors in both equations. This can result in a poorly performing model as well as instability in the coefficients of Heckman selection models (Cameron and Trivedi 2005). The inverse Mills ratio (IMR) can be highly correlated with the outcome equation's regressors (Puhani 2000). This can create multicollinearity problems unless the selection equation is able to discriminate well between the observed and unobserved.

A similar problem to this is overcome in Dunne and Hughes (1994). There they use non-linear specifications of existing variables in the selection equation. This is the method adopted here.

The selection component of the Heckman maximum-likelihood (ML) model is specified below. It predicts whether a firm is observed between t-1 and t+n[121];

$$\text{Selection}_i = f(\text{Age}_i, \text{Takeover}_i, \text{Size}^E_i, \mathbf{Size}^{E\,2}_i, \ln(\text{LU}_i), \mathbf{\ln(LU_i)^2}, \ln(\text{RLP}_i), \mathbf{\ln(RLP_i)^2}, \mathbf{\ln(RLP_i)*Size^E_i}, \text{Entity}_i, \text{Location}_i, \mathbf{Location_i*\ln(RLP)_i}, \text{Location}_i*\text{Takeover}_i, \text{Takeover}_i*\ln(\text{RLP}_i), \text{Size}^E_i*\text{Takeover}_i, \text{Industry}_i) \quad (8)$$

The regressors in bold type within equation 8 are the unique variables that are not included in the performance model[122]. The unique variables used in this selection model are polynomials (square) of existing regressors (productivity and size – both employee and local units). The others are interactions.

[121] The selection model is very similar to the exit one in the preceding chapter. The exit model measures non-survival over a shorter time period 2004-06, measuring it one year after acquisition to strengthen the causality. It is likely that exits beyond one year from takeover are less (directly) caused by acquisition.

[122] This is sometimes also referred to as the outcome part of the selection model.

The novel interactions to the selection part are location with productivity and size with productivity. The first capture the effect that competitive pressures may have a differential effect by location, so lower productivity firms may be able to survive in less competitive areas, such as the periphery. Size is interacted with productivity to produce another unique variable in the selection equation. This variable, along with the size variables, should capture the increased chances of survival that a relatively larger firm has and this is improved further if it is more productive. Larger firms may have higher fixed costs and this may prevent the negative effects of productivity as suggested in Hopenhayn (1992). The firms likely to have the highest chance of exit are the smallest and least productive (both jointly and independently).

Using interaction terms and polynomials of existing variables to try and address the problem of identification in the selection model may still result in the exclusion restriction only being satisfied by the degree of non-linearity in the (inverse) Mills ratio (IMR) (Hall 1987). Models with few exclusion restrictions, a high degree of censoring and low variability among the regressors (or large error variance in the selection equation) can all contribute to the near collinearity between regressors and the IMR (Leung and Yu 1996, p. 201).

Given the susceptibility of Heckman selection methods to collinearity problems, a two-part model is estimated separately in addition to the (full information) ML selection model, as suggested by Puhani (2000) [123].

The first part of the two-part model is effectively the estimates in chapter 8; the exit model. The second part of the model is simply equation (6) estimated by OLS, but the coefficients are only relevant to SMEs that survive across the entire period.

Endogeneity

Takeover and performance are linked. In chapter 7 more productive SMEs are found

[123] A very high correlation amongst the regressors in the second part of the selection model suggests multicollinearity is present (no specific test for multicollinearity exists). However, the estimation sample is extremely large and, as shown in the results later, most of the regressors are statistically significant. No variables appear to have extreme values, large standard errors are not observed and the model does not struggle to converge when estimated. Therefore none of the common potential effects of multicollinearity are found. Multicollinearity might be present in my selection model but not of its consequences are. As multicollinearity does not violate OLS assumptions (Greene 2003), it is ignored.

to have an increased likelihood of acquisition. Without a takeover, firms may subsequently improve their productivity. Therefore acquisitions may not cause productivity to improve; causation might be the other way. An unobservable characteristic might make the firm more productive, whilst also making it more desirable for acquisition. This could result in the post-acquisition productivity also being high. Therefore takeover might not be independent of the level of performance, as acquisitions could be endogenous. To reduce the possible problem of endogeneity, DiD is used.

Productivity is measured both before and after takeover and the difference is compared to non-acquired SMEs. This removes fixed variables that are both observed and unobservable, which might also affect the chances of takeover (see equations (2) to (5))[124]. If takeovers are correlated with fixed effects then DiDs will control for this.

The effects of observable characteristics, such as size or industry, are controlled for that may affect the change in performance and are correlated to takeovers (see chapter 7). However, if takeovers are positively related to post-acquisition performance, it might be that acquired firms are bought because of some unobservable characteristic that also generates high productivity growth[125].

Growth persistence and serial correlation

The measure of SME performance chosen – the difference in productivity or employment, is also a measure of growth. If SME growth is persistent from one period to another then this can create serial correlation in the performance measure. Serial correlation can cause the estimates of equation 6 to be inconsistent when estimated by OLS. This is investigated with two 3-year productivity growth rates (2001 to 2004 and 2004 to 2007). Following Dunne and Hughes (1994), who were also concerned with growth persistence in their analysis of firm growth, the later

[124] DiD does not control for unobserved temporary effects that are specific to the firm that may affect the likelihood takeover.

[125] A common solution to the endogeneity problem is to use instrumental variables. Similar work looking at the effect of acquisitions, or ownership change, is carried out elsewhere, see, for example, McGuckin and Nguyen (2001). An identification problem, similar to the selection problem arises where variables are required that are correlated with takeover but not performance change. Conceptually this is difficult and practically it is nearly impossible as all of the available variables are used (and significant) in predicting takeovers.

period's growth is regressed on the earlier period's growth for just those SMEs that survive over the entire period;

$$(\ln Y_{07} - \ln Y_{04}) = \alpha + \beta(\ln Y_{04} - \ln Y_{01}) \quad (9)$$

Equation (9) is estimated by OLS and the results are reported below for both productivity and employment. The regression sample is only of SMEs that survive from 2001 to 2007. This is just over half of the SMEs sample. The coefficient on past growth is statistically significant but negative (see table 9.7). However, the past change in productivity and employment (2001 to 2004) only explains 8 percent of the variability of the change in productivity and 2 percent of employment respectively.

Previous growth or performance change cannot be observed for nearly half of the sample. For SMEs where it can be observed, growth persistence is small, weak and negative, as in Dunne and Hughes (1994). Prior changes in performance appear to be a relatively poor predictor of later changes. Also given the substantial proportion of SMEs where prior growth is not observed, I do not consider that the analysis suffers from the persistence of growth[126].

Table 9.7 – Growth persistence regression results

Variable	$\ln Y_{07} - \ln Y_{04}$ (Productivity)	$\ln Y_{07} - \ln Y_{04}$ (Employment)
$\ln Y_{04} - \ln Y_{01}$	-0.266***	-0.136***
N	954,925	954,925
Adj. R^2	0.08	0.02

Legend: * p<0.1; ** p<0.05; *** p<0.01
N.B. Constants removed
Source: ONS, author's own calculations

Heteroskedasticity

A potentially significant problem with estimating performance is heteroskedasticity. The variance of performance change (or growth) might vary by firm characteristics such as the size of the firm, as found in Dunne and Hughes (1994). Small firms might

[126] A potentially linked source of upward bias can occur when lagged dependent variables are included in the estimation (Nickell 1981). SME fixed effects of productivity are removed when DiDs are used (see equation 3). Also equation 6 shows that the prior level of productivity is included but this is not LP (used for the dependent variable) but RLP.

have a much higher variance of performance change relative to larger SMEs. It is not only size that may be a factor but also age. If the model of firm evolution is consistent with Jovanovic (1982), then younger firms may also display a greater variation in performance. If heteroskedasticity is present, OLS estimates remain unbiased, consistent and asymptotically normally distributed (Greene 2003). However, the estimate will be inefficient with biased standard errors. This bias may lead to incorrect t values resulting in erroneous inference of variables (Cameron and Trivedi 2005).

To try to account for heteroskedasticity, both age and (absolute) size are controlled for in the performance estimation model. However, a Breusch-Pagan test finds the null of homoskedasticity is rejected in the OLS estimations. Given the uncertainty of the exact nature of any potential heteroskedasticity and that not all methods can be integrated into a selection model, Huber-White robust standard errors are used in both the OLS and ML selection models[127] [128].

Time and business cycle effects

The DiD measure shows the difference in performance between SMEs that have and have not been acquired. The difference estimate uses two time periods, removing common time trends (Cameron and Trivedi 2005). Any time effects that differ between the acquired and non-acquired SMEs will be reflected in the takeover variable. The inclusion of independent variables with the DiD method will account for some of the heterogeneous time effects. For example, inflation is not accounted for in the productivity measures and this may vary by industry. This can be controlled for with industry variables.

Other effects that will vary with time might be linked to business cycles and stock market effects. Business cycles are likely to affect firm performance but can be ignored with DiDs if they affect the acquired and non-acquired equally. However, if

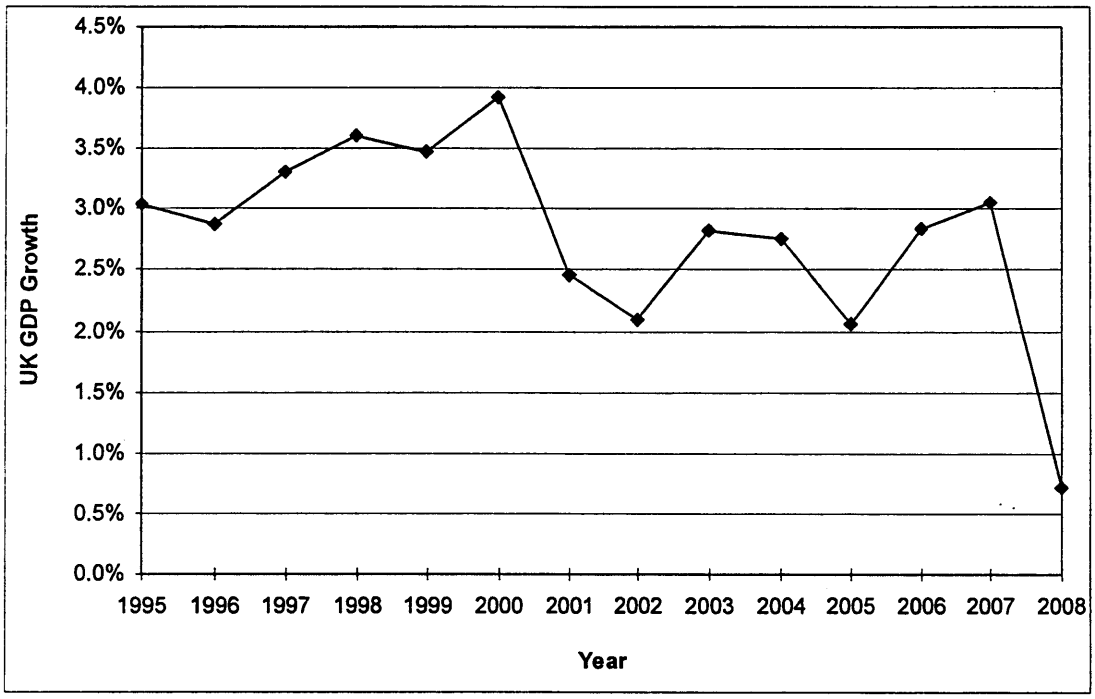
[127] A probit model is used in the selection equation. In probit (and logit) models, heteroskedasticity causes problems to the conditional means and not just the conditional variances (Greene 2003). This can result in inconsistent coefficient estimates. Using a robust option to compute standard errors does not deal with this. Therefore the use of robust standard errors may only reduce the problems of heteroskedasticity in the second (performance) part of the model. A heteroskedastic consistent probit estimator within a selection model is not explored.

[128] The weighted least squares are not used.

performance is measured across different years then it is possible that the effects of takeover may vary across time.

Performance is measured at different intervals over the period 2001 to 2007. Figure 9.1 shows the UK growth rate between 1995 and 2008. For the period used, the growth rate is fairly constant at between 2-3 percent.

Figure 9.1 - UK GDP Growth 1995 to 2008



Source: ONS (2009b)
N.b constant prices (2003)

Within the two sub-periods 2001 to 2004 and 2004 to 2007, the growth of the economy is also broadly equivalent, 2.56 percent for 2001 to 2004 and 2.65 percent for 2004 to 2007 (table 9.8). It is therefore unlikely that the business cycle may affect the results differentially between periods, as UK growth is relatively constant across the periods used for the analysis.

Table 9.8 – UK GDP Growth Statistics 2001 to 2007

Growth 2001-04	2.56%*
Growth 2004-07	2.65%*
Average growth rate 2001-07	2.58%

Source: ONS (2009b)
Nb constant prices (2003)
*Compounded annual growth rates

Changes in the stock market may alter the motivations and effects of takeovers. A buoyant stock market can increase the market value of acquiring firms. This can lead to easier access to funds, at least for listed firms, and perhaps make it easier for acquirers to develop acquired firms. A change in the stock market may also reflect a change in expectations for future growth. A rising stock market might mean acquisitions are undertaken to allow firms to try and take advantage of the more favourable environment (Mueller 1969, 1977 in Melicher et al. 1983, p. 424). This might cause further investment in the acquired firm, improving its performance. Alternatively, more acquirers in a rising market might result in a form of diminishing returns. Acquirers might be attracted into the market that is less suitable and able to invest and expand an acquired firm. This might lower after acquisition performance, increase the chances of exit or both.

The trend of the stock market varies over the periods used to measure post-acquisition performance. Table 9.9 shows the growth of the FTSE 100[129] across the period 2001-2007. During the first period used for the analysis, 2001 to 2004, the FTSE fell at an annual rate of around 10 percent. The second period used, 2004 to 2007, when the FTSE grew at an annual rate of around 12 percent. The difference in market performance across the periods is likely to be reflected in the after acquisition performance of SMEs. This may partially explain some of the different results between periods in the preliminary analysis of performance change shown above.

[129] For a graphical representation of these data see chapter 7 - figure 7.4.

Table 9.9 – FTSE 100 2001 to 2007

Period	Compounded annual growth rates
2001-04	-10.4%
2004-07	11.6%
2001-07	0.0%

Source: Yahoo Finance (2009)

9.6 Multivariate Performance Results

OLS and selection models are compared across each of the three periods for both productivity and employment performance. A change in the results between the OLS and selection estimates suggests the effects of exits are being captured in the latter's estimation[130].

9.6.1 SME productivity performance

The effect of takeovers on productivity is presented across three periods: 2004 to 2007, 2001 to 2004 and 2001 to 2007 (tables 9.10 to 9.12, respectively). The results for both the OLS and selection models are presented. For each period, the selection model's coefficients relating to performance are in the top half and in the lower one the coefficients relating to whether an SME survives the period are presented.

Table 9.10 shows the results for the period 2004 to 2007, where takeovers are identified in 2005. The statistical significance of rho (ρ) in the selection models indicates whether sample selection is present. In the selection model (with robust standard errors) a Wald test finds a significant degree of correlation with 99 percent confidence[131]. Few differences exist between the two models. Likely causes of this are a weakly specified selection model or selection bias does not have an effect on the results.

[130] The OLS and ML selection models differ very little for most models of productivity and employment. This could occur for a couple of reasons. First, perhaps there is little sample selection is present in the OLS models. However, rho is significant in all of the selection models. Alternatively, it could be caused by a poor fitting selection model (Bushway et al. 2007). Given identification problems discussed previously, it is likely that the model is not fully accounting for attrition and this is reflected in our final outcome estimates in the selection model.

[131] When robust standard errors are used with ML estimation, likelihood ratio tests are inappropriate and Wald tests should be used (Sribney 1997a).

The performance findings described next are applicable to both the OLS and selection models. The coefficient on takeover is significant (with 99 percent confidence in the selection model) and positive. To assess the total effect of acquisitions on productivity, the variable interactions with takeover need to be included. The takeover-location (e.g. Periphery*Takeover) interactions are negative but statistically insignificant across the models. However, the interactions of takeover with productivity (Takeover*ln(RLP)) and employment (Takeover*Employment) are significant and negative.

Using the coefficients from the selection model, the total effect of takeovers can be estimated by differentiating model 6 (the estimated equation) by takeovers (T);

$$\frac{\Delta(\ln Y_{t+n} - \ln Y_{t-1})}{\Delta T_t} = 0.21822 - 0.31995 * \ln(\mathrm{RLP}_{t-1}) - 0.00119 * \mathrm{Employment}_{t-1} + 0 * \mathrm{Location}_{t-1}$$

The total effect of acquisitions on productivity for the period 2004 to 2007 varies depending on the prior level of (relative) productivity and employment. The results indicate that takeovers may increase productivity and even more so if SMEs are less productive and smaller. At the sample averages, the effects of takeovers are;

0.21822-0.31995* -0.5353-0.00119*5.18 = 0.38

This suggests that takeovers increase productivity by 38 percent for average SMEs. However, this is a little misleading as the takeover analysis suggests that more productive and relatively larger SMEs have a higher chance of takeover, both of which have a reductive effect on the takeover effect on performance.

Looking just at productivity, solving the above derivative = 0, and when employment is at the mean value;

0.31995*ln(RLP) = 0.21822-0.00119*5.18
RLP = 1.94

Takeovers increase productivity for averaged sized SMEs with prior RLP below 1.9. For firms with high relative productivity (greater than 1.9 when taken at the average size), takeovers reduce performance. The tipping point of productivity, that when higher than, results in a negative effect for takeovers on productivity is reduced for larger firms. For example, an SME with employment of 100, the level of productivity is only 1.36. Beyond this point, takeovers have a negative effect for SMEs with employment of 100.

This result for highly productive firms (regardless of size) is consistent with 'intrapreneurship' hunting by acquirers and the acquired firms losing what ultimately made them a high performer. As the location-takeover interactions are insignificant, no location heterogeneity is found in the effect of takeovers upon productivity performance for the period 2004 to 2007. This is inconsistent with hypothesis 7.

Looking at the other variables, the coefficient on the prior level of productivity is negative and significant. This indicates that it has an inverse relationship with the change in productivity – more productive firms are likely to suffer a fall in performance subsequently[132]. This is likely to be caused by reversion to the mean; high or low performing SMEs return to more average levels of performance.

The location variables are both significantly different from the omitted case, the core. They indicate once variables such as size and industry are controlled for, SMEs located outside of the core are likely to suffer a relatively lower change in performance. This is suggestive of a widening (labour) productivity gap between SMEs in the core and more peripheral regions.

Below the performance results are the estimates from the selection part of the Heckman ML equation. It shows the effects on the probability of an SME surviving from 2004 to 2007. Some of the coefficients of this equation are also of interest as the specification is effectively the same as the exit model in the previous chapter[133]. The selection equation shows that takeovers in 2005 decrease the chances of the SME

[132] The full effect of productivity also needs to include its interaction with takeover.
[133] The relevant model in the previous chapter looked at the probability of exit and so it is the inverse of this one. A negative coefficient here is equivalent to a positive one in the exit model.

surviving until 2007, consistent with the previous chapter's findings. Location-takeover interactions are also included and for the mid-periphery this is negative but not statistically significant. For the periphery, this interaction is positive and significant (at the 95 percent level). This indicates that takeovers in the periphery increase the chances of an SME surviving two years after acquisition, relative to the core. However, the periphery-takeover coefficient is smaller (in absolute terms) than the takeover coefficient, so the total effect of SME acquisitions in the periphery is to increase their probability of exit[134].

The next table (9.11) shows the results for the period 2001 to 2007. The sample of SMEs is from 2001 and takeovers are identified in 2002 with the change in productivity being measured over 6 years (5 years[135] after takeover). The results from the selection model (second regression in table 9.11) show rho is significant according to the Wald test, indicating sample selection bias is present and significant.

A few differences exist between the OLS and selection models. In the latter, the coefficient on takeover is insignificant from zero. However, with the OLS model, takeovers have a significant effect. As for the interactions, the takeover-employment interaction is insignificant in the selection model but significant in the OLS version. The location-takeover variables are both positive but statistically insignificant[136]. However, the productivity-takeover interaction is significant and negative (in both models). The total effect of takeovers for this period according to the selection model is that they may increase performance for the least productive SMEs but the reverse for the most productive. No location-takeover effect exists, consistent with the previous period[137].

In both of the models for this period, SMEs in the mid-periphery and periphery have lower increases in productivity relative to the core, also consistent with the previous

[134] This ignores the interaction of takeover with employment as it is statistically insignificant.
[135] 2002 to 2007
[136] Mid-periphery-takeover is statistically significant with 95 percent confidence with OLS.
[137] The main differences between the OLS and selection models for the period 2001-07 are with the age and business entity variables. The age category of 2 to 4 years is statistically insignificant in the selection model but positive and significant in the OLS model. This is consistent with the more general effects of age being that older SMEs experience falls in productivity relative to younger firms. Also, the effect of being registered a partnership results in lower productivity performance relative to self-proprietors (this is positive in the OLS model).

period's results.

The results from the selection equations for the period 2001 to 2007 are below the productivity estimates. The coefficient on takeover is positive but only significant at the 90 percent level in explaining survival[138].

The final period, 2001 to 2004 (table 9.12), is with the same sample of firms as previous but performance is measured over a shorter period after acquisition (two years)[139]. Rho on the selection model is significant, indicating sample selection is present.

In the selection model, the takeover coefficient is positive but statistically insignificant, as are the location-takeover interactions. In the OLS model the takeover variable (but not the location interactions) is significant. However, the takeover interactions with productivity and employment are significant and negative in both models. At the sample average for productivity and size, takeovers increase productivity consistent with the results for the period 2004-07 above. However, this depends on the size and productivity of SMEs. Using the coefficients from the selection model for the period 2001-04, the total effect of takeovers can be estimated by differentiating model 6 (the estimated equation) by takeovers (T);

$$\frac{\Delta(\ln Y_{t+n} - \ln Y_{t-1})}{\Delta T_t} = 0 + -0.0010762*\text{employment} + -0.0967787*\ln(\text{RLP}) + 0*\text{location}$$

Looking just at productivity, solving the above derivative = 0, and when employment is at the mean value;

0.0967787*ln(RLP) = -0.0010762*5.28

RLP = 0.94

[138] The full effect of SME acquisition must include the relevant interactions.

[139] The length of time for both the time between productivity observations and after acquisition is the same for the 2004 sample results earlier.

Therefore, for highly productive SMEs (productivity above 0.94) takeovers reduce productivity but for average or below productive firms, takeovers are beneficial. This is qualitatively consistent with the previous two periods. Also consistent is that both the mid-periphery and periphery have lower changes in productivity relative to the core.

Below the outcome (productivity) estimates are the ML selection equation results. The coefficient on takeovers in 2002 for an SME surviving until 2004 is both positive and significant. The coefficient has the opposite sign from the results of the period 2004 to 2007. Inclusion of the takeover interactions (only significant one is with employment) indicates acquisitions in 2002 may have a positive effect on survival until 2004 but this is reduced with larger SMEs, with the effect reversing at around 74 employees. This general result differs slightly from earlier results (where takeovers are measured in 2005)[140].

[140] A formal test on the effect of takeovers on the chances of exit a year after acquisition is positive for this period (not shown).

Table 9.10 – DiD SME productivity (2004-2007) regressions

Regression model	OLS with (robust SE)	ML selection model (robust SE)
Dependent variable	**$LnLP_{07}$-$lnLP_{04}$**	
$Takeover_{05}$	0.120***	0.218***
$Ln(RLP)_{04}$	-0.284***	-0.320***
$Ln(local\ unit)_{04}$	-0.063***	-0.093***
$Employment_{04}$	0.004***	0.003***
$Takeover_{05}$* $Employment_{04}$	-0.001***	-0.001***
Age 2 to 4	0.184***	0.174***
Age 5 to 9	0.150***	0.037***
Age 10 to 19	0.104***	-0.103***
Age 20+ years	0.069***	-0.188***
$Company_{04}$	0.058***	0.077***
$Partnership_{04}$	-0.013***	-0.023***
$Mid\text{-}periphery_{04}$	-0.017***	-0.041***
$Periphery_{04}$	-0.009***	-0.030***
Mid-periphery*$Takeover_{05}$	-0.025	-0.027
Periphery*$Takeover_{05}$	-0.012	-0.043
$Takeover_{05}$*ln(RLP)	-0.103***	-0.103***
Industry controls	Y	Y
N	1,327,404	1,327,404
R^2	0.11	
Selection equation	**Survive 2004-07**	
Age 2 to 4		-0.051***
Age 5 to 9		0.143***
Age 10 to 19		0.377***
Age 20+ years		0.508***
$Takeover_{05}$		-0.219***
$Employment_{04}$		0.014***
$Employment_{04}$^2		-7.27E-05***
$Takeover_{05}$*$Employment_{04}$		-2.58E-04
$Ln(local\ unit)_{04}$^2		-0.048***
$Ln(local\ unit)_{04}$		0.109***
$Ln(RLP)_{04}$		0.081***
$Ln(RLP)_{04}$^2		0.032***
Ln(RLP)* $Employment_{04}$		-0.001***
$Mid\text{-}periphery_{04}$		0.041***
$Periphery_{04}$		0.020***
Mid-periphery*$Takeover_{05}$		-0.017
Periphery*$Takeover_{05}$		0.067**
Takeover05*Ln(RLP)		0.008
Mid-periphery*Ln(RLP)		0.013***
Periphery*Ln(RLP)		0.013***
Industry controls		Y
N		1,897,288
ρ		-0.765***

Legend: * p<0.1; ** p<0.05; *** p<0.01
N.B. constants removed
Source: ONS, author's own calculations

Table 9.11 – DiD SME productivity (2001-2007) regressions

Regression model	OLS (robust SE)	ML Selection model (robust SE)
Dependent variable	**$lnLP_{07}$-$lnLP_{01}$**	
$Takeover_{02}$	0.059**	0.049
$Ln(RLP)_{01}$	-0.393***	-0.466***
$Ln(local\ unit)_{01}$	-0.056***	-0.123***
$Employment_{01}$	0.005***	0.004***
$Takeover_{02}$*$Employment_{01}$	-0.003***	-0.001
Age 2 to 4	0.066***	0.003
Age 5 to 9	-0.011***	-0.241***
Age 10 to 19	-0.090***	-0.478***
Age 20+ years	-0.119***	-0.576***
$Company_{01}$	0.043***	0.067***
$Partnership_{01}$	0.004**	-0.010***
$Mid\text{-}periphery_{01}$	-0.037***	-0.081***
$Periphery_{01}$	-0.024***	-0.059***
Mid-periphery*Takeover	0.079**	0.065
Periphery*Takeover	0.040	0.018
Takeover*ln(RLP)	-0.110***	-0.079***
Industry controls	Y	Y
N	972,791	972,791
Adj. R^2	0.17	
Selection equation	**Survive 2001-07**	
Age 2 to 4		0.053***
Age 5 to 9		0.293***
Age 10 to 19		0.571***
Age 20+ years		0.674***
$Takeover_{02}$		0.049*
$Employment_{01}$		0.013***
$Employment_{01}$^2		-6.7E-05***
$Takeover_{02}$*$Employment_{01}$		-0.003***
Ln(local unit)^2		-0.048***
$Ln(local\ unit)_{01}$		0.145***
$Ln(RLP)_{01}$		0.097***
Ln(RLP)^2		0.016***
Ln(RLP)*$Employment_{01}$		-3.6E-04***
$Mid\text{-}periphery_{01}$		0.058***
$Periphery_{01}$		0.032***
Mid-periphery*Takeover		-0.010
Periphery*Takeover		-0.016
Takeover*Ln(RLP)		-0.026*
Mid-periphery*Ln(RLP)		0.016***
Periphery*Ln(RLP)		0.017***
Industry controls		Y
N		1,832,969
ρ		-0.808***

Legend: * p<0.1; ** p<0.05; *** p<0.01
N.B. constants removed
Source: ONS, author's own calculations

Table 9.12 – DiD SME productivity (2001-2004) regressions

Regression model	OLS (robust SE)	ML Selection model (robust SE)
Dependent variable	**$lnLP_{04}$-$lnLP_{01}$**	
$Takeover_{02}$	0.054**	0.015
$Ln(RLP)_{01}$	-0.345***	-0.393***
$Ln(local\ unit)_{01}$	-0.063***	-0.103***
$Employment_{01}$	0.004***	0.003***
$Takeover_{02}$*$Employment_{01}$	-0.002***	-0.001***
Age 2 to 4	0.113***	0.084***
Age 5 to 9	0.066***	-0.069***
Age 10 to 19	-0.012***	-0.236***
Age 20+ years	-0.041***	-0.301***
$Company_{01}$	0.027***	0.048***
$Partnership_{01}$	-0.001	-0.009***
$Mid\text{-}periphery_{01}$	-0.033***	-0.060***
$Periphery_{01}$	-0.036***	-0.053***
Mid-periphery*Takeover	0.034	0.030
Periphery*Takeover	0.007	0.009
Takeover*ln(RLP)	-0.115***	-0.097***
Industry controls	Y	Y
N	1,250,712	1,250,712
Adj. R^2	0.16	
Selection equation	**Survive 2001-04**	
Age 2 to 4		0.012***
Age 5 to 9		0.257***
Age 10 to 19		0.526***
Age 20+ years		0.614***
$Takeover_{02}$		0.161***
$Employment_{01}$		0.014***
$Employment_{01}$^2		-7.8E-05***
$Takeover_{02}$*$Employment_{01}$		-0.002***
Ln(local unit)^2		-0.050***
$Ln(local\ unit)_{01}$		0.142***
$Ln(RLP)_{01}$		0.104***
Ln(RLP)^2		0.020***
Ln(RLP)*$Employment_{01}$		-0.001***
$Mid\text{-}periphery_{01}$		0.069***
$Periphery_{01}$		0.033***
Mid-periphery*Takeover		-0.022
Periphery*Takeover		-0.089*
Takeover*Ln(RLP)		-0.024
Mid-periphery*Ln(RLP)		0.030***
Periphery*Ln(RLP)		0.030***
Industry controls		Y
N		1,832,969
ρ		-0.722***

Legend: * p<0.1; ** p<0.05; *** p<0.01
N.B. constants removed
Source: ONS, author's own calculations

9.6.2 SME employment performance

The analysis is now repeated using the same models across the same three periods but with employment as the performance measure. In table 9.13 the estimates for the two models (OLS and Heckman ML) are shown for the period of 2004 to 2007.

The final column shows the estimates from the selection model. Rho is significant and therefore not accounting for selection would yield inconsistent results; the OLS set-up is inappropriate. However, only minor differences between the OLS and selection models exist. The coefficient on takeover is significant and negative in both the OLS and Heckman models. The interaction with employment is also significant but positive and needs to be included when assessing the effects of takeover.

Using the coefficients from the selection model for the period 2004-07, the total effect of takeovers on employment can be estimated by differentiating model 6 (the estimated equation) by takeovers (T);

$$\frac{\Delta(\ln Y_{t+n} - \ln Y_{t-1})}{\Delta T_t} = -0.0802859 + 0.0008777*\text{employment} + 0*\ln(\text{RLP}) + 0*\text{location}$$

At the sample averages, the effect is -0.076. This suggests that for the average SME, takeover results in a fall in employment of around 8 percent. This effect reduces for larger SMEs. For example, it is only around 4 percent for firms with 50 employees. The takeover effect on employment is positive once firms are around 90 employees.

The other findings from the selection performance model relating to size, age, productivity and location are consistent with the OLS model[141]. The location variables are significant and suggest SMEs in the periphery and mid-periphery (proportionately) increase employment more than those located in the core. This evidence, along with that of the overall productivity performance of SMEs outside of the core suggest that labour productivity decreases in the periphery (relative to the core) perhaps due to the relative change in employment between locations.

[141] Relative productivity (RLP) is positive and significant. This suggests relatively productive firms increase employment proportionately more. The (employment) size coefficient is negative and significant. This suggests that larger SMEs add proportionately fewer employees relative to smaller firms.

Below the outcome estimates of the ML selection model are the estimates of survival for the period 2004 to 2007. This model is similar to the selection model for productivity of the equivalent period[142].

The results of employment performance for the period 2001 to 2007 are shown in table 9.14. Sample selection for this period is significant, as shown by the significance of rho. The coefficient on takeover in the selection model is insignificant, like in OLS. The interaction of takeover with employment is also insignificant but the one with productivity is not (significant at the 95 percent level) and is positive. The interaction of takeover with mid-periphery is significant (at the 95 percent level) and negative but the equivalent with the periphery is not significant. These interactions with takeover are also (qualitatively) consistent with the OLS model.

The total effect of takeovers on employment for small firm targets in the period 2001 to 2007 varies according to productivity. It is positive for highly productive SMEs but is negative for those that are around average or lesser productive, reducing slightly further if located in the mid-periphery.

Most of the other effects in the selection and OLS models are consistent[143]. The effect of location is the same as the previous period; SMEs in both the periphery and mid-periphery proportionately increase employment more relative to those in the core. The only qualitative difference between the selection and OLS models is age[144].

[142] The results are qualitatively the same apart from the location-productivity interactions differ in sign. However, key to this study is that the interpretation of the effect of takeovers is consistent; acquisitions reduce the probability of surviving over the period 2004-07.
[143] The initial level of productivity is positive and significant. This suggests more productive SMEs proportionately increase employment more than lesser productive firms. The effect of initial employment is negative (as described for the previous period) and the effect of age also decreases employment.
[144] With the selection model, older SMEs are more likely to increase their employment. This is the opposite of the effects in the OLS models.

The selection model's coefficients explaining whether SMEs survive over the period are not discussed as they are very similar to the productivity model for the same period[145].

The results of employment performance for the final period, 2001 to 2004, are shown in table 9.15. Sample selection is significant as shown by statistical test on rho. The takeover variable in the selection model is qualitatively consistent with the OLS estimate; significant and positive. But the location-takeover interactions are statistically insignificant. The productivity –takeover interaction is positive and significant. The employment-takeover interaction is positive in both models but statistically insignificant in the selection model. These results suggest takeovers have a positive effect on employment, increasing with the initial level of productivity. There is no size differential effect nor any location effects with takeovers.

Like the previous periods, all the effects of productivity, size and location are consistent across the selection and OLS models[146]. The location variables are significant and positive suggesting proportionately larger employment increases for SMEs located in the periphery and mid-periphery, relative to the core. Age is not consistent between the OLS and selection models[147].

Below the performance estimates are the selection coefficients. This is the same model as the one used for productivity over the same period[148].

Interpretation of the effects of SME takeovers on employment and productivity across all of the periods are discussed next.

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[145] The only differences are that the coefficient on takeovers is now more statistically significant (at 99 percent level; previously it was only at the 90 percent level), the productivity interaction with takeover is insignificant and the location-productivity interactions switch signs. All other effects are consistent. The survival estimates suggest that for takeover in 2002 increase the chances of SMEs surviving the period to 2007 but all the interactions needs to be considered and the total effect, at least larger SMEs may differ to this.

[146] The level of productivity has a significant and positive effect. Size is also significant and negative.

[147] In the selection model it is again positively related to a change in employment with each older age category has an increasingly positive coefficient. Generally the opposite is found with OLS, with age having a negative effect on employment.

[148] The results of the first part of the selection model are also similar to the productivity one for the same period. However, the productivity-location variables have switched signs. The full effects of takeovers need to be interpreted along with all of its interactions. In doing so, takeovers increase the chances of survival for the period 2001-04 but this is reduces as SMEs get larger, until around the size of 70 employees where they decrease the chances of survival.

Table 9.13 – DiD SME employment (2004-2007) regressions

Regression model	OLS (robust SE)	ML Selection model (robust SE)
Dependent variable	**$lnEmp_{07}$-$lnEmp_{04}$**	
$Takeover_{05}$	-0.033**	-0.080***
$Ln(RLP)_{04}$	0.090***	0.099***
$Ln(local\ unit)_{04}$	0.049***	0.066***
$Employment_{04}$	-0.003***	-0.003***
$Takeover_{05}$* $Employment_{04}$	0.001***	0.001***
Age 2 to 4	-0.022***	-0.019***
Age 5 to 9	-0.096***	-0.045***
Age 10 to 19	-0.123***	-0.026***
Age 20+ years	-0.140***	-0.019***
$Company_{04}$	0.001	-0.001
$Partnership_{04}$	-0.002**	0.005***
$Mid\text{-}periphery_{04}$	0.036***	0.045***
$Periphery_{04}$	0.046***	0.052***
Mid-periphery*$Takeover_{05}$	-0.008	-0.005
Periphery*$Takeover_{05}$	0.005	0.023
$Takeover_{05}$*ln(RLP)	0.009	0.010
Industry controls	Y	Y
N	1,327,404	1,327,404
Adj. R^2	0.05	
Selection equation	**Survive 2004-07**	
Age 2 to 4		-0.021***
Age 5 to 9		0.191***
Age 10 to 19		0.434***
Age 20+ years		0.575***
$Takeover_{05}$		-0.216***
$Employment_{04}$		0.022***
$Employment_{04}$^2		-1.14E-04***
$Takeover_{05}$*$Employment_{04}$		-0.001
$Ln(local\ unit)_{04}$^2		-0.064***
$Ln(local\ unit)_{04}$		0.101***
$Ln(RLP)_{04}$		0.078***
$Ln(RLP)_{04}$^2		-0.011***
Ln(RLP)* $Employment_{04}$		-0.001***
$Mid\text{-}periphery_{04}$		0.043***
$Periphery_{04}$		0.023***
Mid-periphery*$Takeover_{05}$		-0.056*
Periphery*$Takeover_{05}$		0.023
$Takeover_{05}$* $Ln(RLP)_{04}$		0.017
Mid-periphery*Ln(RLP)		-0.011***
Periphery*Ln(RLP)		-0.018***
Industry controls		Y
N		1,897,288
ρ		0.621***

Legend: * p<0.1; ** p<0.05; *** p<0.01
Source: ONS, author's own calculations

Table 9.14 - DiD SME employment (2001-2007) regressions

Regression model	OLS (robust SE)	ML selection model (robust SE)
Dependent variable	**$LnEmp_{07}$-$lnEmp_{01}$**	
$Takeover_{02}$	0.030	0.036
$Ln(RLP)_{01}$	0.162***	0.189***
$Ln(local\ unit)_{01}$	0.038***	0.087***
$Employment_{01}$	-0.004***	-0.004***
$Takeover_{02}$*$Employment_{01}$	0.001	-0.001
Age 2 to 4	-0.085***	-0.046***
Age 5 to 9	-0.181***	-0.035***
Age 10 to 19	-0.206***	0.042***
Age 20+ years	-0.274***	0.018***
$Company_{01}$	0.062***	0.048***
$Partnership_{01}$	-0.015***	-0.003*
$Mid\text{-}periphery_{01}$	0.054***	0.076***
$Periphery_{01}$	0.068***	0.082***
Mid-periphery*Takeover	-0.076**	-0.069**
Periphery*Takeover	-0.038	-0.023
Takeover*ln(RLP)	0.046***	0.030**
Industry controls	Y	Y
N	972,791	972,791
Adj. R^2	0.09	
Selection equation	**Survive 2001-07**	
Age 2 to 4		0.063***
Age 5 to 9		0.309***
Age 10 to 19		0.586***
Age 20+ years		0.684***
$Takeover_{02}$		0.075***
$Employment_{01}$		0.021***
$Employment_{01}$^2		-1.1E-04***
$Takeover_{02}$*$Employment_{01}$		-0.003***
Ln(local unit)^2		-0.058***
$Ln(local\ unit)_{01}$		0.130***
$Ln(RLP)_{01}$		0.101***
Ln(RLP)^2		-0.017***
Ln(RLP)*$Employment_{01}$		-0.001***
$Mid\text{-}periphery_{01}$		0.052***
$Periphery_{01}$		0.025***
Mid-periphery*Takeover		-0.005
Periphery*Takeover		-0.028
Takeover*Ln(RLP)		-0.004
Mid-periphery*Ln(RLP)		-0.009***
Periphery*Ln(RLP)		-0.013***
Industry controls		Y
N		1,832,969
ρ		0.737***

Legend: * p<0.1; ** p<0.05; *** p<0.01
Source: ONS, author's own calculations

Table 9.15 – DiD SME employment (2001-2004) regressions

Regression model	OLS (robust SE)	ML Selection model (robust SE)
Dependent variable	**$lnEmp_{04}$-$lnEmp_{01}$**	
$Takeover_{02}$	0.037**	0.062***
$Ln(RLP)_{01}$	0.128***	0.146***
$Ln(local\ unit)_{01}$	0.059***	0.088***
$Employment_{01}$	-0.004***	-0.004***
$Takeover_{02}$*$Employment_{01}$	0.001**	9.5E-05
Age 2 to 4	-0.041***	-0.024***
Age 5 to 9	-0.093***	-0.013***
Age 10 to 19	-0.095***	0.038***
Age 20+ years	-0.137***	0.017***
$Company_{01}$	0.078***	0.071***
$Partnership_{01}$	-0.008***	-0.001
$Mid\text{-}periphery_{01}$	0.029***	0.042***
$Periphery_{01}$	0.037***	0.044***
Mid-periphery*Takeover	-0.037	-0.036
Periphery*Takeover	-0.025	-0.025
Takeover*ln(RLP)	0.040***	0.031***
Industry controls	Y	Y
N	1,250,712	1,250,712
Adj. R^2	0.08	
Selection equation	**Survive 2001-04**	
Age 2 to 4		0.026***
Age 5 to 9		0.284***
Age 10 to 19		0.556***
Age 20+ years		0.638***
$Takeover_{02}$		0.170***
$Employment_{01}$		0.023***
$Employment_{01}$^2		-1.2E-04***
$Takeover_{02}$*$Employment_{01}$		-0.002***
Ln(local unit)^2		-0.040***
$Ln(local\ unit)_{01}$		0.058***
$Ln(RLP)_{01}$		0.113***
Ln(RLP)^2		-0.017***
Ln(RLP)*$Employment_{01}$		-0.002***
$Mid\text{-}periphery_{01}$		0.057***
$Periphery_{01}$		0.017***
Mid-periphery*Takeover		-0.011
Periphery*Takeover		-0.104**
Takeover*Ln(RLP)		0.006
Mid-periphery*Ln(RLP)		-0.005**
Periphery*Ln(RLP)		-0.010***
Industry controls		Y
N		1,832,969
ρ		0.644***

Legend: * p<0.1; ** p<0.05; *** p<0.01
N.B. constants removed
Source: ONS, author's own calculations

9.7 Discussion of SME performance results

The total effect of SME acquisitions on employment and productivity can be summarised across the three time periods by differentiating equation 6 by takeover (T);

$$\frac{\Delta(\ln Y_{t+n} - \ln Y_{t-1})}{\Delta T_t} = K + \gamma_9 \text{Location}_{t-1} + \gamma_{10} \ln(\text{RLP}_{t-1}) + \gamma_{11} \text{Employment}_{t-1} \qquad (10)$$

where Y is either employment or productivity.

The takeover effect includes the exit element if the coefficients are from the selection model. The selection models presented in the previous section show the effect on performance is affected by the takeover coefficient (K) and the interactions of takeover with the (prior) level of RLP (γ_{10}) and employment (γ_{11}). The location effect (γ_9) on post-acquisition performance (employment or productivity) is consistently insignificant[149].

The coefficients from the above results are used to graph the effects on performance (productivity and employment) by prior productivity and size (employment) in figures 9.2 and 9.3, respectively. The periods 2001 to 2004, 2001 to 2007 and 2004 to 2007 are shown in each figure[150] using the sample average for employment and productivity, respectively.

9.7.1 SME productivity performance

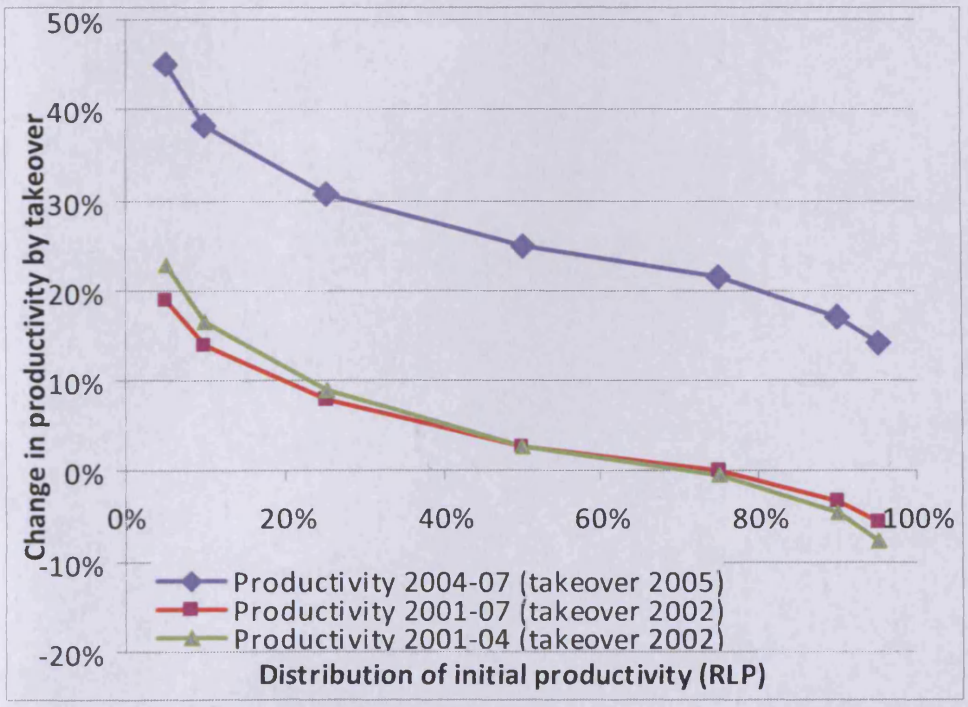
The first chart suggests that generally takeovers increase productivity. The effect of takeovers on productivity is positive for most firms, decreasing in effect as SMEs are (initially) more productive and only turning negative at the top end of productivity in the periods 2001 to 2004 and 2001 to 2007 (takeover measured in 2002 for both periods) when using the average size.

[149] The takeover mid-periphery interaction is significantly difference from zero (relative to the core) for employment performance in the period 2001-07, this in not included here.
[150] The figures use the estimates from the ML selection model (with robust errors).

The positive effect of takeovers on productivity is perhaps caused by synergies or acquirers providing new firms with resources (like finance) to be able to improve their performance, at least for the lesser productive firms. Whereas the result for highly productive firms is consistent with 'intrapreneurship' hunting by acquirers and the acquired firms losing what ultimately made them a high performer.

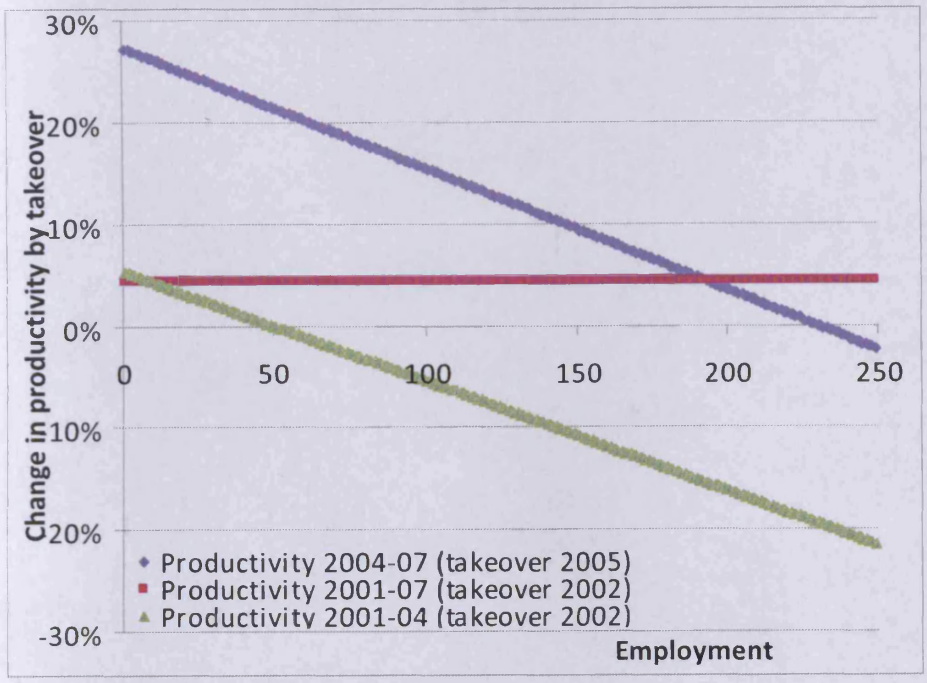
In the period 2004 to 2007, takeovers (in 2005) have a positive impact on all small businesses, when the average size is used. However, the next chart (figure 9.2) shows that size may have a negative relationship with the effect of takeovers on SME productivity. Larger SMEs are more likely to experience much smaller changes in productivity post-acquisition (consistent with the period 2001 to 2004), perhaps even turning negative for the largest. However, over the longer period (2001 to 2007) with takeovers measured in 2002, there is no size variation of the takeover effect on productivity. Acquisitions have a constant positive effect on productivity across the size distribution for that period (when using average productivity at the average value).

Figure 9.2 – Effect of SME takeovers on productivity by prior productivity



Source: ONS, author's own calculations
NB Size taken at the sample average (5.2)

Figure 9.3 – Effect of SME takeovers on productivity by size



Source: ONS, author's own calculations
NB Productivity taken at the sample average

The evidence relating to size and productivity variation suggests that small business takeovers are beneficial to most firms in terms productivity except in some instances for the largest and most productive SMEs. Only the very top performers or relatively larger SMEs may suffer in their productivity after acquisition.

The magnitude of the (positive) effect of takeover on productivity also varies across the periods. At the median value of RLP, takeovers increases productivity by around 25 percent in 2004 to 2007 (at the size average) with takeover in 2005 but only around 3 percent for both of the periods 2001 to 2004 and 2001 to 2007, when takeovers are measured in 2002.

9.7.2 SME employment performance

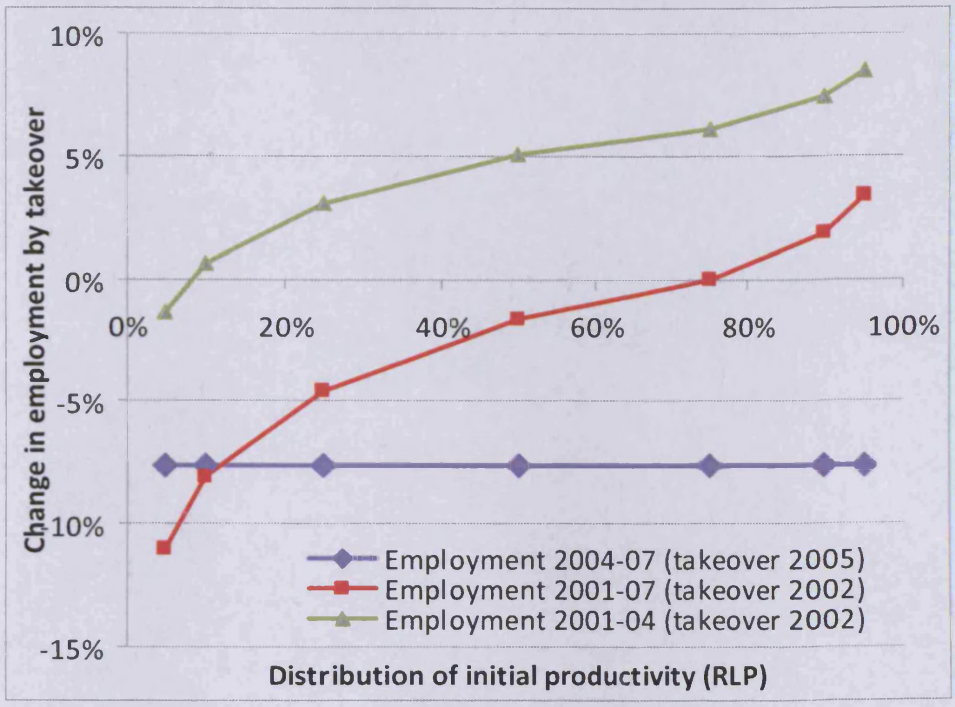
The effects of takeovers on employment are shown in figure 9.4 over the distribution of productivity. All of the periods indicate that takeovers of the least productive SMEs may result in a fall in employment. However, the results appear to vary according to the period.

For the period 2004 to 2007 with takeover measured in 2005, figure 9.4 shows the takeover effect on employment across the productivity distribution and it is consistent at around -7.5 percent. For the other two periods (2001 to 2004 and 2001 to 2007)[151] with takeovers measured in 2002, higher productivity results in less negative falls in employment post-acquisition, with increases in employment for SMEs at the upper end of productivity in the longer period (2001 to 2007). Increases in employment from takeover are exhibited across most instances of productivity in the period 2001 to 2004, with only the very least productive showing falls in employment post-acquisition.

The effect of takeovers on employment only alters according to the size of the firm before it was acquired in the period 2004 to 2007 (see figure 9.5). In this period, the effect is negative for the smallest but becomes more positive as the SME size increases. At around 100 employees (using the average level of productivity) the acquisition effect becomes positive on employment. For the two other periods, the size of the firm has no effect on the takeover-employment relationship. However, it is positive (at around 5 percent) for the period 2001-04 but negative (at around 2.5 percent) for the period 2001-07.

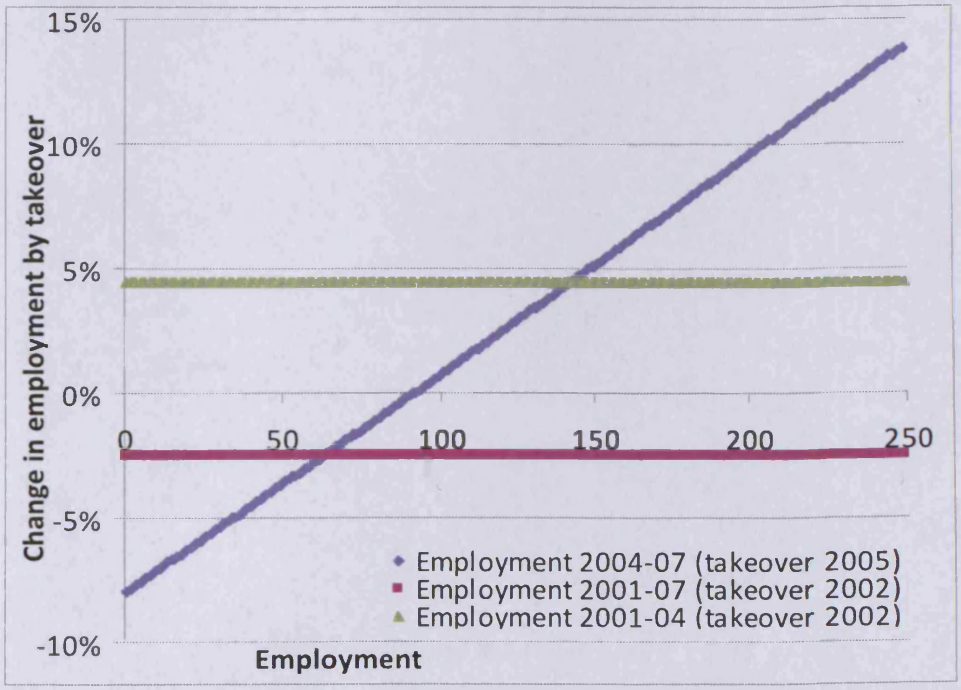
[151] Although I use three time periods, only two takeover years are used, 2002 and 2005. For the periods 2001 to 2004 and 2001 to 2007 it is only the after acquisition period that varies. Therefore there are only 2 independent time periods, as 2001 to 2007 is an extension of the period 2001 to 2004.

Figure 9.4 – Effect of SME takeovers on employment by prior productivity



Source: ONS, author's own calculations
NB Size taken at the sample average (5.2)

Figure 9.5 – Effect of SME takeovers on employment by size



Source: ONS, author's own calculations
NB Productivity taken at the sample average

The effect of takeovers varies depending on the period. The differences between the periods 2001 to 2004 or 2007 and 2004 to 2007 is perhaps indicative of the differing effects takeovers have in the years 2005 and 2002. This is perhaps caused by different trends in the stock market between the periods. When the stock market is increasing (2004 to 2007), takeovers increase subsequent labour productivity for all but the larger or most productive SMEs. A rising stock market may provide acquirers with more resources to invest in acquired SMEs, helping to improve the performance of most acquired small firms. Some of these gains in productivity may come about from the potential falls in employment that is caused by takeover (capital deepening). This is consistent with the lower to negative changes in productivity for the largest SMEs, as it is only these firms during this period that exhibit acquisitions that result in a rise in employment.

During a downturn in the stock market (2001 to 2004), acquirers may not be valued as highly and therefore be limited in their resources that they can obtain to invest in acquisitions. They are perhaps more likely to drain the acquired or under-invest in it; reducing its performance. Hence takeovers in 2002, used in the period 2001 to 2004 and 2001 to 2007, have a smaller positive effect on productivity and a negative effect for the more productive or relatively larger SMEs. However, takeovers also result in an increase in employment (on average) during this period. Therefore this additional employment (the opposite to capital deepening), perhaps due to takeover, may also help to explain the smaller increases (or even falls in some cases) of productivity due to takeovers in this period.

9.8 Conclusion

Takeovers have significant effects on SME performance, even when the effect of exits or sample attrition is allowed for. Takeovers boost the productivity of small firm targets, except for the most productive or relatively larger SMEs, during a period of a rising stock market. However, during the same period, acquisitions may reduce small acquired firm's employment, perhaps causing this rise in productivity. This is consistent with takeovers resulting in capital deepening, perhaps now possible from the injection of resources from the acquirer.

During a falling market, takeovers may also increase the productivity of targets but reduce it for larger SMEs or those with relatively high productivity. However, during this period, takeovers also proportionately increase SME employment by around 4 percent (on average) - even more so if they have higher initial productivity. The effects on productivity are broadly consistent with the existing evidence for larger, less productive firms and the Q-theory of mergers; takeover improves productivity after acquisition.

Across all periods, after acquisition, takeovers do not raise labour productivity for the most productive and largest SMEs. This is consistent with acquirers renewing their vitality by absorbing the ideas and entrepreneurship of these high performing firms.

Location has no significant influence on the impact of takeovers on either productivity or employment but it does affect performance more generally. The performance of SMEs, not just related to takeovers, in the periphery is stronger than those in the core location in terms of adding employment. However, the reverse is true for labour productivity. The productivity findings are consistent with SMEs in the periphery adding, and using, more employment to their production functions relative to those in the core. The larger employment increase in the periphery (including Wales) is consistent with aggregate employment statistics for the wider economy (ONS 2009a; WAG 2007)[152]. Over time, increases in SME employment in the periphery, relative to the core, may contribute to the relatively low labour productivity of firms in more peripheral locations.

The empirical work presented so far has showed that SMEs are more likely to be acquired if they are relatively more productive. Other findings in this thesis also suggest that they result in a significantly increased chance of exit across all locations but especially in the core. For those that survive, on average, they result in an increase in (labour) productivity for the acquired across all regional locations. The next chapter combines the results that acquired small firms have a higher chance of exit and that

[152] This is consistent with the findings of Hatton and Tani (2005) that find employment migration from more core locations as an impact of immigrants. If immigrants are not suitably measured in official statistics, this may account for employment increasing more in the periphery in both aggregate and (official) business data.

takeovers affect performance, to estimate the total effect on productivity of SME takeovers from targeted firms.

Chapter 10 - The Aggregate Effect on Regional Productivity from Acquired SMEs

10.1 Introduction

The aim of this thesis is to investigate the effects of SME acquisitions on regional productivity. The last three chapters have established that SMEs are on average, more likely to be more productive and the target firms are more likely to be located in the core region. Acquired small firms also have an increased likelihood of exiting in subsequent periods and that takeovers improve (labour) productivity for those that survive across all locations. It has not been possible to estimate the effects acquisitions have on acquirers, so I can only estimate the effect on regional productivity that occurs from the targets – acquired SMEs.

The remaining empirical components of the thesis estimate the total effect on aggregate productivity from the targets of SME takeovers in Great Britain and the core and periphery regions. This allows me to answer the question whether SME takeovers, or at least the effects on the acquired, benefit or reduce regional productivity.

10.2 Methodology

10.2.1 The effect of SME takeovers on performance in aggregate

The aggregate impact from the targets of SME takeovers on productivity depends upon the marginal effect of takeovers on productivity (Δ ln(Prod) / ΔT) and the probability of a firm being acquired Pr(T). If either of these vary by firm size, then it is not appropriate to multiply the average effect by the number of firms to obtain the aggregate result. The simple approach of ignoring size effects assumes the smallest SMEs have the same contribution to aggregate productivity as an SME with 249 employees. If both the chances of takeover and its impact vary by size, then using the average figures ignores the possibility that large acquired SMEs may disproportionately influence the total impact. To overcome this, it is possible to also weight each firm according to their employment share.

Equation 1 posits that the productivity performance (prod) of firm i is affected by takeover (T), an interaction of takeover and employment (T.E) and some other unspecified factors (Z)[153];

$$\ln(Prod_{it+j}) = a_1 T_{i\,t} + a_2 T_{i\,t}.E_{i\,t-j} + a_3 Z_{i\,t-j} + u_i \qquad (1)$$

If size (employment) does not influence the productivity impact of takeover, larger acquired SMEs subsequently increase productivity by the same proportion[154] as small firms, then $a_2 = 0$. In this scenario, the average effect (a_1) is relevant to all SMEs and so may be multiplied by the average productivity change of firms taken over and the number of firms acquired to obtain the aggregate effect. It does not matter that larger SMEs taken over contribute more to aggregate productivity, as the proportionate effect of takeovers is the same as the smallest businesses.

If there is a size effect of takeovers for SMEs; $a_2 \neq 0$, then a_1 will reflect the size invariant effect of takeovers but will not capture the full effect of takeovers on productivity. This is;

$$\Delta \ln(Prod) / \Delta T = a_1 + a_2 E_{it}$$

To obtain the total impact, the marginal effect of takeovers on performance ($\Delta\ln(Prod) / \Delta T$) is estimated for every SME, providing a predicted effect that acquisition would have on its performance. Then, both the chances of takeover and its effect need to be weighted to reflect the fact that larger SMEs contribute more to the economy. In short, the aggregate effect from the targets of SME takeovers on performance is the individual firm's chances of takeover multiplied by the productivity impact of takeovers, times the firm's weight (W) or contribution to aggregate productivity within the SME sector, summed across all firms;

$$\sum_{i=1}^{n} Pr(T_t)_i .(\Delta \ln(Prod) / \Delta T)_{it+j} .W_{it-j} \qquad (2)$$

[153] The actual equation in chapter 9 includes interactions with productivity and location but these are ignored here to simplify the exposition. As the productivity-takeover interaction is significant, this is included in the estimation to obtain the performance effect of takeovers.

[154] Note that this is not the amount with use of the levels but a proportionate effect as the method to estimate the performance effect uses difference-in-differences.

where $Pr(T)_i$ is the probability of takeover for each SME;

$(\Delta \ln(Prod) / \Delta T)_{it+j}$ is the individual effect that takeovers have on performance (here logarithm of productivity). This is found from equation 1;

W_{it-j} is the weight of each firm and is the SMEs' share of total employment[155] from the entire sample;

$E_i / \sum E_i$

10.2.2 The Effect of SME Takeover-Exits

The aggregate effect of SME exits caused by takeover depends upon the probability of takeover and the marginal effect of takeovers on the probability of exit. As with the impact of takeover on performance, if size affects the probability of takeover or the takeover-exit effect then it is not possible to estimate the aggregate effect using the sample means. Larger acquired SMEs have a greater impact on the aggregate than the average and the total effect must reflect their greater importance.

The probability of takeover is the same as above. The effect of takeovers on exit can be calculated using equation 3. This is analogous to performance above; the inclusion of takeover-size interactions can capture any possible size-varying effects[156];

$$Pr(X_{it+j}) = \beta_1 T_{it} + \beta_2 T_{it}.E_{it-j} + \beta_3 Z_{it-j} + v_i \qquad (3)$$

$$\Delta X / \Delta T = \beta_1 + \beta_2.E_{it-j}$$

Therefore the marginal effect of takeovers on the probability of exit should include $\beta_2.E_{it-j}$ if it varies by firm size ($\beta_2 \neq 0$). This marginal effect $(\Delta X / \Delta T)_i$ will be positive (negative) if takeovers increase (decrease) the chances of exit. This differentiates it from the probability of exit and (or given) takeover as, by its nature, this latter value can only be positive as it is a probability. However, I need to be able to factor the

[155] See appendix for an explanation on why employment, and not output weights, are most suitable.
[156] The actual equation in chapter 8 includes interactions with productivity and location but these are ignored here to simplify the exposition. These are included when estimating the actual value.

effect of takeovers either increasing or decreasing the chances of exit and not just capture the overall probability of exit with takeover.

The marginal effect of takeover on exit also depends on the productivity of firms relative to the (weighted) average level. If takeovers increase the chances of exit but they involve firms that are less productive than the average level, then their departure boosts the overall level of productivity. Therefore a measure of the impact of SME closures consequent upon takeover needs to include their productivity relative to the (weighted) average level of productivity.

In summary, the effect of takeover-exits on aggregate productivity depends on a probability of takeover, but also how this affects the probability of exit, the SME's differential productivity and its share of employment. These effects need to be summed across all firms, as shown below;

$$\sum_{i=1}^{n} Pr(T)_{it} .(\Delta X / \Delta T)_{i\,t+j} .((Prod_{i\,t-j} - \overline{Prod}_{t-j}) / \overline{Prod}_{t-j}).W_{i\,t-j} \qquad (4)$$

Where $Pr(T)_{it}$ is the same as equation 2 and is the probability of takeover;
$(\Delta X / \Delta T)_i$ is the marginal effect of takeover on exit for each firm;
$\overline{Prod}_{t-j}$ is the (weighted) average of productivity across all firms at time t-j and;
The firm's productivity relative to the aggregate level is captured in the third term of equation 4.

10.2.3 The total effect from the targets of SME acquisitions on aggregate productivity

The total effect (from targets) includes the impact on performance and also the influence on the probability of closure[157]. The impact of exits (equation 4) is subtracted from any performance effect (equation 2) of takeovers to get the aggregate effect;

[157] The takeover-relocation effects are ignored here as they are found to be very small – see chapter 8.

$$\sum_{i=1}^{n} [(Pr(T)_{it} . (\Delta \ln(Prod) / \Delta T)_{it+j} . W_{it-j}) -$$

$$(Pr(T)_{it} . (\Delta X / \Delta T)_{it+j} . ((Prod_{it-j} - \overline{Prod}_{t-j}) / \overline{Prod}_{t-j}) . W_{it-j})] \quad (5)$$

For simplicity, any indirect effect that may occur from a firm altering its weight after takeover is not measured here. Firms with increasing productivity may also expand and obtain a greater share from less productive enterprises or from those that ultimately fail. There are two possible indirect effects from a change in share. Takeovers might make SMEs larger by adding employment (but alternatively they may shed jobs) and more productive SMEs are likely to increase their market share (but again, takeovers can be mismanaged and market share lost).

The first effect I can test for in the period used for this analysis. Takeovers have a varying effect on a firm size (employment) in the period 2004 to 2007, depending on the SME's prior employment. Therefore it is likely that takeover may change the relative weight of the firm but it is not clear which direction this might be. Therefore this dynamic is not included. Regarding the second effect, any positive (negative) changes to productivity are likely to result in an increased (decreased) market share. There is a trade-off between allowing the full effects of takeovers to work through and the increasing difficulty with the elapse of time of isolating these impacts. I have chosen to measure performance two years (2007) after takeover (2005) so that fewer extraneous factors can affect performance and the effect of takeovers is less likely to be confounded. Essentially the index used is base weighted (Laspeyres), and if the market works well, this method may understate the impact of takeovers.

The above methodology and the data do not allow for the effects of SME acquisitions to include those that may occur to the acquirers. It is therefore only possible to estimate a total effect on aggregate productivity that comes from the targets only. The engagement of firms as acquirers in the market for corporate control should be to try and increase the profits of their own firm, increasing productivity. Despite the controversy that still exists in the empirical literature on this issue, if a positive effect is assumed then any positive effect from the acquired is likely to be enhanced from the impact on acquirers. However, as it is not possible to tell where the acquirer operates (e.g. core or periphery) and what the relative magnitude is, it is not possible

to estimates whether in total SME acquisitions (including the effects from acquirers) increase or ameliorate the core-periphery productivity gap. However, it is possible to say whether the impact on regional productivity from the targets of SME acquisitions affect regional productivity and the core-periphery productivity gap.

10.3 Results

10.3.1 Total effect on aggregate productivity from the targets of SME takeovers

To quantify the total effect of takeovers from acquired firms, equation 5 is estimated on the 2004 sample, with performance measured over the period 2004 to 2007 and takeovers in 2005. I only look at productivity performance as it is the main performance variable of interest to measure the effects on regional productivity. Exits are also measured over the period 2004 to 2007[158]. To reduce any bias caused by errors in using a predicted probability of takeover, such as one from the models used in chapter 7, the calculations assume each firm that is observed to have been acquired had a probability of takeover of 1 and others a probability of zero. The results of this are shown in table 10.1

The two effects are shown: performance and exit, and the difference of this are the total effects. This is computed for Great Britain and the three locations: the core, mid-periphery and periphery.

The results for Great Britain show that the effects from the targets of SME acquisitions have a positive effect on aggregate SME productivity. The effect of takeovers on performance increases productivity over the period 2004 to 2007 by 0.36 percent. The effect of takeover on exits is to decrease productivity by 0.09 percent. The resulting total effect for Great Britain is that takeovers increase aggregate SME productivity by 0.27 percent. The aggregate effect of takeovers is also positive for each of the three locations. The takeover-growth effect is largest for the core and smallest for the periphery; increasing productivity there by 0.25 percent.

[158] This is one year later than those shown in chapter 8 (2004-6) but is consistent with the selection results from the Heckman equations shown in chapter 9. This difference of one year makes very little difference to the resulting estimates but allows the estimates to be across consistent years.

Despite the marginal effect of takeovers being largest for SMEs in the core (see chapter 8), the exit effect is largest (more negative) in absolute terms for firms in the mid-periphery (0.115 percent) and smallest (less negative) in absolute terms for the periphery (0.054 percent). This is because the aggregate takeover-exit effect on productivity also depends on the productivity of the firm relative to the location's (weighted) average (see equation 4).

The aggregate total effect on productivity from the targets of SME acquisitions in the core is greater than that of the periphery and mid-periphery. This indicates that despite takeovers improving aggregate productivity in all of these locations, the market reallocation of resources from the effects on acquired SMEs contributes to the productivity gap between the core and periphery.

This difference is likely to be driven by the number of SME acquisitions that occur in each location. The performance effect, positive for all locations, is the dominating effect in aggregate but the result of takeovers on SME productivity is the same across all locations (see chapter 9). Therefore the performance effect in aggregate varies across locations due to the percentage of takeovers in a given location. More acquisitions in a given region will increase the aggregate performance effect and therefore increase the total aggregate impact.

Table 10.1 – Effect on aggregate SME productivity 2004-7 from the targets of small firm acquisitions

Location	Aggregate SME takeover-performance effect	Aggregate SME takeover-exit effect	Total aggregate productivity Effect from the targets of SME takeovers
Periphery	+0.304%	-0.054%	+0.250%
Mid-periphery	+0.332%	-0.115%	+0.217%
Core	+0.419%	-0.061%	+0.357%
Great Britain	+0.356%	-0.089%	+0.267%

Source: ONS, author's own calculations

10.3.2 Total effect on aggregate productivity from the targets of SME takeovers – bivariate probit results

The above estimation assumed that exits and takeovers are independent. However, the bivariate probit estimation of these two variables in chapter 8 shows that their errors are correlated (and statistically significant) and so perhaps it is more appropriate to

use the results from the bivariate probit model instead of the separate probit for exit[159]. This will only affect the exit component shown, as it does not affect the performance part of the estimate[160].

Consistent with the standard exit probit estimate results, all locations benefit in aggregate productivity from the targets of SME takeovers. The relative ranking across the regions is also consistent as before, with the core benefiting the most (increasing productivity by 0.341 percent). The exit effects are slightly larger and this results in the slightly smaller total effect with the bivariate probit method[161]. The total effect for Great Britain is now estimated to increase productivity by 0.257 percent (instead of 0.267 percent).

Table 10.2 – Effect on aggregate SME productivity 2004-7 from the targets of small firm acquisitions: bivariate probit method

Location	Aggregate SME takeover-performance effect	Aggregate SME takeover-exit effect	Total aggregate productivity Effect from the targets of SME takeovers
Periphery	+0.304%	-0.056%	+0.248%
Mid-periphery	+0.332%	-0.121%	+0.211%
Core	+0.419%	-0.078%	+0.341%
Great Britain	+0.356%	-0.099%	+0.257%

Source: ONS, author's own calculations

10.3.2 Total economy effect on aggregate productivity from the targets of SME takeovers

Using the results above, it is possible to apply a weighting factor based on SME employment share to make the results applicable to the entire (private) sector economy.

[159] Consistent with above, the exit effects with the bivariate probit model are estimated over the period 2004-7. The results of this differ very little to those presented in chapter 8 where the time period was 2004-6.

[160] In the case of the case of the bivariate probit model, it is possible to compute the probability of exit given takeover; $Pr(X_{t+j}| T_t)_i$ instead of using the marginal probability of exit from takeover ($\Delta X / \Delta T_{it+j}$). However, for the method adopted here, the conditional probabilities are not needed but the marginal. The conditional probabilities do not provide information on whether a takeover increases the likelihood of exit or not. The marginal probability does exactly this.

[161] The aggregate effect of takeovers has not been repeated for just non-micro SMEs as this would make the calculations unnecessarily complex as a significant proportion of SME takeovers and its employment would have been omitted.

Using the Small Business Service statistics (BIS 2006) on firms with employees between 1 and 249[162] from 2005[163], SME weights can be applied to the results on aggregate SME productivity for each location. This is shown in table 10.3. The economy wide effect from the targets of SME takeovers for Great Britain is estimated to increase productivity by 0.109 percent. Again the core has the largest effect, despite having the smallest SME share of employment. The effects on acquired SMEs here increase aggregate productivity by 0.127 percent. The next largest is the periphery, increasing productivity by 0.116 percent. For the mid-periphery, the effect increases aggregate productivity, economy wide, by 0.093 percent.

Therefore, even allowing for the relative importance of SMEs within each location's economy, small firm takeovers in the periphery help to advance productivity growth, as it does in all regions. However, the core benefits the most and so its relative productivity advantage is maintained and strengthened by SME takeovers, at least from their effects on the targets of such acquisitions. The contribution to the regional productivity gap is (0.127-0.116 =) 0.011 percentage points, albeit a small part.

The mid-periphery experiences a smaller boost to the economy from takeovers in 2005 (0.093 percent) than either the core or periphery. This lesser effect is primarily caused by the greater (weighted) takeover-exit effect there, perhaps in part due to its proximity to the core. Proximity may make external takeovers from larger firms based in the core more likely in the mid-periphery if information attenuates with distance. If so, the rate of moving the acquired assets to the core, deregistering target firms in the process, at least for a few larger SMEs (that matter substantially because the takeover-exit effect is weighted by employment).

[162] This ignores firms that do not have any employment, which is more consistent with the sample used in the analysis.
[163] Data for 2004 is not available at the regional level.

Table 10.3 – Economy wide effect on aggregate productivity 2004-7 from the targets of small firm acquisitions

Location	SME share of private sector employment	Economy wide effect on productivity
Periphery	46.9%	0.116%
Mid-periphery	44.1%	0.093%
Core	37.3%	0.127%
Great Britain	42.5%	0.109%

Source: ONS, author's own calculations
NB Use of the bivariate probit estimates

The most plausible explanations for the different experiences of core and periphery, suggested by NEG, must be related to the wealth and density of the two areas. Density of population and business in the core may mean greater competition, agglomeration economies or both, helping information to flow about possible targets and triggering more takeover activity – the likely cause for the differential aggregate effects. The greater wealth could provide more significant profit opportunities or capital - if information flows attenuate with distance - both of which would motivate acquisitions.

10.3.3 The aggregate effects of SME takeovers over time

The positive effect from the targets of SME takeovers is driven by their impacts on performance. This effect was relatively consistent across the periods I have previously estimated (2001 to 2002 and 2001 to 2007) – see chapter 9. For most SMEs, takeovers results in a positive change to productivity. However, the results for the other periods suggest that the performance effect might be lower in the other periods, perhaps due to the different phases of the stock market. This also suggests that the aggregate effect for the other time periods might be lower than the one estimated above. However, there is no evidence to suggest that the ranking or relative magnitudes between regions and locations will change. The core will still have a higher effect and this is primarily driven by the greater percentage of takeovers there, regardless of the year or phase of the stock market. This time invariance is also likely to be true for the effect of exits. The takeover-location variables in the exit estimations[164] do not indicate that acquisitions in regions outside of the core have a higher chance of exit across any of

[164] These are done in the Heckman selection models and actually report on the chances of survival – the inverse case. These results to this can be found in chapter 9.

the periods. Therefore the scale of the aggregate effect from the targets of SME acquisitions may change between different time periods but the location ranking will not.

10.4 Conclusions

The impact of SME acquisitions on regional economies, ignoring any consequences for the acquiring firm, depends on their incidence and their subsequent effect in terms of performance and relative chances of exit on those firms that have been acquired. For takeover-exits, the firm's productivity relative to the regional (weighted) average is also important. Factoring in all these effects, the total effect from the targets of SME takeovers on aggregate productivity is positive for all locations. Once the relative size of the SME sector is considered, the economy wide effect of small firm acquisitions in 2005 is that they add 0.109 percent to aggregate productivity for Great Britain.

Despite being positive, the aggregate effect of SME acquisitions varies by location and it is highest for the core. This is driven by the higher rate of takeovers there. In turn more frequent acquisition is likely to be caused by the greater intensity of competition and agglomeration economies in the core, creating more opportunities and information on possible targets. Therefore the effects from targets of SME acquisitions widen the gap of productivity between the core and periphery, not taking into account any possible gains to the acquiring firm. However, the relative gain to the core on an economy-wide basis is very small for takeovers in 2005; 0.011 percentage points of productivity. A caveat to this quantification is that it only refers to one year's experience. It is well known that there are large fluctuations in annual takeovers of publicly quoted firms and so the same may be expected of SMEs.

Regional productivity gaps may be widened by the operation of the SME takeover market and more than the reported small core-periphery productivity gain difference. The above estimates do not include the effects that acquisitions have on acquirers. The data source does not allow the acquirer to be identified and therefore its subsequent performance after acquiring an SME and its location cannot be used. Assuming rationally that on average acquisitions result in an improvement in

performance for buyers, or at least no deterioration, then if all or most acquirers are located in the core then this will be an unmeasured reason for an increasing differential. However, if acquirers are local, this will act to enhance the reported productivity effects for each location.

But the key finding that the core gains more from a process which should be common to the periphery as well, and is not dependent on the location of large firm headquarters, carries a lesson about the gap. Rather than regarding takeovers as harmful to periphery regions, policy makers should attempt to understand why takeovers are less frequent there, and should consider ways of improving the operation of this market for SMEs in these places.

Appendix

Appropriate weights

The appropriateness of employment weights with labour productivity can be shown below. There are two firms each with employment (e) and output (q).

$P = Q/E$ where $q_1+q_2 = Q$, $e_1+e_2 = E$ and $p_i = q_i/e_i$

$Q/E = p_1.(e_1/(e_1+e_2)) + p_2.(e_2/(e_1+e_2)) = (q_1/e_1).(e_1/(e_1+e_2)) + (q_2/e_2).(e_2/(e_1+e_2)) =$
$(q_1/(e_1+e_2)) + (q_2/(e_1+e_2)) = (q_1+q_2)/(e_1+e_2)$

The inappropriateness of output weights can also be shown;

$P = Q/E \neq (q_1/e_1).(q_1/(q_1+q_2)) + (q_2/e_2).(q_2/(q_1+q_2)) =$
$(1/q)((q_1^2/e_1) + (q_2^2/e_2))$

Given that output weights to productivity do not aggregate appropriately, I recommend using only employment weights when labour productivity is used.

Chapter 11 – Conclusions

A lack of data has meant the operation of SMEs has received much less attention than large, particularly manufacturing, firms. In particular, the market for SME control is almost entirely unstudied. The effects of takeovers on SMEs have never been measured, at least on the present scale, and their resulting impact on regional productivity; from exit and performance, have never before been estimated. Yet SMEs account for half of private sector output in Britain and a higher proportion of employment. In a peripheral region such as Wales, these businesses provide an even larger share of turnover and employment than they do in all other regions of Britain; there SMEs account for over three-quarters of employment (77 percent) (BIS 2006)[165].

Because the SME sector is so large, its productivity and growth are vitally important to the performance of the economy as a whole. While in most countries and regions SMEs are less productive than large firms, they are also often the source of important innovations, historically they are the origin of some large long-lived enterprises and they make up significant proportions of regional and national output and employment. This suggests they may play a critical role in creating and maintaining the productivity lag of peripheral regions, such as Wales, behind the British average and particularly core areas.

This thesis has used a new data set (BSD) of nearly all British firms that allows an unprecedentedly detailed study of SMEs in a spatial context, with particular attention to the market for SME control. Markets may operate, weakly or strongly, to offset regional disparities, or they may exacerbate them. For instance, low wage regions may attract labour-intensive firms and so increase the local demand for labour, in the (neoclassical) offsetting or 'trickle down' scenario. Or complementarities in production may mean that regions with agglomerations of human capital attract even more, and thereby increase their productivity advantage (endogenous growth and NEG).

[165] The regional contribution of output by SMEs is similarly high as employment in Wales (62 percent) (BIS 2006).

The purpose of this thesis was to examine the operation of the market for ownership of SMEs in a spatial context. For the first time, this is linked to the impact on regional productivity. In this market, larger firms may attempt to compensate for a lack of internally generated innovation by acquiring dynamic small enterprises. Contrary to the existing evidence for large firms, the new findings presented in this thesis are consistent with this hypothesis; highly productive SMEs are more likely to be taken over, even when the effects of industry, size and location are controlled. However, this effect is found to be non-linear; a j-curve relationship exists between productivity and the likelihood of takeover. Consistent with evidence for large firms, less productive small businesses have a higher chance of being acquired than more averagely productive firms. However, the highest probability of acquisition is for the most productive, generating the overall positive relationship for the likelihood of takeover with productivity.

Within the framework that is used to analyse the market for small firms, the process of compensation for lack of 'intrapreneurship' may have a spatial dimension because of readier access to finance in the 'core' regions, although there is little supporting empirical evidence. Alternatively, according to NEG models agglomeration of production in 'core' areas generates external economies and triggers more intense local competition. In the first case, large firms, typically headquartered in core regions, with better access to finance, may disproportionately buy up innovative SMEs in the periphery. In the second, more intense competition in the core may also stimulate a stronger demand for core SMEs than for those in periphery regions. Dividing the British economy into core and periphery locations according to their aggregate productivity (GVA per head, worker or per hour) the evidence presented in this thesis favours the second alternative; SMEs located outside the core are less likely to be bought out, regardless of their productivity. This is perhaps due to information problems on potential targets. If more acquirers are located in the core, then when information attenuates with distance, more acquisitions are likely to target firms there. However, the (annual) probability of small firm takeover is very small regardless of location (although the possible, cumulative, acquisition effects might not be small over the lifetime of an acquired firm).

Even if SMEs are not disproportionately taken over in the periphery, they may be subject to closure or relocation to a greater extent. Large firms may choose to exploit synergies by moving innovative assets of the acquisition to the headquarters (core) region. New evidence in this thesis relating to SMEs shows that one year after being acquired, takeovers do raise the chance of a small firm exiting by between 3 and 7 percentage points. However, the regional bias is the opposite of that originally hypothesised; the core has a higher probability by around 3 percentage points. Takeovers also increase the probability of relocation, again consistent with takeovers as a synergistic investment by the acquirer. This effect is greater for SMEs originally located in more peripheral regions relative to the core but the overall effect is very small and much lower than for exits.

Small business targets that are not closed or relocated may benefit from synergies. Larger, often publicly quoted, acquiring firms with readier access to finance, most apparently during booms when the stock market is rising, have greater opportunity to invest in their new purchases. It turns out that takeovers do indeed boost SME labour productivity, although less so for the most productive or relatively larger SMEs, during a period of a rising stock market. This latter result would be expected if acquiring firms attempted to compensate for a lack of internally generated innovation, or searched for management or other assets that they could strip out of the target SMEs. However, during the same period, acquisitions may reduce small acquired firm's employment, perhaps causing this rise in labour productivity, as resources are used more intensively to enhance productivity.

A hypothesis advanced in this thesis is that larger firms interested in buying SMEs may be less able to do so and less able to invest in them when financial conditions are not so buoyant. In these circumstances, expansion to utilise synergies would be extensive, increasing employment. In a period when the stock market fell, 2001 to 2004 in the present study, takeovers increased the productivity of targets but reduced it for larger SMEs or those with relatively high productivity. Also during this period, takeovers proportionately increased SME employment by around 4 percent (on average) and even more so if they had higher initial productivity, consistent with the hypothesis.

Overall, the effects on SME productivity from takeover are broadly consistent with the existing evidence for larger, lesser productive firms. Takeovers reallocate resources to be used more efficiently and improve the productivity of more poorly performing firms, similar to the Q-theory (and related theories) of mergers. Across all periods, after acquisition, takeovers do not raise labour productivity for the most productive and largest SMEs. This is consistent with acquirers renewing their vitality by absorbing the ideas and entrepreneurship of these high performing firms. However, location has no significant influence on the impact of takeovers on either productivity or employment. SME targets in the core and periphery perform equally well on average after takeover.

For the first time, in this thesis the aggregate productivity effect of takeovers on targeted small firms is estimated. The calculation requires the marginal effect of takeovers on productivity, the probability of a firm being acquired and the exit effect of acquisitions. The resulting (net) effect on aggregate productivity from acquired SMEs in 2005, accounting for the relative size of the SME sector, was to raise labour productivity in Great Britain by 0.109 percent over the years 2004 to 2007. Perhaps surprisingly, the impact in the core region, at 0.127 percent, was slightly larger than in the periphery (0.116 percent), but very small for all locations (for one year's worth of small firms takeovers). The higher impact for the core is the result of the higher rate of SME takeovers there.

A caveat to the quantification of this impact is that it only refers to one year's experience. It is well known that there are large fluctuations in annual takeovers of publicly quoted firms and so the same may be expected of SMEs.

Regional productivity gaps may be widened by the operation of the SME takeover market more than this small core-periphery productivity gain difference. The above estimates do not include the possible effects that acquisitions have on acquirers. The data source does not allow the acquirer to be identified and therefore its subsequent performance after acquiring an SME and its location cannot be used. Assuming rationally that acquisitions result in an improvement in performance for buyers, then if all or most acquirers are located in the core then this will be an unmeasured reason for

an increasing differential. However, if acquirers are local, this will act to enhance the reported productivity effects for each location.

Another feature not captured here is the possible effect that selling-up has on the owners of small firms. The analysis allows for the effects of the target being closed down or moved out if the entrepreneur is not a serial one. But serial entrepreneurs may create a supply of high performing, productive small firms. 'Successful' exits may provide entrepreneurs finance to enable further start-ups, as former business owners reinvest after selling-up, allowing the process to begin all over again. It is not possible to identify whether firms that are sold directly cause a start-up in the same region and the scale of serial entrepreneurship that successfully exit post-takeover is not known. The interaction of SME takeovers and their relationship with subsequent start-ups is an interesting one but is beyond the scope of this thesis. It should be noted that in any case building up a new successful enterprise takes time; successful serial entrepreneurship will not be instantaneous. In the period during which a 'successor' enterprise is becoming established, a periphery zone experiencing closures after extra-regional takeover will experience job and skills loss, even if eventually another business eventually arises.

A key finding of this thesis is that overall small firm acquisitions benefit all locations due to the effect they have on productivity performance of the acquired. Therefore rather than regarding takeovers as harmful to periphery regions, policy makers should attempt to understand why takeovers are less frequent there, and should consider ways of improving the operation of this market for SMEs in these places.

The thesis begins from a problem as perceived by policy makers (such as former MP Adam Price) not necessarily as perceived by neoclassical economists. The fact that takeovers improve performance is consistent with an absence of market failure. Takeovers are a mechanism that allows resources to be redistributed or moved - 'asset reshuffling' (Hall 1988). However, there might still be some market failure, as suggested in the literature and the analysis. The literature suggests that small firms are likely to suffer from asymmetry of information problems, a potential source of market failure in the neoclassical sense, which may affect both their access to finance and also the chances of acquisition. Focusing on the latter, potential buyers may not be

able to learn about the firm (especially young and small ones) from readily available sources of information. Acquirers may avoid private targets that have not adequately signalled the value of their resources. However, information problems may also work the other way, where profitable businesses that are keen to sell are unable to learn of suitable buyers. The results in this thesis show that SME takeovers occur less frequently in more peripheral locations. This might be because more firms, especially large ones, are more likely to be located in the core and according to NEG models, information flows may be better within core areas. In the periphery there might be fewer formal or informal networks in these areas, especially in relatively more deprived areas (Allinson et al. 2007). These can all hinder the gathering of information on potential buyers and sellers. Also, information may attenuate with distance, further hampering the rate of takeovers in the periphery, as it is likely there are fewer potential buyers locally. A degree of imperfect information may be a potential problem wherever small targets are located

Policies to facilitate SME takeovers could aim to improve formal or informal networks, or to increase information flows more generally about potential buyers and sellers, for instance with matching databases. This could help ease a possible cause of market failure that reduces the rate of takeovers, which are generally found to be positive – at least for the targets, in all locations but especially in peripheral areas.

Additionally, policies that seek to increase collaborative agreements between large and small firms may be also beneficial (Shen and Reuer 2005). First, such policies could overcome the problems of private information between buyers and sellers. Second, they may enable small firms to obtain the resources, external expertise and access specialised assets and competencies of other (larger) firms on offer to SMEs (Colombo et al. 2006). These resources may enable small businesses to improve their performance without necessarily requiring takeover. If so, peripheral region productivity would be boosted, perhaps even enabling these areas to catch-up with more productive locations.

References

Ahuja, G. and Katila, R. 2001. Technological acquisitions and the innovation performance of acquiring firms: a longitudinal study. *Strategic Management Journal* 22(3), pp. 197-220.

Akerlof, G. A. 1970. The Market for "Lemons": Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics* 84(3), pp. 488-500.

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.

Ali-Yrkko, J. et al. 2005. Does patenting increase the probability of being acquired? Evidence from cross-border and domestic acquisitions. *Applied Financial Economics* 15(14), pp. 1007-1017.

Allansdottir, A. et al. 2002. *Innovation and competitiveness in European biotechnology*. Enterprise Directorate General, European Commission.

Allinson, G. et al. 2007. *The Operation of the SME Transfer Market*. Report for BERR and UK partners.

Alvarez, S. and Barney, J. 2001. How entrepreneurial firms can benefit from alliances with large partners. *Academy of Management Executive* 15(139-148).

Armstrong, H. and Taylor, J. 2000. *Regional Economics and Policy*. 3rd ed. Blackwell Publishers.

Ashcroft, B. et al. 1994. The Regional Dimension of Takeover Activity in the United Kingdom *Scottish Journal of Political Economy* 41(2), pp. 163-175.

Ashcroft, B. and Love, J. H. 1992. External Takeovers and the Performance of Regional Companies: A predictive model. *Regional Studies* 26(2), pp. 545-553.

Ashcroft, B. and Love, J. H. 1993. *Takeovers, Mergers and the Regional Economy*. Edinburgh University Press.

Ashenfelter, O. 1978. Estimating the Effect of Training Programs on Earnings. *The Review of Economics and Statistics* 60(1), pp. 47-57.

Avery, R. B. et al. 1998. The role of personal wealth in small business finance. *Journal of Banking & Finance* 22(6-8), pp. 1019-1061.

Baldwin, R. E. and Okubo, T. 2006. Heterogeneous Firms, Agglomeration and Economic Geography: Spatial Selection and Sorting. *Journal of Economic Geography* 6(3), pp. 323–346.

Barnes, M. and Martin, R. 2002. Business Data Linking: An introduction. *Economic Trends* No. 581.

Barnes, P. 1999. Predicting UK Takeover Targets: Some Methodological Issues and an Empirical Study. *Review of Quantitative Finance and Accounting* 12(3), pp. 283-302.

Barriosa, S. et al. 2005. The dynamics of agglomeration: evidence from Ireland and Portugal. *Journal of Urban Economics* 57(1), pp. 170-188.

Barro, R. J. and Sala-i-Martin, X. 1995. *Economic Growth.* New York : McGraw-Hill.

Bates, T. 2005. Analysis of young, small firms that have closed: delineating successful from unsuccessful closures. *Journal of Business Venturing* 20(3), pp. 343-358.

Baum, C. F. 2006. *An Introduction to Modern Econometrics Using Stata.* Stata Press.

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.

Baumol, W. J. and Wolff, E. N. 1984. On Interindustry Differences in Absolute Productivity. *Journal of Political Economy* 92(6), p. 1017.

Berger, A. N. et al. 2006. *Why do borrowers pledge collateral? new empirical evidence on the role of asymmetric information.* Federal Reserve Bank of Atlanta.

Berger, A. N. and Udell, G. F. 1992. Some Evidence on the Empirical Significance of Credit Rationing. *The Journal of Political Economy* 100(5), pp. 1047-1077.

Berger, A. N. and Udell, G. F. 1995. Relationship Lending and Lines of Credit in Small Firm Finance. *The Journal of Business* 68(3), pp. 351-381.

Berger, A. N. and Udell, G. F. 1998. The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance* 22(6-8), pp. 613-673.

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.

Bertrand, O. and Zitouna, H. 2007. Domestic versus cross-border acquisitions: which impact on the target firms' performance? *Applied Economics*, pp. 1-18.

Bhattacharjee, A. et al. 2009. Macroeconomic Instability and Business Exit: Determinants of Failures and Acquisitions of UK Firms. *Economica* 76(301), pp. 108-131.

Binks, M. R. and Ennew, C. T. 1996. Growing firms and the credit constraint. *Small Business Economics* 8(1), pp. 17-25.

BIS. 2006. *SME Statistics 2005* [Online]. Available at: http://stats.berr.gov.uk/ed/sme/ [Accessed: 5th March 2008].

BIS 2008. High growth firms in the UK: Lessons from an analysis of comparative UK performance. *Economics Paper No. 3.*

BIS. 2009. *The stock of VAT registered enterprises* [Online]. Available at: http://stats.berr.gov.uk/ed/vat/VATStatsTables1a1e2007.xls [Accessed: 16th April 2009].

Böckerman, P. and Lehto, E. 2006. Geography of Domestic Mergers and Acquisitions (M&As): Evidence from Matched Firm-level Data. *Regional Studies* 40(8), pp. 847 - 860.

Boddy, M. et al. 2005. Regional Productivity Differentials: Explaining the Gap. *Discussion Papers from University of the West of England, School of Economics* No. 515.

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.

Brickley, J. A. et al. 2007. *Managerial economics and organizational architecture.* 4th ed. McGraw-Hill Irwin.

Brouwer, A. E. et al. 2004. The firm relocation decision: An empirical investigation. *The Annals of Regional Science* 38(2), pp. 335-347.

Brown, C. and Medoff, J. L. 1987. The Impact of Firm Acquisitions on Labor. *NBER Working Paper* 2273.

Burke, A. and Hanley, A. 2006. Bank Interest Margins and Business Start-Up Collateral: Testing For Convexity. *Scottish Journal of Political Economy* 53(3), pp. 319-334.

Burke, A. E. et al. 2000. When Less is More: Distinguishing Between Entrepreneurial Choice and Performance. *Oxford Bulletin of Economics and Statistics* 62(5), pp. 565-587.

Bushway, S. et al. 2007. Is the Magic Still There? The Use of the Heckman Two-Step Correction for Selection Bias in Criminology. *Journal of Quantitative Criminology* 23(2), pp. 151-178.

Cameron, A. C. and Trivedi, P. K. 2005. *Microeonometrics: methods and applications.* Cambridge University Press.

Capron, L. and Shen, J.-C. 2007. Acquisitions of private vs. public firms: Private information, target selection, and acquirer returns. *Strategic Management Journal* 28(9), pp. 891-911.

Cassiman, B. et al. 2005. The impact of M&A on the R&D process: An empirical analysis of the role of technological- and market-relatedness. *Research Policy* 34(2), pp. 195-220.

Caves, R. E. 1989. Mergers, takeovers, and economic efficiency : Foresight vs. hindsight. *International Journal of Industrial Organization* 7(1), pp. 151-174.

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.

Chaaban, J. et al. 2005. The role of technical efficiency in takeovers: Evidence from the French cheese industry, 1985-2000. *Agribusiness* 21(4), pp. 545-564.

Chapman, K. 2003. Cross-border mergers acquisitions: a review and research agenda. *Journal of Economic Geography* 3(3), pp. 309-334.

Chapman, K. and Edmond, H. 2000. Mergers/Acquisitions and Restructuring in the EU Chemical Industry: Patterns and Implications. *Regional Studies* 34(8), pp. 753 - 767.

Clarke, R. and Ioannidis, C. 1996. On the relationship between aggregate merger activity and the stock market: some further empirical evidence. *Economics Letters* 53(3), pp. 349-356.

Cloodt, M. et al. 2006. Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. *Research Policy* 35(5), pp. 642-654.

Cole, R. A. 1998. The importance of relationships to the availability of credit. *Journal of Banking & Finance* 22, pp. 959-977.

Colombo, M. G. et al. 2006. In search of complementary assets: The determinants of alliance formation of high-tech start-ups. *Research Policy* 35(8), pp. 1166-1199.

Conyon, M. J. et al. 2001. Do hostile mergers destroy jobs? *Journal of Economic Behavior & Organization* 45(4), pp. 427-440.

Conyon, M. J. et al. 2002a. The impact of mergers and acquisitions on company employment in the United Kingdom. *European Economic Review* 46(1), pp. 31-49.

Conyon, M. J. et al. 2002b. The productivity and wage effects of foreign acquisition in the United Kingdom. *Journal of Industrial Economics* 50(1), pp. 85-102.

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, pp. 284-315.

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.*

Cowling, M. 2007. *The Role of Loan Guarantee Schemes in Alleviating Credit Rationing in the UK*. University Library of Munich, Germany.

Cressy, R. 2006. Determinants of Small Firm Survival and Growth. In: Mark Casson, B.Y., Anuradha Basu, and Nigel Wadeson ed. *The Oxford Handbook of Entrepreneurship*
Oxford University Press, pp. 161-193.

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.

David, R. 2008. Business Backbone. *Institute of Welsh Affairs* Summer 2008, pp. 26-29.

Davidson, C. and Ferrett, B. 2007. Mergers in Multidimensional Competition. *Economica* 74(296), pp. 695-712.

de Meza, D. 2002. Overlending? *The Economic Journal* 112(477), pp. F17-F31.

de Meza, D. and Southey, C. 1996. The Borrower's Curse: Optimism, Finance and Entrepreneurship. *The Economic Journal* 106(435), pp. 375-386.

de Meza, D. and Webb, D. C. 1987. Too Much Investment: A Problem of Asymmetric Information. *The Quarterly Journal of Economics* 102(2), pp. 281-292.

Degryse, H. and Ongena, S. 2005. Distance, Lending Relationships, and Competition. *The Journal of Finance* 60(1), pp. 231-266.

Deneckere, R. and Davidson, C. 1985. Incentives to Form Coalitions with Bertrand Competition. *The RAND Journal of Economics* 16(4), pp. 473-486.

Dessyllas, P. and Hughes, A. 2005. *The Revealed Preferences of High Technology Acquirers: An Analysis of the Characteristics of their Targets*. Centre for Business Research, University of Cambridge

Dickerson, A. P. et al. 1997. The Impact of Acquisitions on Company Performance: Evidence from a Large Panel of UK Firms. *Oxford Economic Papers* 49(3), pp. 344-361.

Disney, R. et al. 2003. Restructuring and productivity growth in UK manufacturing. *The Economic Journal* 113(489), pp. 666-694.

Dunne, P. and Hughes, A. 1994. Age, Size, Growth and Survival: UK Companies in the 1980s. *The Journal of Industrial Economics* 42(2), pp. 115-140.

Dunne, T. et al. 2005. Exit from regional manufacturing markets: The role of entrant experience. *International Journal of Industrial Organization* 23(5-6), pp. 399-421.

Eurostat 2003. *Business Register - Recommendations Manual.* Office for Official Publications of the European Communities.

Evans, P. and Welpton, R. 2009. Business Structure Database - The Inter-Departmental Business Register (IDBR) for Research. *Economic & Labour Market Review* 3(6), pp. 71-75.

Everett, J. and Watson, J. 1998. Small Business Failure and External Risk Factors. *Small Business Economics* 11(4), pp. 371-390.

Fauli-Oller, R. 2002. Mergers between Asymmetric Firms: Profitability and Welfare. *The Manchester School* 70(1), pp. 77-87.

Figueiredo, O. et al. 2002. Home-field advantage: location decisions of Portuguese entrepreneurs. *Journal of Urban Economics* 52(2), pp. 341-361.

Findlay, R. 1978. Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model. *The Quarterly Journal of Economics* 92(1), pp. 1-16.

Foreman-Peck, J. 1995. *Smith & Nephew in the Health Care Industry.* Edward Elgar Publishing.

Foreman-Peck, J. et al. 2006. Growth and Profitability of Small and Medium sized Enterprises: Some Welsh Evidence. *Regional Studies* 40(4), pp. 307–319.

Foster, L. et al. 1998. Aggregate Productivity Growth: Lessons from Microeconomic Evidence. *NBER Working Paper No. W6803.*

Fothergill, S. and Guy, N. 1990. *Retreat from the Regions* Jessica Kingsley Publishers and Regional Studies Association.

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.

Fujita, M. and Thisse, J. F. 1996. Economics of Agglomeration. *Journal of the Japanese and International Economies* 10, pp. 339-378.

Gan, J. 2007. Collateral, debt capacity, and corporate investment: Evidence from a natural experiment. *Journal of Financial Economics* 85(3), pp. 709-734.

Garmaise, M. J. and Moskowitz, T. J. 2003. Informal Financial Networks: Theory and Evidence. *Rev. Financ. Stud.* 16(4), pp. 1007-1040.

Geroski, P. A. 1984. On the relationship between aggregate merger activity and the stock market. *European Economic Review* 25(2), pp. 223-233.

Gilbert, R. J. and Newbery, D. M. G. 1982. Preemptive Patenting and the Persistence of Monopoly. *The American Economic Review* 72(3), pp. 514-526.

Girma, S. 2005. Technology Transfer from Acquisition FDI and the Absorptive Capacity of Domestic Firms: An Empirical Investigation. *Open Economies Review* 16(2), pp. 175-187.

Girma, S. and Görg, H. 2007. Multinationals' Productivity Advantage: Scale Or Technology? *Economic Inquiry* 45(2), pp. 350-362.

Granstrand, O. and Sjolander, S. 1990. The acquisition of technology and small firms by large firms. *Journal of Economic Behavior & Organization* 13(3), pp. 367-386.

Green, M. B. and Cromley, R. G. 1982. The Horizontal Merger: Its Motives and Spatial Employment Impacts. *Economic Geography* 58(4), pp. 358-370.

Green, M. B. and Cromley, R. G. 1984. Merger and acquisition fields for large United States cities 1955-1970. *Regional Studies* 18(4), p. 291 — 301.

Green, M. R. 1990. *Mergers and acquisitions: Geographical and spatial perspectives.* Routledge.

Greene, W. H. 1996. Marginal Effects in the Bivariate Probit Model.*Working Papers.* New York University, Leonard N. Stern School of Business, Department of Economics.

Greene, W. H. 1998. Gender Economics Courses in Liberal Arts Colleges: Further Results. *Journal of Economic Education* 29(4), pp. 291-300.

Greene, W. H. 2003. *Econometric Analysis.* 5th [International] ed. Upper Saddle River, N.J.: Prentice Hall.

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.

Grimpe, C. and Hussinger, K. 2008. Pre-empting technology competition through firm acquisitions. *Economics Letters* 100(2), pp. 189-191.

Guerard, J. 1989. Mergers, stock prices, and industrial production : Further evidence. *Economics Letters* 30(2), pp. 161-164.

Gugler, K. et al. 2003. The effects of mergers: an international comparison. *International Journal of Industrial Organization* 21, pp. 625-653.

Gugler, K. and Yurtoglu, B. B. 2004. The effects of mergers on company employment in the USA and Europe. *International Journal of Industrial Organization* 22(4), pp. 481-502.

Gujarati, D. N. 2003. *Basic Econometrics*. International Edition ed. McGraw-Hill.

Hall, B. 1987. The Relationship Between Firm Size and Firm Growth in the US Manufacturing Sector. *The Journal of Industrial Economics* 35(4), pp. 583-606.

Hall, B. H. 1988. The Effect of Takeover Activity on Corporate Research and Development. In: Auerbach, A.J. ed. *Corporate Takeovers: Causes and Consequences*. UMI, pp. 69 - 100.

Hanley, A. and Zervos, V. 2007. The Performance of UK Takeovers: Does the Nationality of Acquirers Matter? *International Journal of the Economics of Business* 14(2), pp. 283–297.

Harris, R. 2002. Foreign Ownership and Productivity in the United Kingdom - Some Issues When Using the ARD Establishment Level Data. *Scottish Journal of Political Economy* 49, pp. 318-335.

Harris, R. 2006. *Labour Productivity Growth in Wales 1990-98: Evidence Based on the Annual Respondents Database (ARD) - Stage 2: Detailed Analyses* National Assembly for Wales.

Harris, R. 2008. Models of Regional Growth: Past, Present and Future.*SERC Discussion Papers*. Spatial Economics Research Centre, LSE. Also forthcoming in the Journal of Economic Surveys.

Harris, R. 2009. *The Effect of Foreign Mergers and Acquisitions on UK Productivity and Employment*.

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*.

Harris, R. and Li, Q. C. 2008. Evaluating the Contribution of Exporting to UK Productivity Growth: Some Microeconomic Evidence. *The World Economy* 31, pp. 212-235.

Harris, R. and Robinson, C. 2002. The Effect of Foreign Acquisitions on Total Factor Productivity: Plant-Level Evidence from U.K. Manufacturing, 1987-1992. *Review of Economics and Statistics* 84(3), pp. 562-568.

Harrison, J. S. et al. 1991. Synergies and Post-Acquisition Performance: Differences versus Similarities in Resource Allocations. *Journal of Management* 17(1), pp. 173-190.

Hatton, T. J. and Tani, M. 2005. Immigration and Inter-Regional Mobility in the UK, 1982-2000. *The Economic Journal* 115(507), pp. F342-F358.

Headd, B. 2003. Redefining Business Success: Distinguishing between Closure and Failure. *Small Business Economics* 21(1), pp. 51-61.

Healey, M. J. 1981. Locational Adjustment and the Characteristics of Manufacturing Plants. *Transactions of the Institute of British Geographers* 6(4), pp. 394-412.

Healey, M. J. 1982. Plant closures in multi-plant enterprises - the case of a declining industrial sector. *Regional Studies* 16(1), pp. 37-51.

Heckman, J. J. 1979. Sample Selection Bias as a Specification Error. *Econometrica* 47(1), pp. 153-161.

Heywood, J. S. and McGinty, M. 2007. Mergers among leaders and mergers among followers. *Economics Bulletin* 12(12), pp. 1-7.

Heywood, J. S. and McGinty, M. 2008. Leading and Merging: Convex Costs, Stackelberg, and the Merger Paradox. *Southern Economic Journal* 74(3), pp. 879-893.

HM Treasury 2001. Productivity in the UK: The Regional Dimension.

HMRC. 2007. *What is VATable?* [Online]. Available at: http://customs.hmrc.gov.uk/channelsPortalWebApp/downloadFile?contentID=HMCE_CL_001225 [Accessed: January 2007].

Holl, A. 2004. Start-ups and relocations: Manufacturing plant location in Portugal. *Papers in Regional Science* 83(4), pp. 649-668.

Holmes, T. J. and Schmitz, J. A., Jr. 1995. On the Turnover of Business Firms and Business Managers. *The Journal of Political Economy* 103(5), pp. 1005-1038.

Holmes, T. J. and Schmitz, J. A., Jr. 1996. Managerial Tenure, Business Age, and Small Business Turnover. *Journal of Labor Economics* 14(1), pp. 79-99.

Holtz-Eakin, D. et al. 1994. Sticking it Out: Entrepreneurial Survival and Liquidity Constraints. *The Journal of Political Economy* 102(1), pp. 53-75.

Hopenhayn, H. A. 1992. Entry, Exit, and firm Dynamics in Long Run Equilibrium. *Econometrica* 60(5), pp. 1127-1150.

Howells, J. 1990. The Internationalization of R&D and the Development of Global Research Networks. *Regional Studies* 24(6), pp. 495 - 512.

Huck, S. et al. 2001. Big fish eat small fish: on merger in Stackelberg markets. *Economics Letters* 73, pp. 213-217.

Huck, S. et al. 2004. Profitable Horizontal Mergers without Cost Advantages: The Role of Internal Organization, Information and Market Structure. *Economica* 71(284), pp. 575-587.

Huggins, R. et al. 2003. *Regional Stock Exchanges – A Viable Option for Wales and Other UK Regions?* Robert Huggins Associates.

Hughes, A. 1989. Small firms' merger activity and competition policy. In: Barber, J. et al. eds. *Barriers to growth in small firms.* Routledge, pp. 128-172.

Hughes, A. et al. 1980. Hypothesises about Mergers In: Mueller, D.C. ed. *The Determinants and Effects of Mergers* Cambridge: Oelgescher, Gunn and Hain, pp. 27-66.

Hussinger, K. 2010. On the importance of technological relatedness: SMEs versus large acquisition targets. *Technovation* 30(1), pp. 57-64.

Institute for Employment Studies 2006a. *Annual Survey of Small Businesses: UK 2005.*

Institute for Employment Studies 2006b. *Annual Survey of Small Businesses: UK Wales 2005*

Jovanovic, B. 1982. Selection and the Evolution of Industry. *Econometrica* 50(3), pp. 649-670.

Jovanovic, B. and Rousseau, P. L. 2002. The Q-Theory of Mergers. *The American Economic Review* 92(2), pp. 198-204.

Karpaty, P. 2007. Productivity Effects of Foreign Acquisitions in Swedish Manufacturing: The FDI Productivity Issue Revisited. *International Journal of the Economics of Business* 14(2), pp. 241–260.

King, G. and Zeng, L. 2001. Logistic Regression in Rare Events Data. *Political Analysis* 9(2), pp. 137-163.

Klagge, B. and Martin, R. 2005. Decentralized versus centralized financial systems: is there a case for local capital markets? *Journal of Economic Geography* 5(4), pp. 387-421.

Krugman, P. 1991a. *Geography and trade.* MIT Press.

Krugman, P. 1991b. Increasing Returns and Economic Geography. *The Journal of Political Economy* 99(3), pp. 483-499.

Krugman, P. 1998. What's new about the new economic geography? *Oxford Review of Economic Policy* 14, pp. 7-17.

Krugman, P. and Venables, A. J. 1995. Globalization and the Inequality of Nations. *The Quarterly Journal of Economics* 110(4), pp. 857-880.

Lapan, H. and Bardhan, P. 1973. Localized technical progress and transfer of technology and economic development. *Journal of Economic Theory* 6(6), pp. 585-595.

Lehto, E. L. O. and Lehtoranta, M. O. 2004. Becoming an acquirer and becoming acquired. *Technological Forecasting and Social Change* 71(6), pp. 635-650.

Leigh, R. and North, D. J. 1978. Regional aspects of acquisition activity in British manufacturing industry. *Regional Studies* 12(2), pp. 227-245.

Leung, S. F. and Yu, S. 1996. On the choice between sample selection and two-part models. *Journal of Econometrics* 72(1-2), pp. 197-229.

Levenson, A. R. and Willard, K. L. 2000. Do Firms Get the Financing They Want? Measuring Credit Rationing Experienced by Small Businesses in the U.S. *Small Business Economics* 14(2), pp. 83-94.

Lichtenberg, F. R. 1992. *Corporate Takeovers and Productivity*. The MIT Press.

Lichtenberg, F. R. et al. 1987. Productivity and Changes in Ownership of Manufacturing Plants. *Brookings Papers on Economic Activity* 1987(3), pp. 643-683.

Lucas, R., Jr. 1988. On the mechanics of economic development. *Journal of Monetary Economics* 22(1), pp. 3-42.

Maksimovic, V. and Phillips, G. 2001. The Market for Corporate Assets: Who Engages in Mergers and Asset Sales and Are There Efficiency Gains? *The Journal of Finance* 56(6), pp. 2019-2065.

Mankiw, N. G. et al. 1992. A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics* 107(2), pp. 407-437.

Martin, C. et al. 2002. *SME Ownership Succession – Business Support and Policy Implications*. Report prepared for SBS Research & Evaluation.

Martin, R. 1999. The new 'geographical turn' in economics: some critical reflections. *Cambridge Journal of Economics* 23(1), pp. 65-91.

Mason, C. and Harrison, R. 1994. Informal Venture Capital in the UK in Finance and the Small Firm. In: Hughes, A. and Storey, D.J. eds. *Finance and the Small Firm*. Routledge, pp. 64-111

Mason, C. and Harrison, R. 2006. After the exit: Acquisitions, entrepreneurial recycling and regional economic development. *Regional Studies* 40(1), pp. 55-73.

Matsusaka, J. G. 1993. Target Profits and Managerial Discipline During the Conglomerate Merger Wave. *The Journal of Industrial Economics* 41(2), pp. 179-189.

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.

McKillop, D. G. and Barton, L. P. 1995. An Analysis of the Financing Requirements of Small and Medium Sized Firms in Northern Ireland. *Regional Studies* 29(3), pp. 241-249.

Melicher, R. W. et al. 1983. A Time Series Analysis of Aggregate Merger Activity. *The Review of Economics and Statistics* 65(3), pp. 423-430.

Meyer, B. D. 1995. Natural and quasi-experiments in economics. *Journal of Business & Economic Statistics* 13(2), p. 151.

Michaelas, N. et al. 1999. Financial Policy and Capital Structure Choice in U.K. SMEs: Empirical Evidence from Company Panel Data. *Small Business Economics* 12(2), pp. 113-130.

Molecular Light Technology. 2008. *Molecular Light Technology* [Online]. Available at: http://www.mltresearch.com/index.htm [Accessed: March 2008].

Moore, B. 1994. Financial Constraints to the Growth and Development of Small High-Technology Firms. In: Hughes, A. and Storey, D.J. eds. *Finance and the Small Firm* Routledge, pp. 112-144

Murphy, E. et al. 2004. *Finance for Small Firms – An Eleventh Report*. Bank of England

Nguyen, S. V. et al. 1995. The Impact Of Ownership Change On Employment, Wages, And Labor Productivity In U.S. Manufacturing 1977-87. *Center for Economic Studies, U.S. Census Bureau Working Papers* (95-8).

Nguyen, S. V. and Ollinger, M. 2002. *Mergers and Acquisitions and Productivity in the U.S. Meat Products Industries: Evidence from the Micro Data*. Center for Economic Studies, U.S. Census Bureau.

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.

Nickell, S. 1981. Biases in Dynamic Models with Fixed Effects. *Econometrica* 49(6), pp. 1417-1426.

OECD 2001. OECD Productivity Manual: A Guide to the Measurement of Industry-level and Aggregate Productivity Growth. *International Productivity Monitor* 2(Spring), pp. 37-51.

OECD 2006. *The SME Financing Gap: Volume 1 - Theory and Evidence* OECD Publishing.

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. 2007a. *Guide to the IDBR* [Online]. Available at: http://www.statistics.gov.uk/CCI/nugget.asp?ID=195 [Accessed: January].

ONS. 2007b. *Inter Departmental Business Register (IDBR) - A Brief Guide* [Online]. Available at: http://www.statistics.gov.uk/idbr/idbr.asp [Accessed: May 2007].

ONS. 2008a. *The SPPI* [Online]. Available at: http://www.statistics.gov.uk/cci/nugget.asp?ID=13 [Accessed: October 2008].

ONS. 2008b. *Virtual Microdata Laboratory (VML)* [Online]. Available at: http://www.ons.gov.uk/about/who-we-are/our-services/unpublished-data/business-data/vml/index.html [Accessed: July 2008].

ONS. 2009a. *Estimates of workforce in employment* [Online]. ONS. Available at: https://www.nomisweb.co.uk/Default.asp [Accessed: June 2009].

ONS. 2009b. *Gross Domestic Product Statistics* [Online]. Available at: http://www.statistics.gov.uk/statbase/tsdtables1.asp?vlnk=pgdp [Accessed: 3rd Feb. 2009].

ONS. 2009c. *Mergers & Acquisitions data* [Online]. Available at: http://www.statistics.gov.uk/StatBase/Product.asp?vlnk=72&Pos=1&ColRank=1&Rank=240 [Accessed: 16th April 2009].

Oulton, N. 1998. Competition and the dispersion of labour productivity amongst UK companies. *Oxford Economic Papers* 50(1), pp. 23-38.

Palepu, K. G. 1986. Predicting takeover targets: A methodological and empirical analysis. *Journal of Accounting and Economics* 8(1), pp. 3-35.

Paton, D. et al. 2004. *Productivity Measurement in a Service Industry: Plant-Level Evidence from Gambling Establishments in the United Kingdom.* Rensselaer Polytechnic Institute, Department of Economics.

Paton, D. and Williams, L. V. 2007. Broadcasting Productivity Growth in the UK.*Occasional Paper Series*. Nottingham University Business School.

Penrose, E. T. 1980. *The Theory of the Growth of the Firm*. 2nd ed. Basil Blackwell Publisher.

Perry, M. K. and Porter, R. H. 1985. Oligopoly and the Incentive for Horizontal Merger. *The American Economic Review* 75(1), pp. 219-227.

Petersen, M. A. and Rajan, R. G. 1994. The Benefits of Lending Relationships: Evidence from Small Business Data. *The Journal of Finance* 49(1), pp. 3-37.

Petersen, M. A. and Rajan, R. G. 2002. Does Distance Still Matter? The Information Revolution in Small Business Lending. *The Journal of Finance* 57(6), pp. 2533-2570.

Piscitello, L. and Rabbiosi, L. 2005. The impact of inward FDI on local companies' labour productivity - evidence from the Italian case. *International Journal of the Economics of Business* 12(1), pp. 35-51.

Powell, R. G. 1997. Modelling Takeover Likelihood. *Journal of Business Finance & Accounting* 24, pp. 1009-1030.

PR Newswire. 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].

Puhani, P. 2000. The Heckman Correction for Sample Selection and Its Critique. *Journal of Economic Surveys* 14, pp. 53-68.

Ravenscraft, D. J. and Scherer, F. M. 1987a. Life After Takeover. *The Journal of Industrial Economics* 36(2), pp. 147-156.

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

Ravenscraft, D. J. and Scherer, F. M. 1989. The profitability of mergers. *International Journal of Industrial Organization* 7(1), pp. 101-116.

Rice, P. and Venables, A. 2003. Equilibrium Regional Disparities: Theory and British Evidence. *Regional Studies* 37(6), pp. 675 - 686.

Robson, M. T. 1996. Housing wealth, business creation and dissolution, in the U.K. regions. *Small Business Economics* 8(1), pp. 39-48.

Rodriguez-Pose, A. and Zademach, H.-M. 2003. Rising Metropoli: The Geography of Mergers and Acquisitions in Germany. *Urban Studies* 40(10), pp. 1895–1923.

Roll, R. 1986. The Hubris Hypothesis of Corporate Takeovers. *The Journal of Business* 59(2), pp. 197-216.

Romer, P. M. 1986. Increasing Returns and Long-run Growth. *Journal of Political Economy* 94(5), pp. 1002-1037.

Romer, P. M. 1990. Endogenous Technological Change. *Journal of Political Economy* 98(5), pp. S71-102.

Rowlands, C. 2009. *Provision of growth capital to UK SMEs* [Online]. Available at: www.berr.gov.uk/files/file53698.doc [Accessed: March 2010].

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.

Salis, S. 2008. Foreign Acquisition and Firm Productivity: Evidence from Slovenia. *World Economy* 31(8), pp. 1030-1048.

Santarelli, E. and Lotti, F. 2005. The Survival of Family Firms: The Importance of Control and Family Ties. *International Journal of the Economics of Business* 12(2), pp. 183-192.

Schary, M. A. 1991. The Probability of Exit. *The RAND Journal of Economics* 22(3), pp. 339-353.

Schoar, A. 2002. Effects of Corporate Diversification on Productivity. *The Journal of Finance* 57(6), pp. 2379-2403.

Shen, J.-C. and Reuer, J. 2005. Adverse Selection in Acquisitions of Small Manufacturing Firms: A Comparison of Private and Public Targets. *Small Business Economics* 24, pp. 393-407.

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 Working Papers in Economics* 0601.

Siegel, D. S. et al. 2005. Ownership Change, Productivity, and Human Capital: New Evidence from Matched Employer-Employee Data in Swedish Manufacturing. *Rensselaer Working Papers in Economics* Number 0502.

Singh, A. 1971. *Takeovers: Their Relevance to the Stock Market and the Theory of the Firm*. Cambridge University Press

Singh, H. and Montgomery, C. A. 1987. Corporate Acquisition Strategies and Economic Performance. *Strategic Management Journal* 8(4), pp. 377-386

Small Business Research Centre 1992. The State of British Enterprise – Growth Innovation and Competitive Advantage in Small and Medium-Sized Firms. University of Cambridge.

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.

Smith, I. J. and Taylor, M. J. 1983. Takeover, closures, and the restructuring of the United Kingdom ironfoundry industry. *Environment and Planning A* 15(5), pp. 639 – 661.

Sribney, W. 1997a. *Likelihood-ratio test after survey/robust ML estimation* [Online]. StataCorp. Available at: http://www.stata.com/support/faqs/stat/lrtest.html [Accessed: February 2009].

Sribney, W. 1997b. *Stata 5: Pseudo R2 in weibull* [Online]. StataCorp. Available at: http://www.stata.com/support/faqs/stat/wbl.html [Accessed: June 2009].

Stam, E. et al. 2008. Renascent entrepreneurship. *Journal of Evolutionary Economics* 18, pp. 493–507.

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

Stokes, D. and Blackburn, R. 2001. *Opening Up Business Closures: A Study of Businesses That Close and Owners' Exit Routes* Kingston: Kingston University,Small Business Research Centre.

Storey, D. J. 1996. *Understanding the Small Business Sector*. Routledge.

Thaler, R. H. 1988. Anomalies: The Winner's Curse. *The Journal of Economic Perspectives* 2(1), pp. 191-202.

The Western Mail. 31st July 2002. *MP calls for action on 'predators' as jobs are lost* [Online]. Available at: http://www.walesonline.co.uk/news/uk-news/2002/07/31/mp-calls-for-action-on-predators-as-jobs-are-lost-91466-12077423/ [Accessed: March 2008].

Tomz, M. et al. 1999. *RELOGIT: Rare Events Logistic Regression, Version 1.1* [Online]. Cambridge, MA: Harvard University. Available at: http://gking.harvard.edu/ [Accessed: 1/10/2007].

Tsagkanos, A. et al. 2006. Predicting Takeover Targets: New Evidence from a Small Open Economy. *International Research Journal of Finance and Economics* (4), pp. 172-183.

Twomey, J. and Taylor, J. 1985. Regional Policy and the Interregional Movement of Manufacturing Industry in Great Britain. *Scottish Journal of Political Economy* 32(3), pp. 257-277.

UWE 2006. *Understanding productivity variations between Wales and the Rest of the UK* Report to the Economic Research Advisory Panel, Welsh Assembly Government.

van Dijk, J. and Pellenbarg, P. H. 2000. Firm relocation decisions in The Netherlands: An ordered logit approach. *Papers in Regional Science* 79(2), pp. 191-219.

Verbeek, M. 2008. *A Guide to Modern Econometrics*. 3rd ed. John Wiley and Sons.

WAG. 2007. *Workplace Employment by Industry in Wales, 2001 to 2005* [Online]. Available at: http://wales.gov.uk/docrepos/40382/40382313/statistics/economy/econ-2007/sb34-2007.pdf?lang=en [Accessed: June 2009].

Wesson, T. 1999. A model of asset-seeking foreign direct investment driven by demand conditions. *Canadian Journal of Administrative Sciences* 16(1), pp. 1-10.

Wheelock, D. C. and Wilson, P. W. 2000. Why do Banks Disappear? The Determinants of U.S. Bank Failures and Acquisitions. *Review of Economics and Statistics* 82(1), pp. 127-138.

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

Wingfield, D. et al. 2005. Relative regional consumer price levels in 2004. *Economic Trends* 615, pp. 36-46.

Wiseman, J. et al. 2005. *Annual Survey of Small Businesses: Wales 2004/05* [Online]. Available at: http://new.wales.gov.uk/deet/publications/bande/sbs/2004/sbs04.pdf?lang=en [Accessed: November 2008].

Yahoo Finance. 2009. *FTSE 100 Historical Prices* [Online]. Available at: http://uk.finance.yahoo.com/q/hp?s=%5EFTSE&a=00&b=1&c=1995&d=11&e=31&f=2008&g=m&z=66&y=132 [Accessed: 3rd Feb.].

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