Private Equity Buyouts and Firm Efficiency:

Evidence from UK Public to Private

Transactions

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DECLARATION

I certify that this work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy being studied at the University of Greenwich. I also declare that this work is the result of my own investigations except where otherwise identified by references and that I have not plagiarised the work of others.

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ACKNOWLEDGEMENTS

ABSTRACT

This study investigates the impact of 293 public to private buyouts in the UK manufacturing industry during the period 1997-2007 on firms' technical efficiency using a probabilistically matched buyout dataset. I use data envelopment and stochastic frontier analysis techniques to empirically measure production efficiency, which differs from most previous studies where the impact of financial performance or the movement in a company's share price is tested. For the sample used and period investigated, no evidence is found that companies involved in public to private buyout ownership changes operate more efficiently than a control sample of PLCs not involved in buyouts. This finding is consistent with the hypothesis that managers of PLCs have learned how to operate their companies in a similar way to those owned by private equity.

LIST OF ABBREVIATIONS

ABI   Annual Business Inquiry

AIM   Alternative Investment Market

ARD   Annual Respondent Database

BVCA   British Venture Capital Association

CEO   Chief Executive Officer

DEA   Data Envelopment Analysis

EU   European Union

EVCA   European Venture Capital Association

FSA   Financial Services Authority

GMB   National Union of General and Municipal Workers.

GOA   United States Government Accounting Office

HCSC   House of Commons Select Committee

IDBR   Inter Department Business Register

IOSCO   International Organisation for Securities Commission

IPO   Initial Public Offering

IUF   International Union of Food, Agricultural, Hotel, Restaurant, Catering, Tobacco and Allied Workers' Associations

LBO   Leverage Buyout

MBI   Management Buy-in

MBO   Management Buyout

NIC   National Insurance Contributions

ONS   Office for National Statistics

PAYE	Pay As You Earn
PLC	Public Limited Company
PSE	Party of European Socialists
P-T-P	Public to Private
SFA	Stochastic Frontier Analysis
TUC	Trade Union Congress.
UK	United Kingdom
US	United States of America
VAT	Value Added Tax
WEF	World Economic Forum

DEFINITIONS

- **Buyout and Venture Capital**

Under the broad term of private equity are two fundamentally different types of investor behaviour (Wood and Wright, 2010). The first, venture capital, involves early stage investors who provide capital in return for input in setting organisational direction. The general consensus is that the effects of this are generally positive (Wood and Wright, 2010, Goergen et al. 2011). In contrast, what is sometimes referred to as private equity per se, is when an investor purchases, or facilitates in the purchase, of a company, or in the premises that either new management, or at least a change in management style may enhance returns. In effect, this involves the purchase of publicly quoted companies and taking them private via so called public to private transactions (Goergen et al. 2011). [1]

- **Buyout**

In order to be included as a buyout in this study, over 50 per cent of the issued shares of a company must change ownership with either management or a private equity firm or both jointly having a controlling stake upon deal completion (CMBRO).

- **Efficiency**

A producer is technically efficiency if, and only if, it is impossible to produce more of any output without producing less of some other output, or using more of some inputs (Koopman, 1951, Farrell, 1957).

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[1] For a more detailed distinction between buyouts and venture capital see Fraser-Sampson, 2007 :7-22.

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

This study investigates the impact of private equity leverage buyouts (LBOs) and management buyouts (MBOs) on firms' technical efficiency. The study focuses specifically on public to private (P-T-P) transactions in the UK manufacturing industry during the period 1997 - 2007. A critical policy issue concerning buyouts is whether they enhance economic efficiency. There is growing public policy interest in the role of private equity investors. Central to this debate is a concern that private equity may represent an extreme form of capitalism, seeking to maximise short term shareholder wealth while paying little attention to the interests of broader stakeholder groups or organisational sustainability (Goergen et al. 2011).

Over the last 10 years, private equity firms have played an increasingly important role in rapidly and radically restructuring organisations worldwide through buyouts (Axelson et al. 2007; Financial Services Authority, 2007; House of Commons Select Committee, 2007; Wright et al. 2009; Party of European Socialist, 2009). In 2005, the total UK buyout market accounted for over half of all acquisitions by value compared to less than 20 per cent two decades earlier (Wright et al. 2006).[2] The increased involvement of buyout firms in large sectors of UK corporate activity is often attributed to the inefficient management of public companies by managers and executives (British Venture Capital Association). Accordingly, executives of private equity firms argue in line with Mann (1965) and Jensen and Ruback's (1983) market for corporate control hypothesis; that managers of publicly owned companies are destroying shareholder value because they are unable to operate their companies efficiently (BVCA). Private equity executives contend that this erosion of shareholder value can only be halted by private equity firms buying failing PLCs and injecting superior management teams into them to turn the company around by reallocating and managing corporate resources more efficiently (BVCA). This has led to an increase in the number and size of companies listed on the London Stock Exchange being targeted by private equity firms in public to private (P-T-P) buyout deals over the last two decades (Wright, 2006, Goergen et al. 2011).

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[2] Financial Times, July 6, 2006.

As the size and value of PLCs targeted in P-T-P buyout deals have increased; so too has criticism from UK and European trade unions and politicians (Wright, 2006, 2009, PES, 2009). The trade unions argue that any value created by buyouts comes not from operational efficiency gains created by new management teams after a buyout, but from asset stripping target companies and laying off large numbers of employees (Trade Union Congress, 2007). This has resulted in Brendan Barber, General Secretary of the Trade Union Congress (TUC) accusing private equity executives of being "amoral asset strippers" and "casino capitalists" enjoying huge personal windfalls from deals as they gamble with other people's futures. In a similar vein, Franz Müntefering, Chairperson of Germany's ruling Social Democratic Party compares private equity executives to "swarms of locusts that fall on companies, devour all they can, and then move on." Other opponents of buyouts argue that private equity corporate restructuring is damaging to the economy, and the morale and productivity of organisations (Drucker, 1986, 1988; General Municipal Boilermakers and Allied Trade Union; 2007; International Union of Food, 2007; PES, 2009). In turn, a number of leading financial experts have queried the role of buyouts on the economy, and cautioned that the level of debt taken on by private equity firms could lead to financial instability (HCSC, 2007; FSA; 2007; Bank of England, 2013). However, the BVCA rejects these concerns, arguing that the performance of private equity backed companies "significantly strengthens the UK economy."

Previous and most current studies on buyout efficiency are often unclear about the type of efficiency being measured, i.e., financial or technical efficiency. The early studies on efficiency are based mostly on accounting or event study techniques, and on US evidence. These studies generally report inefficiencies in companies operating in the US financial, gas, oil, transportation, and broadcasting industries during the 1980s, and that buyouts generate significant returns to target shareholders (Jensen, 1988). The sources of these early gains are reported to come from operating efficiency. However, accounting studies measure the profitability of companies, and event studies examine the movement in share price around an event window. These techniques are therefore not measures of technical efficiency. Other studies on buyout efficiency employ total factor productivity (TFP) techniques. These studies generally report mixed results, and are often based at the firm, rather than plant level. While TFP is a correct measure of technical efficiency, the technique contains a one-sided error term and therefore

involves the interpretation of the residual components of a regression as TFP; lumping factors under management control and random factors together when they are not (Murillo-Zamorano, 2004).

Lichtenber and Siegel (1987) for instance, find that efficiency in plants involved in buyouts increased one year prior to buyout and last for up to seven years after. However, the authors also report that four year after the ownership changes, 49 per cent of the productivity gains that existed between companies involved in ownership changes and those that did not, disappear. Verman (1993) used TFP to examine buyouts and find relative productivity one and two years after the MBO to be below the level one year before the MBO. McGuckin and Nguyen (1995) report company ownership changes are associated with the transfer of plants with above average productivity, whilst Nguyen and Ollinger (2006) report that plants in the US meat industry are very productive before mergers. On the other hand, Harris et al (2005) report that on average, plants involved in MBOs in the same industry are less productive and less efficient prior to the buyout, and experience a substantial increase in efficiency after the buyout. Alternative views on the sources of efficiency gains in buyouts are that they derive from value transferred from stakeholders to shareholders (Drucker, 1986, 1988), financial engineering (Law, 1985; Drucker, 1988; Shleifer and Summers, 1988; TUC, 2007; Renneboog et al. 2007), asset stripping and reductions in employee numbers (TUC, 2007). Despite these inconsistencies, Mann (1965), Mead (1968), and Jensen's (1988) disciplinary mergers theory prediction that companies involved in buyouts will perform poorly before a buyout or merger due to poor management and have improved performance after the buyout persist.

The inconsistencies in previous studies on buyout efficiency gains give rise to an alternative buyout theory. Rappaport (1990) hypothesises that because managers of PLCs have adapted financial and operational techniques similar to those employed by private equity firms in companies they purchase in P-T-P buyout deals, such as shedding underperforming division, selling assets not essential to operations, repurchasing stock, increasing leverage, closing uneconomic plants and offices, and outsourcing much of their production processes; including materials and labour, in response to changes in the competitive and financial environment, no long term efficiency gains are expected from P-T-P ownership changes or ownership, and as

buyout of PLCs act as a form of shock therapy, any efficiency gains are not expected to be long-lived.

Difficulties have arisen in investigating the competing arguments over P-T-P buyout efficiency gains. The secretive nature of the UK private equity industry means that it is impossible to obtain input and output data from the industry to investigate technical efficiency in P-T-P buyouts. Therefore, very little is actually known about the productivity performance of P-T-P buyouts in the UK manufacturing industry and factors influencing it. Thus an assessment of UK P-T-P buyout efficiency and productivity should be of interest to policy makers.

Farrell (1957) states that if the theoretical arguments as to the relative efficiency of different economic units are to be subjected to empirical testing, it is essential to be able to make some actual measurement of efficiency. Equally he continues, if economic planning is to concern itself with particular industries, it is important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources. Davis and Kouchhar (2002) argue that only by measuring efficiency and productivity, and separating their effects from those of the operating environment so as to create a level playing field, can we explore hypotheses concerning the source of efficiency or productivity differentials.

While the majority of empirical studies on technical efficiency in P-T-P buyouts use one technique to estimate efficiency, this study focuses on two methodological approaches: the construction of a nonparametric piecewise frontier using a linear programming method known as data envelopment analysis (Charnes et al., 1978), and the construction of a parametric production function using stochastic frontier analysis (Aigner and Chu, 1968; Aigner et al. 1997; Meeusen and van de Broeck 1977). These techniques, and a sample of 293 companies operating in the UK manufacturing industry during the period 1997-2007 obtained from the Centre for Management Buyout Research at the University of Nottingham,[3] and the Office for National Statistics are used to investigate whether companies involved in P-T-P buyout ownership changes operate more efficiently after the buyout than a sample of PLCs.

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[3] The CMBOR is now based at Imperial College London since 2011.

The main strengths of stochastic frontier analysis are that it deals with stochastic noise and also allows statistical tests of hypotheses concerning production structures and degrees of inefficiency. Its main weaknesses are that it requires an explicit imposition of a particular parametric functional form from the underlying technology, and an explicit distributional assumption of the inefficiency error term. The principal advantage of data envelopment analysis is that it does not require an explicit *a priori* determination of a production function and that efficiency is measured relative to the highest observed performance rather than against some average. Neither does data envelopment analysis require an explicit assumption about the inefficiency term. However, because data envelopment analysis is deterministic and attributes all deviations from the frontier to inefficiencies, a frontier estimated by DEA is likely to be sensitive to measurement errors or other noise in the data (Odeck, 2007).

This is the first study to use two different frontier techniques respectively, and plant level panel data to investigate technical efficiency in P-T-P buyouts in the UK manufacturing industry. The study is also the first to examine whether the geological location of plants and the type of buyout, i.e., LBO or MBO have an impact on the technical efficiency of companies involved in P-T-P buyouts.

Firstly, for the sample used and period under investigation, I find no evidence of increase or decrease in technical efficiency from PLCs to private equity over the long run. This finding is inconsistent with the disciplinary merger theory prediction that target companies will perform poorly prior to a buyout and have improved performance after the buyout, and the market for corporate control hypothesis which state that alternative management teams target poorly performing companies due to their inefficiency. The finding is however, consistent with the hypothesis that managers of PLCs have learned from private equity owned companies, how to operate PLCs more efficiently (Rappaport, 1990). Secondly, no evidence is found that the location or type of buyout affects the technical efficiency of companies operating in the UK manufacturing industry.

The research hypothesis, questions, and contributions highlighted previously are detailed below. A section detailing the organisation of this study then follows.

1.1 Research Questions

- Do companies involved in P-T-P ownership changes operate more efficiently than public limited companies not involved in ownership changes?

- Does the location of companies involved in P-T-P buyouts have an impact on its technical efficiency?

- Does the type of P-T-P buyout have an impact on firms' technical efficiency?

1.2   Contributions

- This is the first study to use DEA to investigate efficiency in UK public to private buyouts

- This is the first time that both DEA and SFA respectively is used to analyse the effects of   public to private buyouts on technical efficiency of companies operating in the UK manufacturing industry

- The study is the first to focus on UK public to private buyouts using reporting unit data

- This study examines for the first time, whether the type of UK buyout i.e., LBO or MBO affects the efficiency of companies in the UK public to private buyouts in the manufacturing industry

- This is also the first study to examine whether the location of plants involved in UK public to private buyouts have an impact on firm's technical efficiency

- The study covers a more recent period than previous studies

1.3   Organisation of Chapters

This rest of this thesis is organised as follows:

An overview of the work is provided in **Chapter 1**. The justification for the study, the research questions, and contributions are provided in chapter one,

A review of the buyout theoretical literature is given in **Chapter 2**. The theoretical background of buyouts is examined through a variety of theoretical lenses.

Chapter 3 provides a review of buyout empirical literature and the techniques used to measure efficiency. The combined review of the theoretical and empirical literature, along with a wide ranging review of the anecdotal literature leads to the identification of several gaps in the current literature.

Chapter 4 examines technical efficiency and buyout efficiency measures.

The research hypotheses are presented, and data and the research sample are discussed. Sample statistics are presented, as is the variable selection, description, and several correlation matrixes presented in **Chapter 5**.

Chapter 6 presents the methodology, the research models, and model specifications. The model variables are specified, and model equations presented.

Results and discussion of findings are presented in **Chapter 7**.

Chapter 8 presents the research conclusion; policy implications; discusses future research; and research limitations.

CHAPTER TWO: THEORETICAL LITERATURE REVIEW

2.0   Theoretical Literature Review

The study of buyouts is complex because there are so many moving parts, and possible motivations for the buyout. There are around twelve main theories on buyouts and the motivation for them. No study on the subject can be properly undertaken without considering and understanding the impact of at least some of these variables on the different stakeholders affected by a buyout transaction; and motivation for managers to engage in them, particularly in P-T-P buyouts. Without such an understanding, the findings reported below will make no sense. For this reason, this study commences with a review of some buyout theories that are considered to be the most relevant to buyouts. These are: shareholder/stakeholder, agency, incentive realignment, market for corporate control, free cash flow, leverage/debt, and the undervaluation of target companies theories. Also included in this section is a review of the literature on outsourcing and employment. The purpose of including these two sections in the theoretical literature is to provide some insight into what are probably the two most unrecognised influential drivers of value in P-T-P buyouts. The theoretical literature generates a substantial amount of potentially interesting research questions. However, it must be emphasised at this point that not all of these can or will be tested in this study. This is because many of them have been addressed by other researchers to varying degrees, because data limitations will not permit the testing of others, and doing so will not add any significant new information to what is already known, and simply because they are not the main focus of this study. However, it is important that the selected topics are included in order to make sense of the buyout story.

A review of the empirical literature on buyout efficiency follows the theoretical literature review. The empirical review focuses first on accounting and event studies that measure the profitability of a company and the movement in share price respectively. It then turns to studies that use total factor productivity, data envelopment analysis, and stochastic frontier analysis techniques to measure a company's technical efficiency. The section concludes with a summary and the identification of the research hypothesis to be tested.

2.1   Agency Theory

Adam Smith (1776), in the Wealth of Nations was probably the first to suggest that private production is more efficient than public production. He states of a private producer, "By pursuing his own interest he frequently promotes that of the society more efficiently than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good."

Following Adam Smith (1776), an argument arising from the property rights literature, and related to Williamson (1964) asserts that public production is inherently less efficient than private production. Converting this into its modern context of Agency theory[4] Williamson (1964) argues that given the freedom to do so, managers would seek to maximise a utility function with staff and emoluments as arguments in addition to profit. This argument asserts that the concentration and transferability and incentive forces private owners to monitor managerial performance, and that this incentive is diminished for public owners, who are dispersed and whose ownership is not transferable. Consequently, public managers have greater freedom to pursue their own objectives at the expense of conventional objectives.

In other words, agency theory suggests that managers of PLCs cannot be trusted to operate their companies in the best interest of their shareholders (Jensen and Meckling, 1976, Jensen, 1988), as they will put their own interests ahead of those of their shareholders, and this divergence from shareholders interest will lead to poor corporate behaviour and inefficiency (Mann, 1965; Mead, 1968; Jensen and Meckling, 1976). The principal-agent problem (or agency dilemma) therefore concerns difficulties in motivating one party (the "agent"), to act in the best interests of another (the "principal") rather than in his or her own interests (Jensen and Meckling, 1976). This problem of agency it is argued; can only be overcome by aligning managerial interest to those of shareholders, which will lead to increased firm efficiency (Jensen and Mecklin, 1976; Amihud and Lev, 1981; Hill et al, 1988; Jensen, 1989; Turk, 1990; Fox and Macus, 1992; Jensen, 1993; Pham and Hill, 1995; Froud and Williams, 2007; Meuleman et al, 2009).

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[4] Agency theory suggests that managers will become less diversified in their own personal wealth if given a stake in the company that they work for (Amihud and Lev, 1981, Hill et al., 1988, Turk, 1990).

In order to incentivise managers to create corporate efficiency, researchers such as Jensen and Murphy (1990) recommend reward compensation schemes that link chief executive officers' (CEO) compensation to corporate performance. Singh (1990); Green (1992); Garvey (1992); and Kaplan and Stein (1993) all provide empirical evidence to support the agency prediction that aligning managerial interest to that of the company provides them with positive incentives to look for efficiency gains that will increase the value of the company and therefore their stake. Although there are disagreements about some details, CEO stock options in general are typically assumed to ameliorate agency problems, and such incentive structures remain a best practice promoted by compensation consultants. However, there is little empirical evidence to show that managerial incentives lead to increased technical efficiency in companies involved in P-T-P buyouts.

2.1.2   Incentive Realignment Hypothesis

The incentive realignment hypothesis suggests that firm efficiency will be improved by providing managers with incentives to align their interests with those of their company (Jensen and Mecklin, 1976; Amihud and Lev, 1981; Hill et al, 1988; Jensen, 1989).

Most studies on managerial incentives are based on the financial profitability of the company, not on its technical inefficiency, i.e., on how efficiently the company converts inputs into outputs. Moreover, the perceived relationship between ownership of a company and its profitability is challenged by Demsetz (1984) who argues that since ownership of a company emerges as an endogenous outcome of competitive selection; in which various cost advantages and disadvantages are balanced to arrive at an equilibrium organisation of the company, no relationship between the ownership structure of a company and its profitability is expected.

Lowenstein (1985); Law (1986); Drucker (1986, 1988); Shleifer and Summers (1988) are also critical of buyouts, particular P-T-P buyouts. These authors argue that buyouts are little more than means of capturing rents, and create little or no social value. Additionally, Drucker (1986) asserts that rather than focusing on efficiency, a more plausible explanation for buyouts is that executives of buyout firms have a comparative advantage at transferring wealth from stakeholders to shareholders by squeezing other beneficiaries of corporate wealth in situations where incumbent managers are unable or

reluctant to do so. Moreover, these authors contend that gains in buyouts come not from efficiency, but from the exploitation of financial market misevaluations, and the use of tax benefits. Consistent with these views, DeAngelio (1986) argues that buyouts engender potentially severe conflicts of interest for insider managers, who both have a fiduciary duty to negotiate a fair value for their publicly held shares and are themselves the purchasers of these shares. In light of such criticism, Jacobs (1991), Pham and Hill (1995) warn that the agency prediction that buyouts increases efficiency should be taken with caution, as expectations do not always match outcome.

Core et al (1999); Blasi and Kruse (2003); Yermack (2006); and Denvers et al (2006) argue that even if long term incentives for top management teams enhanced company performance directly; it indirectly reduces company performance by facilitating acquisition behaviour. Following this line of reasoning, Harris and Bromiley (2007) suggest that rather than providing managers with an adequate incentive for the good management practices that the literature assumes, the large potential pay-offs provide managers with an enticement to cheat, commit fraud, or cook the books in an attempt to fabricate the levels of corporate performance that will trigger the pay-off. The authors conclude that conventional formulated theories are naive in presuming that managerial responses to incentives are limited to actions that build true corporate value.

Acknowledging that buyouts are financially profitable, Lazonic and O'Sullivan (2002) associate the large increases in managerial incentives with a persistent worsening of the distribution of income in the US. They argue that on the basis of superior economic performance, private equity shareholders have inserted themselves into a social environment where innovative enterprises for decades allocated resources that have created value, and now make the ideological claim that, as the "principals" in the modern corporation, they as shareholders have the predominant, if not the only voice in determining the distribution of value already created. Laznick (2001) continues to argue that in the real economy, the widespread and engrained belief in the theory of the market economy tends to render ungovernable those corporate executives and political elites who wield power over the allocation of resources; while it tends to leave vulnerable, the vast majority of the population who depend on the strategic decisions of the enterprise and the state to create economic opportunity.

Nikoskelainen and Wright (2007) use probability regression and buyout data from the CMBOR for 321 exited UK buyouts to examine the impact of governance on value increase in UK buyouts during the period 1995-2004. Tests on a restricted sample of exited buyouts show that management's equity stake is a significant factor in determining LBO returns only in larger and successful buyouts. However, no evidence is found that the governance structure of buyouts is a main driver of LBO returns. Inconsistent with this finding, Wright et al (2009) contend that the buyout governance structure provides incentives to reduce agency and free cash flow problems.

The need for companies to involve in buyouts and for managers to be incentivised to create value is further questioned by Froud and Williams (2007). The authors assert that the gains from buyouts available to those who supply a minority of the capital in the form of equity are available regardless of what management does at the operating level. Such gains are a matter of arithmetic at the financial engineering level, rather than a consequence of how private equity governance aligns owners and management interests, and in principle, public companies could improve returns on equity by re-leveraging and taking out more debt. This is consistent with Sir Paul Myners (2007) who points out that "private equity executives are, for the most part, highly skilled technicians, but more expert in identifying and releasing value than creating it."

Froud and Williams (2007) and an article in the FT (2007) contend that private equity represents a rearrangement of ownership claims for value capture which allows value extraction, particularly for the benefit of the few who are positioned as private equity principals or senior managers. The legacy effects of private equity is therefore likely to be a cultural shift which normalises value capture insofar as it helps to institutionalise and normalise value extraction for the few as a practice and motivation for investors and managers in Western economies. Therefore, rather than creating efficiency, one of the attractions of private equity is that the business model concentrates equity ownership and fee income in a few hands so that a managerial elite can gain "life changing amounts of money."

Demonstrating how investing in private equity buyouts benefits executives, Froud and Williams (2007) and Golding (2007) point out that even though pension funds and other outsiders who invest in private equity become limited partners with an equity stake, the private equity fund is managed by a few private equity general partners who

earn fees and a share of the profits, while a few senior managers in the operating business often receive substantial equity stakes as a form of incentive and reward. General partners' earnings take two forms: first an annual management fee of around 1-2 per cent of committed capital, and second, a share of the profits of the fund usually about 20 per cent; payable after a hurdle rate of return has been achieved. The management fee skims a first tranche of value from the fund and provides a reward that is completely unrelated to performance, while the carried interest provides the opportunity to generate significant returns in the form of capital gains for the general manager, provided value can be extracted for the equity claimant (Froud and Williams, 2007).

In line with such views, Cuny and Talmor (2007) argue that for the managerial incentive alignment argument to be compelling, it should explain why incentive contracts and capital structural changes cannot be structured under current ownership. Without such arguments, the economic rationale for a non-strategic sale of an ailing company to improve its operational performance remains unclear. Furthermore, from an academic viewpoint, ownership changes before a turnaround seem at odds with the separation of ownership and control. This is particularly puzzling since most private equity firms do not claim to possess industry-specific skills. Rather, turnarounds often involve an assessment by professional consultants with such abilities. This is in line with Goossens et al (2008) who argue that the fact the company is involved in an ownership change is in itself positive and leads to value creation, whether or not private equity investors are involved in the transaction. Moreover, Harris (2008) argues in line with agency theory; that corporate managers cannot be trusted, and that incentive pay ultimately exacerbates the very agency problem it is purported to solve. Phalippou (2009) argues that considering the way buyout compensation contracts bury, in details, costly provisions that are difficult to justify on the basis of proper incentive alignment, it would be premature to assert that agency conflicts are lower in private, than in public equity.

As the theoretical and empirical evidence have grown against private equity investment in P-T-P buyouts, private equity executives use agency theory to argue that the focus of PLC executives should solely be on corporate shareholders, as they are the only

legitimate owners of the company, and the company should be operated in their sole and best interest (More, 1999). However, this suggestion has also run into difficulties.

2.1.3   Shareholder and Stakeholder Theory

Shareholder theory implies that the ultimate measure of a company's success is the extent to which it enriches shareholders (Jensen and Meckling, 1976). The justification for focusing on shareholders' interest is found in traditional property rights laws. This is a central part of the private equity buyout model in which it is stated: The function of managers is to "*maximise shareholder value*" (BVCA). The modern argument for shareholder value starts with the director's fiduciary duty to run the company in the interests of shareholders (Moore, 1999). This view gathered a great deal of traction during the buyout boom years of the 1980s and 1990s.[5] This view may well hold if all companies involved in buyouts were private. However, the current trend is to target PLCs. As a consequence, like agency theory and the managerial incentive realignment theory, shareholder theory ran into problems when private equity firms started taking more and larger PLCs private, and paid out large sums to corporate and buyout executives for allegedly creating efficiency gains, while laying off large numbers of workers. This has led UK trade unions and other opponents of the buyout model to raise questions over whose interests PLCs should be operated.

Early survey evidence suggests that rather than concentrating on shareholders alone, managers of UK PLCs felt committed to the enhancement of overall corporate wealth, including the company's human capital when making decisions (Donaldson and Lorsch, 1983). Moreover, Law (1986) argues that contrary to financial theory, the shareholder is not the only bearer of residual risk in the company. This has given rise to the competing stakeholder theory, which argues that PLCs should be operated in the interests of all its stakeholders (Drucker, 1988, 2001). In line with Law (1986), Drucker (1988) contends that in the modern context, thought must be given as to what management should be accountable for; and how, and through whom its accountability can be discharged. He continues:

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[5] For a discussion on shareholder theory see Jensen (1989, 2001), and Sternberg (1986).

"The shareholders' interest, both short-and long-term, is one of these areas, but it is only one. Buyout firms and their financial backers maintain that management is solely accountable to shareholders whatever their wishes, even if these represent nothing more than short-term speculative gains and asset stripping. This is indeed what the law says. But the law was written for early nineteenth century business conditions, well before large enterprises and management came into being."

Categorically rejecting the agency theory suggestion that managers of PLCs are systematically fleecing their shareholders, and that privately equity shareholders have a superior claim over stakeholders, Drucker (1988) argues that:

"The moral and legal arguments offered by agency theory that managers of PLCs will enrich themselves at the expense of the organisation and the recipients of its residual cash flows, the shareholder; places the shareholder in a superior position to stakeholders; and is the result of the overextended metaphor of agency theory in economics."

Drucker's (1988) view is that ownership of PLCs has shifted from private ownership to the pension funds of a country's employees. He argues this is the "most positive development of the twentieth century; because it resolves the social question that provoked the nineteenth century – the conflict between "capital" and "labour" by merging the two." He contends that takeovers are only a symptom of the fundamental questions pension fund socialism raises about the legitimacy of management - to whom are managers accountable? For what? And what is the purpose and rationale of large PLCs.

In contrast, Jensen (1989) supports the concept of private equity taking over PLCs, and argues contrary to Lowenstein (1985); Law (1986); Drucker (1986, 1988); and Shleifer and Summers (1988) that:

"Developments as striking as the restructuring of our financial markets and major industries reflect underlying economic forces more fundamental and powerful than financial manipulation, management greed, reckless speculation, and the other colourful epithets used by defenders of the corporate status quo. The forces behind the decline of the public corporation differ from industry to industry. But its decline is real, enduring, and highly productive. It is not merely a function of the tax deductibility of interest, nor does it reflect a transitory LBO phase through which companies pass before investment bankers and managers cash out by taking them public again. Nor, finally, is it premised on a systematic fleecing of shareholders and bondholders by mangers and others with superior information about the true value of corporate assets."

Donaldson and Preston (1995) interceding, contend that even though stakeholder theory goes beyond the purely descriptive observation that "organisations have stakeholders," the notion that stakeholder management contributes to successful economic performance is insufficient to stand alone as a basis for the stakeholder theory. However, he continues, the truth is; that the most prominent alternative to stakeholder theory (i.e., shareholders theory) is morally untenable. The theory of property rights, which is commonly offered to support the conventional shareholder view, in fact, in its modern and pluralistic form, supports stakeholder theory instead.

Sternberg (1996) rejects the view that PLCs should operate for the benefit of all stakeholders, and argues that "stakeholder theory is incompatible with business and all its substantive objectives, and undermines accountability, property rights, the duty of agents to principals, and the wealth-creating capabilities of business." However, Mitchell et al (1997) dismisses Sternberg's views, and argue that stakeholder theory must account for power and urgency as well as legitimacy, and no matter how distasteful or unsettling the results, managers must know about entities in their environment that hold power and have the intent to impose their will upon the company. Power and urgency must be attended to if managers are to serve the legal and moral interest of legitimate stakeholders. However, Sternberg (1996, 1997) rejects these assertions, and contends that even though stakeholder theory is widely offered as a corrective to perceived defects of business ethics, and as an alternative model of corporate governance, far from being a source of improvement, stakeholder theory is fundamentally misguided, incapable of providing better corporate governance, business performance or business conduct.

Sternberg (1997) is supported by Jensen (1997)[6] who maintains that corporations vest control rights in shareholders, without any apparent thought for the long-term corporate implications of what is being suggested. He continues, "They are the constituency that bears business risk and therefore have the appropriate incentives to maximise corporate value. Assigning control to any other group would be tantamount to allowing that group to play poker with someone else's money, and would create inefficiencies." The implicit denial of this proposition is the fallacy of the so-called stakeholder theory of the corporation, which argues that corporations should be run in the interest of all

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[6] A Theory of the Firm. Governance, Residual Claims, and Organisational Forms. Harvard Business Press.

stakeholders. Despite there being evidence of executives operating PLCs successfully for many years, Jensen (1997) argues that stakeholder theory offers no account of how conflicts between different stakeholders are to be resolved, and gives managers no principles on which to base decisions, except to follow their own preferences.

Reinforcing the views of Sternberg (1996) and Jensen (1997), Jensen (2001) asserts that stakeholder theory plays into the hands of special interest groups that wish to use the resources of corporations for their own ends, and argues:

"Stakeholder theory gives special interest groups the appearance of legitimate political access to decision-making power in organisations, and it deprives these organisations of a principled basis for rejecting those claims. The result is to undermine the foundation of value-seeking behaviour that enables markets and capitalism to generate wealth and high standards of living worldwide. If widely adapted, stakeholder theory will reduce social welfare even as it advocates to increase it."

Opposing Sternberg (1996) and Jensen (1997), Drucker (2001) contends that a company's human capital is its chief asset, and argues:

"The means of production is knowledge, which is owned by the knowledge workers and is highly portable. Knowledge workers provide capital, just as much as does the provider of money. The two are dependent on each other. This makes the knowledge worker equal to an associate or partner."

Whiles maintaining his rejection of the principles of stakeholder theory, Jensen (2001) concedes, in line with Drucker (2001) that "It is a basic principle of enlighten value maximisation that we cannot maximise the long–term value of an organisation if we ignore any important constituency. Companies cannot create value without good relations with customers, employees, financial backers, suppliers, regulators, and communities." In an attempt to resolve the dispute between shareholder and stakeholder theory, Jensen (2001) offers the balanced scorecard approach (enlighten stakeholder theory). However, this was not sufficient to lay the dispute to rest, and Fontrodona and Sison (2006) assert that:

"The assumption that shareholders own the company is not justified even within the framework of agency theory. If the company is a "nexus of contract" as argued by Jensen and Meckling (1976), then no one owns the company, because one cannot own a mere nexus. There can only be owners of various production factors. PLCs exist, primarily, not because of cost reductions, but because of a need for different competencies or the division of labour. These competencies are the fruit of the

combined efforts of individuals seeking a common goal. Therefore, the purpose of the company is not to maximise shareholder wealth but to provide an opportunity for stakeholders to develop themselves both materially and morally through the relationships they establish.

Consistent with the stakeholder arguments, Jack Welch, former head of General Electric concedes that, the emphasis he and other corporate executives and investors placed on shareholder value since his speech in 1981 is misplaced. He states "managers and investors should not set share price increase as their overarching goal. Short term profits should be allied with an increase in the long-term value of a company. On the face of it therefore: *"Shareholder value is the dumbest idea in the world. Shareholder value is a result, not a strategy. Your main constituencies are your employees, your customers and your products* (Jack Welch, 2009). In line with this admission, Nwanji and Howell (2009) suggest that a combination of both shareholder and stakeholder strategy could enable management to deliver the needs of stakeholder groups, while in the long term maximise wealth for shareholders.

2.1.4 Debt/Leverage

An alternative and more current criticism of P-T-P buyouts is they are motivated to take advantage of the large amount of cheap debt available to buy these types of companies. Debt (also known as leverage) in the buyout capital structure is intimately linked with free cash flow theory, and agency theory that managers of PLCs will enrich themselves at the expense of the organisation and the recipients of its residual cash flows (the shareholders). The principal advantage of debt in the buyout capital structure is the tax savings it generates from the ability to offset interest payments against the company's tax liability (Drucker, 1986). This is an important benefit because interest payments are tax deductible, whereas payments to equity holders are not.

The BVCA makes great play of its members' ability to leverage the PLCs they buy. Indeed Drucker (1986) argues that gains in buyouts, comes from the exploitation of financial market misevaluations, and the use of tax benefits associated with free cash flows. A study by accounting firm Ernst & Young confirms the importance of leverage in the buyout capital structure. It shows that only one fifth of the returns achieved from

buyouts come from strategic and operational improvements. The balance is attributed to additional leverage (Ernst & Young, 2008).

Private equity employing debt in its capital structure allows it to make large acquisitions without having to commit a lot of capital (Golding, 2007). It is well documented that debt reduces the agency costs of free cash flow by reducing the cash available for spending at the discretion of managers (Jensen, 1986, Garfinkel, 1989). The benefits from the increased performance enables debt servicing costs to be met, the consumption of managerial perquisites to be reduced and surplus cash to be disgorged to the market place for subsequent reinvestment in profitable projects (Wright et al, 1990). Theory suggests that the threat caused by failure to make debt repayments serves as an effective motivating force to make managers operate their companies more efficiently (Jensen, 1986; 1988; 1989). The type of efficiency referred to by this theory, is financial efficiency, which is brought about by the distribution of free cash flow. Froud and Williams (2007) points out that in principle; PLCs could improve return on equity by re-leveraging and taking out more debt. However, many PLCS declined to so, properly recognising that the control hypothesis of debt does not imply that debt issues will always have a positive control effect (Jensen, 1986), and retaining some cash flow to meet future challenges rather than resorting to debt. Little of the buyout theoretical literature focuses on the risks debt pose to a company, and the fact that debt has to be repaid at some point in the future.

Nevertheless, the retention and use of free cash flow by PLC corporate managers has been viewed as a central weakness in PLCs since Jensen (1986). Jensen (1989) contends that retaining free cash flow creates conflicts between shareholders[7] and managers, and maintains that for a company to operate efficiently and maximise value, free cash flow must be distributed to shareholders rather than retained and wasted, on what he considers to be organisational inefficiencies.

However, researchers such as Cybert and March (1963), Bourgeois (1981), Singh (1986) and Sharfman et al (1988) do not view the retention and use of free cash flow as a waste of corporate resources, but as organisational slack; which should be retained by

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[7] For a discussion on shareholder theory see Jensen and Mecking (1976) Sternberg (1996, 1997), Mitchell et al (1197) and Jensen (2001).

managers and reinvested in the company. Still, Fox and Marcus (1992) argue that cash flow may be embodied in valuable options for future actions that may otherwise not be feasible. It could simply buy the company time to wait for some degree of uncertainty to be resolved or for information to arrive. Under conditions of uncertainty, it can provide the company with the flexibility to make changes, and it may be used as a means to secure the long-term commitments needed from stakeholders. Viewed this way, cash flow offers the potential for competitive advantages, and if properly used; the potential for innovation allows managers to compete more successfully in global markets (Hirsch et al. 1990).

Recognising the difficult position many managers of PLCs find themselves trying to avoid being targeted and taken over by private equity, Drucker (1986) argues that it is too dangerous for any PLC to be liquid, as this will only attract a buyout bid that can expect to repay itself, and the debt incurred in bidding for the company out of the target company's own cash flow. Companies who find themselves in a liquid position, no matter how much cash they may need only a few months further on, hasten to squander the cash, for instance in buying up assets that are alien to their own business; that has only one advantage, it absorbs a lot of money. Moreover, companies increasingly cut back on expenses for the future, such as research and development. This is consistent with Rappaport (1990) who observes that buyout firms target companies that have strong and predicable cash flows, readily separable assets or businesses available for sale, products with well-known brand names and strong market positions that are not subject to rapid technological changes.

The GMB (2007) and IUF (2007) explain that part of private equity's strategy for unlocking value in target companies includes the sale of (and sometimes leaseback) of property assets, the sale of physical assets other than real estate, depleting cash reserves, and the use of the target company's assets to secure new loans. These practices generate greater free cash flow and so it is said that the value of the company's assets have been unlocked. However, Wol Kolade, Chairman of the BVCA rejects the GMB and IUF contention that private equity firms asset strip target companies to generate free cash flow to service debt, and argues that:

"This is probably the most illogical accusation to throw at an industry that survives by making businesses more successful, by growing them and adding value. You can't

create value in a business by stripping it of what makes it profitable, any more than you can attempt to sell a car on at a profit after you have removed its wheels. The whole idea of asset stripping, firing half the workforce and releasing a company as a wreck is completely nonsense. If we did that we would be out of business."

Recognition of the risks posed to companies involved in buyouts by over leveraging have now started to emerge. A report by the Bank of England points out that, capital gains on a private equity investment reflects any value added in restructuring the target company, for instance, by raising revenues and increasing margins. These gains should, to a certain extent, be determined by the skill of the general partner in setting strategy and, in some cases, introducing new management. But they are also a function of deal leverage. In certain cases, the report continues, the total cost of an acquisition will fall with the amount of debt funding used, implying that returns can be increased through greater leverage. This results from a failure of the Modigliani-Miller (1958) Capital Irrelevance Theorem. A failure of this theorem rests on there being financial frictions that distort the relationship between the cost of debt and the amount of equity. If capital markets were fully efficient; which is comprehensively rejected by Shleifer (1988), the capital structure of a transaction would have no impact on its overall cost of funding. However, a variety of information and incentive problems and policy distortions (for example the tax deductibility of debt) are widely believed to cause deviations from this theoretical equilibrium (Bank of England, 2013).

2.1.5   Disciplinary Mergers Theory

Given the perceived entrenchment of corporate managers, and the perceived poor performance of PLCs discussed in the theoretical literature above, agency theorists such as Friedman (1970), Jensen and Meckling (1976), and Jensen (1989) argue in line with Manne (1965), for the need for a takeover market that, functioning as a market for corporate control, will discipline managers whose companies perform poorly.

Berle and Means, (1932), Marris, (1963), Williamson, (1964), and Sappington, (1983) all argue that it is a "well-established argument" that managers in PLCs do not have strong incentives to allocate corporate resources in a way to maximise shareholder value. This led to the development of Mann (1965), Mead (1968), and Jensen (1988, 1989) disciplinary mergers theory prediction that plants or companies performing

poorly before a buyout will become takeover targets, and will have improved performance after the takeover.

To test the disciplinary mergers theory, Lichtenberg and Sigel (1992) apply a matching theory model closely related to the matching theory of job turnover developed by Jovanovic (1979) and used extensively in labour market studies to investigate corporate ownership changes. According to this theory, heterogeneous groups of workers and employers continually engage in a matching process that improves the fit between workers and jobs. Lichtenberg and Sigel (1992) argue that "companies are constantly evaluating the match or fit between plant and parent," and that "the quality of the match is the major determinant of corporate decisions to maintain or relinquish ownership of an establishment." Lichtenberg and Sigel (1992) theory contains two important implications:

(1)   Low productivity, an indicator of poor match between the establishment and its management, will lead to ownership changes.

(2)   A change in ownership will result in increased productivity.

It is upon these premises that private equity relies for its justification of targeting and taking over PLCS.

2.1.6   Market for Corporate Control Hypothesis

The market for corporate control is viewed as a major component of the managerial labour market (Jensen, 1988). Mann (1965), Jensen and Ruback (1983) define the market for corporate control as an arena in which alternative management teams compete for the right to manage corporate resources, such as employees and free cash flows (Jensen and Ruback, 1983; Jensen, 1988; Jarrell et al 1988). Consistent with the disciplinary mergers theory, the market for corporate control hypothesis predicts that superior management teams will target underperforming companies in takeover bids. According to Jensen (1984, 1988) the large returns received by corporate shareholders in early buyouts are due to improved management and increased efficiency brought about by restructurings.

According to Jensen (1988, 1989), buyouts loosen control over vast amounts of resources; enabling them to move more quickly to their highest valued use. Jensen claims this is facilitated by the buyout governance structure, which provides stronger incentives for managers to operate companies more efficiently than the PLC governance structure. Jensen (1988) argues that because existing PLC managers have trouble abandoning strategies they have spent years devising and implementing; even when these strategies require the abandonment of major projects, relocation of facilities, changes in managerial assignments, and the closure or sale of facilities or divisions, it is easier for new top-level buyout managers with fresh views of the business and no ties with the current employees or communities to make such changes.

Identifying deficiencies in Jensen's (1988) arguments over the benefits of ownership changes, Von Thadden (1989) points out that Jensen's arguments lack awareness of what precisely creates gains in ownership changes. Jensen originally argues that "The exact nature of the changes in assets, liabilities, management, employment, and operating strategies would give us a much better understanding of the sources of gains from "takeovers." However, he then contradicts this in a discussion on agency problems and free cash flow where he states: "Many of the benefits in going private and *LBO* transactions seem to be due to the control function of debt. These transactions are creating a new organisational form that competes successfully with the open corporate form because of advantages in controlling the agency costs of free cash flow," switching the argument from takeovers in general to LBOs.

Jensen (1988) also acknowledges that the changes that triggered early buyouts came about, because a variety of political and economic conditions created a climate where economic efficiency required the major restructuring of corporate assets. These factors included the relaxation of restrictions on mergers imposed by US antitrust laws; withdrawal of resources from industries growing slowly or that needed to shrink; deregulation in the financial services industry; the oil and gas transportation industries; the broadcasting industry; improvements in takeover technology, including a larger supply of increasingly sophisticated legal and financial advisors; and improvements in financing technology. However, these are factors not necessarily under the control of managers, and which are different from any wilful act on the part of managers in PLCs, or their inability to manage corporate resources efficiently. Consistent with this view,

Law (1985, 1986); Drucker (1986); Lowenstein (1985, 1986); and Shleifer and Summers (1988) argue that takeovers are largely a form of financial rearrangement which creates private value by capturing rents but creates little or no social value, and that the disruption costs of some hostile takeovers may well exceed their social benefits.

Contributing to the debate against buyouts, Hansmann (1988) argues that ownership forms are more variegated that just private or public, and identifies investor-owned companies, customer owned firms, worker owned firms, and firms without owners (non-profit enterprises). He argues that each deals differently with problems associated with hierarchy, coordination, incomplete contracts, monitoring and agency costs. This leads to an expectation that different ownership forms will generate differences in performance. Building on this argument, Von Thadden (1989) asserts "corporate control is a good that determines the activities of a company and hence influences the preferences of its shareholders in different ways. Therefore, transferring control to one group of shareholders does not necessarily imply that a well-defined value is increased; only that corporate activities are redirected according to the preference of the new shareholders. The efficiency implication of this change must therefore be judged case by case and should not be taken for granted a priori." Therefore, the general claims of the market for corporate control hypothesis should be met with doubt, as the far reaching assertions and policy recommendations in Jensen (1988) are not justified. Nor is the concept of the market for corporate control fit to describe takeover practices in Europe.

Considering the competing buyout arguments, Rappaport (1990) contends that it is impossible to overstate how deeply the market for corporate control has changed the attitudes and practices of US managers, and points out that in response to shareholders' requests for the return of cash, hundreds of PLCs have shed underperforming divisions, sold assets not essential to operations, repurchased stock, increased leverage, and closed uneconomic plants and offices. This restructuring wave is not a fad he continues; it is an enlightened response to profound changes in the competitive and financial environment. Following this reasoning, Rappaport (1990) concludes that executives of PLCs have learned lessons from the early waves of buyouts on how to operate their companies like those owned by buyout firms. Therefore he contends, no efficiency gains are expected from buyout ownership changes. Moreover, P-T-P buyouts are a

form of shock therapy, capable only of producing one-off gains. Companies involved in buyouts and ownership changes are therefore transitory organisations with a limited life span.

Consistent with Rappaport (1990) alternative buyout hypothesis, opponents of private equity contend that when private equity firms take control of a target company, the new management's focus is not on actual business operations, i.e., converting inputs into outputs, or the provision of services, or increasing operating margins. Instead it is on extracting maximum cash out of the business in the quickest time (GMB 2007, IUF, 2007).

In line with observations made by Jensen (1988), and consistent with Rappaport (1990) alternative buyout hypothesis, Wruck (2008) concludes that since Jensen and Ruback (1983), the dramatic expansion of the private equity market, and the resulting competition between corporate and financial buyers for deals have both reinforced and revealed the limitations of the definition of the market for corporate control. The effects of private equity on the behaviour of companies both public and private have been important enough to warrant a new definition of the market for corporate control, one that emphasises corporate governance and the benefits of competition for deals between private equity firms and public acquirers.

CHAPTER THREE: EMPIRICAL LITERATURE REVIEW

3.0 Empirical Literature Review

Attempts to empirically test the various buyout theories discussed in the theoretical literature above, and therefore firm efficiency, have been undertaken using a variety of techniques. This section therefore looks at the main techniques used to test these theories. These include accounting studies, event studies, total factor productivity techniques, data envelopment analysis, and stochastic frontier analysis. The section also considers the suitability of the techniques to address the question of efficiency in buyouts.

3.1 Accounting Studies

Accounting studies examine company performance based on accounting data such as net income, operating and net cash flows to assess how efficiently a company is deploying its assets. The buyout theoretical literature suggests that the corporate resources alternative management teams compete for the right to manage in target PLCs is free cash flow. Many empirical studies analyse the performance of buyouts based on a company's post cash flow performance.

Weston and Mansinghka (1971) use US accounting data to test the performance of conglomerate companies for the period 1960-1968 using profitability as the measure of performance. For the year 1968, they find that the earnings rates of companies in the control sample are significantly higher than acquiring conglomerate companies, and that acquired companies are less leveraged than the acquirers. Melicher and Rush (1974) report similar results for the period 1960-1969. This suggests that PLCs are being targeted to gain access to unused cash flows. However, Melicher and Rush (1974) suggest that the acquisitions in their sample may have been undertaken as a defence strategy against hostile buyouts. While the study is only on conglomerate acquisitions, it provides some evidence that companies were not necessarily purchased because they were performing badly.

Opler (1992) investigates operating performance following buyouts in a sample of 44 large US LBOs during the period 1985-1989 using operating cash flow. The author

finds that median operating cash flow to sales increased by 16.6 per cent one year before the buyout until two years for the LBO sample. The study does not report the proportion of friendly and hostile buyouts. This is important, since if there are a lot of friendly takeovers in the sample; it may help to explain these results, as friendly takeovers could have been undertaken as a defensive mechanism, or simply for synergy gains, rather than to discipline managers, as argued in the theoretical literature above. If this is not the case, then the result may provide empirical support for the hypothesis that buyout firms target healthy PLCs. The author also purports operating profit per employee rose by an average of 31.8 per cent in the two years following the buyout. The rise in operating cash flow per employee suggests that LBOs are associated with significant improvements in labour productivity, which may mean reductions in employee numbers. The sample in this study is small and biased towards larger buyouts, and is limited to the first two years of the buyout. The study also surprisingly excludes buyout of divisions of companies.

Perry and Williams (1994) examine a sample of 175 US MBOs during 1981-1988 and find no negative discretionary accruals in the year prior to the buyout announcement. Moreover, when the authors apply their method to DeAngelo's (1986) sample, they find no evidence of significant accrual changes before the MBO.

Franks and Mayer (1996) investigate hostile UK buyouts in 1985 and 1986 using accounting data. Focusing on the extent to which hostile takeovers give rise to management board turnover and post takeover restructuring, they find that the performance of target companies are not inferior to that of a sample not involved in buyouts or merger activity, matched on firm size and industry, except for Q ratios. However, they report that it is difficult to distinguish between the financial performance of target companies prior to a bid and after an accepted bid. Moreover, the authors find that over two and five years prior to a takeover bid, target companies display superior abnormal share price performance compared to a sample, and that only in the year prior to a bid is there worse performance. This suggests that private equity firms do not necessarily target poorly performing companies as suggested by Drucker (1986, 1988) and that there is possible manipulation of accounting data downwards by executives of PLCs to help justify the buyout.

Agrawal and Jaffe (2003) use US financial data for a sample of 2,083 acquisitions for the period 1926-1996 to examine the long-run operating performance of target companies before they are acquired. All companies are within the same two-digit primary SIC industry code. Performance is measured in terms of both operating returns on assets, and operating returns on sales. The result for operating return on asset is significant. This indicates that there are no significant differences between target companies and their controls. The results for operating return on sales also show significant differences between targets and the control sample. These results are inconsistent with the disciplinary mergers hypothesis.

Weir and Wright (2006) use accounting and financial data for 96 UK P-T-P buyouts and probability regression to calculate sales growth, free cash flow and capital expenditure, and buyout data to examine whether P-T-P transactions are different from listed companies. They find that companies involved in P-T-P buyouts are likely to have lower growth prospects and valuation, suggesting, consistent with the undervaluation hypothesis, that going private via an MBO may result from management's knowledge of private information that leads to them believing that the market has an incorrect perspective of the company's prospects.

Several limitations are noted with accounting study techniques. Lichtenberg and Siegel (1987) state that because many ownership changes involves only parts or divisions of a company, it is difficult to assess the impact of such partial acquisition or divesture using financial data at the level of the company.

Verma (1993) pointed out that aggregate measures of firm performance such as net income, are less informative about the operating performance of a company because they incorporate many other factors in addition to the direct outcome of operating decisions. It is better therefore to use a more direct measure of operating performance that is based on the total factor productivity of the company. In addition, Thompson and Wright (1995) argue that accounting techniques tend to be short term in nature, typically two to three years post-buyout, and miss one important component of managerial control, technical efficiency employed in the partial accounting ratios used in studies such as Kaplan (1989) and Smith (1990).

Finally, Harris et al (2005) argues that the accounting profits used in accountancy studies are not necessarily perfectly correlated with real firm performance, as policy

decisions regarding the optimal level of buyout activity hinge mainly on their impact on economic efficiency (i.e., the social returns to buyouts) and not on their effects on profitability (i.e., the private returns to buyouts).

3.2   Event Studies

Contrary to accounting studies, event studies examine the cumulative abnormal returns (CARs) to shareholders in acquired companies in the period surrounding the announcement of a buyout. Since the 1970's event studies have dominated private equity research (Bruner, 2002). An efficient market is defined as one in which a share price fully incorporates all available information on the security and that the share price provides accurate signals for optimal resources allocation (Fama, 1970). A large body of empirical evidence on the combined market value of US acquiring and acquired companies suggest that takeovers have a positive net effect on stockholder wealth.

Early event studies are based mostly on conglomerate firms. Whilst conglomerate firms such as Hanson Plc were indeed public companies, they play a critical role in helping to explain some of the dynamics of buyouts. It also provides a critical link with Drucker (1986, 1988) and Rappaport (1990) theoretical hypothesis which suggested that managers of PLCs have learned lessons from the early wave of buyouts, and were operating their companies more efficiently, and in a similar manner to the buyout model.

Smith and Schreiner (1969) compare the efficiency of target selection by conglomerates with that of investment companies (buyout firms). Their findings indicate superior performance for companies owned by investment firms. The data for the investment companies is based on actual industry distributions. However, the results for companies owned by conglomerate firms is a simulation based on the industries in which the conglomerate firms operate.

Linters (1971) starts to develop a case for financial leveraging as a motive for conglomerate mergers in the form of taking advantage of suppressed debt capacity of target companies. It is argued that by acquiring a less leverage company, the acquiring firm's debt ratio is lowered and consequently there develops the potential for more

borrowing. Reid (1971) proposes alternatively, that conglomerate firms are motivated by size maximisation objectives as opposed to profit maximisation objectives. That is, managers of conglomerate firms focus on growth in sales, assets, and employees in an effort to improve their prestige and job security.

Weston and Mansinghaka (1971) propose, contrary to the disciplinary mergers theory, that companies become conglomerates through defensive diversification activities, i.e., diversification to avoid adverse developments in existing markets and operations. To examine this hypothesis, the authors use data from the Fortune 500 and multiple measures to examine the efficiency performance of 63 US conglomerate firms covering two periods, 1958-1960 and 1960-1968 against a sample of companies involved in mergers. They find that the growth rates are significant compared to both control samples separately or jointly. The differences in the growth rates between the two random samples are not significant. For the year 1958, the earnings rates of the control samples are significantly higher than the earning rates of conglomerates. However, by 1968, no significant differences are observed in earnings performance among conglomerates and the control groups. According to the authors, the results show that an important economic efficiency of conglomerate firms has been to raise the profitability of firms with depressed earnings to the average for industry.

Lintner (1971) linked these increases to leverage taken on by conglomerate firms. The authors show that in 1958 the debt ratios of conglomerate firms were significantly lower than those of one of the random samples, but they were not significantly different in 1968. Compared with non-industrial companies, conglomerate firms employed higher debt ratios both in 1958 and in 1968. In addition, compared with both samples, the debt ratios of conglomerate firms grew more rapidly during the period 1958-1968.

However, as early as the 1970s, conglomerates behaving like private equity firms became a source of contention.[8] For instance, Reid (1971) points out that whilst Weston and Mansingka (1971) claim that conglomerates increased economic efficiency for the industry in general, they did not discuss nor report any findings on the industry effect in their study. Moreover, they note that the attempt to claim economic efficiency appears almost simultaneously as the view of part of the economic wreckage becomes visible

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[8] http://www.guardian.co.uk/business/2004/nov/03/politics.politicalnews

on the business and financial scene. Re-examining and updating the data used in Weston and Mansingka (1971), they find that profits to net-worth and profits-to-sale ratios are lower in 1960 for conglomerates, but not statistically significant. Like Weston and Mansinghka (1971), the author concluded that the slight improvement in the profits-to-net worth ratio from 1960 is probably due to the increased use of leverage by conglomerate firms rather than the result of operating inefficiencies.

Melicher and Rush (1974) investigate the acquisition performance of mergers using size, earnings performance, factors influencing earning performance, and five year performance (including factors affecting leverage and price earnings) as measures of firm performance. The results relating to earnings performance show that acquiring conglomerate firms significantly lagged behind their non-conglomerate counterparts in terms of pre-merger operating profit levels. The suggestion from this is that conglomerate firms were on average, acquiring relatively more profitable companies, which is consistent with Weston and Mansinghka defensive diversification hypothesis, which states that conglomerate firms acquire companies and diversify into areas that are relatively more profitable than existing areas of operation. They also confirm that conglomerate firms utilised significantly higher levels of leverage that non-conglomerate companies, but the leverage difference between the two groups is not significant, which is consistent with Rappaport (1990) hypothesis that managers of PLC owned companies have adapted operating strategies from the buyout industry.

Other event studies focus on the cumulative abnormal returns (CAR) to target shareholders at various time periods around an event window in mergers. The results from these studies are mixed.

Halpern (1973) criticises the methodology used in previous event studies on merger activities. The author argues that to distinguish between companies in mergers on the basis of buyers or sellers is arbitrary and has no economic justification, as in the case of mergers, it is plausible the seller is seeking to take over the buyer. To address this limitation, US share price data for companies involved in successful mergers for the period 1950-1965 and regression analysis is used to find a base date[9] to estimate an

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[9] An initial problem in these studies is to find the base date for which to measure share prices. This is the latest share price recording prior to any discounting of the takeover (Firth, 1979).

event window seven months, and up to twenty three months before a buyout bid announcement date. Using the relative size of companies in mergers, measured by the value of their equity at the base date, and a comparison of the gains for the larger and smaller companies in the merger, show that the mean adjusted gains to larger companies in mergers is positive, and that on average, the total adjusted gains from mergers are divided evenly which suggest that no profitability gains are obtained from mergers.

Firth (1979) uses bid data for 224 successful buyouts to examine the profitability of UK takeovers during the period 1972-1974 up to 48 months before the bid, and an event window one and two months after the bid, settling on a base date for measuring total gains as being one month prior to the takeover. Consistent with the disciplinary mergers theory, the author finds that acquired companies earned slightly negative returns in the 36 months period up to 12 months before the bid. Companies in the sample had negative CAR of -1.5 per cent prior to the buyout, and 58 per cent of firms in the sample had negative CARs. In month -1 they report a sharp jump in residuals with over 80 per cent of the buyout sample showing abnormal gains, which is attributed to leakage of bid news and/or the build-up of a pre-buyout share stake by the buyout company. The author also points out that as some of the takeover premiums paid for acquiring companies are often so large that they discount all the obvious profit potential. Thus such takeovers will be fairly expensive for the acquiring firm and their share prices may fall.

Keown and Pinkerton (1981) examine the movement in share prices of 101 companies listed on New York and American Stock Exchange from 1975-1978 prior to the announcement of a buyout. Unlike Firth (1979) samples were gathered for 157 trading days surrounding the announcement date (126 trading days before, 31 day after the announcement date). They show that the CAR becomes positive 25 trading days prior to the announcement date, and approximately half of the total increase in CAR occurs prior to the announcement date. Similarly, the daily average residuals are positive on 26 out of the 27 days prior to the announcement date, and are significantly different from zero at 90 per cent significance level on ten of the final eleven days prior to the announcement date. In addition, substantially more than half the daily residuals are positive on each of the five days prior to the announcement. This suggests substantial

trading on inside information[10] concerning the prospective merger begging approximately one month before the announcement date. This finding is consistent with theoretical arguments from Law (1986), Lowenstein (1986, 1990), Shleifer and Summers (1988), Drucker (1986, 1988).

Jarrell and Poulsen (1987) estimate the premiums paid in 663 successful tender offers from 1962-1985. They show that the average buyout premiums paid to target company shareholders averaged 19 per cent in the 1960s, 35 per cent in the 1970s, and 30 per cent from 1980-1985. These figures are consistent with 13 studies of pre-1980 data contained in Jensen and Ruback (1983) which show that targets of successful tender offers and mergers before 1980 earned positive returns ranging from 16 to 30 per cent. Jarrell et al (1988) conclude that the premiums in takeovers represent real wealth gains and are not simply wealth redistributions. In addition, studies by Kaplan (1989); Lichtenberg and Siegel (1990); Singh (1990); Kaplan and Stein (1993) show that buyouts realise efficiency and productivity gains.

Shleifer and Summer (1988) on the other hand, argue that since some empirical evidence suggestz that redistribution in association with buyouts can be large and that perhaps some inefficiency results also, it is incorrect to gauge the efficiency gains from takeovers by looking at event study measures of increases in shareholder wealth.

Palepu (1990) cautions that as early results from event studies show there is a possibility that LBOs may lead to a decline in efficiency, there is a need for these studies to focus on the relationship between LBOs and the efficiency of an organisation. Moreover, Long and Ravenscraft (1993) argue that buyouts lead to long-term decline in research and development spending and profitability. Moreover, the authors state that event studies only offer evidence of the stock market reaction to buyouts, and therefore lack the empirical evidence required to make strong judgement regarding the impact of buyouts on efficiency.

Phan and Hill (1995), DeAngelo et al (1984), and Madden et al (1990) report that rather than operational efficiency gains, it is the changes in the structure and strategy of companies involved in US buyouts that creates efficiency. Robbie and Wright (1995),

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[10] The earning management hypothesis is examined at 2.2.4 below.

Weir et al (2005), Nikoskelainen and Wright (2007) report similar findings for UK P-T-P buyouts.

Agrawal and Jaffe (2003) use US share price data for the New York Stock Exchange and a sample of 2,083 acquisitions for the period 1926-1996 to examine stock return performance prior to acquisitions. All but one of the CARs up to month -3 are positive which means that the results do not support the hypothesis that companies are targeted because of poor performance, either as a whole or for sub-samples. The results are adjusted for firm size, past returns, and book-to-market value, and they are statistically significant.

Most event studies are predicated on the basis of efficient stock markets (Halpern, 1973). However, Shliefer (2001) raised doubts over the use of event studies to address questions such as whether buyouts enhance economic efficiency. The author questions the efficient market hypothesis (EMH) which asserts that changes in share prices following the announcements of a buyout reflect changes in future real firm performance or economic efficiency. The author argues that policy decisions regarding the optimal level of buyout activity hinges mainly on its impact on economy efficiency (i.e., the social returns to buyouts), not on their effects on share prices. Coupled with this, Verma (1993) and Harris et al, (2005) argue that aggregate measures such as the market value or earnings per share are less informative about operating performance than operating income because they reflect many factors besides the direct outcome of operating decisions. However, operating income can still be considered a "noisy" measure because it incorporates both the controllable and uncontrollable portions of operating performance.

Critiquing event study techniques, Agrawal and Jaffe, (2003) point out that most event studies focus on stock returns over a short period (a few days or a few months) around the announcement of an acquisition. Consequently, an investigation of long-run stock returns is generally a sideline in these studies. Equally, most of these papers were written before the development of current methodologies for analysing long-run stock returns. Therefore, existing evidence on long-run stock price performance of takeover targets should be treated with caution.

In addition to the above methodological limitations, Fraser-Sampson (2007) states that private equity is different in so many ways, but most importantly it is the only asset class where (1) annual returns are meaningless, invalid and irrelevant and (2) true returns can only be measured many years in arrears. Thus, while we should make full use of the available data, we should always be ready to temper the results with perceived trends and personal experience, particularly where we may be in the midst of structural changes.

Because of the limitations of the accounting and event study techniques, they are rarely used in current research to measure efficiency in companies that are involved in buyouts. In fact, most studies on UK buyouts are undertaken at the private equity fund level using techniques not suitable for the measurement of technical efficiency, and most are sponsored by the BVCA.[11] Few of these studies focus on the technical efficiency of the individual target companies or plants.

In attempts to measure buyout efficiency using accounting data, some early studies focused on Jensen's free cash flow theory to try and explain efficiency gains and value, while the more recent theoretical and empirical literature suggest buyout efficiency gains and value may derive from outsourcing production and employment (Harris et al, 2005).

3.3   Free Cash Flow

Free cash flow in PLCs is associated with agency problems. Jensen's free cash flow theory implies that managers of PLCs will retain and waste free cash flow on unprofitable investments and managerial perquisites. The IUF and UK GMB unions contend that when private equity targets and take PLCs private, the new management's focus is not on improving operational efficiency, i.e., converting inputs into outputs, it is on extracting as much cash out of the business as quickly as possible to pay down the borrowing it has taken out to buy the company, and to pay out in dividends to buyout executives. The BVCA consistently rejects the accusation it is targeting PLCs because of their potential cash flow. This empirical question has been examined a number of

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[11] See Acharya and Kehoe (2007).

times since the earliest buyouts, as free cash flow is considered one of the major sources of post buyout gains, and is central to the theoretical arguments over the retention and pay out of free cash flow.

DeAngelo et al (1984) and Madden et al (1990) examine the impact of buyouts on efficiency and find that buyouts generate significant operating efficiencies, which also contribute to enhance cash flow in the private company. However, the authors report that productivity gains in their samples (measured by increased free cash flow) are achieved through savings on registration and other public ownership expenses and through improved incentives for corporate decision makers under private ownership.

Smith (1990) investigates changes in the operating performance of 58 companies involved in US P-T-P MBO during 1997-1986 and find significant increases in operating returns from the year before to the year after the buyout as measured by operating cash flows. An increase in pre buyout cash flow may indicate that target companies were experiencing little inefficiency before the buyout as suggested by Rappaport (1990), or that managers were preparing the companies to sell to private equity. Bull (1986); Kaplan (1989); Kaplan and Stein (1991); Kitching (1989); Long and Ravenscroft (1991); Muscarella and Vetsuypens, (1990); and Smith (1990) document increases in before and after-tax cash flows following US buyouts. Kaplan (1989) and Smith (1990) show that capital expenditure decline following LBOs, suggesting that buyouts reduce expenditure on R&D that would have been funded by retained cash flow. Kaplan (1989) argues this decline represents a reduction in wasteful investments.

The study by Kaplan and Smith is widely cited as evidence that LBOs result in greater efficiency. However, the study only considers LBOs that occurred in the early and mid-1980s. In addition, Jensen (1986) shows that gains were easily made in the early buyout wave because executives in industries such as the U.S oil, gas, and steel were slow to respond to changes in the American economy which meant many PLCs in these industries performed poorly; because executives continued to commit resources to projects with negative net present values. It is therefore generally accepted that early hostile buyouts served a valuable purpose in breaking up large underperforming companies or forced them to restructure their operations in the 1980s and 1990s (Drucker, 1986, Lowenstein, 1990). It is however not generally accepted that hostile

buyouts serve any purpose beyond this role, or indeed that the retention and use of free cash flow by PLC executives represent a waste of corporate resources.

Morck et al (1988) use a sample of all publicly traded Fortune 500 companies to analyse the characteristics of targets of hostile takeovers. Of this, a sample of 82 companies underwent a takeover during the period 1981-1985. Using Tobin's q^{12} as a measure of analysis, they report, consistent with free cash flow theory, that companies experiencing hostile bids between 1981 and 1985 were slow growing, had lower Tobin's q, and less investment of their income.

Lehn and Poulsen (1989) use event study to investigate the source of stock holder gains in a sample of 263 buyout transactions during 1980-1987. They find a significant relationship between undistributed cash flow and a company's decision to go private. In addition, using a premium technique, they find that premiums paid to stockholders are significantly related to undistributed cash flow. Carow and Roden (1997) find similar to Lehn and Poulsen (1989), that companies with high cash flow and low Tobin's q are more susceptible to buyouts. They report that companies in their sample have higher abnormal returns, and companies which substantially increased leverage, and MBOs with high inside ownership prior to a buyout, have lower abnormal returns.

Smith (1990) uses operating cash flows to investigate changes in the operating performance of 58 MBOs during 1997-1986. The authors find that operating returns increase significantly from the year before to the year after the buyout. Hall (1990), Lichtenberg (1990), Opler (1992), Long and Ravenscraft (1993) Ofek (1994) Desbrierres and Schatt (2002) all provide evidence of cost cutting and improved margins and efficiency after buyouts. However, these studies measure the profitability of companies; which is not the same as measuring technical efficiency.

Ippolito and James (1992) use pension termination data from a sample of 278 US companies undergoing P-T-P LBOs for the period 1980-1987 to test Shleifer and Summers (1988) efficiency theory. Using takeover attempts as independent variable, and two types of excess assets as dependent variables, they report that the coefficients for excess assets are positive, and although each itself is not statistically significant,

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[12] As a ratio of the market value of the firm to the replacement cost of its tangible assets, Tobin's q can be viewed as measuring the intangible assets of the firm (Morck et al, 1988:114).

their sum is significant at the 95 per cent level of significance. Consistent with Shleifer and Summers (1988) they report that the efficiency theory can explain a substantial number of LBO related terminations, but not enough to undermine the transfer theory. They conclude that the magnitude and significance of their results is inconsistent with the hypothesis that excess assets are a dominant factor in attracting either LBOs or takeover attempts.

Opler (1992) uses operating and net cash flow for 44 US buyouts to investigate operating performance in LBOs between 1985 and 1989. The author finds that median operating cash flow to sales of companies involved in buyouts starts to rise from one year before to two years after the buyout. Consistent with the hypothesis that buyouts are motivated by the potential free cash flow of companies (Drucker, 1988), the author report that median net cash flow rises significantly after LBOs which provides a statically significant rise in cash pay-out potential.

Opler and Titman (1993) use US longitudinal manufacturing data to examine the motives for LBOs by comparing a sample of 180 companies involved in LBOs against a sample that did not. In the study, growth opportunity is proxy by growth, which is the change in the company's asset base, and book to market value. After controlling for other effects, they find that companies with high cash flows are more likely to become LBO targets. However, the coefficients for these variables are not statistically significant. Consistent with Jensen's free cash flow theory, they conclude that companies with high cash flow and low Tobin's q are more likely to be involved in buyouts.

Evans et al (2005) assess the characteristics of firms involved in buyouts during 1990-1999 using a sample of 80 Australian companies. The authors report that high levels of free cash flow are not associated with the likelihood of going private. Australian buyouts are characterised as having high liquidity, lower growth rates, and lower levels of leverage and R&D expenses. However, these are precisely the attributes that attract buyout firms' attention (Drucker, 1986, 1988).

Weir et al (2005) use financial and accounting data, with buyout data from the CMBOR, and choice-based sampling to investigate factors influencing the decision of 95 UK public companies to go private during the period 1998-2000. Inconsistent with

free cash flow theory, they find no evidence that the extent of free cash flow differs between non-acquired and acquired companies. They do however find that companies going private are smaller, more likely to have higher CEO shareholdings, higher institutional shareholdings, more duality, and lower q ratios. The importance of CEO shareholding is consistent with evidence that one of the most important factors driving post-buyout returns is management equity stake, not high leverage, which suggests, contrary to the free cash flow hypothesis, that the financial performance of buyout firms is not simply associated with free cash flow issues.

Renneboog et al (2007) use share price data for 117 companies involved in UK P-T-P buyouts during the period 1997-2003 and a premium analysis and event study technique to examine the source and magnitude of expected shareholder gains. They find, in line with Weir et al (2005) and most US studies, no evidence to sustain the free cash flow hypothesis, and conclude that companies are not taken private to reduce free cash flow as predicted by Jensen (1989). However, the modern argument is not that private equity is targeting PLCs to reduce free cash flow, but to increase and take advantage of it to fund their acquisitions. Moreover, Chapel et al (2010) use multivariate testing to examine how private equity chooses buyout targets in Australia. They report that target companies have relatively greater financial slack, greater financial stability, greater cash flow and lower measurable growth prospects, which contradicts Reeneboog et al (2007).

The IUF and GMB trade unions point out that in order to be able to service the debt used private equity firms to buy target companies, and pay out dividends to private equity shareholders and executives buyout firms have to lay-off large numbers of employees and outsource production and materials to cheaper destinations.

3.4   Outsourcing Production

Harris et al (2005) suggested that increased levels of efficiency in targeted PLCs may be due to measures taken by new owners or managers to reduce the labour intensity of production, via outsourcing of intermediate goods and materials to destinations with cheaper labour costs such as China and India. Contracting out of businesses activities to

national and foreign destinations has been undertaken for decades; however, the phenomenon appears to have come to prominence with outsourcing of services becoming increasingly important in buyouts (Willcoxs and Plant, 2003, Windrum et al, 2009). Outsourcing involves the transfer of goods and service production previously carried out internally to an external provider (Domberger, 1998), and is thought to improve productivity by increasing the efficiency with which inputs are used (Olsen, 2006), with lower labour costs being the main driver of outsourcing (Pfannenstein and Tsai, 2004).

Although much of the media attention has tended to focus on the use of foreign outsourcing by manufacturers and call centres, the vast majority of outsourcing in the UK and the US is done locally by service firms, not manufacturers (Willcoxs and Plant, 2003, Windrum et al. 2009).

Using a sample of 19 PLCs operating in the UK non-financial sector over a three year period and variables to measure the impact of outsourcing on profitability, Juma's and Woods (2000) finds that outsourcing decreases employment costs almost immediately. An examination of the changes in employment costs by changes in wages divided by sales indicates that employment costs decreased by 1.7 per cent and 2.1 per cent in t_0 and t_1 respectively, and that these changes are statistically significant. In contrast, Gilley and Rasheed (2000) and Jian et al (2006) Bengtsson (2008), Bengsson and Dabhilkar (2009) find no significant evidence that outsourcing affects firm performance in the US IT industry directly.

Gorzig and Stephan (2002) use firm level panel data from Germany to show companies which increase material inputs relative to internal labour costs perform better in terms of gross operating surplus than other companies. However, companies that increase external services relative to internal labour costs, thus outsourcing service functions previously provided within the company, performs worse. Similar findings are reported by Dabhilkar and Bengtsson (2008) for manufacturing who use data from 267 Swedish manufacturing plants to examine the comparative effects of outsourcing in relation to alternative manufacturing practices and find that in comparison to outsourcing in manufacturing, other practices relating to the enhancement of manufacturing capabilities, such as investment in new technology and production processes, work organisational change and closer external co-operation with customers and suppliers

have a much stronger ability to predict improvements in operating performance, and that alternative manufacturing practices have been overshadowed by the many promises of outsourcing. The effects of outsourcing are also found to have a significant productivity effect in the US manufacturing industry (Houseman, 2007).

Windrum et al (2009) examine total outsourcing, organisational innovation and long-term productivity growth using simulation. The result shows that large scale outsourcing restricts the scope for future organisational innovation in firms, leading to lower productivity growth. Presumably this is because companies cannot respond to changes in the production process as quickly as if it had direct control of production. However, this may be related to the type of industry that outsourcing takes place in, since Kishan and Cieslak (2012) report major increases in outsourcing in facilities management in the pharmaceutical industry generating savings of 15-20 per cent totalling $6.5 billion dollars across a five year contract term.

As outsourcing is recognised as an important result-oriented vehicle for improving efficiency and lowering operating costs (Deguise and Rosenfield, 2009), it is not unreasonable to assume that managers of PLCs responded to this development by imitating the actions of private equity owed companies in outsourcing some of their production processes (Lowenstein, 1990:163). Indeed, Lerner (2007) asked, "Why PLCs did not employ the tactics of private equity owned companies."[13] It seems that is precisely what many PLCs such as the china maker Wedgwood have done (news.bbc.co.uk), not only with the level of debt employed in their capital structures (Lowenstein, 1990:163), but also with other measures to increase efficiency, such as outsourcing materials and labour (TUC, 2007). However, Deguise and Rosenfield (2009) caution that the recent growth in domestic and foreign outsourcing in developed economies greatly complicates the measurement and interpretation of key economic indicators and may result in inflated and misleading increases in productivity measurements.

While not strictly related to P-T-P buyouts, Hall and Lobina (2007) investigate privatisation in the UK water industry that was once in state ownership, and where private equity is now very active. They find that many of the privatised water

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[13] Learning from private equity boards, Harvard Business School working Knowledge. January 2007. Joseph McCafferty, The Buyout Binge: Imitating the Masters, CFO Publishing Corporation. Vol. 23. April 2007.

companies have replaced direct labour by outsourcing work to contractors. Between 1994-95 and 1989-99 cuts of 22% in labour costs amounting to around £90 million are recorded, but nearly half of this was off-set by a rise of £40 million in the cost of agencies and contractors services that were previously carried out by their own employees. This provides credibility to the idea that private equity firms are actively involved in outsourcing.

3.5   Employment

Most of the cost management literature and empirical studies of cost structures indicate that employment costs are the second biggest cost variable in manufacturing companies. This is consistent with evidence from outsourcing announcements which indicates that most outsourcing contract companies transfer significant numbers of their employees in affected areas to outsourcing suppliers, retaining only a small number of employees to manage liaison with the contractors (Juma's and Woods, 2000). The effects of buyouts on employment is at the centre of a heated debate between private equity buyout firms and UK trade unions which has catapulted the issue to the heart of UK and European policy debate (Wright et al. 2009).

The Trade Unions Congress (TUC) and IUF accuse private equity firms of imposing "savage job cuts" on employees after a buyout, citing examples such as the AA, Birds Eye, Little Chef the restaurant chain, and Boots the retail chemist chain. In response, private equity cites evidence from the BVCA and EVCA, the trade body representing UK and European private equity firms respectively, and the CMBOR, suggesting that UK buyouts create hundreds of thousands of jobs (BVCA, 2007). When pressed to justify this claim, the industry was unable to do so, stating that to accuse the industry of destroying jobs is an illogical claim (BVCA).

Despite the denial of the private equity buyout industry, early evidence from the UK finds that job losses occur mostly at the time of private equity ownership changes (Wright and Coyne, 1985). Wright et al (2009) suggest that this may be due to UK buyouts in the 1980s being more focused on restructuring troubled businesses that resulted in saving jobs in the long term. However, it is questionable whether private

equity has ever been concerned with saving jobs in companies they buy.[14] For instance, in the sale of the AA, the new management team cut too many jobs at the time of the buyout; which negatively impacted their core business, resulting in the AA having to re-hire staff. However, this was at reduced pay, hours, and changes in terms and conditions of employment. The new CEO of the AA at the time admitted, "we have gone too far in reducing jobs" (Tim Parker, 2006).

Kaplan (1989) reports small increases in employment at companies involved in US buyouts. However, Lichtenberg and Siegel (1990) report that on average; LBOs are associated with slower employment growth than their peers. They find that non-production workers experienced the largest fall over a three year period, while employment of production workers was unchanged. This is consistent with private equity firms reducing the junior and middle management structure of target companies soon after a buyout. Advancements in IT make it easier to outsource non-production jobs. Juma's and Wood (2000) report that employment costs decrease immediately when a company outsources employment. The literature on outsourcing indicates that employment costs are the second biggest cost in manufacturing. Therefore, reducing non-production employees has the potential to create large savings. This is in line with research from outsourcing announcements which shows that companies outsource significant numbers of their employees, retaining only a small number to manage outsourcing contracts (Juma's and Woods, 2000).

Likewise, the work foundation (2007) reports that in the first year of a buyout, about 60 per cent of private equity owned companies increased the number of staff, and about 36 per cent cut them. Distinguishing between MBI[15] and MBOs,[16] the study finds that MBOs increase jobs by about 13 per cent over five years. MBIs, however, cut them on average by 18 per cent over six years. In line with Lichtenberg and Siegel (1990) the study finds that on average, wages in private equity owned companies grow more slowly than in the private sector generally.

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[14] See comments in congress report and HCSC.

[15] The new owners remove most of the existing management team and impose new managers.

[16] The organisations' existing management team raise the finance to take the company private.

Amess and Wright (2007) use unbalanced panel data for 5,369 companies involved in LBOs over the period 1999-2005 to investigate the effects of LBOs on wages and employment in the UK. They find that acquired companies have significantly lower wage and employment growth than non-LBOs. Disaggregating the data, they find employment growth to be 0.51 per cent higher for MBOs, and 0.81 lower for MBI. The authors interpret this to mean that MBOs and MBIs have a differing impact on a company's employment behaviour and should not be treated as homogenous. Moreover, the authors suggest that the results are consistent with MBOs exploiting growth opportunities that lead to greater employment growth, and MBIs not creating employment opportunities, which is in line with private equity purchasing the company purely as an investment.

In response to the impact of the global financial crisis starting in 2007 on the UK economy, but partially also because of the distortions in evidence about private equity's impact on employment, the UK Parliament set up a House of Commons Select Committee (HCSC, 2007) to investigate the impact of buyouts on the UK economy and employment. The BVCA gave evidence stating that over the last five years (2002-2007), jobs in private equity backed companies had grown faster than in FTSE 100 and FSTE 250 companies (9 per cent per annum on average, compared with two per cent) The BVCA provided no supporting evidence to support its claims. However, the committee was advised that it should not rely on the evidence from the BVCA, because it is based on un-weighted measures skewed by the number of small firms included in the study (HCSC, 2007). Totally out of its depth on the matter, the HCSC concluded: *"We have received many individual examples of job creation and job losses in private equity owned companies, but meaningful overall figures are elusive."* The HCSC proceeded to allow the BVCA to draw up its own code of conduct to regulate itself.

Hall (2007), critiquing the BVCA report presented to the HCSC argues that: "The major surveys conducted for the UK, EU, and US private equity associations suffer from a number of flaws, both in sampling and in data quality, rendering their estimates of employment impact effectively worthless." Hall (2007) continues in a similar vein to Rappaport (1991), that private equity ownership appears to have no clear overall effect on employment compared with other forms of ownership. Consistent with this view, Jon Moulton, founder and managing partner of private equity firm Alchemy Partners also criticised private equity lobbying groups and the BVCA for using "dodgy

statistics" in an attempt to improve the industry's public image. Commenting on research released by the BVCA to employment figures, he states "We're putting these things out as fact and we shouldn't" (www.theguardian.com).

US trade unions have also expressed concern to a US Congressional Committee about the potential for private equity firms to leave acquired companies financially weakened because of increased use of debt and, in turn, to prompt private equity firms to cut jobs or slow the pace of job creation (GOA, 2008). This has elicited a different response from the US private equity industry to the Congressional hearing. In response to the trade union accusations, Douglas Lowenstein, President of the US Private Equity Council stated:

"Private equity activity is part of a larger pervasive domestic and international economic wave that is driving changes across all classes of American companies, regardless of their capital and ownership structure. Private equity is not causing these economic changes; neither can it operate in a business environment isolated from them. The truth is that, as with any other acquisition involving public or private companies, private equity transactions can result in layoffs. In other cases, they may be short term layoffs until job growth over the long term increases as the business grows stronger. Even when some lay-offs are essential, private equity has probably preserved hundreds of thousands of jobs that might have otherwise been lost by underperforming or failing businesses. There is no evidence that private equity firms are more likely to cut jobs than any other form of ownership."

Because of the controversy, uncertainties, constant denials over job cuts by the private equity industry, and general lack of quality of studies on the subject, delegates of the World Economic Forum (WEF) commissioned several reports on the impact of buyouts on employment. In the first report, Davis et al (2008) use a comprehensive dataset of 5,000 US buyouts for the period 1980 – 2005 to examine the impact of buyouts on employment and find that private equity owned companies have slower job growth than comparable companies up to three years after a buyout, but this increased slightly higher in the fourth and fifth years. The net effects of these changes are lower employment growth than comparable companies five years after the buyout. The study also finds that private equity owned companies undertake more acquisitions and divestures, and are more likely to shut down existing companies and open new ones. This is interpreted as meaning private equity firms have a greater willingness to restructure acquired companies and disrupt the status quo in an effort to improve efficiency. The study also finds that target companies underperform their peers in

employment growth prior to the acquisition. This suggests that buyout targets are different from target companies prior to acquisition, making it difficult to attribute differences in employment outcome after acquisition to private equity involvement. Further uncertainty is due to the limited number of academic studies of the impact of recent buyouts on employment and difficulty faced by the studies in isolating the specific impact of private equity (GOA, 2008).

In the second WEF report, Davis et al (2008) use the same dataset constructed for the 2008 report to focus in greater depth on the impact of buyouts on employment. This study finds companies targeted and acquired by private equity firms in buyouts experience an intensification of job creation and destruction in the first two years following the buyout. This is achieved through establishment entry and exit, and acquisitions and divestures which creates a net growth differential of two per cent. Only two thirds of the net differential is due to improved productivity from continuing operations. The other one third is due to buying and selling companies, or closing them down, which they are more likely to do than comparable firms. In fact, the report confirms that its findings are "dominated" by the finding that target companies are much more likely to close underperforming companies than comparable firms.

The study also finds that earnings per worker at target companies are higher than non-target companies, but not from companies with continuing operations. The authors interpret this as meaning that in terms of employment, private equity owned companies have little to gain from buyouts, which is consistent with Rappaport (1990) who argues that managers of public companies have learned how to operate PLCs more efficiently from the early waves of buyouts. The findings of 2009 World Economic Forum Report on productivity are restricted to US manufacturing sector, and on labour productivity.

CHAPTER FOUR: TECHNICAL EFFICIENCY

4.0 Technical Efficiency

Farrell (1957), motivated by the need to develop better methods and models for evaluating productivity, argues that; if the theoretical arguments as to the relative efficiency of different economic units are to be subjected to empirical testing, it is essential to be able to make some actual measurement of efficiency. Equally, if economic planning is to concern itself with particular industries, it is important to know how far a given industry can be expected to increase its output by simply increasing its efficiency, without absorbing further resources. Farrell (1957) points out that whilst attempts to solve this problem usually produced careful measurements of some or all of the inputs and outputs of the industry, they failed to combine these measurements into any satisfactory measure of efficiency. Responding to the inadequacies of separate indices of labour productivity and capital, Farrell proposed an activity analysis approach that could more adequately deal with the problem, and stated that his measure is intended to "be applicable to any productivity organisation, from a workshop to a whole economy." In the process, he extended the concept of productivity to the more general concept of efficiency (Cooper et al., 2011). The measurement of economic efficiency is intimately linked to the use of frontier functions (Murillo-Zamorano, 2004). The modern literature in both fields begins with the seminal paper of Farrell (1957).

Koopman (1951) provided a definition of technical efficiency: an input-output vector is technically efficient if, and only if, increasing any output or decreasing any inputs is possible only by decreasing some other output or increasing some other input.

Influenced by the work of Koopmans (1951) and the author's formal definition of technical efficiency, and Debreu (1951)'s measure of technical efficiency, Farrell (1957) introduced a method to decompose the overall efficiency of a production unit into its technical and allocative components. Farrell characterised the different ways in which a productive unit can be inefficient either by obtaining less than the maximum output available from a determined group of inputs (technically inefficient) or by not purchasing the best package of inputs given their prices and marginal productivities.

Farrell (1957) states "when one talks about the efficiency of a firm one usually means its success in producing as large as possible an output from a given set of inputs."

Farrell (1957) measure of technical efficiency takes account of all inputs and yet avoids the index number problems associated with previous attempts to empirically measure efficiency. Farrell (1957) measure of efficiency was developed in constant returns to scale framework. This was extended to incorporate variable returns to scale by Charnes et al (1984), and name data envelopment analysis. The work of Farrell (1957) also influenced the development of stochastic frontier analysis by Aigner et al (1977) and Meeusen and van den Broeck (1997). Both techniques are able to measure technical efficiency in any type of organisation.

The main strengths of stochastic frontier are that it deals with stochastic noise and also allows statistical tests of hypothesis concerning production structure and degree of inefficiency. Its main weaknesses are that it requires an explicit imposition of a particular parametric functional form for the underlying technology, and an explicit distributional assumption for the inefficiency term. The principal advantage of the data envelopment approach is that it does not require an explicit *a priori* determination of a production function and that efficiency is measured relative to the highest observed performance rather than against some average. Moreover, data envelopment analysis does not require an explicit assumption about the inefficiency term. However, because the data envelopment analysis method is deterministic and attributes all deviations from the frontier to inefficiency, a frontier estimated by data envelopment analysis is likely to be sensitive to measurement errors or other noise in the data (Odeck, 2007).

The way that efficiency is measured in public to private buyouts is an important question. Pestieau and Tulkens (1993) argue that public organisations have objectives and constraints (e.g., fiscal balance and universal services, uniform price requirements, but at the same time, a soft budget constraint) different from those of private companies, and that in order to level the playing field, the only common ground on which to compare their performance is on the basis of their technical efficiency.

Fried et al, (2008) state that when discussing the economic performance of producers, it is common to describe them as being more or less efficient or more or less productive. The productivity of producers means the ratio of its inputs to its outputs, and that this ratio can be easily calculated if the producer uses a single input to produce a single

output. In the more likely event that the producer uses several inputs to produce several outputs, the outputs must be aggregates in some economically sensible fashion, as must the inputs so that productivity remains the ratio of two scalars. Productivity growth then becomes the difference between output growth and input growth. Variations in productivity either across producers or through time, is thus a residual. In principle therefore, the residual can be attributed to differences in production technology, differences in the scale of operations, differences in operating efficiency, and differences in producer operating environments. The OECD (2001) and US Bureau of Labour Statistics (2005) attribute variations in productivity through time to these same sources.

When attempting to measure efficiency, the problem is of which indicators to include, how to weight them, and how to define the potential it faces (Farrell, 1957). The selection and weighting of indicators are controversial although comparisons are appropriately made relative to best practice rather than to some ideal standard (Farrell, 1957, Fried et al, 2008). In line with Farrell (1957), Fried et al (2008) points out that these same difficulties apply to the evaluation of firm performance, and argues that we cannot know the "true" potential, whatever the economic objective, we are able to observe best practice and its change through time, and we can also observe variations in performance among producers operating beneath best practice. Fried et al, 2008 argues interest therefore focuses on the identification of best practice producers and on benchmarking the performance of the best against that of the best. Businesses themselves routinely benchmark their performance against that of their peers, and academic interest in benchmarking is widespread, although potential synergies between the approaches adapted by the two communities have yet to be fully exploited.

Critiquing corporate benchmarking, Davis and Kouchhar (2002) enquire why there is so much interest in measuring efficiency. Fried et al (2008) provides several reasons for this:

First, only by measuring efficiency and productivity, and separating their effects from those of the operating environment so as to create a level playing field can we explore hypotheses concerning the source of efficiency or productivity differentials. The authors state that identification and separation of controllable and uncontrollable

sources of performance variation are essential to the institution of private practices and public policies designed to improve performance.

Second, efficiency and productivity measures are successful indicators of performance matrices, by which producers are evaluated. However, for most producers, the ultimate success indicator is financial performance, and the ultimate metric is the bottom line.

4.1   Buyout Efficiency Studies

In an effort to measure the technical efficiency of companies involved in buyouts, three analysis techniques have been used. These are total factor productivity, data envelopment analysis, and stochastic frontier analysis.

Early buyout studies attempted to use total factor productivity (TFP) techniques to measure the technical efficiency of companies involved in buyouts. Theoretically, TFP is an appropriate measure of efficiency because it takes into account all inputs, and is therefore able to address the limitations found in accounting and event studies. As most early studies on buyouts were based on the private equity fund level, which often precluded the measurement of efficiency at the company or plant level, Lichtenberg (1997) propose that data at the plant or reporting unit level be used to measure efficiency in buyouts, and that it is more desirable to assess the total factor productivity (TFP)[17] of buyout plants before and after MBOs.

Lichtenberg and Siegel (1987) use time-series unbalanced cross-sectional data for 20,493 plants in the US manufacturing industry during the period 1972-1981 to analyse efficiency. The input variables are, capital, labour, materials, and the output variable is plant turnover. A sample for the period 1973-1980 shows that the relative level of efficiency in plants increased from 1 year after the buyout to year 7 years after. However, within four years after ownership changes, 49 per cent of the productivity gap that existed at the beginning between companies involved in ownership changes and those that did not disappears. Further examination of plant efficiency using a dataset for 1974 - 1980 shows that plants involved in one or more transactions during

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[17] The total factor productivity index can be broadly defined as a ratio of an aggregate of outputs to an aggregate of inputs (Verma, 1993:201).

this period experienced 0.58 per cent higher TFP growth than their industry counterparts who remained with the same company. The study is size biased in favour of larger companies, and only plants in continuous operation are observed; plants that close or fail are not included, which could again bias the results. Moreover, all companies involved in ownership changes are included in the dataset, not necessarily just buyouts, and because the results are from time-series regressions, they cannot be generalised to the population.

Lichtenberg and Siegel (1990) extend their 1987 study using plant level data from the US Longitudinal Research Database (LRD) and a sample of 14,300 manufacturing plants to examine firm efficiency in US MBOs during the period 1982-1986 to examine the relationship between MBOs and TFP. The authors employed a two stage approach to assess the impact of MBOs on TFP. In the first stage, they computed residuals from within industry four-digit SIC and OLS regression of Cobb-Douglass production functions. The variables are capita, labour (defined as production worker equivalent man-hours), and nominal value materials.

For a sample for 1982 to 1986, they find that plants involved in buyouts are more efficient in the years prior to the buyout compared to the post buyout years. However, they also find that productivity is significantly higher in the first three years after the buyout than in any of the eight years before the buyout, compared to non-buyout plants. They note that MBO is more efficient than LBO. This suggests a difference between LBO and MBOs. Consistent with Rappaport (1990), they find evidence that buyouts are transitory. A sample of 38 LBOs for 1981 and 1982 had no significant effect on productivity in the post buyout year. Moreover, the authors report that they are unable to establish whether efficiency gains are caused by the buyouts, or whether they would have occurred in the absence of buyouts. The LRD contains data on more than 19000 mostly large manufacturing plants (Harris et al, 2005) which creates a potential size bias.

Verman (1993) used TFP and firm level financial data for fifteen US manufacturing companies that underwent an MBO during the period 1982-1986 to test for the presence of real efficiency gains. The data is computed weighted input and output weighted price

indices.[18] They find that relative productivity one and two years after the MBO is below the level one year before the MBO. They also find that relative changes in productivity for the MBO sample are less than the industry average. This study is based on firm level data, however, Lichtenberg (1987, 1990) asserted that it is more desirable to assess the total factor productivity (TFP) of plants before and after MBOs. Moreover, the results do not support the hypothesis of enhanced post-buyout efficiency.

McGuckin and Nguyen (1995) use unbalanced plant level panel data for 28,294 plants and TFP to investigate ownership changes in the US manufacturing industry, and to test Lichtenberg and Siegel (1992) matching theory. They find that firm ownership changes are associated with the transfer of plants with above average productivity. The study is based only on labour productivity. Moreover, the authors report that when analysing productivity at the plant level using TFP, measurements problems often arises even with simple labour productivity. One problem is that because output prices vary across plants, data on output prices at the plant level are required for estimating plants' real output. Another problem is that prices vary over time due to inflation (McGuckin and Nguyen, 1995). These results suggest that the managerial disciplinary merger theory cannot be used to explain most buyouts. The study is based on mergers and acquisitions in the US meat manufacturing and packaging industry; which may or may not include P-T-P buyouts. The study is also based on labour productivity, and therefore fails to take into account capital services, material inputs, and other real inputs as they were not available from the US LRD.

Nguyen and Ollinger (2006), use TFP to investigate the motives for mergers in the US meat industry from 1997-1992. The authors find that plants in the US meat industry are very productive before mergers, which corroborates the findings of McGuckin and Nguyen (1995). McGuckin and Nyuyen (2006) point out that two measurement problems arise when using LP. First, output prices are necessary for each plant because output mix varies across plants, yet accurate prices data do not exist. Second, prices change over time. To mitigate these problems, Christensen et al (1981) proposed using relative LP, which is defined as the ratio of (nominal) plant LP to average (nominal) industry labour productivity.

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[18] The author provides an appendix of the limitations of this study on page 200-2001 for the interested reader.

Harris et al (2005) use GMM estimation of within-industry (two-digit SIC) and one-stage augmented Cobb-Douglass production, with unbalanced panel data from the ONS Annual Respondent Database to assess TFP in the UK manufacturing plant industry during the period 1982-1998. The data consist of capital, labour, and intermediate goods. The unbalanced MBO sample consists of 979 MBOs and 4877 plants that experienced a buyout during the period 1994-1998. They report that on average, plants involved in MBOs in the same industry are less productive and less efficient prior to the buyout in the short and long term than plants before the buyout. Consistent with Lichtenberg and Sigel (1990), the authors report that after the MBO, plants experience a substantial increase in TFP, and are more efficient in the short and long term, and that the findings appear to be pervasive across industry sectors.

Harris et al (2005) observe that representative MBO plants generate considerable less output in the post buyout period, yet downsize their workforce even more dramatically, which results in a significant increase in labour productivity and TFP. The authors state that their findings, in conjunction with evidence on changes in the capital/labour and materials/labour ratios, imply that the improvements in efficiency are due to measures undertaken by new owners or managers to reduce the labour intensity of production, via outsourcing of intermediate goods and materials. However, despite its evident importance in buyouts, outsourcing has received little, if any consideration in the buyout literature (Harris et al, 2005).

Critiquing the technique used by Amess (2003) to measure efficiency, Harris et al (2005) incorrectly criticised the author for presenting evidence on the effects of full firm MBOs on TFP based on OneSource company level data. Harris et al (2005) asserts that it is inappropriate to estimate TFP using financial data at the firm level, for two reasons. First, the construction of TFP measures requires reliable and comprehensive information on capital and intermediate materials. These variables are typically not reported in financial statements and thus are not contained in files such as Compustat, data stream, or OneSource. Second, the accuracy of TFP measures also depends on the accuracy of inputs and output price deflators, because inputs and outputs should be computed in constant dollars. The problem is that many large firms have plants in diverse industries, where there may be substantial variation in price change. However, in files such as Compustat, these organisations must be classified, at the corporate level, into a single four-digit SIC industry. Therefore, as shown in Lichtenberg and Siegel

(1991), the use of a single set of output and input deflators can introduce substantial measurement error into the calculation of TFP measures. Finally, much MBO activity occurs below the firm level. Thus, it is best to use plant level data to examine the impact of MBOs on economic performance. However, Amess (2003) in fact used stochastic frontier analysis in his study to assess efficiency.

Because TFP contains only a one-sided error term and therefore involves the interpretation of the residual components of a regression as TFP; lumping factors under management control and random factors together, the use of TFP as a measure of efficiency has declined. Amess (2003) argues, consistent with Farrell (1957), that stochastic frontier production is arguably superior to TFP because the random and deterministic component is decomposed into random noise and technical efficiency.

However, as data on inputs, such as capital required for the measurement of TFP is rarely available (McGuckin and Nguyen, 1995), and because TFP assumes that all deviations from the efficiency frontier are under the control of managers, when they are not (Murillo-Zamorano, 2004), the technique is rarely used in buyout studies.

To address the limitations found in buyout studies based on TFP, researchers adapted frontier techniques such as data envelopment analysis techniques, and stochastic frontier analysis. Surprisingly, only a few studies have used these techniques to analyse efficiency in UK buyouts. However, the techniques are used widely in other countries to analyse efficiency in a variety of industries.

Worthington (2001) employed a two-stage probit and tobit DEA method adapted to panel data to analyse efficiency in pre and post mergers in Australian credit unions during 1993-1997. The analysis from the tobit model shows that mergers increase both pure and scale efficiency. In addition, the author reports that loan portfolio diversification, management ability, earnings and asset size are a significant influence on the probability of acquisition, but the primary determinant of being acquired is a smaller asset size. However, in terms of pure technical efficiency; acquired credit unions are no less efficient than the industry average.

Cowie (2002) examined efficiency in 50 companies in the British bus industry during 1998-1999. The author finds efficiency improvements over the period of the sample, but improvements cannot be wholly attributed to the achievement of economies of

scale. More specifically, improvements in internal efficiency of acquired companies and some scale economies within groups of companies are found, the latter of which may have resulted from the eradication of competition.

Chaaban and Requillart (2005) use a two-staged DEA technique to analyse the main determinants of takeovers in the French cheese industry during the period 1995-2000. There appears to be 2,762 observations over the period. The authors estimate firm specific efficiency and scale economies and use the findings to evaluate a random effects logit model of the determinants of takeovers. The results show that inefficient companies have a lower probability of being taken over. The results are not statistically insignificant. This suggests that technical efficiency is not a main driver of takeovers in the French cheese industry. The coefficients relating to increasing and constant returns to scales are both negative and statistically significant. Companies with increasing or constant returns to scale face a lower risk of being acquired. This suggests that the nature of scale economies at the company level plays an important role in takeover activity. The severe limitation of this technique is that it attributes all deviations from the frontier to efficiency (Chaaban and Requillart, 2005). The study do not distinguish between takeovers and mergers, or hostile or non-buyouts, and is based on a single industry, and the actual numbers of companies involved in the sample is unclear.

Liu et al (2007) measure corporate performance in the Taiwanese telecommunications industry and the relationship between corporate performance and M&A transactions. They report that M&A strategy does not enhance corporate performance in the communication industry, but having an internal growth strategy improves corporate performance.

Picazo-Tadeo et al (2009) use survey data for 34 companies in the Spanish water industry to compute input-specific scores or technical efficiency to assess environmental factors, and managerial efficiency among water companies. In terms of ownership changes and efficiency, they find that privately owned water companies are efficient, but only outperform public companies in the management of labour.

Alperovych et al (2013) use a Malmquist DEA technique and UK buyout data from the period 1999-2008 to investigate the impact of vendor sources and private equity investors' experience on post buyout efficiency. The authors report that divisional buyouts show higher efficiency improvements than private and secondary buyouts.

Multivariate analysis shows a positive and significant effect of private equity experience on post buyout efficiency, suggesting that improvements in efficiency takes place in the first two years after the buyouts in their sample. This finding is consistent with recent empirical evidence commissioned by the BVCA which shows that efficiency in companies involved in buyouts lasts only for three years. Consistent with previous studies from the CMBOR, Alperovych et al (2013) study includes both private to private and P-T-P buyouts in the analysis which makes it impossible to compare efficiency between public and private buyouts.

Stochastic frontier analysis (SFA) is an alternative method used to measure technical efficiency in companies. Unlike DEA, SFA has a two sided error component, which allows inefficiency to be broken down into technical efficiency and statistical noise. Only a few studies have used SFA to measure efficiency in UK P-T-P buyouts. However, the technique is widely used in a variety of industries to measure efficiency.

Benefratello (2002) used financial data for 34 companies operating in the Italian pasta industry during the period 1981-1997, and SFA to examine the impact of acquisitions on the technical efficiency of acquired companies. Consistent with the disciplinary mergers theory, the author finds evidence that acquired companies underperformed prior to the ownership change. Moreover, acquired companies experienced a statistically significant increase in technical efficiency for up to six years after the change in ownership, compared to the control sample. The parameter for companies located in the south is positive and significant, implying that these companies are less efficient. This implies that the location of a company or plant has an impact on a firm's technical efficiency.

Amess (2003) presents UK evidence on the effects of full firm MBOs using SFA, based on data from OneSource firm level data. The author reports that MBOs have higher efficiency in the two year prior to the buyout, and have higher efficiency in each of the first four years post buyout. Buyouts in the sample do not have higher efficiency beyond the fifth year post buyout. The findings are inconsistent with the disciplinary mergers and market for corporate control hypotheses. The findings are however, consistent with Rappaport (1990) suggestion that the MBO governance structure is transitory because the discipline of debt and the concentration of ownership create

strategic inflexibility in the face of competition. Moreover, the study does not measure material usage, and is based on firm level data.

4.2   Chapter Summary

Agency theory suggests that private ownership is more efficient than public ownership. The disciplinary mergers theory and market for corporate control hypothesis predicts that these inefficient PLCs or plants will be targeted in buyout deals by superior management teams who will improve the companies' performance after the buyout (Mann, 1965, Mead, 1968, Jensen, 1988, 1989). However, Rappaport (1990) alternative buyout theory suggests that executives of PLCs have learned lessons from early buyouts on how to operate their companies like those owned by buyout firms, therefore, no efficiency gains are expected from P-T-P buyout ownership changes, and companies involved in P-T-P buyouts are transitory organisations with a limited life span.

Attempts to measure efficiency in companies involved in P-T-P buyout ownership changes using accounting and event study techniques have been unsuccessful. This is because policy decisions regarding the optimal level of buyout activity hinge mainly on its impact on economic efficiency (i.e., the social returns to buyouts) not on their effects on share prices or profitability (i.e., the private returns to buyouts) (Harris et al, 2005). Other attempts have been made to measure efficiency using TFP techniques. In particular, Lichtenberg and Siegel (1990) suggested the use of total factor productivity of plants before and after buyouts to overcome the limitations of accounting and event study techniques. However, as data on inputs, such as capital required for the measurement of TFP is rarely available (McGuckin and Nguyen, 1995), and because TFP contains only a one-sided error term and therefore involves the interpretation of the residual components of a regression as TFP; lumping factors under management control and random factors together when they are not (Murillo-Zamorano, 2004), the technique is rarely used to measure technical efficiency in buyouts.

In order to properly measure technical efficiency in companies involved in buyout ownership changes, the literature suggests researchers should adapt frontier techniques such as data envelopment analysis or stochastic frontier analysis techniques. These techniques are used to successfully measure technical efficiency in companies in a number of countries around the world, but the techniques are rarely employed in studies

on P-T-P buyouts. Amess (2003) uses stochastic frontier analysis to investigate MBOs in a single UK industry. Alperovych et al (2013) use DEA to examine efficiency in UK buyouts. However, their study focuses on the firm level and includes all type of buyouts, and buyouts in all industries, and focuses on post-buyout efficiency. Neither study addresses the simple question of whether private production in P-T-P buyouts is more efficient than public production as suggested by the disciplinary mergers' theory. These omissions present a gap in the UK buyout literature that this study will seek to address.

CHAPTER FIVE: HYPOTHESIS, DATA and VARIABLES

5.0 Introduction

In this chapter, the research hypothesis is presented and discussed. The hypothesis relates to P-T-P ownership changes. Data and data sources are then examined and discussed. This is followed by a discussion on the construction of the research sample, and presentation of sample statistics. A discussion on the research variables, their description, selection and definition and expected relationship with efficiency then follows, and finally, summary statistics and correlation matrices are presented and discussed.

Pestieau and Tulkens (1993) argue that because public organisations have objectives and constraints different from those of private companies, the only common ground on which their performance can be compared, is on the basis of their technical efficiency. Davis and Kouchhar (2002) concurring, argue that only by measuring efficiency and productivity, and separating their effects from those of the operating environment so as to create a level playing field, can we explore hypotheses concerning the source of efficiency or productivity differentials.

5.1 Hypothesis: Ownership and Ownership Changes

Alchian (1965) argues that public production is inherently less efficient than private production. The theory of disciplinary mergers therefore asserts that buyouts will discipline managers of target companies or plants who pursue objectives other than profit maximisation. That is, acquiring firms will take over poorly performing firms or plants and then improve their performance by replacing existing mangers with superior ones (Lichtenberg and Sigel, 1992). Reinforcing this view, Meade (1968) and Jensen (1989) contend that companies involved in P-T-P ownership changes will survive while inefficient ones (i.e., public companies) will continue to be taken over. Specifically, the governance structure of companies involved in P-T-P buyouts is long-lived, and therefore, efficiency gains are expected to continue after the buyout (Jensen, 1989).

Much of the early concerns on buyouts arose from possibilities for increases in market power (Stigler, 1950).[19] Later interest has focused on the question of whether buyouts are undertaken by opportunistic managers pursuing their own objectives rather than maximising shareholder value (McGuckin and Nguyen, 1995).

The theoretical literature provides a variety of reasons why managers of PLCs might engage in acquisitions. This could be for reasons such as empire building (Baumol, 1967, Muller, 1969, 1993). Other managerial motives help to explain a strategy of acquisitions that may not be in shareholders' interests. For example, a strategy might help managers entrench themselves (Shleifer and Vishy, 1989), or managers might systematically overestimate their ability to improve the acquired firms performance (Roll, 1986). The difficulties in understanding managerial motives to engage in buyouts reinforce the theoretical arguments that researchers performing empirical work in the field of both industrial organisation and finance have not had much success in finding efficiency reasons for acquisitions (McGuckin and Nguyen, 1995).

Finance studies of the 1980s and 1990s typically conclude that the gains from buyouts are positive, but with few exceptions find that most, if not all of the gains accrue to the selling firms shareholders and not to those of the acquiring firms (Jensen and Rubuck, 1983). Industrial organisational studies also, by and large, find little in the way of gains in this period.[20] This pattern of evidence leads many to conclude that the takeover and merger (particularly conglomerate mergers) waves of the 1960s and 1970s were primarily associated with management not maximising shareholder value. This suggests that the acquisitions of the 1980s were motivated by the gains available from replacing managers of badly performing companies with superior ones (Manne, 1965, Meade, 1968, Jensen and Ruback, 1983, Jensen, 1988). This rationale for buyouts is supported by Lichtenberg and Sigel (1992) who report that acquired companies generally exhibit low productivity prior to their acquisition, and show improved performance following ownership changes. However, these findings contradict Ravenscroft and Scherer (1987) who find that acquired firms are highly profitable operations before acquisition with little or no gains to acquiring companies.

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[19] Stigler, G.J. (1950). Monopoly and Oligopoly by Merger. American Economic Review. Vol. 40:23-34.

[20] For a review of the empirical evidence, see Mueller (1993).

Matsuska (1993) using a sample of companies involved in US mergers to investigate efficiency confirms Ravenscroft and Scherer's (1987) finding of highly profitable companies prior to acquisition. Likewise, McGuckin and Nguyen (1995), Nguyen and Ollinger (2006) report that plants in the US manufacturing and meat industry respectively, are very productive prior to buyouts.

In addition to the inconclusive findings for efficiency in buyouts, the periods of time buyout efficiency gains are reported to last for are inconsistent. Lichtenberg and Sigel (1987) report that buyout efficiency in US manufacturing plants last for up to seven years after buyouts. Opler (1992) finds efficiency gains in US buyouts one year before the buyout, and report they last up to two years after. Benfratello (2002) finds companies in the Italian pasta industry experience increases in technical efficiency lasting up to six years following acquisition, and also suggests that firm location has an impact on firm efficiency. Research commissioned by the BVCA (2013) shows that buyouts only outperform other ownership structures in the first three years following the buyout. From the fourth year after the buyouts, productivity in buyouts falls below that of the control sample. Alperpvych et al (2013) report that efficiency gains in a sample of UK buyouts happen only in the first two years of the buyout. These studies suggest that buyouts are not long-lived.

DeAngelo et al (1984) and Madden (1990) attributes buyout efficiency gains to registration and other public ownership expenses and improved managerial incentives. Harris et al (2005) on the other hand, attribute gains in buyouts to measures taken by new mangers to reduce the labour intensity of production via outsourcing of intermediate goods and materials, an area of P-T-P buyouts that has received little attention in the empirical literature. These inconsistencies are consistent with Rappaport (1990) who hypotheses that no efficiency gains are expected from P-T-P buyout ownership changes, because executives of PLCs have adapted operational strategies from the private equity buyout model, such as shedding underperforming divisions; selling assets not essential to operations; repurchasing stock and increased leverage; closing uneconomic plants and offices; and outsourcing much of the production processes, including materials and labour. Moreover, the author argues, that the buyout governance structure is transitory because the discipline of debt and the concentration of ownership creates strategic inflexibility in the face of competition. This view is

consistent with buyouts being a form of shock therapy, capable only of generating one-time permanent improvements in performance.

Rappaport (1990) alternative buyout hypothesis therefore leads to the following hypothesis and research questions:

Hypothesis 1

H_0:   Private equity P-T-P ownership and ownership changes are not significantly related to firm technical efficiency.

H_1:   Private equity P-T-P ownership and ownership changes are positive and significantly related to firm technical efficiency.

The literature reviewed above also leads to the following research questions.

1.   Do gains from P-T-P buyout ownership changes persist after the buyout?

2.   Does the location of a firm or plant affect firm efficiency?

3.   Does the type of P-T-P buyout affect firm efficiency?

In order to test the hypothesis and research questions stated above, a probabilistically matched reporting unit buyout dataset described below, data envelopment and stochastic frontier analysis is used to examine technical efficiency of companies operating in the UK manufacturing industry during the period 1997-2007. The focus of this study is on P-T-P buyouts in the UK manufacturing industry, and is based on two different analysis techniques, DEA and SFA. This study differs from Alperpvych et al (2013) who also use data envelopment analysis to examine firm efficiency in UK buyouts. Their study uses a single analysis technique, focuses on all UK buyouts, including private to private and P-T-P buyouts, and is based on all industries, and the whole company, rather than the plant level.

5.2   Data

In microeconomic production theory, a firm's input and output combination is depicted using a production function. Using such a function one can show the maximum output that can be achieved with any possible combination of inputs, that is, one can construct a production technology frontier (Seiford & Thrall, 1990). However, one of the main difficulties in carrying out research on UK P-T-P buyouts is obtaining data to measure technical efficiency. By and large, the private equity industry does not publish its results, and data that is available can be inconsistent and hard to reconcile, as both private equity firms and their limited partners use diverse calculations (Ghai et al. 2014). Moreover, after P-T-P buyouts, the new private equity owners immediately withdraw the PLCs they take over from the Stock Exchange. Data on the former PLCs is therefore lost as the new private equity owners are not required to publish quarterly or annual financial reports, or provide information on inputs and outputs used in production. In addition, the database from the Centre for Buyout Research at the University of Nottingham (CMBOR), on which much research on buyouts is based, may have serious methodological issues (Ghai et al. 2014). Nevertheless, the CMBOR database is a valuable data source. Therefore, in order to address the aforesaid deficiencies and to assess the impact of P-T-P buyouts on the technical efficiency of companies operating in the UK manufacturing industry during the period 1997-2007, this study uses data from two sources.

The first data source is the CMBOR.[21] Founded in 1986, the CMBOR is financed and funded by private equity, and collects data to monitor and analyse buy-outs, with and without private equity investment. It was the first centre to be established devoted to the study of private equity and buyouts (CMBOR). Overall buyout sample selection for this study is therefore determined by the buyout data provided by the CMBOR. The only data fields the CMBOR provide are: Name of the buyout; Date of the buyout; Value of the buyout; Sector the buyout operates in; Sales; Employees; Private equity provider; Buyout exit type; and the date of the buyout exit. The CMBOR also supplies fields for partial sales to show, Name; Value; Date. Fields for acquisition show, Name; Value; Date. Fields for full exit data show, Names of acquirers; Value; Date; Turnover; and Employees.

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[21] The CMBOR is now based at Imperial College London, since 2011.

The CMBOR provides data for 355 UK public to private buyouts for the period 1995-2009. The CMBOR reports that for buyouts on its database, data only includes the buy-out stage of the private equity market (MBO, MBI, IBO, BIMBO) and does not include any other stage such as speed, start up, development or expansion capital.

In order to be included as a buy-out in the CMBOR files, over 50 per cent of the issued share capital of the company has to change ownership with either management or a private equity company or both jointly having a controlling stake upon deal completion. Buy-outs and buy-ins must be either management led or led by a private equity company using equity capital primarily raised from one or more private equity funds.

Transactions that are deemed not to adhere to the private equity or MBO/MBI model are not included. Unless otherwise stated, data includes all buy-outs whether private equity backed or not[22] and there is no size limit to deals recorded. Transactions funded from other types of funds such as Real Estate funds and infrastructure funds are not included. Deals in which a private equity firm buys property as an investment are not included. In order to be included, the target company (the buy-out) must have its own separate financing structure and must not be held as a subsidiary of a parent holding company after the buy-out.

Firms that are purchased by companies owned by a private equity firm are treated as acquisitions and are not included in the buy-out statistics. Where CMBOR values are quoted, all values derive from the total transaction value of the buy-out (Enterprise value) and include both equity and debt.

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[22] For this study, only P-T-P buyouts are selected.

Table 1: Industries Targeted by Buyout Firms.

Chemicals manufacturing	Construction	Electrical engineering
Food manufacturing	Leather/footwear m-m	Mechanical instrument eng
Medical/pharmaceutical	Metal goods Eng.	Other manufacturing
Paper manufacturing	Textiles	Timber/furniture
Agriculture/fish	Media	Medical health care
Wholesale distribution	Banking/finance/insurance	Computer software
Hotel/catering/leisure	Real estate	Transport/communication
Business services/leasing	Retail distribution	Biotechnology
Computer services		

The primary source of information in the CMBOR files is a biannual survey of all private equity and debt providers in the UK and European buyout market. Other data sources include press releases, company reports and stock exchange circulars (CMBOR). This approach enables extensive cross-checking of data to ensure reliability (Harris et al. 2005). As the focus of this study is on the UK manufacturing industry, companies not involved in manufacturing are dropped.

The P-T-P buyout dataset obtained from the CMBOR consists of 355 buyouts for the period 1990 to 2009. From the CMBOR buyout dataset, 62 companies are deleted because the data relates to periods before 1997 or after 2007, leaving a sample of 293 UK P-T-P buyouts for the period 1997-2007.

5.3   Descriptive statistics

Figure 1: Movement in UK Buyouts

Figure (1) below shows the total number of UK P-T-P buyouts reported by the CMBOR for the period 1997-2007. The CMBOR reports a total of 355 UK buyouts for the period. 62 buyouts are dropped as they take place before or after the period of this study. This leaves a sample of 293 P-T-P buyouts in the UK for the period 1997-2007.
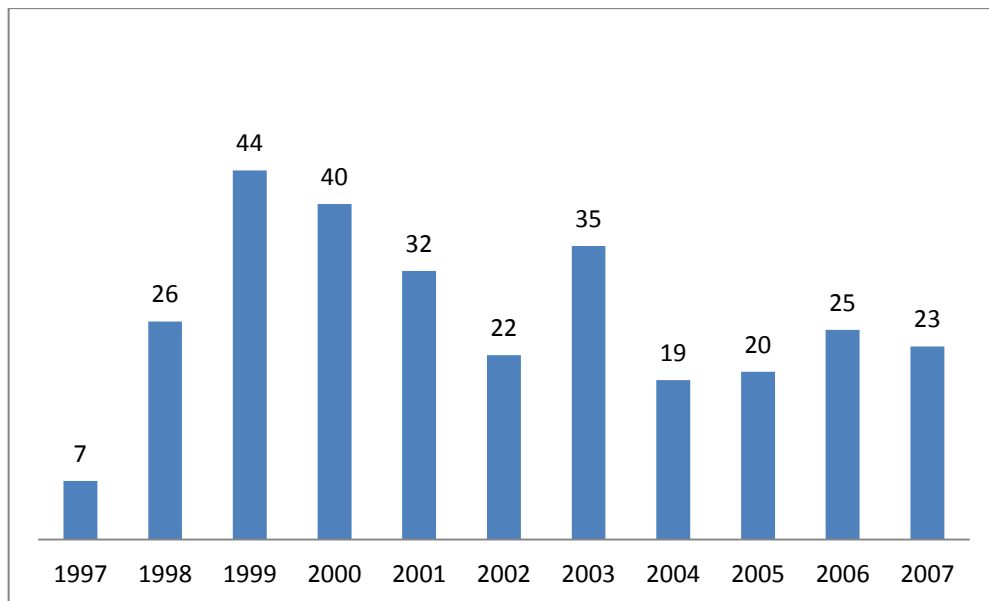
The number of P-T-P buyouts peeked at 44 in 1999 before commencing on a gradual downward trend until 2002 (figure 1). Although the number of buyouts climbs slightly in 2003, they fall again in 2004 with no substantial recovery since.

Figure 2: P-T-P Buyout Types

Figure (2) below shows the breakdown by type of buyout for the UK manufacturing industry during the period 1997-2007. The figures are derived from the sample of 293 P-T-P buyouts for the period obtained from the CMBOR.
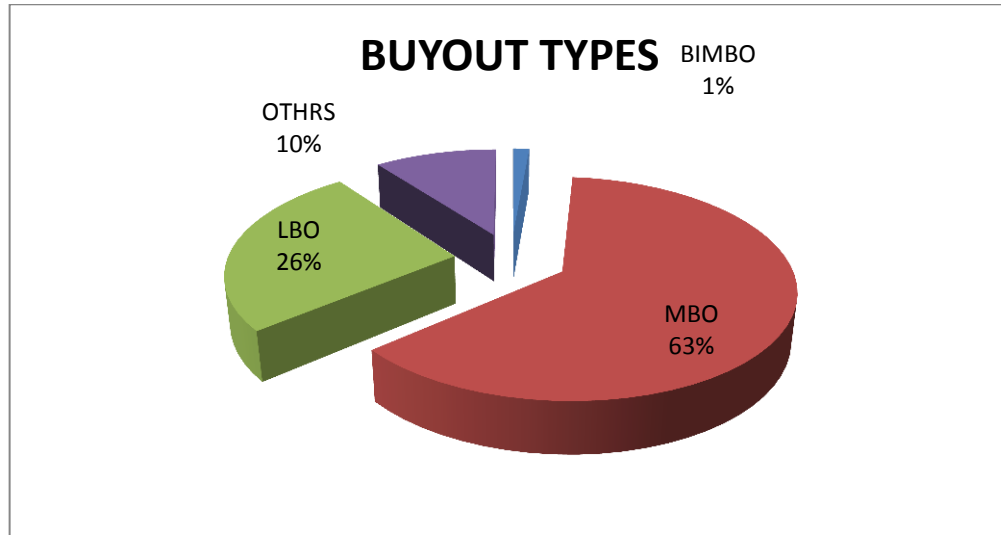
Figure (2) above shows that of the total of 293 PLCs involved in P-T-P buyouts during the period 1997-2007, 63 per cent of companies were purchased in management buyouts, 26 per cent in leverage buyouts, 10 per cent in BIMBO, and 1 per cent others.

Figure 3: Buyout Purchases by Region

Figure (3) shows the percentage of buyouts by region.

Buyout Purchases by Region
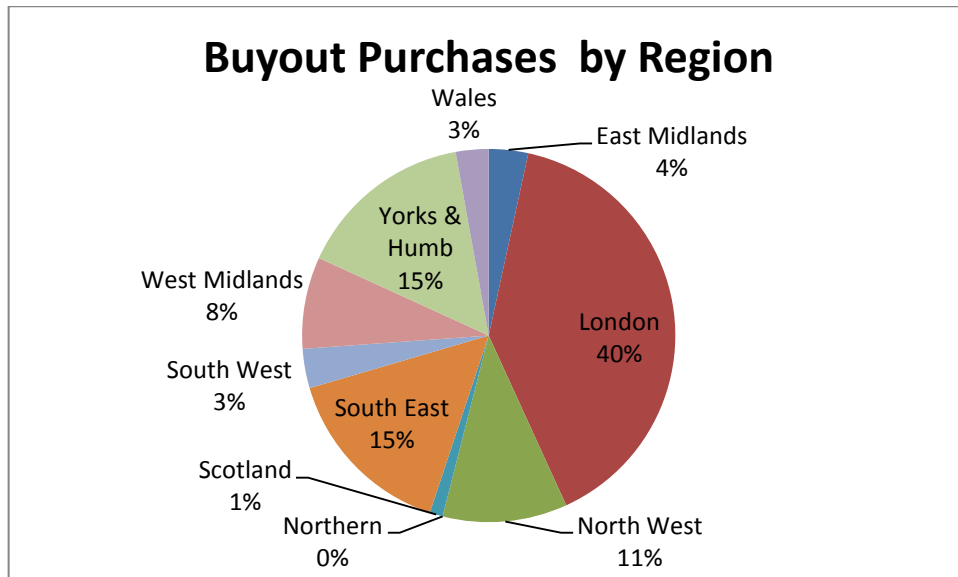
The three regions with the largest number of buyouts during the period under investigation are London 40 per cent, the South East, and Yorkshire and Humberside with 15 per cent.

Figure 4: Buyout Exit Type 1997-2007

Figure (4) below shows the mode buyouts exited during the period 1997-2007. The figures are derived from the buyout sample of 293 companies obtained from the CMBOR.

Buyout Exits 1997-2007
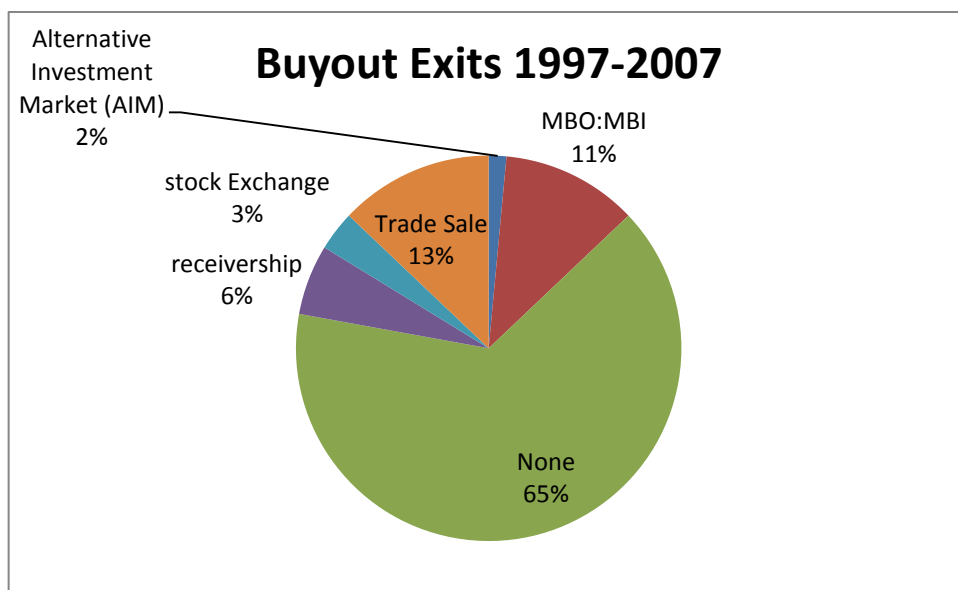
Figure (4) above shows that of the 293 UK P-T-P buyouts during the period 1997 – 2007. 13 per cent exited by way of a trade sale 65 per cent (the company is sold to another company soon after the buyout), 11 per cent was involved in a MBO or MBI, 6 per cent ended in receivership, and 5 per cent was returned to the stock or alternative market.

Figure 5: Number of Buyout Disposals by Year

Figure (5) below shows the number of private equity owned companies disposed of year by year.[23] The figures derive from the CMBOR sample of 293 buyouts for the period 1997-2007.
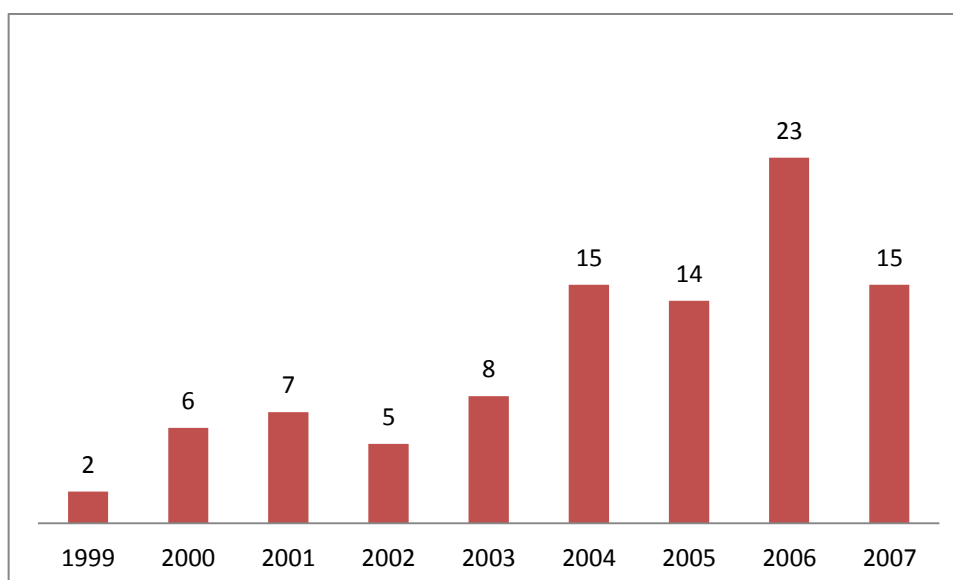
The highest number of companies disposed of by private equity took place in 2006, followed by 2004 and 2007 (figure 5). There are no disposals in 1997 and 1998 (not shown in chart), probably because UK buyouts were in their infancy during these periods. This is demonstrated by the gradual increase in the number of buyouts from 2000 reaching a peak in 2006. The steep fall in buyout numbers in 2007 may be related to the onset of the global financial crisis that came to a head in 2007/8.

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[23] The CMBOR reported that 8 buyouts exited in 2008, 9 in 2009, and 5 in 2010.

Figure 6: Buyout Exit by Region

Figure (6) below shows buyout exit by region based on 95 P-T-P buyouts. These are not industry specific.
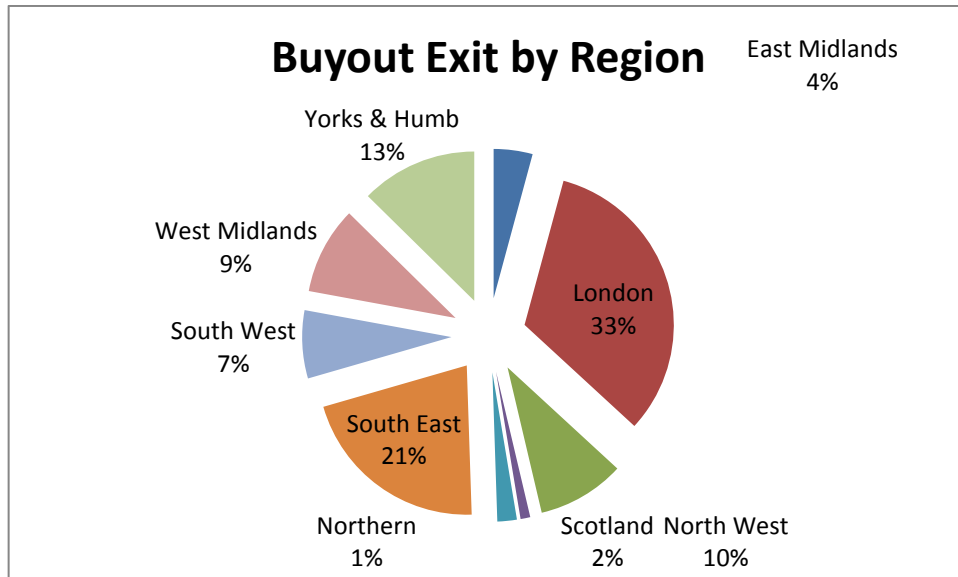
London and the South East experienced the largest number of buyout exits during the period under investigation. 33 per cent of buyouts exited in London, 21 per cent in the South East, and 13 per cent in Yorkshire and Humberside.

All companies not actually involved in manufacturing, such as finance, insurance, agriculture, business services, wholesale distribution, computer services, media, real estate, medical health care, computer software, and transportation and communication are dropped from the CMBOR dataset, leaving a buyout sample of 133 P-T-P buyouts.

Table 2: CMBOR Variables

Table 2 shows the variables obtained from the CMBOR and used in this study. The list of variables provided by the CMBOR was more extensive than below. However, only these were selected for use in the ONS data match.

Name of Buyout	Type of Buyout	Buyout Source
Address of Buyout	County	Region
Month of Buyout	Year of Buyout	Buyout Activity
Value of Buyout	Turnover	Activity Description
Type of Buyout Exit	Year Buyout Exit	Month Buyout Exit

The private equity industry works closely with the CMBOR and provides it with deal level information annually. Most of the information provided is on the type of buyout, date of the buyout, date buyout exits, name and address of the buyout, and the purchase price. No data on input prices are provided, nor does it provide any plant level or reporting unit level data. In order to obtain such buyout data, an alternative data source is required.

The second data source is the UK Office for National Statistics (ONS), more specifically, the ONS Annual Respondent Database (ARD). The ONS is the executive office of the UK Statistics Authority, a non-ministerial department which reports directly to the UK Parliament. The ONS was formed on 1 April 1996 by the merger of the Central Statistical Office (CSO) and the Office of Population Censuses and Surveys (OPCS). The ONS is charged with the collection of data and the publication of statistics related to the UK economy at national, regional and local levels.

The ONS ARD is a database that combines information from ONS IDBR business surveys over time. The ARD contains details on the name, address and postcode of companies surveyed. It also holds detailed information on company inputs and outputs, including turnover, materials, energy, employment, and numerous other firm

characteristics at the enterprise, reporting unit and plant level. This information can be used to construct efficiency measures based on estimation of production frontiers using techniques such as DEA and SFA.

Since 1994, the businesses selected for the ONS surveys have been drawn from the ONS Inter-departmental Business Register (IDBR). The IDBR covers about 98% of business activity (by turnover) in GB. Each year a stratified sample is drawn for the ONS Annual Business Review (ABI) and thus the data stored on the ARD is from businesses' respondents returning questionnaires that are sent out by the ONS. Under the 1947 Statistics of Trade Act, it is a legal requirement that businesses complete and return them to the ONS. The IDBR also records data from the administrative sources of VAT records for all 3.7 million of so businesses. These data relate to name, location, birth, turnover, and employment of the business (ONS). Table 8 provides a summary of the ONS data collection.

Figure 7: Types of IDBR Units and how they fit together
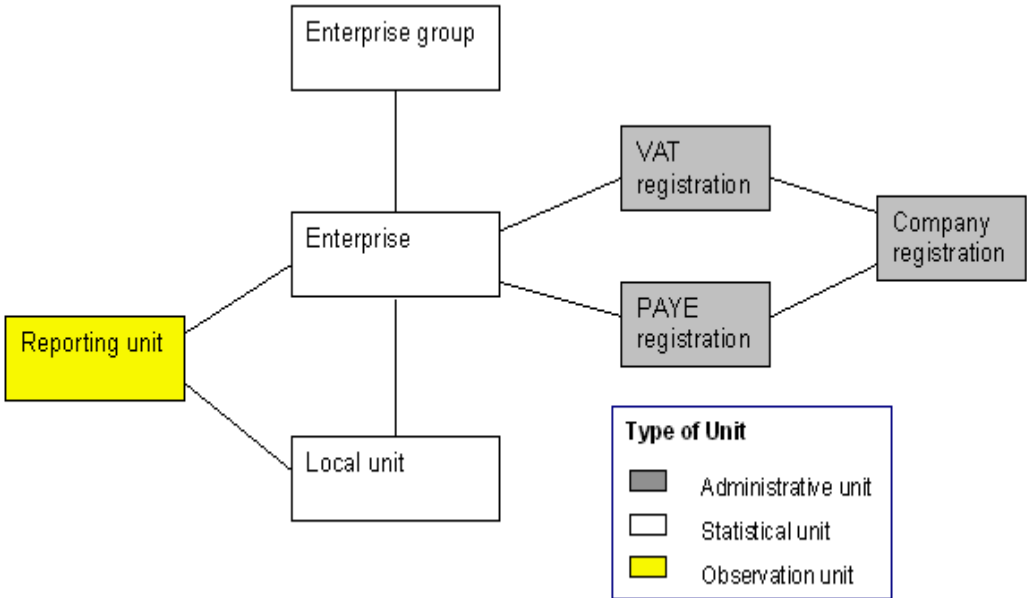
(Source: ONS, 2013)

The business data collected by the ONS can be used in studies relating to social and economic policy-making. Much of the data on which policy-makers depend is produced by ONS through a combination of a decennial population census, samples and surveys and analysis of data generated by businesses and organisations. The reliance on this data source by government (local and national) makes the ONS material central to debates about the determination of priorities, the allocation of resources and for decision making.

The range of variables collected by the ONS since 1970 on the ARD has varied over the years and the same variable names can sometimes hide changing definitions or elements included in questionnaires and derived variables. The central variables collected are measures of employment, turnover/output, capital expenditure and intermediate consumption. The data from these direct responses are used to calculate derived variables such as per head measures and gross value added. Postcodes and industrial classification (Standard Industrial Classification codes) are included from the business register along with the nationality of the ultimate owner of the business. Although the register lists business names and full addresses, the ARD does not (ONS).

In order to obtain UK buyout data at the plant or reporting unit level, the CMBOR buyout file and PLC matching sample, containing the name, address, postcode, date of buyout and date buyout exit is sent to the ONS for it to link with comparable data on its business database. The ONS business data used in this study is obtained from the Inter Departmental Business Register (IDBR) and Annual Respondent Database (ARD). Figure 7 shows the matching process the CMBOR and PLC samples undergo to produce the research dataset. The CMBOR buyout data must first go through the ONS IDBR database.

Figure 8: ONS Matching Process

Figure 8 shows the ONS matching process used for the CMBOR buyout and PLC sample.

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                          ┌─────────────────────┐
                          │       CMBOR         │
                          │  355 P-T-P buyouts  │
                          └─────────────────────┘
                                    │
                                    ▼
                          ┌─────────────────────┐
                          │        ONS          │
              ┌───────────│    Data Match       │
              │           │  293 P-T-P buyouts  │
              │           └─────────────────────┘
              │
              ▼
┌─────────────────────┐   ┌─────────────────────┐   ┌─────────────────────┐
│      ONS IDBR       │   │      ONS ARD        │   │   Buyout Dataset    │
│ 133 P-T-P Observations│→ │ Research Variables  │ → │ 103 reporting units │
│                     │   │   65 P-T-P buyouts  │   │   704 observations  │
└─────────────────────┘   └─────────────────────┘   └─────────────────────┘
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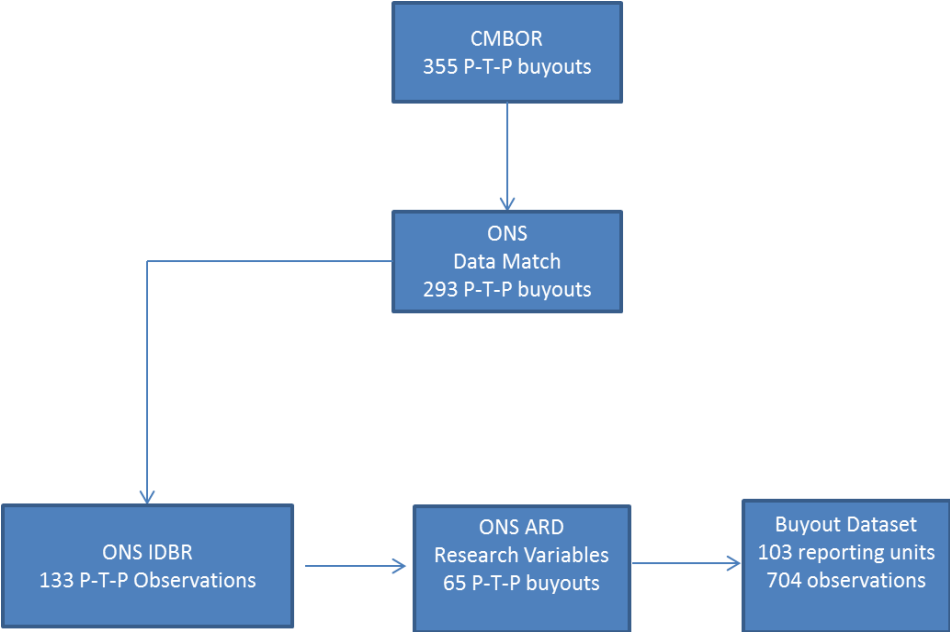
Using the name, address, and postcodes provided in the CMBOR buyout and PLC datasets, the ONS searches its IDBR for comparable records. The purpose of the IDBR matching process is to obtain a unique ONS enterprise reference number for as many of the companies in the CMBOR and PLC sample as possible. No research work can be carried out on any ONS database without first obtaining an enterprise reference number for each company. An enterprise reference number allows an individual company to be followed through various time periods. The IDBR is the sampling frame for surveys of businesses carried out by the ONS and by other government departments. It is also a key data source for analysis of business activity.

The ARD surveys are a census of large businesses and a sample of smaller ones, although the specific sampling frame has varied over time. Each year, information is collected from approximately 14,000-19,000 establishments *(known as reporting units)*, based on a sampling methodology that is biased towards larger establishments (ONS, 2010) See figure (8). The ARD files contain a higher proportion of smaller plants than the US Longitudinal Research Database (LRD) used by Lichtenberg and Sigel (1987, 1990) to examine efficiency in US buyouts, which makes it useful for measuring efficiency at the plant or reporting unit level. The ONS ARD is an unbalanced panel, in

contrast to the extract of the US LRD used by Lichtenberg and Sigel (1987, 1990), which consists mainly of continuous plants.[24] Figure (7) above shows the sources of the ONS data used to construct IDBR and ARD databases. The data collected can be observed at the reporting or local unit level. All data on the IDBR are treated as restricted commercial and are protected by the Code of Practice for Official Statistics and by specific legislation (ONS, 2013).

An advantage of using data from the ONS is it is more reliable, and is reported at the plant and reporting unit level. It it also easier to access than data sources such as OneSource, Compustat, and FAME. As a result, Harris et al (2005) argue that the measurement of efficiency requires reliable and comprehensive information on capital and intermediate materials, and these variables are not typically reported in financial statements and thus are not contained in databases such as OneSource, Compustat, and FAME. Moreover, the accuracy of efficiency measures also depends on the accuracy of input and output price deflators; because inputs and outputs should be computed in constant dollars. However, many large firms have plants in diverse industries, where there may be substantial variation in price changes. However, in files such as Compusat, these organisations must be classified, at the corporate level, into a single four digit SIC industry (Harris et al. 2005).

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[24] Griffiths (1999) and Harris provide an overview of the ARD database.

5.4   Research Sample

From the dataset of 133 P-T-P buyouts obtained from the CMBOR and sent to the ONS for matching with its IDBR, 192 define enterprise reference matches, 922 multi-matches, and 46 definite no matches are obtained. Because sample size is always a concern for econometric work, especially in this study, which already suffers from a small buyout dataset, the multi-match folder is re-examined to see if it is possible to increase the size of the buyout dataset. This cleaning process provides an additional 55 definite matches; bringing the buyout dataset to a total of 247 definite enterprise matches.

In order to examine whether companies involved in private equity P-T-P buyouts operate more efficiently than companies owned by PLCs, a PLC matching dataset is constructed by obtaining data for 473 manufacturing companies listed on the London Stock Exchange from Thompson Reuter's financial database. PLCs in the matching sample must be in the same industry as companies in the buyout dataset matched on four digits SIC code, and must not have been involved in a buyout during the period of study. In order not to bias or unnecessarily limit the number of possible matches, it is necessary to make the PLC matching criteria as wide as possible. The PLC dataset undergoes the same ONS probability matching process as the buyout dataset, which produces 295 definite IDBR matches.

The results for the 247 definite enterprise matches from the buyout dataset, and 295 definite IDBR matches for the PLC dataset provided by the ONS IDBR matching process, is used to search the ONS ARD to obtain annual input output data for each reference number. From the results of the companies identified by the ARD, companies with two or less years' data, companies with missing data for turnover, materials, capital, and employment, and companies with zero balances are dropped. This cleaning process provides the final research dataset.

For the private equity buyout dataset, there are 65 enterprises which own 103 reporting units, which produce a total of 704 observations. For the PLC dataset, there are 251 enterprises which own 367 reporting units producing a total of 2377 observations. Combining the buyout and PLC datasets produces a total of 316 enterprises, 470 reporting units, and 3081 observations. This is combined to make the final unbalanced panel research dataset. The unbalanced nature of the panel from the ARD is useful for

there is considerable entry and exit over a long period (Harris et al. 2005). One other advantage of having an unbalanced panel is that there are more chances of small as well as large companies being included in the sample.

Green and Mayes (1991) use panel data and a stochastic frontier model to assess technical inefficiency in the UK manufacturing industry; Battese and Coelli (1992, 1995) Indian Paddy Farmers; Sharof and Dar (1996) Bangladesh rice farmers; Rosko (2001) US care homes; Benfratello (2002) Italian pasta industry; Amess (2003) UK machinery and equipment manufacturers; Lachaal et al, (2005) Tunisian olive farming; Peng and Wang (2004) Taiwanese banking industry; Green (2005) and Al-Sharkas et al. (2008) US banking industry; Filippini and Green (2006) electricity distribution sector; Tsionas and Papadogonas (2006) firm exit and technical inefficiency; Souza et al, (2007) Brazilian water utilities; Farsi et al, (2007) Swiss gas distribution sector; Pham et al, (2009) Vietnamese manufacturing sector; and Farsi and Filippini (2009) Swiss multi utilities.

5.4.1 Sample Statistics

Table 3: Number of Buyout Observations 1997-2007

Table 3 shows the number of unique buyout deals per year and the number of year observations per deal during the period 1997-2007. Only companies with two or more years of data are included in the research dataset. Companies with zero values for capital, labour, and materials are dropped. The rows for year represent unique buyouts. The columns represent the number of years' observations per buyout. The % is calculated by number of annual buyouts / by total number of buyouts.

Year	2	3	4	5	6	7	8	9	10	11	Total
1997	0	2	2	2	7	2	7	4	11	17	54
1998	1	0	0	1	3	1	1	1	1	0	9
1999	0	0	1	1	1	0	1	1	0	0	5
2000	0	1	0	0	3	0	0	0	0	0	4
2001	0	1	3	1	0	1	0	0	0	0	6
2002	0	4	1	0	1	0	0	0	0	0	6
2003	1	3	3	5	0	0	0	0	0	0	12
2004	0	1	5	0	0	0	0	0	0	0	6
2005	0	1	0	0	0	0	0	0	0	0	1
2006	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0
Tots	2	13	15	10	15	4	9	6	12	17	103
Obs	4	39	60	50	90	28	72	54	120	187	704
%	*1.94*	*12.62*	*14.57*	*9.71*	*14.56*	*3.88*	*8.74*	*5.83*	*11.65*	*16.50*	100%

The row for 1997 in table (3) above shows that 54 P-T-P buyouts took place in 1997. Two buyouts were observed three times, two four, two five, seven six, two seven, seven eight, four nine, eleven, ten, and seventeen, eleven times in 1997. The highest number of buyouts observed is 54 in 1997 and 12 in 2003. 16.5 per cent of the total buyout sample is observed 11 times, 14.5 per cent four times, 14.6 per cent six times, and 12.6 per cent three times. There are a total of 704 observations for the buyout dataset for the period 1997-2007. No buyout observations are recorded after 2006. This is because the ONS has no recorded observations for these years. This is consistent with the table 3 which shows only one company was observed one time.

The overall low number of observations in the buyout dataset is probably due to the fact that private equity firms sell, buy or trade companies quickly after purchasing them. The numbers may also be further reduced because private equity firms also exit buyouts between three and five years, and also because a larger number of buyouts have been dropped from the sample due to insufficient input output data.

Table 4: Number of PLC Observations 1997 – 2007

Table 4 shows the number of PLCs in the sample each year, and the number of years observation per unit during the period 1997-2007. Only companies with two or more years of data are included in the research dataset. Companies with zero values for capital, labour, and materials are dropped. The rows for years represent unique observation. The columns represent number of year observations per unit. The % is calculated by number of annual buyouts / by total number of buyouts.

Year	1	2	3	4	5	6	7	8	9	10	11	Total
1997	1	2	16	19	23	16	24	35	28	22	31	217
1998	1	1	8	2	7	4	5	6	4	6	0	44
1999	1	0	7	5	2	7	1	7	5	0	0	35
2000	0	1	1	4	3	3	2	0	0	0	0	14
2001	0	0	1	2	2	4	2	0	0	0	0	11
2002	1	1	2	3	3	11	0	0	0	0	0	21
2003	2	2	0	1	1	0	0	0	0	0	0	6
2004	0	0	6	3	0	0	0	0	0	0	0	9
2005	1	1	8	0	0	0	0	0	0	0	0	10
2006	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0
Tots	7	8	49	39	41	45	34	48	37	28	31	367
Obs	7	16	147	156	205	270	238	384	333	280	341	2,377
%	1.91	2.18	13.35	10.63	11.17	12.26	9.27	13.08	10.08	7.62	8.45	100

Table (4) above shows there are more observations for the PLC than the buyout. This is expected as there is a ratio of 3-4 PLCs to each buyout. Also, PLCs tend not to be larger than private equity target companies, and they also tend to change ownership less often than companies in the buyout dataset. This can be seen from the appearance of

observations in years one and two. This means that companies in the PLC dataset are more likely to be observed, and more frequently than companies in the buyout dataset. Of the 2377 PLC observations shown above, 13.35 per cent of the PLC dataset was observed three times, 13.1 per cent eight times, 12.3 per cent six times, and 11.1 per cent five times during the period 1997-2007. No observations are recorded after 2005 as there are no buyout observations recorded for this period by the ONS as it takes two to three years for the data to appear in the ONS database after it has been collected and cleaned. Therefore, as this data was not available at the time of contracting the research dataset, it was not collected, and therefore no PLC comparisons are made.

Table 5: Number of Buyout Observations by Region 1997-2007

Table 5 shows the number of buyouts that took place in the region during the period 1997-2007. The administrative regions that companies operate in are obtained from the ONS. The ONS split England and Wales into nine regions. Northern Ireland is excluded as it has its own administrative regions.

Year	South East	East Anglia	South West	West Mids	East Mids	Yorks & Humb	North West	North	Wales	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
1997	7	4	3	5	9	11	8	3	4	54
1998	12	2	4	4	8	12	7	4	4	57
1999	14	2	3	4	8	11	5	4	3	54
2000	17	4	3	4	7	14	5	4	3	61
2001	15	5	3	5	8	12	10	4	4	66
2002	15	4	2	2	9	14	10	4	3	63
2003	18	5	4	5	10	12	14	3	4	75
2004	19	4	3	5	10	9	13	3	4	70
2005	17	3	4	5	9	11	13	2	5	69
2006	15	3	4	6	9	8	16	2	7	70
2007	18	4	3	5	10	8	9	3	5	65
%	23.72	5.67	5.11	7.10	13.78	17.33	15.63	5.12	6.54	100
Total	167	40	36	50	97	122	110	36	46	704

Table (5) above shows that the majority of buyout activity took place in the South East during the period under investigation, followed by the East Midlands, the North West, and Yorkshire and Humberside. Regional buyout activity gradually increased from 1997, peaking at seventy five in 2003, before commencing a downward trend that continues today. 2003 and 2004 records the largest number of observations. Even though the number of buyouts fell to 65 in 2007, observations increased suggesting that private equity firms may have been unable to dispose of their portfolio companies due to the onset of the financial crisis.

Table 6:   Regional PLC Observations 1997-2007

Table 6 shows the number of PLC ownership by region during the period 1997-2007. The administrative regions that companies operate in are obtained from the ONS. The ONS split England, Scotland and Wales into nine regions. Northern Ireland is excluded as it has its own administrative regions.

Regions>	South East (1)	East Anglia (2)	South West (3)	West Mids (4)	East Mids (5)	Yorks & Humb (6)	North West (7)	North (8)	Wales (9)	Total
1997	77	5	17	22	16	22	20	10	28	217
1998	80	7	16	23	17	20	21	9	28	221
1999	88	7	20	23	18	20	20	15	34	245
2000	88	7	22	21	15	22	24	13	40	252
2001	88	7	21	27	13	18	21	15	34	244
2002	86	7	15	25	13	12	23	12	41	236
2003	91	5	22	23	13	12	17	10	40	233
2004	85	5	17	26	12	12	17	11	35	220
2005	76	1	15	20	10	12	15	10	36	195
2006	61	2	16	16	13	8	12	4	27	159
2007	62	1	13	17	13	8	9	3	31	157
%	37.11	2.27	8.29	10.22	6.44	6.98	8.37	4.71	15.73	100
Total	882	54	194	243	153	166	199	112	374	2377

Table 6 shows that 33 per cent of observations in the PLC sample took place in the South East, followed by Wales 15.73 per cent, the West Midlands 10.22 per cent, and the North West 8.37 per cent. The largest number of observations is recorded in 2003. Wales seems more prominent in the PLC dataset than the buyout dataset. Unlike private equity, PLC observations did not peak in 2003, but experienced a downward trend from the same period as private equity owned companies. The matching firms are not proportional across regions. This is because when constructing the PLC matching dataset, the main concern is firm size and industry.

Table 7: Source of Research Variables

CMBOR	ONS	
	IDBR	ARD
Ownership	Enterprise	Turnover
Date of Buyout	Reference	Capital
Exit Date	Number	Labour
Buyout Type		Materials
Exit Type		Region
Sector		SIC code
Region		Year

Table 7 shows the source and variables used in the analysis below. The CMBOR source provides the name of the buyout. This is used to create the ownership variable. The date of the buyout and exit date is used to identify the year the buyout starts and end. Buyout type is used to create a dummy variable for Buyout. Region is used to create a dummy variable for location, and buyout type is used to create a dummy variable for buyout. The ARD provides the output variables turnover, and input variables of capital, labour, and materials, variables used in the production frontier.

5.5 Variable Selection

Farrell (1957) states that if the theoretical arguments as to the relative efficiency of different economic systems are to be subjected to empirical testing, it is essential to be able to make some actual measurement of efficiency. A number of attempts have been made to measure efficiency in buyouts, but most of these use techniques and variables that measure the profitability of the buyout target company or the movement in its stock price prior to the buyout; rather than its efficiency. Other studies have focused on the private equity fund level rather than the plant or reporting unit level. Farrell (1957) further states that when measuring efficiency, it is important to know how far a given industry or company can be expected to increase its output by simply increasing its efficiency, without absorbing further resources. This means that the variables selected to investigate efficiency; and the level of the organisation they are selected from is critical (Lichtenberg (1987).

When carrying out studies on technical efficiency using DEA and SFA, the adaptability of the techniques means that variable selection can often be specific to the type of industry under investigation. Kopp and Smith (1980) use capacity, demand patterns, and capital to examine efficiency in steam generating plants. McGuckin and Nguyen (1995) based their study of efficiency on US plant ownership changes purely on labour productivity because of difficulties obtaining data on inputs such as capital. Battese and Coelli (1995) included land, labour, and bullocks in an investigation of efficiency in Indian paddy farming. Amess (2002) employs data from the CMBOR and ONESOURCE consisting of employment, fixed assets, and value added, to investigate UK buyouts. Benefratello (2002) uses capital, labour, and materials as inputs; and turnover as output in a panel to investigate technical efficiency in the Italian pasta industry. Hirschhause et al (2006) included capita, labour, and maximum peak load as input variables, and total amount of electricity distributed as output variable to estimate efficiency in the German electricity industry, and Al-Sharkas et al (2007) included costs and profits in a study on the US banking industry. Meanwhile, researchers such as Timmer et al (2007), working on the EU KLEMS project, are seeking to harmonise the use of input variables of various categories of capital, labour, energy, materials, and services EU wide in productivity and efficiency studies.

An advantage of having access to the ONS ARD is that it contains over one thousand different variables including key input variables such as capita, labour, materials, and output variables such as turnover at the establishment, reporting unit, and plant level.[25] Surprisingly, few studies on UK buyouts include these key variables to focus on technical efficiency at the plant level or reporting unit. This is very odd, given that microeconomic theory postulates that a company employs a bundle of resources of inputs, such as capital, labour and materials, to produce output (turnover in this study). The general definition of productivity is the ratio of (real) output to (real) inputs[26] (Lichtenberg and Siegel, 1990).

In line with Lichtenberg and Siegel (1990 suggestion, and the EU KLEMS initiative, this study employs reporting unit data consisting of capital, labour, materials as input variables, and turnover as the output variable from the ONS ARD, and key dummy variables selected from the literature to investigation technical efficiency in UK P-T-P in the UK manufacturing industry for the period 1997-2007. A major advantage of these variables in efficiency studies is that they are embedded in a clear analytical framework rooted in production functions and the theory of economic growth. It provides a conceptual framework within which the interactions between variables can be analysed, which is of fundamental importance for policy evaluation (Timmer et al. 2007).

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[25] The ONS no longer collects plant level data.

[26] This definition specifies real rather than nominal output and inputs because we seek to eliminate the influence of price changes when making efficiency comparisons (Lichtenberg and Siegel, 1990).

5.6 Variable Description

TURNOVER - is calculated as the natural logarithm of real annual turnover. It is calculated at the reporting unit level by adding to the value of sales of goods produced, goods purchased and resold without further processing, work done and industrial services rendered and non-industrial services rendered. Turnover is also used to control for firm size in the matching PLC dataset.

CAPITAL – is calculated as the natural logarithm of capital stock. It is constructed at the reporting unit level by the ONS using the Perpetual Inventory Method (PIM). In summary, the PIM depreciates the previous year's capital stock and then adds on the current investment, this process continues for each year of the series. [27]The MAUS team that constructs the capital stock dataset uses the following depreciation rates set out by ONS: Plant & Machinery 6%, Buildings 2%, and Vehicles 20%. However, alternatives such as those based on BEA estimates include: Plant & Machinery 13%, Buildings 2.5%. Vehicles 25%. [28] Most research on efficiency is based on capital stock calculated using the PIM. For instance Hulten (1990), Lichtenberg and Sigel (1987, 1990), OECD (2001), Benfretello (2002), Amess (2003), Coelli et al (2005), Harris et al (2005), and the ONS calculate capital stock using the PIM technique.

An evolving stream of literature suggests that capital services, which is a flow variable, better reflect the input of capital into production, and thus are more suitable for analysing efficiency than the wealth estimates of capital stock (ONS, 2006).[29] An attempt to use capital services in this study was made. However, after extensive discussions with the ONS, it became clear that "capital services" could not be used as the measure of capital stock, as there are serious methodological problems with the ONS capital service datasets which have caused the ONS to suspend their use.

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[27] When constructing capital stock for this study, capital stock with negative values or zero were dropped in accordance with the literature. For zero values, xtfrontier drops these when it estimates equations with zero values.

[28] For a detailed discussion on how the ONS capital stock is constructed, see Martin (2002) and Gilhooly, (2008).

[29] Gilhooly, (2008) Estimating capital stock at the firm level

Other problems with constructing the capital stock variable include having to deal with a large number of negative capital stock values, some of which came about because the ONS only calculated capital stock values up to 2005. This was overcome by manually calculating a capital stock value for as many missing values as possible by using historical data from the ONS capital stock database. This still left a lot of missing capital stock values, which it was not possible to calculate capital stock values for.

LABOUR – is calculated as the natural logarithm of total employment costs paid for labour during the year to employees. This includes all overtime payments, bonuses, commission, payments in kind, benefits in kind, holiday pay, employers' national insurance contributions, payments into pension funds by employers and redundancy payments, less any amounts reimbursed for this purpose from government sources. No deduction is made for income tax or employees' national insurance contributions etc, payment to working proprietors, travelling expenses, lodgings allowances, etc., are excluded.

In efficiency studies, labour is often measured in different ways. Lichtenberg and Sigel (1990) measured labour as the equivalent man-hours, calculated as production worker man-hours times the ratio of total wages and salaries to production workers. Amess (2003) measured it as the number of employees, and Benfrattello (2002) as deflated value added labour. However, the ONS[30] argues that productivity measures based on hours worked have conceptual advantages over head count efficiency measures which are based solely on the number of workers or jobs rather than the time people actually work. According to the ONS, data on hours worked give a better indication of the actual volume of labour input because a measure of hours worked allows accounting for differences in working patterns. Unfortunately, the ARD holds no data on hours worked. Harris et al (2005) used real intermediate inputs as their measure of labour input. This study follows Harris et al (2005) in the use of real intermediate inputs as the measure of labour input.

MATERIALS - is calculated as the natural logarithm of the cost of raw materials and components used in production processes. The goods made from these materials are sold to generate turnover. Because of the different types of products made by the UK

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[30] ONS Productivity Handbook, chapter 5 – Input measures: Labour and Capital

manufacturing industry, no single definition of materials is available. Following Harris et al., (2005) material is defined as real intermediate inputs.

OWNERSHIP CHANGE - is a dummy variable representing ownership change. It begins one or more years before the company changes ownership from a PLC to private equity, and end in the year following the buyout. To construct this dummy variable, the year that a company enters and exits a P-T-P buyout in the CMBOR file is compared to years of observations provided by the ONS ARD during the period 1997-2007. The years prior to the buyout when the company is PLC owned, or if it reverts back to PLC or some other type of ownership following a buyout is coded (0). All years of private equity ownership, including the year that the buyout starts, and the actual year that it exits the buyout is coded (1). Where there is private equity ownership, but no ownership change takes place, the observation is coded with a missing value. This is to prevent the loss of buyout data that can be used in estimating the production function. Where the CMBOR data shows that a buyout has taken place, but there is no year data in the ARD corresponding to the year of private equity ownership change, the observation is dropped. Observations where the data does not show the start of private equity ownership but shows when private equity exited the buyout are retained, as this provides evidence of ownership changes following a buyout.

OWNERSHIP - is a dummy variable representing legal ownership of a company, i.e., public or private. It is constructed using data from the CMBOR and the LSE. A list of the population of all companies involved in P-T-P LBOs and MBOs during the period 1997-2007 and their industries are obtained from the CMBOR. A similar sample of PLCs is obtained from the LSE, and these are matched against comparable information held on the ONS ARD to create matching samples using turnover and SIC92 codes. No researcher size bias is exercised in the selection of companies to be included in the datasets. The only determinant of firm size is that generated by the data itself in the process of it being cleaned. The only requirement to be included in the datasets is that there must be two or more years of observations per company, as during the first year of ownership change, it is almost impossible to determine whether changes are the result of PLC or private equity ownership (Benfretello, 2002). PLCs are coded (0) and private equity owned companies are coded (1). Ownership is a key variable since the literature suggests that companies involved in buyouts should be more efficient following a buyout than companies that do not engage in buyouts.

LOCATION – is a dummy variable representing the geographical location of a plant or company. England and Wales is divided into nine industrial regions. These are: South-East England, Eastern, London, South-West England, West-Midlands, East-Midlands, Yorkshire and Humberside, Merseyside, and North-East England. The ONS records the address, post-code and region where each plant is located and operated from. This address and location is different from the parent company that owns the plant or reporting unit. The name and address provided by the CMBOR for each company involved in a buyout is compared with similar information held in the ONS ARD. The dataset is divided into companies situated in the London and the South East *(South),* and companies in the North *(North).* Companies in the *South* are coded (0), companies in the *North* are coded (1).

BUYOUT is a dummy variable representing the type of buyout, i.e., leverage buyout or management buyout. This data is provided by the CMBOR, and is a sample from the population of LBOs and MBO for the period 1997-2007. To be included as buyout in the CMBOR database, over 50 per cent of the issued shares of a public company must change ownership with either management or a private equity firm or both, jointly having a controlling stake upon deal completion. Only buyouts with two or more years' observations are included in this variable. Private equity firms determine what is constituted as a LBO and an MBO, and this study follows the determination provided in the data from the CMBOR. This variable is used to estimate whether the type of buyout affects the efficiency of companies.

LBO – is a dummy variable constructed from the buyout dummy variable. It represents companies involved in leverage buyouts during the period 1997-2007. The role of this variable is to measure whether LBOs are more efficient than MBOs. *SIC92* - is the standard industry classification code for 1992. This is obtained by manually reducing the 5 digit ONS SIC92 code to 3 digits.

SECTOR – represents the seven industrial sectors that UK companies operate in. The ONS classifies and places each company in its most appropriate industry sector. The industry sectors are: Construction; catering; motor trades; property; retail; other services, and wholesale. As the UK manufacturing industry contains the largest number of companies, most studies on UK efficiency are based on this sector. Following this trend, this study also focuses on the UK manufacturing industry. All companies involved in

financial services, banking and insurance are dropped in this study, as their heterogeneous nature makes them difficult to measure. Companies in other industries such as construction (CN), catering (CA), wholesale (WH), and other services (ST) are excluded from the study. The industries in which private equity firms operate are used as the guide for the selection of industries on which this study focuses. Using the variables selected and described above, a 10 year unbalanced panel is created.

Table (6) below presents the main research variables used in this study, their definition, and the expected direction of the sign. The variables are described at 3.4.1 above, and specified at 4.7 below. The variable names in brackets denote the name of the variable in the various equations.

Table 8: Variable Definitions and their Expected Relationship with Efficiency

Main research variables and their expected signs		
Variable Name		Expected Sign
Turnover (*ln_turnover*)	Annual turnover	
Capital (*ln_rcapstk95*)	Capital stock	+
Materials purchased (*ln_matpurch*)	The cost of raw materials, goods and services use in production	+
Total Labour Costs (*ln_totlabcosts*)	The cost paid for labour	+
Ownership	Dummy variable where 0 = PLCs, and 1 = companies owned by private equity firms	+
Ownership Change (*Change*)	Dummy variable representing ownership change	+
Location (*North/South*)	Dummy variable representing the geographical location whether a company operates in the north or south of England	-/+
Year	1997 – 2007	+
Sector	Industry sectors companies operate in	+/-
Industry Classification Code (*SIC92*)	Represents the industry each unit operates in	+/-
Buyout	Dummy variable representing the type of buyout, i.e., LBO or MBO.	+/-

Table 8 details the variables used in the study, their definition, and expected directions of their sign.

The variables are obtained from the CMBOR and the ONS. The name for each buyout was obtained from the CMBOR. However, when the buyout name is submitted to the ONS for data matching, the ONS drop the name of each company in the sample, as it is not permitted to disclose any data that will identify an individual company. The ONS replaces each company name with a unique reference number that allows researchers to use its databases when it carries out the data matching process. Variables, such as location, sector, and SIC codes are shared by the two data sources. These are used in the checking process to ensure that the correct companies and industries are being selected. Variables in table 8 with the prefix *ln* signify the logarithm of the variable.

5.7 Summary Statistics

Tables 9 and 10 present summary statistics for the variables in the buyout and PLC dataset respectively.

In order to avoid the outlier effects and standardise data, all the values are taken in their natural logarithmic forms. As can be seen in table 10 and 11, all the (minimum and maximum) values of the variables are close to the mean and the standard deviations are relatively normal (less than 2.5) in all cases. By normalising the data, the abnormalities in time series are substantially minimised.

Table 9:   Mean, Minimum & Maximum Buyout Variabes

Variable	Obs	Mean	Std.Dev	Min	Max
lturnovr	704	10.77	1.437	0	14.49
lmatpurch	704	9.071	1.794	2.890	13.35
lrcapstk	704	10.16	1.391	0	13.78
llabour	704	9.451	1.096	2.772	13.10

Table 10: Mean, Minimum & Maximum of PLC Variables

Variable	Obs	Mean	Std.Dev	Min	Max
lturnovr	2377	10.56	1.5845	0	14.60
lmatpurch	2377	8.476	2.2522	0	13.04
lrcapstk	2377	9.917	1.5511	1.099	15.09
llabour	2377	9.171	1.290	4.060	13.40

Tables 9 and 10 above indicate some interesting points. Both the buyout and PLC variables show similar patterns in terms of turnover. In order to examine the differences and similarities between buyout and PLC companies' variables, t-tests are conducted for each variable. The results show that there is little or no statistical difference between the

means for ownership and private equity at the five per cent level. The result therefore suggests that the hypothesis that ownership changes do not increase firm technical efficiency cannot be rejected.

The mean of the dependent variable for turnover in the buyout and PLC dataset is 10.77 and 10.56 respectively. This indicates that the process of matching by firm size is relatively robust.

The mean of the buyout variable for materials is 9.071 (table 9) and 8.476 for PLCs (table 10). For capital it is 10.16 for private equity and 9.917 for PLCs respectively, and for labour it is 9.451 for private equity and 9.171 for PLCs respectively. On average therefore, turnover is fractionally higher for private equity owned companies than for PLCs. Capita seems to have the largest impact on turnover in private equity and PLC owned companies, followed by labour and materials.

5.8 Correlation Matrixes

Tables (11) and (12) below present results for the Pearson correlation matrixes, and table (13) and (14) present the results for the Spearman correlation matrixes. Correlation measures the strength and direction of the linear relationship between two variables.

Table 11: Pearson's Correlation Matrix for Buyouts

Table (11) presents Pearson correlation results for buyouts based on 704 P-T-P buyout observations for the period 1997-2007.

	lturnover	lrcapstk95	lmatpurch
lturnover	-		
lrcapstk95	0.337*	-	
lmatpurch	0.529*	0.138*	-
ltotlabcost	0.637*	0.376*	0.394*

Statistically significant at the five per cent level of significance

Table 12: Pearson's Correlation Matrix for PLCs

Table (12) presents Pearson correlation results for PLCs based on 2377 PLC observations for the period 1997-2007.

	lturnover	lrcapstk95	lmatpurch
lturnover	-		
lrcapstk95	0.456*	-	
lmatpurch	0.610*	0.416*	-
ltotlabcost	0.758*	0.429*	0.647*

* Statistically significant at the five per cent level of significance.

The correlation in the Pearson matrix in tables 11 and 12 above is positive and statistically significant at the five per cent level. The correlation between turnover and capital in table 11 is 0.337, material and labour 0.529, material and capital 0.138. The correlation between turnover and labour in table 12 is 0.637, labour and capital 0.376, and labour and material 0.394. The positive correlation between the variables indicates that as one variable increases, so does the other variable.

The relationship between the variables in the PLC Pearson's correlation matrix in table 12 above is positive and significant at the five per cent level. The correlation between turnover and capital is 0.456, turnover and materials 0.610, turnover and labour 0.758. The correlation between materials and capital is 0.416, labour and capital is 0.429, labour and materials 0.647.

The correlation between the variables in the PLC matrix is stronger than those for private equity. Turnover and labour have the strongest correlation in the PLC and private equity matrices. However, the correlation between turnover and labour is 0.758 in the PLC matrix than for private equity 0.637. The correlation between labour and materials in the PLC matrix 0.647 is strong compared to private equity 0.394, as is the correlation between materials and labour 0.416 in the PLC matrix and 0.138 for buyouts. There is little difference in the correlation of turnover and material 0.610 for PLCs and 0.529 for buyouts, and capital and labour 0.456 and 0.337 respectively.

The Spearman's rank correlation matrices in table 9 and 10 measure the extent to which, as one variable increases, the other variable tends to increase, without requiring that increase to be represented by a linear relationship.

Table 13: Spearman Correlation Matrix for Buyouts

Table (13) presents Spearman's correlation results for buyouts based on 704 P-T-P buyout observations for the period 1997-2007.

	lturnover	lrcapstk95	Lmatpurch
lturnover	-		
lrcapstk95	0.487*	-	
lmatpurch	0.669*	0.341*	-
ltotlabcost	0.713*	0.463*	0.468*

* Statistically significant at the five per cent level of significance.

The correlation between capital and materials in the buyout sample in table 13 is 0.341. Between capital and labour it is 0.463, and between material and labour it is 0.468. The correlation between the variables is positive. This indicates that as one score increases, so do the others, and the relationship is statistically significant at the five per cent level.

Table 14: Spearman Correlation Matrix for PLCs

Table (14) presents Spearman's correlation results for PLCs based on 2377 PLC observations for the period 1997-2007

	lturnover	lrcapstk95	lmatpurch
lturnover	-		
lrcapstk95	0.475*	-	
lmatpurch	0.660*	0.442*	-
ltotlabcost	0.808*	0.435*	0.647*

* Statistically significant at the five per cent level of significance.

The correlation between capital and materials in the buyout sample in table 14 above is 0.341. Between capital and labour it is 0.463, and between material and labour it is 0.468. The correlation between the variables is positive. This indicates that as one score increases, so do the others, and the relationship is statistically significant at the five per cent level. The correlation matrix also examines whether there is any evidence of multicollinearity in the model. The distribution presented in the correlation matrix suggests that the variables are normally distributed.

In both the Pearson and Spearman correlation matrices above, the correlation between materials and labour is strongest in both the correlation matrices, but the strength of association between the two variables is strongest in the PLC sample. The conventional dictum states that "correlation does not imply causation", means that correlation cannot be used to infer a causal relationship between the variables. However, Pevalin and Robson (2009) argue this dictum should not be taken to mean correlations cannot indicate the potential existence of causal relations. However, the causes underlying the correlation, if any, may be indirect and unknown.

CHAPTER SIX: METHODOLOGY

6.0 Introduction

Previous attempts to empirically measure efficiency in buyouts have been undertaken using a variety of techniques. Early studies use techniques based on accounting data such as net income, operating cash flow and net cash flow to assess how efficiently companies deploy their assets. However, as most buyout ownership changes involve only parts or divisions of PLCs it is difficult to assess the impact of such partial acquisitions or divestures on efficiency using financial data at the company level (Lichtenberg and Siegel, 1987). Other researchers employ event studies to examine movements in share prices around an event window. Still, questions have been raised over the efficient market hypothesis which asserts that changes in share prices following the announcement of a buyout do not reflect changes in future real firm performance or economic efficiency (Shliefer, 2001). This renders the above techniques unsuitable for the measurement of technical efficiency.

Theoretically, TFP is an appropriate measure of technical efficiency because it takes into account all inputs. The results from TFP studies are inconclusive. Moreover, because TFP assumes that all deviations from the efficiency frontier are under the control of managers, when they are not (Murillo-Zamorano, 2004), the technique is rarely used in buyout studies. In addition, most studies on buyouts are based on the private equity fund level, whereas Lichtenberg (1997) proposes that data at the plant or reporting unit level should be used to measure technical efficiency in buyouts.

As the number, size, and value of PLCs targeted by private equity firms have increased (Wright et al. 2006), and because of the importance of these companies to stakeholders and the UK economy, it is important to independently examine the claims of superior efficiency made by UK private equity firms. This study contributes to this debate by employing a probabilistically matched unbalanced reporting unit dataset, and a DEA and SFA frontier technique respectively, to investigate the impact of P-T-P buyout ownership changes on the technical efficiency of companies operating in the UK manufacturing industry during the period 1997-2007.

6.1 Research Models

Farrell (1957) states that if the theoretical arguments as to the relative efficiency of different economic units are to be subjected to empirical testing, it is essential to be able to make some actual measurement of efficiency. Two competing approaches for the measurement of technical efficiency are the data envelopment analysis (DEA) and stochastic frontier analysis (SFA) (Ruggiero, 2007, Fried et al, 2008). Since the work of Aigner et al (1977) and Meeusen and van den Broeck (1977), DEA and SFA techniques have become widely used to investigate efficiency in a variety of industries. For example, Benfretello (2002) used SFA and panel data in the Italian pasta industry, Amess (2002, 2003) used SFA and panel data to investigate efficiency in the UK machine manufacturing industry. Following this trend, this study employs two SFA and a DEA technique to estimate technical efficiency in P-T-P buyouts. The rationale for using two competing methods is to counter-check whether the results obtained from one method can be confirmed by the other (Odeck, 2007). DEA and SFA are discussed below.

6.1.2 Data Envelopment Analysis

Farrell (1957) proposed a measure of technical efficiency capable of measuring individual economic units (DMUs) of organisations. The technique did not gain wide attention until Charnes et al (1978) renamed it data envelopment analysis (DEA). DEA is a nonparametric frontier technique, which uses data from observed companies to construct an efficiency frontier against which all other companies in the dataset are measured. Companies that sit on the frontier are considered efficient, and those that do not are inefficient. A numerical coefficient score is given to each firm, defining its relative efficiency.

Charnes et al (1978) extended DEA to an input orientated model, which assumes constant returns to scales (CRS). Coelli and Perelman (1996) and Coelli et al (2005) state a researcher should select an orientation according to which quantities (input or output) managers have control over. However, they further state that in many instances, the choice of orientation will have only minor influence upon the efficiency scores obtained, and the choice of model might be based on the specific characteristics of the research

dataset used in the analysis. Banker et al. (1984) extended DEA to variable returns to scale (VRS). Other researchers have further extended DEA and considered alternative sets of assumptions. The use of the CRS specification when not all DMUs are operating at optimal scale will result in measures of technical efficiency, which are confounded by scale efficiencies. The VRS specification permits the calculation of technical efficiency devoid of these effects (Coelli et al. 2005).

DEA builds on the individual firm evaluations of Farrell (1957) and extends the engineering ratio idea of efficiency measure for a single input, single output analysis to multi-input, multi-output situations (Cook et al. 1991). In this approach, the efficiency of each unit is measured relative to all other units with the restriction that all units operate on or below the efficiency frontier (Cook et al. 1991, Murill-Zamorano, 2004).

Odeck (2007) caution that because DEA yields a relative efficiency measure and defines a unit as inefficient by comparing combinations of inputs and outputs with other units, units operating with input-output quantities sufficiently far from other units at both ends of the size distribution will be defined as inefficient simply due to lack of comparable units. However, these problems are minimal when examining larger samples of units because larger samples decrease the average level of efficiency due to the positive probability of including more efficient outliers in the sample. Another drawback of DEA technique is that model specification and inclusion/exclusion of variables can affect the results (Cook et al. 1991, Odeck, 2007, Murillo-Zamorano, 2004, Zelenyuk and Zheka 2006, Berg 2010).

However, despite its limitations, DEA provides new ways of obtaining empirical estimates of external relationships, such as the production function, or the efficient production possibility surfaces that are a cornerstone of modern economics (Charnes et al. 1978). DEA is flexibible and has the ability to accommodate multiple inputs and outputs. Moreover, with DEA there is no need to explicitly specify a mathematical form for the production function; it is capable of being used with any input-output measurement; the sources of inefficiency can be analysed and quantified for every evaluated unit; and it is useful in uncovering relationships that remain hidden when other methodologies are used (Cook et al. 1991, Ruggiero, 2007).

Researchers in a number of fields have recognised the effectiveness of DEA for modelling operational processes, and its empirical orientation and absence of *a-priori*

assumptions (Cook et al, 1991, Murillo-Zamoro, 2004, Coelli et al, 2005, Odeck, 2007) have resulted in the use of DEA in a number of studies to evaluate the efficiency of firms in both the non-profit and for profit, and regulate and unregulated sectors (Cook et al, 1991, Murillo-Zamorano, 2004). For instance, Majumdar (1998) in the Indian state owned and private sector industry, Banker et al (1988) hospitals, Banker and Morey (1986) restaurants, Brynes et al (1986) mining, Divine (1986) electric and utilities, and Banker (1985) the manufacturing industry. Cowie (2002) the British bus industry, Chaaban (2005) the French cheese industry, Lee (2005) the forestry industry, Tan (2006) the Singapore manufacturing industry, Sanjee (2007) the hotel and catering industry, Hsiang (2007) the Taiwanese banking industry, and Delis et al. (2009) the Greek banking industry. Odeck (2007) use a DEA and SFA and panel data to measure technical efficiency in the Norwegian grain industry.

Following the above authors, this study employs a two-stage DEA variable return to scale (VRS) input oriented approach to investigate technical efficiency in companies involved in P-T-P buyouts in the UK manufacturing industry during the period 1997-2007. In the first stage, three input variables, materials, capital, and labour, and turnover as output variable and specified above, are used to estimate efficiency scores for each company in the sample based on model (1). In the second-stage of the DEA analysis, the efficiency scores obtained from the first stage are used as the dependent variable and ownership and ownership dummies as independent variables to estimate DEA equation (1) below.

6.1.3   DEA Model Specification

DEA is used to compute an efficiency score for a firm as the fraction of actual inputs that is required for the firm to be located on the efficient frontier to produce the same level of outputs. Suppose there are m inputs and s outputs. Let the input and output data for decision making unit j be $x_{1j}, x_{2j}, ..., x_{mj}$ and $y1j, y2j, ..., ysj$, respectively. The variable return to scale DEA model can be expressed with a real variable θ (efficiency score) and a non-negative vector of variables $\lambda = (\lambda 1 \quad \lambda 2 \ ... \ \lambda n)^T$ This model is one first proposed by Banker et al. (1984) and is similar to a model adapted by Lin et al. (2008). The DEA mode is specified as follows:

$$\theta^* = \min_{\lambda} \ \theta$$

$$\text{s.t} \quad \sum_{i=1}^{n} \lambda_j x_{ij} \leq \theta x_{i,0}, \quad \sum_{i=1}^{n} \lambda_j y_{rj} \geq y_{r,0} \tag{1}$$

$$\lambda_j \geq 0, \quad \sum \lambda_j = 1$$

$$i = 1, 2, ..., m, \quad r = 1, 2, ..., s,$$

$$j = 1, 2, ..., n$$

Under the DEA methodology, a firm with an efficiency score of 100% is located on the efficiency frontier in the sense that its inputs cannot be further reduced without decreasing its outputs (Lin et al. 2009). A firm with an efficiency score below 100% is relatively inefficient (Farrell, 1957, Banker et al. 1984, Lin et al. 2009).

6.2.   Stochastic Frontier Analysis

The second frontier technique employed in this study is stochastic frontier analysis (SFA). Aigner et al (1977) and Meeusen and van de Broeck (1977), influenced by the work of Farrell (1957), Aigner and Chu (1968), Seitz (1971) Timmer (1971), Afriat (1973), and Richmond (1974), simultaneously developed SFA models. These models are developed in a production frontier context, and share a composed error component. The first error component is intended to capture the effects of statistical noise; the second

error component is intended to capture the effects of technical inefficiency. Thus producers operate on or below their stochastic frontier production frontier (Kumbhakar, et al, 2000).

Meeusen and van den Brock (1977) assigned an exponential distribution to the inefficiency error, Battesea and Corra (1977) assigned a half normal distribution, and Aigner et al (1977) considered both distributions for the inefficiency error. The parameters to be estimated include β, σ_v^2 and a variance parameter σ_u^2 associated with the error term. Either distributional assumption on the inefficiency error implies that the composed error is negatively skewed, and statistical efficiency requires the model to be estimated by maximum likelihood.

Forsund et al (1984) noted "the main weakness of the stochastic frontier model is that it is not possible to decompose individual residuals into their two components, and so it is not possible to estimate technical efficiency by observation. The best that one can do is to obtain an estimate of mean inefficiency over the sample." To overcome this limitation, Jondrow et al. (1982) propose a model in which either the mean or the mode of the conditional distribution of the error terms is able to provide estimates of the technical inefficiency of each producer in the sample. The half normal and exponential distributions assigned to the one sided inefficiency error term are single-parameter distributions. To correct this, researchers have developed more flexible two-parameter distributions for the inefficiency error term. For example, Afriat et al (1972) proposed a gamma distribution, and Stevenson (1980) proposed Gamma and truncated normal distributions.

6.2.1 SFA Time-variant Model Specification

The first model is the Battese and Coelli (1992) time-variant SFA model for unbalanced panel data. The model is used to investigate efficiency in the UK manufacturing industry during the period 1997-2007, and to address the above research hypotheses and questions. In the time-varying SFA model, technical efficiency is allowed to vary across producers and through time, and the parameterisation of time effects. The efficiency error term is modelled as a truncated-normal random variable multiplied by a specific function of time, and is assumed to be independently and identically distributed non-

negative truncations. In both time-variant and time-invariant models, the idiosyncratic error term is assumed to have a normal distribution. The only panel-specific effect is the random inefficiency term. The Model takes the following form:

$$Y_{it} = f(X_{it}; \beta) \exp(V_{it} - U_{it}) \tag{2}$$

and

$$U_{it} = \eta_{it}.U_i = \{\exp[-\eta(t-T)]\}U_i, \quad t \in \Im(i); i = 1, 2, ..., N; \tag{3}$$

Where Y_{it} denotes the production for the ith firm for the tth period of observation. X_{it}, is a factor of inputs (and firm specific variables), associated with the production of the ith firm in the tth period of observation, and a vector, β, of unknown parameters.

V_{it} are assumed to be independent and identically distributed $N(0, \sigma_v^2)$ random error component representing statistical noise, and is assumed to be independent and identically distributed $N(0, \sigma_v^2)$ random error, independently distributed of the U_{it}.

U_{it} is an error component representing technical inefficiency, and is assumed to be independent and identically distributed non-negative truncations of the $N(\mu, \sigma^2)$ distribution, η is an unknown scalar parameter; and $\Im(i)$ represents the set of T_i time periods among the T periods involved for which observations for the ith firms are obtained.

In the time-variant model, the non-negative firm effects U_{it} decreases, remain constant or increase as t increases, if $\eta > 0$, $\eta = 0$, or $\eta < 0$, respectively. The case in which η is positive is likely to be appropriate when firms tend to improve their level of technical efficiency over time. Further, if the tth time period is observed for the ith firm, then U_i the parameters μ and σ^2, define the statistical properties of the firm effects associated with the last period for which observations are obtained. The model assumed for the firm effects U_i, was originally proposed by Stevenson (1980) and is a generalisation of the half-normal distribution, which has been frequently used in empirical studies (Battese and Coelli, 1992).

6.2.2   SFA Time-invariant Model Specification

The second model is a time-invariant SFA model. In this model, the inefficiency term is assumed to have a truncated-normal distribution. Early panel data models were based on the assumption of time-invariant efficiency. However, the longer the panel, the less tenable this assumption becomes, and the assumption was relaxed in models proposed by Cornwell et al. (1990), Kumbhakar (1990), and Battese and Coelli (1992). In this model, only the U_i inefficiency error term is different from the time-variant model above. The model takes the following form:

$$Y_{it} = f(X_{it}; \beta)\exp(V_{it} - U_i) \tag{4}$$

Where Y_{it} denotes the production for the ith firm for the tth period of observation. X_{it} is a factor of inputs (and firm specific variables), associated with the production of the ith firm in the tth period of observation, and a vector, β, of unknown parameters.

V_{it} represents random statistical noise and are assumed to be independent and identically distributed $N(0, \sigma_v^2)$ random errors;

U_i represents technical inefficiency, and is assumed to have a truncated-normal distribution. Notice that the structure of production technology is assumed to be constant through time, that is, no allowance is made for technical change. All other variables are as specified above.

The time-invariant SFA model assumes that technical efficiency is constant through time for each producer. This assumption of time-invariance of technical efficiency is considered tenuous, particularly in long panels (Kumbhaker et al. 2000). The Battese and Coelli (1992) time-variant SFA model for unbalanced panel data addresses this limitation.

6.3   Variable Specification

The variables specified below for use in the SFA and DEA models in this study have been selected and defined in table (8) above. The variables are: *CAPITAL, LABOUR, MATERIALS, OWNERSHIP, CHANGE, BUYOUT, LOCATION, YEAR, V_{it}. U_{it}. and U_i.*

Where *TURNOVER* is the natural logarithm of real annual total turnover for each reporting unit. *CAPITAL* is the natural logarithm of real total capital stock. *LABOUR* is the natural logarithm of real total labour costs. *MATERIAL* is the natural logarithm of the costs of intermediate inputs. *OWNERSHIP* is a dummy variable that is 0 if the company is PLC owned and 1 if private equity. *CHANGE* is a dummy variable, which takes the value 1 if a company is involved in an ownership change and 0 otherwise. *BUYOUT* is a dummy variable, which takes the value 0 if a company is involved in a LBO, and 1 if a MBO. *YEAR* is calendar year. V_{it} is assumed to be independent and identically distributed. U_i is assumed to have a truncated-normal distribution. U_{it} is a truncated-normal random variable multiplied by a specific function of time. β_0 is a constant term.

6.3.1   DEA Model Equation

In the first stage of the DEA procedure, the input variables specified at 4.7 above, capita, labour, material, and turnover as output, is used to estimate efficiency scores for each company in the sample based on model (4). In the second-stage of the DEA analysis, the efficiency scores obtained from the first stage are used as the dependent variable and ownership and ownership dummies are used as independent variables to address research hypothesis (1) above, and in order to check the robustness of the results from the above SFA equations, the following DEA equation is estimated:

$$e_{i,t} = \alpha \sum_k \beta_k X_{k,i,t} + \sum_k \theta_k OWNERSHIP + \sum_m \theta_m CHANGE + \sum_n YEAR + u_{i,t}, \qquad \textbf{(5)}$$

where $e_{i,t}$ is the efficiency score for firm i in year t $X_{k,i,t}$ represents efficiency variables discussed in section data and summary statistics. Since efficiency scores are truncated below from zero and above from unity, $u_{i,t}$ is an error term with double truncation. The prevalent method in the literature to find the determinants of efficiency gaps among DMUs; is by using Tobit regression analysis because the efficiency scores are censored

at the maximum value of the efficiency scores. Tobit regression uses the efficiency scores as the dependent variable for the possible candidates of influential variables (Ji and Lee, 2010).

6.3.2 SFA Time-variant Model Equation

The Battese and Coelli (1992) time-varying SFA decay model provides maximum likelihood estimates for the Battese and Coelli (1992) time-varying decay model. In this model, the inefficiency effects are modelled as:

$$u_{it} = \exp\{-\eta(t - Ti)\}u_i$$
where **(6)**
$$u_i \text{ iid } N^+(\mu, \sigma_u^2).$$

Battese and Coelli reports that the exponential specification of the behaviour of the firm effects over time (equation 6) is a rigid parameterisation in that technical efficiency must either increase at a decreasing rate, $\eta > 0$, decrease at an increasing rate $\eta < 0$, or remain constant $\eta = 0$. Thus, When $\eta > 0$, the degree of inefficiency decreases over time, when $\eta < 0$, the degree of inefficiency increases over time. Because t=Ti in the last period, the last period for firm contains the base level. If $\eta < 0$, the level of inefficiency increases to the base level. When $\eta = 0$, the time-varying decay model reduces to the time-invariant model (Battese and Coelli, 1992, STATA, 2013).

Using Battese and Coelli (1992) time-variant SFA model for unbalanced panel data, and data from the CMBOR and ONS for the period 1997-2007, the following equations are estimated for companies involved in P-T-P buyouts, and a sample of PLCs operating in the UK manufacturing industry:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(YEAR_{it}) + (V_{it} - U_{it})$$ **(7)**

Where the subscripts i and t refer to the ith reporting unit and the tth observation respectively. *TURNOVER* represents the total value of output (in pounds) for companies operating in the UK manufacturing industry, *CAPITA* represents the total value (in

pounds) spent on employment costs. *LABOUR* represents the total amount (in pounds) spent on labour, and *MATERIALS* represent the total costs (in pounds) paid for intermediate goods. V_{it} and U_{it} are random variables whose distributional properties are defined in section (4.6) above.

To address research hypothesis at (1) above: Do companies involved in P-T-P ownership changes operate more efficiently than companies not involved in ownership changes, the following equation is estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(YEAR_{it}) + \beta_6(OWNERSHIP_{it}) + (V_{it} - U_{it}) \tag{8}$$

To address research question (1) above, do gains from P-T-P buyout ownership changes persist after the buyout, the following equation is estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(YEAR_{it}) + \beta_6(CHANGE_{it}) + (V_{it} - U_{it}) \tag{9}$$

In the time-variant model equations, U_{it} is a truncated-normal random variable multiplied by a specific function of time.

6.3.3   SFA Time-invariant Model Equations

The Battese and Coelli (1995) time-invariant SFA model provides maximum likelihood estimates for the parameters of the time-invariant decay model. In this model, the inefficiency effects are modelled as $u_{it} = u_i, u_i$ iid $N^+(\mu, \sigma_u^2), v_{it}$ iid $N(0, \sigma_v^2)$, and v_{it} and u_i are distributed independently of each other, and of the independent variable in the model. Using the above SFA time-invariant model, the following equations are estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it}) + (V_{it} - U_i)$$

$$\tag{10}$$

To check the robustness of the results from the time variant model (equation 3) above, the following equation is estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(OWNERSHIP_{it}) + (V_{it} - U_i) \tag{11}$$

To check the robustness of the results for the time variant model (equation 4) above, the following equation is estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(CHANGE_{it}) + (V_{it} - U_i) \tag{12}$$

In the time-invariant equations, U_i is assumed to have a truncated-normal distribution.

In addition to the above equations, several other equations are used to examine whether the geographical location of companies or plants owned by private equity firms, and the type of buyout, i.e., LBO or MBO have any impact on efficiency.

In order to investigate research question (2) does the location of a firm or plant affect firm efficiency, the following SFA and DEA time-variant equations are estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(LOCATION) + (V_{it} - U_{it}) \tag{13}$$

$$e_{i,t} = \alpha \sum_k \beta_k X_{k,i,t} + \sum_k \theta k LOCATION\ u,i \tag{14}$$

In order to investigate research question (3) above, does the type of P-T-P buyout affect firm efficiency, the following DEA time-variant equation is estimated:

$$ln(TURNOVER_{it}) = \beta_0 + \beta_1 \ln(CAPITAL_{it}) + \beta_2 \ln(LABOUR_{it}) + \beta_3 \ln(MATERIALS_{it})$$
$$+ \beta_5(BUYOUT) + (V_{it} - U_i). \tag{15}$$

$$e_{i,t} = \alpha \sum_k \beta_k X_{k,i,t} + \sum_k \theta k BUYOUT\ u,i \tag{16}$$

7.0   Results and Discussion

The results for the time invariant and time variant SFA models, and the DEA model respectively are presented and discussed below.

The results of the efficiency measurements for the SFA time-variant and time in-variant measurements are reported in table 15 and 16 respectively.

Table 15: SFA Time-variant Results

Table 15 presents the coefficient results for the production frontier from the Battesea and Coelli (1992) time-variant SFA model. The variables in the production frontier consist of **TURNOVER** as output variable which also controls for firm size and inputs variables of **MATERIALS, CAPITAL**, and **LABOUR**. In the Battese and Coelli (1992) parameterisation of time effects, the inefficiency term is modelled as a truncated-normal random variable multiplied by a specific function of time. The input variables are added to the mode individually to determine their increasing impact on the variable coefficients and the significance *of P value*. Model two shows the coefficient result for **MATERIALS**. Model three shows the coefficient result for **CAPITAL** stock, and model four, the coefficient result for **LABOUR** costs. Model (3) also shows the model with all the variables included. The directions of the signs for the coefficients in the production frontier are expected to be positive and statistically significant. The error term representing statistical noise is assumed to be normally distributed. The results are derived from 367 PLC reporting units and 103 private equity units that provide 3081 observations, 2377 PLC and 704 PE. The model is estimated using maximum likelihood. The inefficiency component is assumed to be independent and identically distributed non-negative truncations.

	Model 1		Model 2		Model 3	
lturnovr	*Coef.*	*P>z*	*Coef.*	*P>z*	*Coef.*	*P>z*
lmatpurch	.1998	**0.000**	.1905	0.000	.1031	0.000
lrcapstk95			.1895	**0.000**	.1132	0.000
ltotlabcost					.6185	**0.000**
ownership	.0846	0.557	.0451	0.729	-.0794	0.429
year					-	-
_cons	41.92	0.044	47.02	0.025	5.873	0.000

The coefficients for the variables in the production frontier, *MATERIALS, CAPITAL, and LABOUR* in model (3) of table 15 are positive and statistically significant at the five per cent level. The coefficient for *OWNERSHIP*[31] in model (3) table 15 is negative and statistically insignificant at the five per cent level and remains so when *MATERIALS* and *CAPITAL* are included. The addition of *LABOUR* in model (3) unexpectedly causes the direction of the coefficient for *OWNERSHIP* to change. The coefficient for *YEAR* in model (3) is dropped as the equation will not converge.

Table 16: Time-invariant Efficiency Results for SFA Model

Table 16 presents the coefficient results for the production frontier from the time-invariant SFA model. The variables in the production frontier consist of *TURNOVER* as output variable which also controls for firm size, and input variables of *MATERIALS, CAPITAL*, and *LABOUR*. In the time-invariant model, the inefficiency term is assumed to have a truncated-normal distribution. The error term representing statistical noise is assumed to be normally distributed. The input variables are added to the model individually to determine their increasing impact on the variable coefficients and the significance of P value. Model (4) shows the coefficient result for *MATERIALS*; model seven shows the coefficient result for *CAPITAL* stock; and model eight, the coefficient result for *LABOUR* costs. Model (6) also shows the time-invariant model with all the variables included. The direction of the signs for the coefficients is expected to be positive and significant. The results are derived from 367 PLC reporting units and 103 private equity units that provide 3081 observations, 2377 PLC and 704 PE. The model is estimated using maximum likelihood.

	Model 4		Model 5		Model 6	
lturnover	*Coef.*	*P>z*	*Coef.*	*P>z*	*Coef.*	*P>z*
lmatpurch	.1999	**0.000**	.1924	0.000	.1036	**0.000**
lrcapstk95			.1882	**0.000**	.1128	*0.000*
ltotlabcost					.6177	*0.000*
ownership	12.11	0.000	10.05	0.000	-.0780	0.437
_cons	4.573	0.577	3.247	0.694	6.041	0.000

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[31] This result is discussed later below.

The coefficients for the variables in the production frontier *MATERIALS, CAPITAL*, and *LABOUR* in model (6) table 16 above are positive and statistically significantly at the five per cent level. However, when *LABOUR* is included in model (6), the sign of the coefficient for *OWNERSHIP* unexpectedly changes direction to negative. The implication of this finding is discussed later below. The results for the production frontier findings in table 15 and 16 suggest that *LABOUR* has the largest influence on *TURNOVER*, given that almost 62 per cent of the cost of *TURNOVER* is attributed to *LABOUR*. The result for *LABOUR* is consistent with the correlation matrices in tables 12-15 above which show *LABOUR* better explain the contribution to *TURNOVER*.

The results for *MATERIALS, CAPITAL*, and *LABOUR* in model (3) and (6) of tables 15 and 16 suggest that companies owned by private equity and PLCs have access to similar resources and that there is little or no difference in the way the two ownership models convert inputs into outputs, or allocate resources. Since P-T-P buyouts are often of divisions or plants of PLCs (or whole companies nowadays), there is a natural expectation that after a buyout, these companies will continue to produce the same goods using the same type of resources inherited from the PLCs they purchase. The most likely areas where differences in technical efficiency would creep in between the buyout and PLC model are probably around material usage and employment. The results are consistent with the view that private equity and PLC executives have learned from each how to deploy corporate resources more efficiently by outsourcing production and labour (Jensen 1994, Harris et al. 2005, Work Foundation, 2007). This is supported by the finding for *LABOUR* which is positive and statistically significant in both the time-variant and time-invariant models. This reinforces the view that there is little difference in the way the two models deploy their resources. Moreover, most of the cost management literature and empirical studies of costs structures indicate that employment costs are the second biggest cost variable in manufacturing companies.

Whilst data limitation makes it impossible to provide conclusive reasons as to why the variables in the production frontier are positive and statistically significant, there are a number of possible explanations for this.

Rappaport (1990) alternative hypothesis suggests that managers of PLCs have learned from private equity executives how to better manage their companies through measures taken to reduce the labour intensity of production (Jensen 1994, Work Foundation, 2007,

Jensen, 1994, Harris et al. 2005). This appears to have been achieved through outsourcing. Olsen (2006) suggests that outsourcing improves productivity by increasing the efficiency with which inputs are used. However, outsourcing has received little attention in the literature. Outsourcing announcements indicate that most outsourcing contract companies transfer a significant number of their employees in affected areas to outsourcing suppliers, retaining only a small number of employees to manage liaison with the contractor (Juma's and Wood, 2000). This may have quietly come about because managers of PLCs have been pressured by control market activities into reforming without a visible control transaction (Jensen, 1994, www.iufdocuments.org).

Research from the CMBOR and the work foundation, (2007) show that new private equity owners cut jobs on average in the first year of the buyout. This is supported by anecdotal evidence. For instance, in 2004, private equity owners Permira and CVC Capital cut 3,400 AA jobs within weeks of buying the company for £1.75 billion. In 2003, Permira purchased Birds Eye and pledged to keep worker's employment terms for at least three years. Within six months managers laid-off 600 workers and closed the plant (www.business.guardian.co.uk). In 2010, a US private equity firm purchased Cadburys and gave undertakings that it would not close a plant employing over 400 employees. Within months it closed the plant transferring production to Poland to save costs. A report prepared for the 2008 WEF finds that private equity owned companies have slower job growth than comparable companies up to three years after the buyout, and are more likely to shut down existing companies.

The finding for labour is consistent with suggestions from UK and European trade unions which argue consistently that the substantial returns reported by private equity owned companies are achieved through major job reductions and changes in the terms and conditions of employee's employment contracts. This is supported by emerging anecdotal evidence which shows that both private equity and PLC owned companies are exploiting the decline in economic conditions to create labour savings by reducing employees' pay, choosing only to pay minimum wage, job and pay freezes, using unskilled East European imported labour, and creating zero hours contracts which places no obligation on employers to provide work. It provides for variable hours and pro rata holidays and sickness benefits (*www.netlawman.co.uk*), meaning workers are committed to a particular employer, but only get work when the employer requires them, and are paid only for the hours worked.

Many of the current employment measures adapted by companies in response to the economic challenges are controversial. In response to the controversy over private equity jobs, Damien Buffini, former managing partner of private equity firm Permier, stated in an interview "*people don't quite understand what we do and the benefits we bring to the economy. There is a positive story about productivity and job creation. Those messages have not gotten through.*" The finding is consistent with evidence given to the 2007 HCSC on private equity by the work foundation 2007 where it states: "In companies where significant job losses have occurred, it is unclear what would have happened to employment had there been no buyout." The HCSC concluded simply, "meaningful overall figures are elusive."

The coefficient result for **YEAR** in the SFA models (1 - 2) of table 15 is negative and statistically insignificant at the five per cent level. This implies that the value of outputs is estimated to have decreased in companies operating in the UK manufacturing industry over the ten year period of study. This would suggest that manufacturing companies are not taking full advantage of any increased technological progress in production. In model (3) of table 15, the equation will not converge when **YEAR** is included. This may imply that the model is time-invariant. Kumbhakar et al (2000) point out that although the practice of including time among the independent variables as a proxy for technical change is common in the estimation of production functions based on panel data, it is relatively uncommon in the estimation of production frontiers using panel data. One possible reason for this is that production frontier models based on panel data are making increasing use of time-varying technical efficiency specifications, and it may be difficult to disentangle the separate effects of technical change and technical efficiency when both effects are proxy by the passage of time.

YEAR in the DEA model (11) table 20 below is negative and statistically significant which contradicts the result for the SFA mode. This result implies that the value of outputs is estimated to have increased in PLCs operating in the UK manufacturing industry during the period of investigation. This result is consistent with Rappaport (1990) alternative hypothesis that executives of PLCs have learned lessons from the early waves of buyouts how to operate their companies like those owned by private equity firms.

In addition to the coefficients for the production frontiers above, table 17 and 18 below present overall inefficiency results for the time-invariant SFA, and Battese and Coelli (1992) SFA model.

Table 17: Overall FSA Time-invariant Technical Efficiency Result

Table 17 below presents overall efficiency parameters for the time-invariant SFA inefficiency model estimated in mode (4) of table (16) above. The focus in this table is on *GAMMA* which should be between 0 and 1. 0 means the company is inefficient, and 1 means it is fully efficient. *GAMMA* is the estimate of $\gamma = \sigma_u^2 / \sigma_S^2$ **sigma2** is the estimate of $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$. Because γ must be between 0 and 1, the optimisation is parameterised in terms of inverse logit of γ, and this estimate is reported as **ilgtgamma**. Because σ_S^2 must be positive, the optimisation is parameterised in terms of $\ln(\sigma_S^2)$, and this estimate is reported as **lnsigma2**. *mu* is the estimate of μ, the mean of the truncated-normal distribution. 470 reporting units (103 private equity and 367 PLC) and 3081 observations (704 private equity and 2377 PLC) are used in the estimation. In the time-invariant model, the efficiency error term is assumed to have a truncated-normal distribution.

Model 7 Time-invariant		
lturnovr	*Coef.*	*P>z*
Mu	*3.155*	*0.000*
sigma2	*1.078*	
Gamma	*.6872*	
sigma_u2	*.7415*	
sigma_v2	*.3366*	

Table 18: Overall SFA Time-variant Efficiency Result

Table 18 presents overall technical efficiency score for the time-variant SFA inefficiency model. This is the result from the estimation of the efficiency frontier in model (4) of table (11) above. The focus in this table is on **GAMMA** which should be between 0 and 1. 0 means the company is inefficient, and 1 means it is fully efficient. **GAMMA** is the estimate of $\gamma = \sigma_u^2 / \sigma_S^2$. **sigma2** is the estimate of $\sigma_S^2 = \sigma_v^2 + \sigma_u^2$. Because γ must be between 0 and 1, the optimisation is parameterised in terms of inverse logit of γ, and this estimate is reported as **ilgtgamm**a. Because σ_S^2 must be positive, the optimisation is parameterised in terms of $\ln(\sigma_S^2)$, and this estimate is reported as lnsigma2. *mu* is the estimate of μ. 470 reporting units (103 private equity and 367 PLC) and 3081 observations (2377 PLC and 704 private equity) are used in the estimation. In the time-variant model, the efficiency error term is assumed to be independent and identically distributed non-negative truncations. In this model, the non-negative firm effects U_{it} decreases, remain constant or increase as t increases, if $\eta > 0$, $\eta = 0$, or $\eta < 0$, respectively. The case in which η is positive is likely to be appropriate when firms tend to improve their level of technical efficiency over time (Battese and Coelli, 1992).

Model 8 Time-variant		
lturnover	*Coef.*	*P>z*
Mu	*2.780*	*0.000*
Eta	*.0131*	*0.001*
sigma2	*1.024*	*-*
gamma	*.6733*	*-*
sigma_u2	*.6893*	*-*
sigma_v2	*.3344*	*-*

The coefficient for **MU** in model (7) of table 17 is positive and statistically significant at the five per cent level.

The coefficient of **ETA** in model (8) of table 18 is positive and statistically insignificant ($\eta > 0$) at the five per cent level. **ETA** indicates that the degree of inefficiency in the UK manufacturing industry is decreasing over time, and that managers are learning lessons from their more efficient counterparts on how to operate their companies more efficiently.

GAMMA (the estimate of $\gamma = \sigma_v^2 / \sigma_s^2$) in model (7) and (8) of table 17 and 18 respectively is .6878 and .6733 respectively. This indicates that companies in the UK manufacturing industry still have some way to go before they can be considered to be operating at full efficiency (recall that **GAMMA** should be between 0-1).

SIGMA_u2 in all the models is positive. This is the variance of the inefficiency effects. When this value is close to zero, it would imply that there is not much evidence of inefficiency based on the model specification (because the part of the error associated to inefficiency does not have much variation).

SIGMA_v2 is the variance of the idiosyncratic error term. This is also positive, indicating there is not much evidence of statistical noise based on the above models.

Ownership Changes

Specific SFA and DEA tests are carried out to examine the hypothesis that ownership changes increase firm efficiency. The estimate of ownership change is undertaken using the buyout sample only. These results are reported in table 19 and 20 below.

Table 19: Time-variant and in-variant Result for Ownership Change

Table 19 presents the coefficient result for **OWNERSHIP** in the Battese and Coelli (1992) time-variant and a time-invariant SFA model. **OWNERSHIP** is a dummy variable, which represents ownership of a company, i.e., private equity or PLC, and last from the time of the P-T-P ownership change until the private equity firm sell or otherwise dispose of the company. The dummy variable for ownership takes the value 0 if PLC owned and 1 if private equity owned. The direction of the sign for **OWNERSHIP** is expected to be positive and statistically significant. Output variable is turnover, and inputs are **MATERIALS, CAPITAL**, and **LABOUR**. The sample consists of 3081 observations (704 private equity and 2377 PLCs) respectively for the period 1997-2007. The mode is estimated using maximum likelihood.

	Model 9 Time-variant		10 Model 10 Time-invariant	
Lturnovr	*Coef.*	*P>z*	*Coef.*	*P>z*
Change	-.0794	0.429	-.0780	0.437
_cons	5.873	0.000	6.040	0.000

Table 20: DEA Result for Ownership

Table 20 presents the coefficient result for **OWNERSHIP** in the DEA Tobit regression time-variant and a time-invariant model. **OWNERSHIP** is a dummy variable which, represents the ownership of the company, i.e., private equity or PLC, and last from the time of the P-T-P ownership change until the private equity firm sell or otherwise dispose of the company. The dummy variable for ownership takes the value 0 if PLC owned and 1 if private equity owned. The direction of the sign for **OWNERSHIP** is expected to be positive and statistically significant. Recall that for the DEA model a two-stage estimation procedure is used to calculate individual efficiency scores for each reporting unit. In the first stage, the three input variables, **MATERIALS, CAPITAL**, and **LABOUR** is used to estimate efficiency scores for each unit in the sample. In the second-stage, the DEA efficiency scores obtained from the first stage *(EFFICIENCY)* is used as the dependent variable and an ownership dummy variable is used as independent variable to estimate efficiency. The sample consists of 3071 observations for the period 1997-2007. 1 observation is left-censored, 2995 uncensored, and 75 right-censored.

	Model 11 Time-variant	
lefficiency	*Coef.*	*P>z*
Change	*-.1201*	*0.002*
_cons	*2.916*	*0.000*
sigma	*.9089*	*-*

For the DEA analysis, a two-stage DEA procedure is used to calculate individual efficiency scores for all observations appearing in the research dataset. Second, Tobit regression and the efficiency scores obtained from the first stage of the two-stage DEA procedure to estimate efficiency, using efficiency as the output variable, and ownership, change, and year respectively as input variables.

The coefficient for ownership **CHANGE** in the SFA and DEA models in tables 19 and 20 respectively is negative and statistically insignificant at the five per cent level. The results indicate that companies involved in P-T-P ownership changes do not operate more efficiently after buyouts than companies in the control sample. The hypothesis that P-T-P ownership changes lead to greater technical efficiency is therefore rejected at the five per cent level.

The results for ownership **CHANGE** are inconsistent with Jensen (1988) and Jovanvic and Rousseau's (2002, 2004) suggestion that ownership changes shift resources to more efficient uses and better managers. The results are different from Lichtenberg and Siegel (1987) who report that plants involved in ownership changes operate more efficiently after buyouts than a control sample, and Benfratello (2002) who report that acquired companies in the Italian pasta industry have above average improvement in efficiency after buyouts. The findings contradict Harris et al (2005) who find that plants involved in UK MBO are less productive than comparable plants before the transfer of ownership, and experience substantial increases in efficiency after the buyout.

The results for ownership **CHANGE** are consistent with Rappaport's (1990) alternative hypothesis which states that no efficiency gains are expected from companies involved in P-T-P ownership changes because managers of PLCs have learned from private equity firms, how to operate their companies more efficiently. The results are in line with McGuckin and Nguyen (1995) who find that ownership changes are associated with the transfer of plants with above average productivity, and Franks and Mayer (1996) who find no evidence of significant underperformance in UK companies prior to buyouts. Amess (2003) also reports that companies involved in UK MBOs have higher efficiency two years before the buyout, and Leslie and Oyer (2008) find no evidence that buyout ownership changes lead to companies owned by private equity outperforming PLCs in operational efficiency. These results are consistent with Roosenboom et al (2006) who report that private equity firms typically target fundamentally strong businesses.

Table 21 and 22 below also examines whether buyouts are long-lived as suggested by Jensen (1988).

Table 21: SFA Time-variant and Time-invariant Results for Ownership

Table 21 presents the coefficient results for **OWNERSHIP** for the Battese and Coelli (1992) time-variant and a time-invariant SFA model. **OWNERSHIP** represents the date that a company changes from being a PLC and becomes a private company. **OWNERSHIP** is expected to be positive and statistically significant. Only the buyout dataset consisting of 101 P-T-P buyout reporting units producing 693 observations are used in the estimation. The variables used are **TURNOVER** as output, **and MATERIALS, CAPITAL**, and **LABOUR** as input variables. Data is obtained from the CMBOR at the University of Nottingham and ONS. The models are estimated using maximum likelihood.

	Model 12 Time-variant		Model Time-invariant 13	
lturnovr	*Coef.*	*P>z*	*Coef.*	*P>z*
Ownership	*-.0441*	*0.401*	*-.0361*	*0.481*
_cons	*4.642*	*0.000*	*4.674*	*0.000*

Table 22: DEA Result for Ownership

Table 22 presents the coefficient result for **OWNERSHIP** in the DEA Tobit regression model. Change represents the date that a company changes from being a PLC and becomes a private company. The focus in this table is on the direction of the sign for **OWNERSHIP** which is expected to be positive. Only the buyout dataset is used in this estimation. Recall that for the DEA model a two-stage estimation procedure is used to calculate individual efficiency scores for each reporting unit. In the first stage, the three input variables, **MATERIALS, CAPITAL**, and **LABOUR** are used to estimate efficiency scores for each unit in the sample. In the second-stage, the DEA efficiency scores obtained from the first stage *(EFFICIENCY)* is used as the dependent variable and various dummy variables are used as independent variables to estimate efficiency. The focus in this table is on the direction of the sign for **OWNERSHIP** which is expected to be positive and statistically significant. Only the buyout dataset consisting of 101 P-T-P buyout reporting units producing 693 observations is used in the estimation. Data is obtained from the CMBOR at the University of Nottingham and ONS. 1 observation is left-censored, 676 uncensored, and 14 are right-censored.

	Model 14 Time-variant	
lefficiency	Coef.	P>z
Ownership	*-.1790*	*0.022*
_cons	*28.41*	*0.259*

The coefficient **for *OWNERSHIP*** in model (12) and (13) of table 21 and model (14) of table 22 are negative and statistically insignificant at the five per cent level. The results indicate that companies owned by private equity firms following a P-T-P buyout are not run more efficiently than companies owned by PLCs. This means buyouts are not long-lived as suggested by Jensen (1989) and Lichtenberg and Siegel (1990).

Interestingly, the DEA coefficient for *OWNERSHIP* in model (14) of table 22 is negative and statistically insignificant at the five per cent level. Recall that one of the main advantages of the DEA technique is its ability to uncover relationships that remains hidden when other techniques are used (Cook et al. 1991). The DEA result for ownership therefore suggests that for the sample used and period under investigation, companies owned and operated by PLCs are more efficient than companies owned and operated by private equity firms.

The result for *OWNERSHIP* is different from Lichtenberg and Siegel (1990) who report that TFP gains in US buyouts last up to three years after buyout, Benfratello (2002) that they continue up to six years after buyouts in Italy, and Pukthuanthong et al (2002) who report gains for up to five years for companies involved in reverse LBOs. Ames (2003) reports gains up to four years after buyouts in the UK manufacturing industry, and Bruto et al (2002) for several years after the buyout. The findings are inconsistent with the early buyout literature, which, report major inefficiencies in companies targeted by buyout firms.

The finding for ownership *CHANGE* and *OWNERSHIP* is consistent with Rappaports (1990) alternative buyout hypothesis, which states that no efficiency gains are expected from P-T-P buyouts as PLCs now operate like companies owned and operated by private equity firms, and are only capable of providing one-off gains. This means that once the target company has undergone various stages of private equity restructuring, such as reducing staffing numbers, disposing of assets, and leverage, it has nowhere else to turn. Opportunities to make similar future gains are diminished, and companies have to fall back on income generated purely from operational improvements. The results are in line with Drucker (1986) who argues that buyouts cannot be justified as leading to a more efficient allocation of resources, and recent empirical evidence from the BVCA[32] which

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[32] See appendix

shows that companies involved in buyouts underperform companies not involved in buyout.

One possible reason for the negative results for ownership *CHANGES* and *OWNERSHIP* could be that previous research on efficiency in buyouts measured the profitability of the buyout rather that technical efficiency, as argued above.

There are other possible, but more controversial explanations for the finding that P-T-P ownership changes and ownership do not affect company technical efficiency. If the sale of the PLC is based on the share price of the company, it is possible that only the company's share price was depressed, which does not necessarily impact the technical efficiency of target companies, plants or divisions. It could also be the result of managers of PLCs preparing their companies, plants or divisions for sale in anticipation of a buyout bid. However, this would be a risky strategy as it could increase the price they would have to pay to buy the company. This would suggest that some senior executives of target PLCs had valuable "insider" information, which they were prepared to sell to private equity firms in return for a seat on the board of the new company (Lowenstein, 1986, Fox and Marcus, 1992). If this is correct, it is in breach of their managerial fiduciary duty to their public shareholders, and could well be treated as insider trading, which is illegal under UK and US regulations.

An alternative (but hotly disputed by the UK private equity industry) explanation, is that private equity firms target and acquire PLCs purely to gain access to their assets, particularly property assets (Drucker, 1989, Fraser-Sampson, 2007). Many of the larger established PLCs have been around for many years. Over the life time of these companies, many of them have acquired assets in the form of factories, plant and machinery, HQ offices, other buildings, and subsidiaries, most of which, with the passage of time and increasing inflation, have become mortgage free and valuable. This is consistent with (Drucker, 1986) who argues that:

"Inflation distorts, it distorts values; it distorts relationships; it creates glaring discrepancies between economic assumptions and economic realities. The most typical distortion of inflation is between the value of assets and their earning power. In any inflation, the cost of capital goods tends to rise much faster than the price of the goods they produce; it thus becomes economical to buy already existing capital assets rather than to invest in new facilities and new machinery. So any company that is rich in fixed assets is worth more when dismembered, that is when its capital assets are being sold as

pieces of real estate, as factories, as machinery and equipment than it is worth on a realistic pricing/earnings ratio based on the value of its output. This is one of the distortions that private equity firms exploit. The stock market values companies on the basis of their earnings. It values them in other words, as going concerns. It does not value them on their liquidation value."

Jensen (1984) argues that a good way for a company to become a takeover target is to make a series of acquisitions that reduces value but allows the value to be recovered through divesture. A bidder that realises that it can make money by selling off the pieces at a profit will likely seize the opportunity. Drucker (1986) therefore predicted that a "company heavy with fixed assets will become a "most inviting target."

The GMB and IUF argue that when a private equity firm takes control of PLCs, the new management's focus is not on improving actual business operations, i.e., output of goods or provision of services, or increasing operating margins, instead it is on extracting maximum cash out of the business in the quickest time, through the sale of assets, including land, and buildings which are used to raise additional loans regardless of the long-term impact on output, productivity and profitability. However, Wol Kolade (2007), chairman of the BVCA in 2007 argues that:

"This is an illogical accusation to throw at an industry that survives by making businesses more successful, by growing them and adding value. You can't create value in a business by stripping it of what makes it profitable, any more than you can attempt to sell a car on at a profit after you have removed its wheels. The whole idea of asset stripping, firing half the workforce and releasing a company as a wreck is completely nonsense. If we did that we would be out of business."

The majority of the theoretical, empirical, and anecdotal evidence reviewed above, strongly supports Drucker's and the trade union's arguments. The evidence shows that in most buyouts, property assets are indeed separated from the operating business and re-mortgaged to release cash to finance the buyout (IUF, 2007; Tipping and Bullard, 2007; Fraser-Sampson, 2007, MacFadyen, 2007). This is common in the case of hotel and restaurant chains, as well as retail businesses such as supermarkets and department stores[33] (IUF, 2007). For instance private equity firm KKR employed this tactic in the

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[33] The retail chain Debenhams is the classic case of private equity buying and re-mortgaging a business to release cash (www.telegraph.co.uk 21.1.2007).

£11 billion P-T-P buyout of the UK pharmaceutical chain Alliance Boots in 2007, where after the buyout, the new owners quietly sold off many of the company's subsidiaries. It did however also buy new companies. The last attempted buyout of a major UK PLC in a sale and leaseback deal is the failed £10 billion pound bid for John Sainsburys the supermarket chain in 2007. At the time, Sainsburys had a property portfolio of 750 supermarkets, £1.6 billion pounds of debt and a capital value of £10 billion pounds. An executive of private equity group Techenguize investment stated "this is a real estate business with a retail business on the side" (www.business.scotsman.com).

Note in models (3) and (6) of table 15 and 16 respectively that the coefficient for **OWNERSHIP** changes to negative and statistically insignificant only when **LABOUR** is included in the model. This suggests that **LABOUR** is the most influential factor on **TURNOVER**, given that over 61 per cent of the cost of **TURNOVER** is attributed to this variable.

A test was carried out on the variables in the production function to see whether there is any change in the direction of the sign of the variable for **OWNERSHIP** at three years (not reported). However, the equation would only converge on the dependent variable and two of the independent variables. Nevertheless, there was no change in the direction or significance of the sign for ownership **CHANGE** or **OWNERSHIP**.

Table 23: Buyout Type SFA Time-variant and Time-invariant Model

Table 23 presents the coefficient result for **BUYOUT** type for the time-variant Battese and Coelli (1992) and a time-invariant SFA model. **BUYOUT** represents the type of P-T-P buyout the company engages in i.e., LBO or MBO. Only the buyout dataset consisting of **TURNOVER** as output variable*, and* **MATERIALS, CAPITAL, LABOUR** as input variables and 105 P-T-P buyout reporting units producing 710 observations are used in the estimation. The models are estimated using maximum likelihood. Data on the type of buyout is obtained from the CMBOR at the University of Nottingham.

	Model 15 Time-variant		Model 16 Time-invariant	
Lturnovr	*Coef.*	*P>z*	*Coef.*	*P>z*
Buyout	*.3453*	*0.047*	*.3389*	*0.051*
_cons	*4.580*	*0.000*	*4.605*	*0.000*

Table 24: Buyout DEA Result

Table 24 presents the coefficient result for **BUYOUT** type in a time-variant and time-invariant two-stage DEA Tobit regression model. For the DEA model, a two-stage process was used. In the first stage, the three input variables, **MATERIALS**, **CAPITAL**, and **LABOUR** are used to estimate efficiency scores for each unit in the sample. In the second-stage, the DEA efficiency scores obtained from the first stage is used as the dependent variable and a dummy variable representing buyout type as independent variable is used to estimate efficiency. Only the buyout dataset consisting of 105 reporting units producing 708 observations is used in the estimation. 1 observation is left-censored, 692 are uncensored, and 15 are right-censored.

	Model 17 Time-variant	
lefficiency	Coef.	P>z
buyout	-.0836	0.276
_cons	2.224	0.000

The coefficient for **BUYOUT** in models (15) and (16) of table 23, and model (17) of table 24 is negative and statistically insignificant. This is consistent with the limited literature, which shows that private equity firms currently use the term LBO, and MBO interchangeably when describing a deal. The deals that private equity firms undertook used to be known as leverage buyouts until a rash of bankruptcies in the US turned the tide of opinion against these companies, when they dropped the 'leverage' from their title (the work foundation, 2007). This is consistent with figure (2) above, which shows an increase in the number of MBOs over LBOs during the period 1997-2007.

Table 25: SFA Time-variant and Time-invariant Model for Location

Table 25 presents the coefficient result for ***NORTH/SOUTH*** in the Battese and Coelli (1992) time-variant and a time-invariant SFA model respectively. ***NORTH/SOUTH*** is a dummy variable representing the geological locations in the UK where companies in the sample operate from. The UK ONS divide the UK into nine government regions. These are South East, London, South West, West Midlands, East Midlands, Yorkshire and Humberside, North West, and North East. To arrive at the ***NORTH/SOUTH*** dummy variable, London and the south east is combined to make a dummy variable for South, and the rest of the UK is combined to make a dummy variable for North. The research dataset consisting of ***TURNOVER*** as output variable*, and **MATERIALS, CAPITAL, LABOUR** as input variables, 470 reporting units (103 private equity and 367 PLCs), 704 private equity, and 2377 PLC observations are used in the estimation. The models are estimated using maximum likelihood. Data is obtained from the CMBOR at the University of Nottingham, and the ONS.

	Model 18 Time-variant		Model 19 Time-invariant	
lturnover	Coef.	P>z	Coef.	P>z
north/south	-.0348	0.627	-.0334	0.640
_cons	5.874	0.000	6.037	0.000

Table 26: DEA Result for Location

Table 26 presents the coefficient result for *NORTH/SOUTH* in Tobit DEA regression model. *NORTH/SOUTH* is a dummy variable representing the geological locations in the UK where companies in the sample operate from. The UK ONS divide the UK into nine government regions. These are South East, London, South West, West Midlands, East Midlands, Yorkshire and Humberside, North West, and North East. To arrive at the *NORTH/SOUTH* dummy variable, London and the south east is combined to make a dummy variable for South, and the rest of the UK is combined to make a dummy variable for North. The research dataset comprising of *TURNOVER* as output variable, and *MATERIALS, CAPITAL, LABOUR* as input variables, 469 reporting units (103 private equity and 367 PLCs), 702 private equity, and 2369 PLC (3071) observations are used in the estimation. Data is obtained from the CMBOR at the University of Nottingham, and the ONS. North/South is a dummy variable representing the geological locations in the UK where companies in the sample operate from. The UK ONS divide the UK into nine government regions. These are South East, London, South West, West Midlands, East Midlands, Yorkshire and Humberside, North West, and North East. To arrive at the *NORTH/SOUTH* dummy variable, London and the south east is combined to make a dummy variable for South, and the rest of the UK is combined to make a dummy variable for North. I observation is left-censored, 2995 are uncensored, and 75 are right-censored.

	Model 20 Time-variant	
lefficiency	Coef.	P>z
north/south	.0538	0.124
_cons	2.385	0.000

The sign of the coefficient for *NORTH/SOUTH* in model (18) (19) of table 25 and model (20) of table 26 is negative and statistically insignificant at the five per cent level of significance. The findings for both the SFA and DEA models are different from those of Benfratello (2002) for the Italian pasta industry. The findings show that there are no differences in efficiency across UK regions when location is divided by north and south. This suggests that companies in the UK manufacturing industry are not selecting regions of operation for technical efficiency reasons.

CHAPTER: EIGHT

CONCLUSION, POLICY IMPLICATIONS, FUTURE RESEARCH, DATA LIMITATIONS

8.0   Conclusion

This study uses a buyout dataset consisting of a sample of PLCs involved in P-T-P buyouts from the CMBOR, and for the first time, two different frontier techniques DEA and SFA respectively to examine the hypothesis that companies involved in P-T-P buyouts operate more efficiently after a buyout than companies owned by PLCs during the period 1997-2007. DEA and SFA allows researchers to examine the technical efficiency of companies rather than their profitability, or movement in their share price as in previous studies. The techniques also allow technical efficiency to be measured at the plant or reporting unit, rather than firm level.

Taking into account the results obtained from the use of the variables and techniques described above, I am confident that companies involved in P-T-P buyouts create no greater technical efficiency gains after a buyout than if a company had remained in public ownership. In addition, neither the type of buyout, nor its location has an impact on the technical efficiency of a company. The biggest contributor to firm technical efficiency comes from reductions in employment costs probably brought about by changes in the terms and conditions of employees' contracts of employment and working hours.

Finally, in view of the suggestion in the literature that the differentiation between private equity and PLCs has waned (Ghai et al. 2014), PLCs may wish to further analyse private equity's past performance and its fundamental underpinnings, particularly, the skills, brand, focus and other capabilities the industry brought to its deals (Ghai et al. 2014), and determine, whether as an industry, or singularly, it can, or wishes to replicate these to build better value for its own stakeholders. If PLCs are unable to, or choose not to follow private equity's lead further, an understanding of how successful private equity firms built their track records and how they will maintain them, will help to inform PLC

executives about the future prospects of any private equity firm in which they choose to invest.

8.1   Data Limitations

Issues surrounding data have been the main limitation in this study. Accurate buyout data at the plant level for companies owned by private equity buyout firms has been almost impossible to obtain. Several approaches were made to the BVCA to ask if it, or any of its members would be prepared to make data available for this study, but all requests were ignored in general. One private equity firm, General Atlantic agreed to be interviewed for this study, and granted an interview, but could not provide any data as this was under the control of the management of individual portfolio companies. This situation should have been partly resolved with the 2007 Walker guidelines, which require private equity firms to publish annual returns similar to those required by PLCs. However, only partial data for 56 private equity owned companies was released in the 2012 disclosures, which would not permit the estimation of technical efficiency in any case. Later data released became available too late to be used in this study. As of 2013, only 79 of the (BVCA) estimated 3800 companies backed by private equity firms were required to provide returns. Having more buyout data would have been helpful in providing more accurate estimates of efficiency, and it would have also allowed a greater range of SFA tests to be undertaken. Subsequently, the buyout dataset for this study is unfortunately smaller than hoped for. Having longer panels for the buyout dataset would have helped to produce a much more robust study which would have provided greater insights into private equity buyout activities.

It was also planned only to include companies owned by private equity firms with three or more years of data in this study. This had to be changed to companies with two or more years of data to ensure there were sufficient companies in the sample to allow for the necessary degrees of freedom.

There are only two places for obtaining data on UK buyouts; the CMBOR and ONS. The CMBOR is funded by private equity, and report it does not collect plant level data, and is selective in the variables it releases. In order for the researcher to access ONS data, they have to become accredited researchers. Researcher wishing to use ONS micro data for

research must become accredited researchers with the ONS. The micro data is stored in the ONS ARD. Data in the ARD are collected under the Statistics of Trade Act 1947. This Act makes it compulsory for firms to complete ONS business surveys but stipulates that all data collected is confidential. The legislation only allows civil servants to have access to these survey returns. However, the ONS has developed a system whereby external researchers are able to access the data in compliance with the Statistics of Trade Act.

Access is now available to researchers via the VML onsite at ONS premises in London, Newport, Titchfield and Southport, under secondment. Researchers are seconded to work for ONS and hence are allowed to access the data as civil servants. As such, they are bound by the ONS Codes of Practice and the Official Secrets Act. The secondment agreement is supplemented by an agreement with the researcher's institution. The VML is ONS's technical solution to accessing the ARD and other business micro data. Data is placed on a secure shared area on a server located in London. Approved users can then log onto the server and access the data from the listed ONS sites. Users have read only access to data files and a work area where they can produce results. It is, however, not possible for researchers to electronically remove information from the VML. Only BDL staff members have external access to the laboratory and are hence able to monitor what goes in and out of the system. Staff members conduct strict disclosure control on all outputs before releasing them to researchers to ensure that no information supplied on an ONS survey return enters the public domain. All users of the ARD undergo a training programme to ensure they are aware of the legal background and practicalities surrounding statistical disclosure control. Any results that are then produced, which researchers wish to transfer out of the laboratory, will undergo intermediate clearance that allows sharing with other researchers named on their contract. A final clearance of output is required before results are published or used for wider dissemination.

8.1.1   Problems with the ARD

The ONS report a number of known problems with the ARD. These falls into two categories: maintaining and using the dataset. The former included:

- The need to recreate the whole dataset every time new data are added;
- Inconsistencies in the linking of pre-1994 firms;
- The need to maintain a separate file of 'standard variables';
- Limiting the panel element by only having SIC80–SIC92 lookup tables;
- Integrating enterprise group reference changes.

8.1.2   Difficulties using the ARD dataset included

- Having three different question sets;
- Finding variables referenced differently depending upon the sector.

A large number of these problems arise because ONS, like other national statistical institutes, collects business data for the production of aggregate statistics. Systems designed for the efficient collection of macro data do not necessarily lead to good micro data. Most of the problems above have been solved with a recent new version of the ARD called ARD2.

8.1.3   Sources of ARD Data

The ARD was formed from a number of ONS business surveys. From 1997 it has been taken solely from the ABI but previously was taken from other surveys such as ACOP. Data from these surveys are linked across time to form a longitudinal database for research. The surveys involved a census of large businesses and a sample of smaller ones, although the specific sampling frame has varied over time. Prior to 1994 the surveys only contained information for production industries. Construction industry data is available from 1994 and then data for six further sectors are available from 1997, meaning that this and subsequent years have businesses from most two-digit SIC categories. Some service sector data are also now available from 1994 to 1996, but these pose additional problems.

In general there are three levels of business unit at which data is collected. This is in line with the European System of Accounts (ESA). Martin and Barnes (2002) detailed these levels from 1994 onwards:

- Enterprise group – the group of all legal units under common control;
- Enterprise – the smallest group of legal units within an enterprise group with a relative degree of autonomy;
- Local unit – the individual site or workplace (factory, shop etc.) at which activity takes place.

In addition to these legal definitions, the IDBR uses an additional statistical unit called the 'reporting unit'. This is the collection of local units used to provide returns and may be specific to the survey being carried out (for example, R&D units can be classified differently for the R&D survey). For most survey respondents, the reporting unit and the enterprise are the same unit and are used for all surveys. This makes linking data from different surveys straightforward.

Initially, the ONS software was unable to analyse DEA and SFA. It took considerable time and effort on the part of the author to negotiate with the ONS for it to purchase and install the up-dated software to enable the analysis of SFA and DEA. However, there is still an outstanding issue with software for doing DEA analysis, as the ONS DEA software is only able to handle small datasets. The data files at the ONS are very large and very complex to use. Unfortunately, the ONS offers the external researcher very little support in getting to grips with using its datasets. It is the researcher's own responsibility to learn how to navigate the various ONS datasets. Fortunately, the ONS and its partners are very open to suggestions from researchers on how it can improve its research facilities, and it is hoped this issue will be addressed in this spirit in due course. Some assistance can be obtained with patient request and negotiations with the ONS staff who generally proved very helpful. There are also difficulties using the ONS capital stock dataset. As a result of the technical difficulties calculating the flow variable, the better measure of capital used in production, the ONS has suspended work developing this dataset. Therefore, observations with negative capital stock values had to be dropped in this study, which was unfortunate as it further reduced the research dataset.

Basing this study only on P-T-P buyouts has meant that a lot of buyouts are lost because they do not fall under the P-T-P category. This has made it difficult to construct as large

a buyout panel as I would have liked. The issues with having a small buyout dataset have made it difficult to carry out a variety of detailed analysis. In order for xtfrontier to carry out estimations with any degree of accuracy, the research sample must be of a sufficiently large size. This could have been overcome by basing the study on plant level data; however, the volume of plants that would have required analysis was too great for a single researcher to undertake in the time allowed. Also, it was difficult to identify when each plant exited a buyout.

It was also intended that the SFA analysis would have been undertaken using Battese and Coelli (1992) time-variant model and Battese and Coelli (1995) frontier model. However, due to unknown difficulties with the datasets, it was not possible to use the Battesea and Coelli (1995) frontier model because the data would not converge when the analysis is ran. Therefore, the lesser time-invariant model is used as the second SFA model. It is recognised and acknowledged that more recent studies now use more up to-date DEA Jack knife techniques to analyse efficiency. However, for a new researcher, these techniques are too advanced at this stage. Not only this but the ONS does not have the software to run such analyses. Therefore, they have not been employed in this study.

8.2   Focus on UK Manufacturing

The business data collected by the ONS is grouped into seven industry sectors: catering, motor trades, production, property, retail, services trades, and wholesale. The UK manufacturing industry accounts for an increasingly small part (11%) of the overall UK economy (guardian.co.uk). The sample is obtained from one industry in order to limit the problem of heterogeneity, to reduce any problems of differing cyclical trends across different industries, and because of the assumption of a common technology as represented in the production function approach (Amess, 2002). Moreover, because the size of most of the other industries that the ONS collects data on is very small, it is usual to restrict analysis on UK buyouts to the manufacturing industry because this is the largest industry, and it is easier to measure.

Restricting the study to the manufacturing industry means the size of the buyout dataset will be small. It also means the research findings cannot be generalised to the overall effect of buyouts on UK efficiency.

8.3 Policy Implications

- As companies involved in P-T-P buyouts operate no more efficiently after a buyout than PLCs, then this raises serious questions over the vast sums paid to managers involved in this type of ownership changes on the basis that this will motivate them to use their superior management skills to manage their companies efficiently. Policy makers may therefore wish to carry out closer assessments of the type and size of PLS being targeted in P-T-P buyout deals and taken private, and whether it is now time for legislative intervention in this type of transaction, and how managers and executives in these are remunerated. Bonus payments should be linked to a company's actual technical efficiency improvements, as opposed to the profitability of the target company or the value of its share price.

- When faced with a proposal to take a PLC private for efficiency reasons, PLC target firm shareholders should be empowered to consider the technical efficiency of the company, and the company targeting the PLCshould be required to state in advance, how it proposes to increase the targeted PLC's technical efficiency after a buyout.

- Effective corporate governance structures should be put in place to guard against corporate managers abusing their positions as executives on PLC boards to target and sell PLCs to private equity. Members of PLC boards should not be permitted to take a position on the board of any PLC that the executive served on prior to the buyout for five years after the buyout.

- Shareholders of PLCs, particularly trustees of pension funds, should be better empowered to protect their members' interest in companies when faced with a buyout proposal. Pension funds, as trustees, should be required to obtain majority consent from their members before agreeing to buyouts of whole PLCs.

- Legislation should be enacted to require private equity firms to publish annual data on the activities of their portfolio companies, irrespective of firm size, value of investment, or speed of exit, in a similar way that PLCs are required to do quarterly. One of the key areas of disclosure in private equity owned companies should relate to

employee numbers and whether full or part time. Disclosure should also be required on whether companies are engaging in the use of zero hours contracts, and if so, to what extent.

- Policy makers should reconsider the arm's length approach to corporate outsourcing, and its long-term impact on employees and the UK economy, and whether this requires legislative intervention.

- A debate on the purpose of large PLCs, their role in society is warranted, and whether they should continue to be subject to free market principles as at present.

8.4   Future Research

- The finding from this study suggests that employment is the biggest contributor to firm efficiency in buyouts. This study was unable to empirically test the impact of P-T-P buyouts on employees directly. Current studies are inconclusive, and are from the employer's perspective. It would be interesting to hear from the employees' perspective. This presents an opportunity for a future study to examine the impact of P-T-P buyouts on employees. This has previously been difficult to achieve because of P-T-P buyout data limitations. However, such studies can be better undertaken as it is now possible for researchers to link several ONS employment surveys to enable such questions to be addressed. These are important questions, as there is great concern about the impact of buyouts on the UK economy, and little is known about it.

- Future research should look into the level of P-T-P buyouts that end in administration after a buyout. Evidence from accounts lodged at Companies House suggests that a greater number of P-T-P buyouts than are examined by this study end in liquidation.

- It would be of interest to know to what extent private equity firms engage in sale and leaseback after P-T-P buyouts.

- It would also be interesting to know to what extent private equity is outsourcing labour and materials.

BIBLIOGRAPHY

Accountancy Ireland (2007). 40% of Global Companies planning to Relocate Shared Services Centre, Institute of Chartered Accountants, Ireland 39 (1) : 93

Accounting Today (2006), Outsourcing: Threat or Opportunity?, Source Media USA

Acharya, V. V. Johnson, T. C (2010). More Insiders, More Insider Trading: Evidence From Private-Equity Buyouts. *Journal of Financial Economics*, *98* (3): 500-523.

Acharya, Viral, Kehoe, Conor (2008). Corporate Governance and Value Creation: Evidence from Private Equity, (13): 439-460.

Afriat, S. N. (1972). Efficiency Estimation of pPoduction Function. *International Economic Review*, *13*(3): 568-98.

Agrawal, A. Jaffe, J. F (2003). Do Takeover Targets Underperform? Evidence from Operating and Stock Returns. *Journal of Financial and Quantitative Analysis*. 38 (4) :721-748.

Aigner, D. J. Chu, S. F (1968). On Estimating the Industry Production Function. *The American Economic Review:* 826-839.

Aigner, D.J, Lovell, A.K, Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics 6 (1)*: 21-37.

Alperovych, Y. Amess, K. Wright, M (2013). Private Equity Firm Experience and Buyout Vendor Source: What is their Impact of Efficiency? *Europena Journal of Operational Research, 228:* 601-611.

Al-Sharkas, A. A., Hassan, M. K., & Lawrence, S. (2008). The Impact of Mergers and Acquisitions on the Efficiency of the US Banking Industry: Further Evidence. *Journal of Business Finance & Accounting, 35 (1-2):* 50-70.

Ambrose, B. W, Winters, D. B (1992). Does an Industry Effect Exist for Leveraged Buyouts? Journal of Financial Management Association. 21: 89-101.

Amershi, A. H. Sunder, S (1987). Failure of Stock Prices to Discipline Managers in a Rational Expectations Economy. *Journal of Accounting Research*, 177-195.

Amess, K (2002). Management Buyouts and Firm-Level Productivity: Evidence from a Panel of UK Manufacturing Firms. *Scottish Journal of Political Economy* 49 (3): 304-317.

Amess, K, (2003). The Effect of Management Buyouts on Firm-Level Technical Inefficiency: Evidence from a Panel of UK Machinery and Equipment Manufacturers. *Journal of Industrial Economics,* 51 (1) :35-44.

Amess, K, Wright, M (2007). The Wage and Employment Effects of Leverage Buyouts in the UK. *International Journal of the Economics of Business* 14 (2):179-195.

Andrade, G. Kaplan, S. N (1998). How Costly is Financial (not economic) Distress? Evidence from Highly Leveraged Transactions that became Distressed. *The Journal of Finance*, *53* (5): 1443-1493.

Anderson, R. I, Springer, M. T, (2003). REIT Selection and Portfolio Construction: using Operating Efficiency as an Indicator of Performance, *Journal of Real Estate Portfolio Management* 9:17-28.

Anderson, R. I, Springer, T.M, Fok, R, Webb, J.R (2002). Technical Efficiencies and Economies of Scale: A Non-parametric Analysis of REIT Operating Efficiency. *European Journal of Operational Research* 139:598-612

Apax Partners (2006). Unlocking Global Value. Future Trends in Private Equity Investment Worldwide.

Arnold, G (2005). Corporate Financial Management, 3rd edition, *FT Prentice Hall, Harlow, Essex UK*.

Arrow, K.J. Chenery, M. B.S, Solo, R.M (1961). Capital-Labour Substitution and Economic Efficiency. *Review of economics and Statistics* 63: 225-250.

Atril, P (2006). Financial Management for Decision Makers, 4th edition, *FT Prentice Hall, Harlow, Essex, UK*.

Axelson, U, Stromberg, P, Weisbeck, M.S (2007). Why are Buyouts Levered?: The financial Structure of Private equity Funds. *National Bureau of Economic Research, Cambridge, MA*

Bailey, M.N, Campbell, D. Hulten, C (1992). The Distribution of Productivity in Manufacturing Plants. *Brooking Papers: Micro-economics, Washington DC*.

Balcombe, K. Fraser, I. Kim, J. H (2006). Estimating Technical Efficiency of Australian Dairy Farms Unsing Alterntaive Frontier Methodologis. *Applied Economics, 38 (19):* 2221-2236.

Banker, R. D, Charnes, A, Cooper, W.W (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Development Analysis. Management Science, 30: 1078-1092.

Banker, R. D. Datar, S. M. Rajan, M. V (1987). Measurement of Productivity Improvements: An Empirical Analysis. *Journal of Accounting, Auditing & Finance, 2 (4):* 319-347.

Bargeron, L. L. Schlingemann, F. P. Stulz, R. M. Zutter, C. J (2009). Do Target CEOs Sell Out their Shareholders to Keep their Job in a Merger? (No. w14724). National Bureau of Economic Research.

Bartov, E (1993). The Timing of Asset Sales and Earnings Manipulation. *Accounting Review, 840-855*.

Battese, G. E. Coelli, T. J (1992). Frontier Production Functions, Technical Efficiency and Panel Data: With Application to Paddy Farmers in India: *Journa lof Productivity Analysis, 3 (1-2): 149-165.*

Battese, G. E, Coelli, T. J (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics 20 (2): 325-332.*

Battese, G.E, Corra, G.S (1977). Estimation of Production Frontier Model with Application to the Pastoral Zone off Eastern Australia. *Australian Journal of Agricultural Economics* 21 (3): 169-179.

Bebchuk, L, Fried, J, M (2003). Executive Compensation as an Agency Problem, *National Bureau of Economic Research, working paper. 9813, July 2003Massachusetts, USA*

Benfratello, L (2002). Beyond Profitability: Effects of Acquisitions on Technical Efficiency in the Italian Pastry Industry. *Managerial and Decision Economics* 23: 399 - 415

Bergstrom, C, Grubb, M, Jonsson, S (2007). The operating Impact of buyouts in Sweden: A Study of Value Creation, *The Journal of Private Equity, 11 (1):* 22.39.

Berndt, E.R. Christensen, L (1973). The Translog Function and the Substitution of Equipment, Structures and Labour in US Manufacturing 1929-1968. *Journal of Econometrics 1 (1):* 81-113.

Blair, M, M (1990). A surprising Culprit Behind the Rush to Leverage. *Brookings Review. 8 :16.*

Booth, L (1998). What Drives Shareholder Value? *Rothman School of Management, University of Toronto, Canada Presented at the Federated Press 1998.*

Boucly, Q, Sraer, D, Thesmar, D (2011). Growth LBOs. *Journal of Financial Economics. 102 (2) :* 432-453.

Bowman, C, Ambronsini, V (2000). Value Creation Verses Value Caputure: Towards a Coherent Definition of Value in Strategy, *British Journal of Management, 11* (1): 1-15.

Bowman, L (2008). Blight of the Living Dead (Cover Story). *Euro money 39:* 62-67.

Boyd, G. A (2008). Estimating Plant Level Energy Efficiency with a Stochastic Frontier. *The Energy Journal*, 23-43.

Braun, M. R. Sharma, A (2007). Divisional Reverse Leveraged Buyout: Finishing School or Financial Arbitrage? *The Journal of Private Equity*, *11* (1): 7-21.

British Venture Capital Association (2008). BVCA Annual Report on the Performance of Portfolio Companies.

British Venture Capital Association (2013). The Growth Initiative. CEO Insights. British Private Equity and Venture Capital Association. February 2013.

British Venture Capital Association (BVCA a). A Guide to Private Equity.

British Venture Capital Association (BVCA b) (2008). Annual Report on the Performance of Portfolio Companies, 2008

British Venture Capital Association (BVCA) (2008 c), The Impact of Private Equity as a UK financial Service

British Venture Capital Association (BVCA) (2008 d). The Economic Impact of Private Equity in the UK.

Bruner, R. F. Paine, L. S (1988). Management Buyouts and Managerial Ethics. *California Management Review*, *30* (2).

Bruner, R. F (2002). Does M&A Pay? A Survey of Evidence for the Decision-Maker. *Journal of Applied Finance, 12 (1)* 48-68.

Bryman A, Bell, E (2007). Business Research Methods. *Oxford University Press, England*.

Business Credit (2009). The Human Element in Making Outsourcing Successful and Addressing Participant Barriers. *Business Credit, 111 (4) 62*.

Business Ethics (2002), Principles of Stakeholder Management. 12 (2) :257-264.

Campbell, A (2008). The Economic Impact of Private Equity. *360, the Ashridge Journal*, 17-21.

Campa, J, M, Hernando, I (2004). Shareholder Value Creation in European M&As. *European Financial management 10* :47-81.

Cao, J. Lerner, J (2006). The performance of Reverse Leverage Buyouts. *National Bureau of Economic Research, Working Paper 12626, Massachusetts USA*.

Carow, K. A. Roden, D. M (1997). Determinants of the stock price reaction to leveraged buyouts. *Journal of Economics and Finance*, *21* (3): 49-59.

Chaaban, J. Réquillart, V. Trévisiol, A (2005). The Role of Technical Efficiency in Takeovers: Evidence from the French Cheese Industry, 1985–2000. *Agribusiness, 21 (4:, 545-564*.

Charnes, A, Cooper, W.W, Rhodes, E (1978). Measuring the Efficiency of Decision Making Units. *European Journal of Opertional Research*: 429-444.

Charnes, A., Clark, C.T., Cooper, W.W., Golany, B (1985). A Developmental Study of Datat Envelopment Analysis in Measuring the Efficiency of Maintenance Units in the US Air Froce. *Annuals of Operations Research 2*: 95-112.

Chaudhuri, S (1994). Public enterprises and private purposes. *Economic and Political Weekly*: 1338-1347.

Cheng, Q. Warfield, T. D (2005). Equity Incentives and Earnings Management. *The Accounting Review, 80(2):* 441-476.

Chou, D, Gombola, M, Liu, F (2006). Earnings Management and Stock Perrormance of Leverage Buyouts. *Journal of Financial and Quantitative Analysis 41 (2) :*407-438.

Clark, R A, Sunley, E, M (1989). Corporate Debt: What Are The Issues and What Are the Choices? *National Tax Journal. 42:* 273-282.

Cobb, C. Douglas, P, H (1928). A Theory of Production. American Economic. *Review Supplement 18*: 139-165.

Coelli, T, J (1996). A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program. *Centre for Efficiency and Productivity Analysis Working Paper No. 8/96. University of New England, Australia.*

Coelli, T, J (1996). A Guide to FRONTIER Version 4.1. A Computer Program for Stochastic Production and Cost Function Estimation, *Centre for Efficiency and Productivity Analysis Working Papers No.7/96. University of New England, Australia.*

Coelli, T, J. Rao, R. O'Donnel, C. Battese, G (2005). An Introduction to Efficiency and Productivity Analysis, 2nd Ed. *Springer Science and Business Media. New York USA.*

Conyon, Martin, J. Gregg, P (1994). Pay at the Top: a study of the Sensitivity of Top Director Remuneration to company Specific Shocks. *National Institute Economic Review 1*: 83-92.

Cooper, W. W. Seiford, L. M. Zhu, J (2011). Data Envelopment Analysis: History, Models, and Interpretations. *In Handbook on Data Envelopment Analysis: 1-39.* Springer US.

Cornelli, F. Karakas, O (2008). Private Equity and Corporate Governance: do LBOs have more Effective Boards. *The Global Impact of Private Equity Report*, 65-84.

Cornwell, C. Schmidt, P, Sickles, R.C (1990). Production Frontiers with Cross-sectional and Time-Series Variations in Efficiency Levels. *Journal of Econometrics 46. (1-2):*185-200.

Cotter, J, F. Peck, S, W (2001). The Structure of Debt and Active Equity Investors: The Case of the Buyout Specialist. *Journal of Financial Economics 59 (1)*: 101-147.

Cowie, J. (2002). Acquisition, Efficiency and Scale Economies: An Analysis of the British Bus Industry. *Transport Reviews, 22 (2:* 147-157.

Cox, B (1997), Lecturing notes topic three, An Accounting Approach to Business Analysis. *Greenwich School of Management UK.*

Cumming, D. Siegel, D, S. Wright, M (2007). Private Equity, Leveraged Buyouts and Governance. *Journal of Corporate Finance 13 (4)*: 439-460.

Cumming, D. Walz, U (2010). Private Equity Returns and Disclosure Around the World. *Journal of International Business Studies*, *41* (4): 727-754.

Cuny, C, J, Talmor, E (2007). A Theory of Private Equity Turnarounds. *Journal of Corporate Finance 13 (4): 629 – 646.*

Dabhilkar, M. Bengtsson, L (2008). Inverst of Diverst? On the Relative Improvement Potential in Outsourcing Manufacturing. *Production Planning and Control. 19*: 212-228.

Dalton, D. R (1989). The Ubiquitous Leverage Buyout: Management Buyout or Management Sell out? *Business Horizon, 32 (4)*: 36-42.

Danielson, M., Heck, J., & Shaffer, D (2008). Shareholder Theory-How Opponents and Proponents Both Get It Wrong.

Davies, A. J. Kochhar, A. K (2002). Manufacturing Best Practice and Performance Studies: A Critique. *International Journal of Operations & Production Management*, *22* (3): 289-305.

Davis, S. J. Lerner, J. Haltiwanger, M, J. Jarmin, R (2008). Private Equity and Employment in the Global Economic Impact of Private Equity Report. *World Economic Forum. Davos.*

DeAngelo, H. DeAngelo, L (1987). Management Buyout of Publicly Traded Corporations. *Financial Analysis Journal,* :38-49.

DeAngelo, H. DeAngelo, L. Rice, E.M (1984). Going Private and Minority Freeze outs, and Stockholder Wealth. *Journal of Law and Economics 27*: 367.

DeAngelo, L, E (1986). Accounting Numbers as Market Valuation Substitutes: A study of Management Buyouts of Public Stockholders. *Accounting Review*, *400-420.*

DeAngelo, L, E (1990), Equity Valuation and Corporate Control. *Accounting Review, 65 (1)* 93-112.

Debreu, G. (1951). The Coefficient of Resource Utilization. *Econometrica: Journal of the Econometric Societ:* 273-292.

Deguise, B. Rosenfield, C (2009). The Human Element in Making Outsourcing Successful and Addressing Participant Barriers. *Business Credit, 111 (4)* :62

Delis, M. D. Koutsomanoli-Fillipaki, A. Staikouras, C. K, Katerina, G. (2009). Evaluating Cost and Profit Efficiency: a Comparison of Parametric and Nonparametric Methodologies. *Applied Financial Economics*, *19* (3), 191-202.

Deloitte Consulting (2005). Calling a Change in the Outsourcing Market. The Realities for the World's Largest Organisations.

Demsetz, H (1983). Structure of Ownership and the Theory of the Firm. The *JL & Econ, 26*: 375.

Denis, D. J (1992). Corporate Investment Decisions and Corporate Control: Evidence from Going-Private Transactions. *Financial Management*, 80-94.

Denvers, C, E. Holcomb, T, R. Holmes Jnr, M, R. Cannell Jnr, A (2006). Inside the Black Box: the Contrasting Effects on TMT Long-Term Incentives on Interest Alignment. *Academy of Management. Best Conference Paper 2006. BPS: HH1.*

Dicker, A (1990). Tax Issues in 'B' De Caires, *Corporate Restructuring, London.*

Diller, C. Kaserer, C (2009). What Drives Private Equity Returns?–Fund Inflows, Skilled GPs, and/or Risk?*. *European Financial Management*, *15* (3): 643-675.

Disney, R, Haskel, J, Henden, Y (2003). Entry, Exit and Establishment Survival in UK Manufacturing. *The Journal of Industrial Economics, 51 (1)*: 91-112.

Disney, R. Haskel, J. Henden, Y (2003). Restructuring and Productivity Growth in UK Manufacturing. *Journal of Industrial Economics, 113 (489)*: 664-694.

Donaldson, T. Preston, L. E (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *Academy of management Review, 20(1:,* 65-91.

Draper, P. Paudyal, K (2008). Information Asymmetry and Bidders' Gains. *Journal of Business Finance & Accounting, 35 (3‑4):* 376-405.

Drucker, P (1976). The Unforeseen Revolution: How Pension Fund and Socialism Came to America. *Heineman. London. UK.*

Drucker, P (1988). Management and the World's Work. *Harvard Business Review:* :65-76.

Drucker, P.F (1986). Corporate Takeovers. What is to be Done? *National Affair 55 (82):* 3-24).

Economist (2006). Barbarians at the Gates of Europe. 378 (8465): 69-70.

Ernest & Young (2008). BVCA Annula Report of the Performance of Portfolio Companies.

Estache, A. Rossi, M. A (2002). How Different is the Efficiency of Public and Private Water Companies in Asia? *The World Bank Economic Review, 16 (1):* 139-148.

Evans, J. Poa, M. Rath, S. (2005). The Financial and Governance Characteristics of Australian Companies Going Private. *International Journal of Business Studies*, *13* (1).

Fama, E.F (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance.*

Fama, E. F., & French, K. R. (1992). The Cross-section of Expected Stock Returns. *The Journal of Finance, 47 (2):* 427-465.

Farrell, M, J (1957). The Management of Productive Efficiency. *Journal of the Royal Society. Series A (General) 120 (3)*: 253-290.

Farrell, M.J, Fieldhouse, M (1962). Estimating Efficient Production Functions under Increasing Returns to Scale. *Journal of the Royal Society. Series A (General) 125 (2)*: 252-267.

Farsi, M. Filippini, M. Greene, W (2006). Application of Panel Data Models in Benchmarking Analysis of The Electricity Distribution Sector. *Annals of Public and Cooperative Economics, 77 (3):* 271-290.

Farsi, M. Filippini, M (2009). An Analysis of Cost Efficiency in Swiss Multi-utilities. *Energy Economics, 31 (2:,* 306-315.

Fidrmuc, J, P. Roosenboom, P. van Dijk, D (2006). Do Private equity Investors Take Firms Private for Different Reasons*? Erasmus Institute of Management, Erasmus University*.

Financial Services Authority (2007). Private Equity: A discussion of Risk and Regulatory Engagement, Feedback on DP06/6 07/3

Financial Services Commission (2007). Private Equity Effects on Workers. Hearing Before the Committee on Financial Services. U.S. House of Representatives. One Hundred and Tenth Congress. First Session. May 16. Serial No. 101-3.

Firth, M (1979). The Profitability of Takeovers and Mergers. *The Empirical Journal 89*: 316-329.

Fontrodona, J. Sison, A. J. G (2006). The Nature of the Firm, Agency Theory and Shareholder Theory: A Critique From Philosophical Anthropology. *Journal of Business Ethics, 66(1:* 33-42.

Førsund, F. R. Lovell, C. A. Schmidt, P (1980). A Survey of Frontier Production Functions and of their Relationship to Efficiency Measurement. *Journal of econometrics, 13(1):* 5-25.

Francesco, G (2009). Welch Slams the obsession with shareholder value as a "dumb idea." *FT 13 March 2009*:1

Franks, J, Mayer, C (1996). Hostile Takeovers and the Correction of Managerial Failure. *Journal of Financial Economics 40*: 163-181.

Fraser-Sampson, G (2007). Private equity as an asset class. *John Wiley & Sons, Sussex, England.*

Fried, H. O. Lovell, C. K. Schmidt, S. S (Eds.). (2008). The measurement of Productive Efficiency and Productivity Growth. *Oxford University Press*.

Friedman, M (1970). The Social Responsibility of Business is to Increase Profit. *The New York Times Magazine,* 13.

Freeman, R. E. Reed, D. L (1983). Stockholders and Stakeholders: A New Perspective on Corporate Governance. *California management review*, *25* (3).

Froud, J. Williams, K (2007). Private Equity and Culture of Value Extraction. New Political *Economy, 12 (3): 406-421.*

Gannon, C,R (1981). An Evaluation of the SEC's New Going Private Rules. Journal of Corporation Law, 7 (1).

Cabeza-García, L. Gómez-Ansón, S (2011). Post-privatisation Ownership Concentration: Determinants and Influence on Firm Efficiency. *Journal of Comparative Economics*, *39* (3): 412-430.

Garfinkel, M, R (1989). The Cause and Consequences of Leveraged Buyouts. *Federal Reserve Bank of St. Louis, USA*

Garvey, J. Gordon, D (2006). Mergers, Acquisitions and Outsourcing. *Security Industry News 12.4.2*.

Gerald, T, G (1992). Leveraging the Underinvestment Problem: How High Debt and Management Shareholdings Solve the Agency Costs of Free Cash Flow. *The Journal of Financial Research, 15*: 149-166.

Gerald, T, G (1995). Debt Finance and the Cost of Management Ownership: Some Elementary Results. *Managerial and Decision Economics, 16*: 37-46.

Ghai, S. Kehoe, C. Pinkus, G (2014). Private Equity: Changing Perceptions and New Realities. *McKinsey & Company. Insights and Publications* April, 2014.

Gill, J. Johnson, P (1997). Research Methods for Managers 2nd edition. *Paul Chapman Publishing, London.*

Gilley, M, K, Rasheed, A (2000). Making More by Doing Less: An Analysis of Outsourcing and its Effects on Firm Performance. *Journal of Management 2000 26*: 763-790.

Gilligan, J, Wright, M, (2010). *Private Equity Demystified*. (ICAEW, London).

Goel, A. M. Thakor, A. V (2003). Why Do Firms Smooth Earnings?. *The Journal of Business, 76 (1):* 151-192.

Goergen, M. O'Sullivan, N. Wood, G (2011). Private Equity Takeovers and Employment in the UK. Some Empirical Evidence. Corporate Governance: *An International Review 19(3)*: 259-275.

Golding, T (2007). Private Equity–Myth and Reality. *Competition & Change*, *11* (4): 348-352.

Goossens, L. Manigart, S. Meuleman, M (2008). The Change in Ownership After a Buyout: Impact on Performance. *The Journal of Private Equity, 12 (1):* 31-41.

Gorzig, B. Stephan, A (2002). Outsourcing and Firm-Level Performance. Discussion Paper 309. *German Institute for Economic Research. Berlin, October 2002.*

Government Accounting Office (2008). Private Equity: Recent Growth in Leveraged Buyouts: Exposed Risks that Warrant Continued Attention. United States Government Accounting Office. Highlights of GOA-08-885. A Report to Congressional Requesters.

Gregory, D (2013). Private Equity and financial Stability. Bank of England Quarterly Bulletin 2013 Q1.

Green, A. Mayes, D (1991). Technical Enefficiency in Manufacturing Industries. *The Economic Journal:* 523-538.

Green, S (1992). The Impact of Ownership and Capital Structure on Managerial Motivation and Strategy in Management Buy-Outs: A Cultural Analysis. *Journal of Management Studies*, *29* (4): 513-535.

Griffith, R, (1999). Using the ARD Establishment Level Data to Look at Foreign Ownership and Productivity in the United Kingdom. The Economic Journal 109: *Royal Economic Society. Blackwell Publihing. Oxford. UK*.

Grinstein, Y (2006). The Disciplinary Role of Debt and Equity Contracts: Theory and Tests. *Journal of Financial Intermediation, 15 (4)*: 419-443.

Gro, A, Gottschalg, O (2006). The Risk Adjusted Performance of US buyouts. *Groupe HEC*.

Guo, S, Hotchkiss, E, S, Song, W (2011). Do Buyouts (Still) Create Value. *Journal of finance 66:* 479-517.

Haarmeyer, D (2008). Private Equity Capitalism's Misunderstood Entrepreneurs and Catalysts for Value Creation. *The Independent Review, 13 (2):* 245-248.

Hall, D (2006). Private Equity and Infrastructure Funds in Public Services and Utilities. *University of Greenwich (PSIRU).*

Hall, D (2007). Unhappy returns to investors in private equity, PSIRU, University of Greenwich (PSIRU).

Halpern, P. J (1973). Empirical Estimates of the Amount and Distribution of Gains to Companies in Mergers. *Journal of Business Vol. 46 (4)*: 554-575.

Halpern, P (1983). Corporate Acquisitions: A Theory of Special Cases? A Review of Event Studies Applied to Acquisitions. *Journal of Finance:* 297-317.

Halpern, P. Kieschnick, R. Rotenberg, W (1999). On the Heterogeneity of Leveraged Going Private Transactions. *Review of Financial Studies, 12*: 281-309.

Hansen, N (1994). The Strategic Role of Producer Services in Regional Development. *International Regional Science Review, 13 (3)*: 187-95.

Hansmann, H (1988). Ownership of the Firm. Journal of Law, Economics and Organisation 4.2: 267-304.

Harris, J (2008). What's Wrong with Executive Compensation? *Journal of Business Ethics*, *85* (1): 147-156.

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 (3):* 318-335.

Harris, R. Siegel D, S. Wright, M (2005). Assessing the Impact of Management Buyouts on Economic Efficiency: Plant-Level Evidence from the United Kingdom. *Review of Economics and Statistics. 87 (1):* 144-153.

Hausman, J. A., & Taylor, W. E. (1981). Panel Data and Unobservable Individual Effects. *Econometrica: Journal of the Econometric Society*, 1377-1398.

Hector, G (1987). Are Shareholders Cheated by LBOs? *Fortune, 115 (2):* 98

Hicks, J.R (1935). Annual Survey of Economic Theory: The Theory of Monopoly. *Econometrica, Vol. 3 (1):* 1-120.

Hirschhausen von, C, Cullmann, A. Kappeler, A (2006). Efficiency Analysis of German Electricity Distribution Utilities – Non-Parametric and Parametric Tests. *Applied Economics 38:* 2553-2566.

Hirschey, M (1986). Mergers, Buyouts and Fakeouts. *The American Economic Review*, 317-322.

Hirst, D (1994). Auditor Sensitivity to Earnings Management. *Contemporary Accounting Research*, 11(1): 405-422.

Hoffman, W (2009). Seeking Closer Shores: Shippers Rethink Global Supply Newtorks as Higher Costs Push Manufacturers Close to Customers. Traffic World.

Hogarty, T. F (1970). The Profitability of Corporate Mergers. *Journal of Business*: 317-327. *Commonwealth Business Media*.

Holmstrom, B. Kaplan, S. N (2001). *Corporate Governance and Merger Activity in the US: Making Sense of the 1980s and 1990s* (No. w8220). National Bureau of Economic Research.

House of Commons Treasury Committee (2007). Private Equity: Response from the Government and the Financial Services Authority to the Committees' Tenth Report of Session 2006-07.

House of Commons Treasury Committee: Private equity Tenth Report of Session 2006–07

Houseman, S (2007). Outsourcing. Off-shoring and Productivity Measurement in United States Manufacturing. *International Labour Review, 146 (1-2)*.

Hsiao (2003). Analysis of Panel Data, 2nd Edition. *Cambridge University Press, Cambridge. UK.*

IOSCO (2010). Private Equity Conflicts of Interest – Final Report, November 2013.

Ippolito, R, James, W (1992). LBOs, Reversions and Implicit Contracts. *Journal of Finance, 47 (1):* 139-167.

IUF (2007). A Workers' Guide to Private Equity Buyouts. Geneva.

Jarrell, G. A. Brickley, J. A. Netter, J. M (1988). The market for corporate control: The empirical evidence since 1980. *The Journal of Economic Perspectives*, 49-68.

Jelic, R, Brahim, S, Wright, M (2005). Performance of Private to Public MBOs: The Role of Venture Capital. *Journal of Business Finance and Accounting, 32 (3)*: 643-792.

Jelinek, K (2007). The Effect of Leverage Increases on Earnings Management. *Journal of Business & Economic Studies, 13(2).*

Jensen, M (1986). Agency Costs of Free Cash Flow, Corporate Finance and Takeovers. *American Economic Review, 76 (2)*: 323-329.

Jensen, M 1989. Eclipse of the Public Corporation. *Havard Business Review, 67 (5)*: 61-74.

Jensen, M, C (1983). Organisational Theory and Methodology. *The Accounting Review, 58 (2)*: 319-339.

Jensen, M. C. Ruback, R. S (1983). The Market for Corporate Control: The Scientific Evidence. *Journal of Financial economics, 11(1):* 5-50.

Jensen, M, C (1984). Takeovers: Folklore and Science. *Harvard Business Review 62:* 109-121.

Jensen, M, C (1987). The Free Cash Flow Theory of Takeovers: A Financial Perspective on Mergers and Acquisitions and the Economy. *The Merger Boom*: 102-143.

Jensen, M. C. (2010). Value Maximization, Stakeholder Theory, and the Corporate Objective Function. *Journal of applied corporate finance, 22(1):* 32-42.

Jensen, M, C. Meckling, W, H (1976). Theory of the Firm: Managerial Behaviour, Agency Costs and Ownership Structure. *Journal of Financial economy, 3 (4):* 305-360.

Jensen, M, Murphy, K, J (1990). Performance Pay and Top Management Incentives. *Journal of Political Economy 98:* 225 – 264.

Jensen, M. C (1988). Takeovers: Their Causes and Consequences. *Journal of Economic Prospective, 2 (1):* 21-48.

Jondrow, J,C. Lovell, A.K, Materov, S. Schmidt, P (1982) On the Estimation of Technical inefficiency in the Stochastic Frontier Production Function Model. *Journal of Econometrics, 19 (2/3):* 233-238.

Jones, D.C, Kalmi, P., Mygind, N (2005). Choice of Ownership Structure and Firm Performance: Evidence from Estonia. *Post-Communist Economics, 17 (1):* 83-107.

Jones, R, (2008) Eureka Private Equity, Heads-up: Fresh Approach to Value Growth Need.

Jovanovic, B. (1979). Job Matching and the Theory of Turnover. *The Journal of Political Economy*, *87* (5): 972.

Juma's, A, H. Wood, D (2000). Outsourcing Implications on Conpanies' Profitability and Liquidity: A Sample of UK Companies. *Work Study, 47*: 265-274.

Kaplan, S (1989). Management Buyouts: Evidence on Taxes as a Source of Value. The *Journal of Finance, 44 (3):* 611-632.

Kaplan, S (1989). The Effects of Management Buyouts on Operating Performance and Value. *Journal of Financial Economics, 24 (2)*: 217-254.

Kaplan, S. Schoar, A (2005). Private Equity Performance: Returns Persistence and Capital. *The Journal of Finance, 60 (4):* 1791-1823.

Kaplan, S, Stromberg, P (2008), Leverage Buyout and Private Equity. *Journal of Economic Perspectives.*

Kaplan, S.N, Schoar, A (2005). Private Equity Returns: Persistent and Capital Flows. *Journal of Finance 60:* 791-823.

Kenours, C (2006). New Outsourcing Targets. Target Privte Equiyt Funds. Security Industry News 9.1.06.

Keown, A. J. Pinkerton, J. M (1981). Merger Announcements and Insider Trading Activity: An Empirical Investigation. *The Journal of Finance, 36 (4):* 855-869.

Kieschnick, R (1998). Free Cash Flow and Stockholder Gains in Going Private Transactions Revisited, *Journal of Business Finance & Accounting, 25 (1 & 2):* 187-202.

Kolade, W (2007). Speech to the Capital Creation Conference, Monte Carlo, BVCA

Koopmans, T. C (1951). Analysis of Production as An Efficient Combination of Activities. *Activity Analysis of Production and Allocation, 13*: 33-37.

Kopp, R.J., Smith, V. K (1980). Frontier Production Functions Estimates for Steam Electric Generation: A comparative Analysis. *Southern Economic Journal, 46 (4):* 1049-1059.

Kosedag, A. Lane, W. R (2002). Is it Free Cash Flow, Tax Savings, or Neither? An Empirical Confirmation of Two Leading Going-private Explanations: The Case of ReLBOs. *Journal of Business Finance & Accounting*, *29* (1-2): 257-271.

Kosman, J (2010). The Buyout of America. How Private Equity is Destroying Jobs and Killing the American Economy. *Penguin Books Ltd. London*.

Krantz, M (2006). Private equity firms spin off cash. *USA Today, March 16*.

Kreuter, B. Gottschalg, O. Zollo, M (2005). Truths and Myths about Determinants of Buyout Performance. In *Conference Proceedings of the Annual European Venture Capital Association Meeting*.

Kumbhakar, S, C (1990). Production Frontiers, Panel Data, and Time-Varying Technical Inefficiency. *Journal of Ecomnomerics 46(1/2):* 201-212.

Kumbhakar, S.C. Knox-Lovell, C.A(2000). Stochastic Frontier Analysis. *Cambridge University Press.*

Kumbhakar, S. C. Tsionas, E. G (2008). Scale and Efficiency Measurement using a Semiparametric Stochastic Frontier Model: Evidence from the US Commercial Banks. *Empirical Economics, 34 (3):* 585-602.

Lachaal, L. Karray, B. Dhehibi, B. Chebil, A (2005). Technical Efficiency Measures and its Determinants for Olive Producing Farms in Tunisia: A Stochastic Frontier Analysis. *African Development Review, 17 (3:,* 580-591.

Law, W.A (1986). A Corporation is More than its Stock. *Harvard Business Review, 64 (3):* 80-83.

Lazonic, W (2001). Public and Corporate Governance: The Institutional Foundation of the Market Economy. *Economic Survey of Europe, 2*.

Lazonic, W, O'Sullivan, M (2000). Maximising Shareholder Value: A New Ideology for Corporate Governance, *Economy and Society, 29 (1):* 13-35.

Lee, D, S (1992). Management Buyouts Proposals and Inside Information. *The Journal of Finance 47 (3): 1061-1079*.

Lee, C. I. Rosenstein, S. Rangan, N. Davidson III, W. N (1992). Board Composition and Shareholder Wealth: The Case of Management Buyouts. *Financial Management*, *21* (1).

Lehn, K, Poulsen, A (1990). The Economics of Event Risk: The Cost of Bondholders in Leverage Buyouts. *The Journal of Corporation Law, 199:* 199-217.

Lehn, K, Poulson, A (1989). Free Cash Flow and Shareholder Gains in Going Private Transactions. *The Journal of Finance 44 (3)*: 771-787.

Lerner, J, Hardyman, F, Leamon, A (200). Venture Capital and Private Equity, A Case Book, 3rd Edition, John Willey and Sons, Inc USA.

Leslie, P, Oyer, P (2008). Managerial Incentives and Value Creation: Evidence From Private Equity. *National Bureau of Economic research, 14331*: 1-40.

Lev, B (2003). Corporate Earnings: Facts and Fiction. *Journal of Economic Perspectives: 27-50.*

Lewis, D, Springer, T. M, Anderson R (2003). The Cost Efficiency of Real Estate Investment Trusts: An Analysis with A Bayesian Frontier Model. *Journal of Real Estate Finance and Economics, 26:* 65-80.

Lichtenberg, F. R, Siegel, D (1990). The Effects of Leverage Buyouts on productivity and Related Aspects of Firms Behaviour. *Journal of Financial Economics, 27 (1)*: 165-194.

Lichtenberg, F. R, Siegel, D (1990). The Effects of Ownership Changes on the Employment and Wages of Central Office and Other Personnel. *Journal of Law and Economics, 33 (2):* 383-408.

Lichtenberg, F. R, Siegel, D (1992). Productivity and Changes in Ownership of Manufacturing Plants. Corporate Takeovers and Productivity. *MIT Press, 25-43. Cambridge, MA.*

Liebeskind, J. Wiersema, M. Hansen, G (1992). LBOs, Corporate Restructuring, and the Incentive-intensity Hypothesis. *Financial Management*, *21* (1).

Lin, C, Ma, Y, Su, D (2009). Corporate Governance and Firm Efficiency: Evidence from China Publicly Listed Firms. *Managerial and Decision Economics, 30 (3):* 193-209.

Lin, C, Su, D (2008). Industrial Diversification, Partial Privatisation and Firm Evaluation: Evidence from Publicly Listed Firms in China. *Journal of Corporate Finance, 14 (4)*: 405-417.

Lintner, J (1971). Expectations, Mergers and the Equilibrium in Purely Competitive Securities Markets. *American Economic Review, 61 (2):* 101-111.

Liu, H. H. Chen, T. Y. Pai, L. Y (2007). The Influence of Merger and Acquisition Activities on Corporate Performance In the Taiwanese Telecommunications Industry. *The Service Industries Journal, 27(8:,* 1041-1051.

Liu, R, Trefler, D (2008). Much Ado About Nothing: American Jobs and the Rise of Service Outsourcing to China and India. *National Bureau of Economic Research, Working Paper No. 14061, Cambridge, MA USA*.

Ljungqvist, A, Richardson, M (2003). The Cash Flow, Return and Risk Characteristics of Private Equity. *National Bureau of Economic Research, Working Paper No. 9454, Massachusetts USA*

Loh, Lawrence (1992). Financial Characteristics of Leveraged Buyouts. *Journal of Business Research, 24 (3):* 241-252.

Long, W, F. Ravenscraft, D, J (1993). LBOs, Debt and R&D Intensity. *Strategic Management Journal, 14 (S1)*: 119-135.

Lorie, J. H. Halpern, P (1970). Conglomerates: The Rhetoric and the Evidence. *Journal of Law and Economics, 13:* 149-166.

Lowenstein, L (1986). No More Cozy Management Buyouts. *Harvard Business Review 64:* 147-156.

Lowenstein, L (1990). Introduction and Foreword: Lesson for Wall Street from Main Street. Journal of Corporation Law, 15 (2): 161-169.

Lowenstine, D, (2007), Private Equity Council, Testimony before the U.S. House Financial Services Committee.

MacFadyen, K, (2007). Fair Vaue Pricing Stirs up Debate in the PE Community. *The Deal Makers Journal, 42 (4).*

Madden, G. Savage, S. Kemp, S (1997). Measuring Public Sector Efficiency: A Study of Economics Departments at Australian Universities. *Education Economics, 5(2:,* 153-168.

Majumdar, S. K (1998). Assessing Comparative Efficiency of the State-Owned Mixed and Private Sectors in Indian industry. *Public Choice, 96 (1-2):* 1-24.

Managhni, F (2006). Impact of Information Technology on the Workforce of the Future: An Analysis. *International Journal of Management, 23(4):* 845-849.

Manne, H. G (1965). Mergers and the Market for Corporate Control, *Journal of Political Economy, 73 (2):* 110-120.

Manufacturing Business Technology (2007). Outsourcing Production may be Fashionable, but not Every One is Cashing in on the Trend. *Reed Business Information Inc*.

Markovits, R (1998). Matters of Principle. *New York University Press.*

Matsusaka, J. G. (1993). Target Profits and Managerial Discipline during the Conglomerate Merger Wave. *Journal of Industrial Economics*, *41*, 179-179.

McCafferty, J (2007). The buyout binge, 23 (4).

McGuckin, R.H. Nguyen, S.V. (1995). On Productivity and Plant Ownership Change: New Evidence from the Longitudinal Research Database. *Rand Journal of Economics, 26 (2):* 257-276.

Meeusen, W. Van den Broeck, J (1977). Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. *International Economic Review 18 (1):* 435-444.

Melcher, R. W, Rush, D. F (1974). Evidence of the Acquisition-Related Performance of Conglomerate Firms. *Journal of Finance, 29 (1):* 141-149.

Melcher, R. W, Rush, D. F (1974). Evidence of the Acquisition-Related Performance of Conglomerate Firms. *Journal of Finance, 29 (1):* 141-149.

Metcalfe, C. E (1998). The Stakeholder Corporation. *Business Ethics: A European Review, 7 (1)*: 30-36.

Meuleman, M. Amess, K. Wright, M. Scholes, L (2009). Agency, Strategic Entrepreneurship, and the Performance of Private Equity-Backed Buyouts. *Entrepreneurship Theory and Practice*, *33* (1): 213-239.

Modigliani, F, Miller, M (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review, 48*: 261-297.

Monks, R, Sykes, A (2002). Capitalism Without Owners will Fail: A Policymaker's Guide to Reform. *Centre for the Study of Financial Innovation. London. UK.*

Monnoyer, M (2007). A Selection from the RESER Congress Granada – Growth and Employment of Services: New Trends in Global World. *The Service Industries Journal, 27 (3):* 189-192.

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Characteristics of Targets of Hostile and Friendly Takeovers. In *Corporate takeovers: Causes and consequences* : 101-136. University of Chicago Press.

Morck, R., Shleifer, A. Vishny, R. W (1988). Alternative Mechanisms for Corporate Control. *The American Economic Review, 79 (4):* 842-852.

Morrel, K. Clark, I (2010). Private Equity and the Public Good. *Journal of Business Ethics, 96 (2):* 249-263.

Morris, T. Wood, S (1991). Testing the Survey Method: Continuity and Change in British Industrial Relations. *Work, Employment and Society 5 (2):* 259-82.

Mueller, D. C (1969). A Theory of Conglomerate Mergers. *The Quarterly Journal of Economics*, *83* (4): 643-659.

Mueller, D. C (1985). Mergers and Market Share. The Review of Economics and statistics, 67 (2): 259-67.

Murillo-Zamorano, L, R (2004). Economic Efficiency and Frontier Techniques. *Journal of Economic Surveys, 18 (1):* 33-77.

Muscarella, C.J. Vetsuypens, M.R (1990). Efficiency and Organizational Structure: A Study of Reverse LBOs. *The Journal of Finance 45 (5):* 1389-1413.

Nielsen, R. P. (2008). The Private Equity-leveraged Buyout form of Finance Capitalism: Ethical and Social Issues, and Potential Reforms. *Business Ethics Quarterly*, 379-404.

Nikoskelainen, E. Wright, M (2007). The Impact of Corporate Governance Mechanisms on Value Increase in Leveraged Buyouts. *Journal of Corporate Finance*, *13* (4), 511-537.

Nguyen, A,G. Ollinger, M (2006). Mergers and Acquisitions and Productivity in the US Meat Products Industries: Evidence from the Micro Data. *American Journal of Agricultural Economics, 88 (3):* 606-616.

Odeck, J (2007). Measuring Technical Efficiency and Productivity Growth: A Comparison of SF and DEA on Norwegian Grain Production Data. *Applied Economics, 39:* 2617-2630.

Office for National Statistics (2013). Poverty and Social Exclusion in the UK and EU, 2005-2011.

Olsen, K. B (2006). Productivity Impacts of Off-shoring and Outsourcing: A Review, OECD Directorate for Science, Technology and Industry (STI Working Paper 2006/1 Paris, OECD).

Opler, T. C. (1992). Operating performance in leveraged buyouts: Evidence from 1985-1989. *Financial Management*, *21* (1).

Opler, T. Titman, S (1993). The Determinants of Leverage Buyout Activity: Free Cash Flow vs. Financial Distress costs. *The Journal of Finance, 48 (5):* 1985-99.

Organisation for Economic Co-operation and Development (OECD) (2004) (OECD).

Palepu, K. G (1990). Consequences of Leveraged Buyouts. *Journal of Financial Economics, 27(1:,* 247-262.

Peng, Y. Wang, K (2007). IPO Underpricing and Flotation Methods in Taiwan–a Stochastic Frontier Approach. *Applied Economics, 39 (21):* 2785-2796.

Pestieau, P. Tulkens, H (1993). Assessing and Explaining the Performance of Public Enterprises. *Finanzarchiv*, *50*: 293-323.

Pevalin, D, Robson, K (2009). Stata Survival Manual. First Edition. Open University Press, Berkshire, England.

Pfannenstein, L, L. Tsai, R (2004). Offshore Outsourcing: Current and Future Effects on American IT Industry. *Iformation System Management, 21 (4):* 72-80.

Phalippou, L (2009). Beware of Venturing into Private Equity. *Journal of Economic Perspective 23 (1)*: 147-166.

Phan, P. H. Hill, C. W (1995). Organizational Restructuring and Economic Performance in Leveraged Buyouts: An Ex Post Study. *Academy of Management Journal*, *38* (3): 704-739.

Pham, H. T. Dao, T. L. Reilly, B (2010). Technical Efficiency in the Vietnamese Manufacturing Sector. *Journal of International Development, 22 (4):* 503-520.

Phillips, R (1997). Stakeholder Theory and a Principle of Fairness. *Business Ethics Quarterly, 7 (1):* 51-66.

Phillips, R. Freeman, R. E. Wicks, A. C (2003). What Stakeholder Theory is Not. *Business Ethics Quarterly, 479-502.*

Picazo-Tadeo, A. J. Sáez-Fernández, F. J. Gonzalez-Gomez, F (2009). The Role of Environmental Factors in Water Utilities' Technical Efficiency. Empirical Evidence From Spanish Companies. *Applied Economics, 41(5:,* 615-628.

Pitelis, C, N (2004). Corporate Governance, Shareholder Value and Sustainable Economic Performance. Corporate Governance, 12 (2).

Porter, M. E. Kramer, M. R (2011). Creting Shareholder Value. Capitalism is Under Siege. How to reinvent capitalism and unleash a wave of innovation and growth. Harvard Business Review, 89 (1/2): 62-77.

Private Equity Wire (2008). How Private Equity can Help get the UK Economy Moving.

PSE (2009). Hedge Funds and Private Equity. A Critical Analysis.

Rappaport, A (1990). The Staying Power of the Public Corporation. *Harvard Business Review 68 (1):* 96-104.

Ravenscraft, D. J. Scherer, F. M (1987). Mergers, Sell-offs, and Economic Efficiency. *Brookings Institution Press*.

Reaching Out (2007). Outsourcing is Not a Bad Word. Media Inc, USA.

Reid, S (1971). A Reply to the Weston/Mansinghka Criticisms Dealing with Conglomerates Mergers. *The Journal of Finance, 23 (4):* 937-948).

Rennboog, L. Simons, T. Wright, M (2007). Why do Public Firms go Private in the UK? The Impact of Privatr Equity Investors, Realignment and Undervaluation. *Journal of Corporate Finance 13 (4):* 591 − 628.

Richard, A, C Emil, M, S (2004). Corporate Debt: What Are the Choices. *National Tax Journal, 42*: 273-282.

Richmond, J (1974). Estimating the Efficiency of Production. *International economic revie:,* 515-521.

Robbie, K. Wright, M (1995). Managerial and Ownership Succession And Corporate Restructuring: The Case Of Management Buy-Ins. *Journal of Management Studies*, *32* (4): 527-549.

Rosko, M. D (2001). Cost Efficiency of US Hospitals: A Stochastic Frontier Approach. *Health Economics, 10 (6):* 539-551.

Ruggiero, J (2007). A Comparison of DEA and the Stochastic Frontier models Using Panel Data. *International Transactions in Operational Research 14 (3)*: 259-266.

Samuelson, R, J (2007). The Enigma of Private Equity. Newsweek, 149 (12).

Saunders, M, Lewis. P, Thornhill, A (2007). Research Methods for Business Students, 4th Edition, FT Prentice Hall, Harlow, England.

Scheel, H. Scholtes, S (2003). Continuity of DEA Efficiency Measures. *Operations Research, 51 (1):* 149-159.

Scherer, F. M (1988). Corporate Takeovers: The Efficiency Arguments. *The Journal of Economic Perspectives*, 69-82.

Seewald, N (2007). Industry aims to get the most of existing assets. *Chemical Week, 169 (3):* 43-43.

Shen, C. H. Chih, H. L (2007). Earnings Management and Corporate Governance in Asia's Emerging Markets. *Corporate Governance: An International Review, 15 (5):* 999-1021.

Shivdasani, A. Wang, Y (2011). Did Structured Credit Fuel the LBO Boom? *Journal of Finance Vol. 66 (4):* 1291-1328.

Shleifer, A, Vishny, R. W (1988). Value Maximisation and the Acquisition Process. *Journal of Economic Perspectives 2:* 7-20.

Shleifer, A. Summers, L (1988). Breach of Trust in Hostile Takeovers. In A. Auerbach, ed: Corporate Takeovers, Causes and Consequences (University of Chicago press).

Shleifer, A. Vishny, R. W. (1997). A Survey of Corporate Governance. *The journal of finance*, *52* (2): 737-783.

Sloman, J, Sutcliffe, M (2004). Economics for Business, 3rd Edition. FT Prentice Hall, Harlow, England.

Smiddy, Oliver (2008). Equity Moves to the Fore as Buyout Sebt Slips. *Private Equity News 04 Dec.*

Smith, A (1790). An Inquiry into the Nature and Causes of the Wealth of Nations.

Smith, A (1990). The effects of Leverage buyouts. *Business Economics, 25 (2).*

Smith, K. V. Schreiner, J. C (1970). A Portfolio Analysis of Conglomerate Diversifications. *Journal of Finance, 24 (3):* 413-428.

Sourafel, G. Thompson, S. Wright, P W (2006). The Impact of Mergers Activity on Executive Pay in the United Kingdom. Economica 73 (290): 321-339.

Sternberg, E (1996). Stakeholder Theory Exposed. *Economic Affairs, 16 (3):* 36-38.

Sternberg, E (1997). The Defects of Stakeholder Theory. *Corporate Governance: An International Review, 5 (1):* 3-10.

Stevenson, R.E (1980). Likelihood Functions for Generalised Stochastic Frontier Estimation. *Journal of Econometrics 13 (1): 57-66.*

Stirling, M. Wright, M (1990). Management Buyouts and the Law. *Oxford, Blackwell Scientific.*

Tadelis, S (2007). The Innovative Organisation: Creating Value Through Outsourcing. *California Management Review, 50 (1).*

Tan, G. R (2006). Efficiency Estimates for Singapore Manufacturing: New Evidence from the Malmquist Index. *Applied Economics Letters, 13 (11:, 715-721.*

The Guardian (2004). Legacy of the Lord with the Midas Touch. 3rd November 2004.

The Work Foundation (2009). Changing Relationships at Work.

Thompson, R. S. Wright, M (1989). Bonding, Agency Costs And Management Buyouts: A Note. *Bulletin of Economic Research*, *41* (1): 69-76.

Thompson, R. S. Wright, M. Robbie, K (1992). Management Equity Ownership, Debt and Performance: Some Evidence from UK Management Buyouts. *Scottish Journal of Political Economy*, *39* (4): 413-430.

Thompson, R. B. Smith, D. G (2001). Toward a New Theory of the Shareholder Role: Sacred Space in Corporate Takeovers. *Tex. L. Rev., 80, 261.*

Thorton, P (2007). Inside the Dark Box: Shedding Light on Private Equity. *The Work Foundation (2007).*

Tilson, E (2007). Buyout Binge is Sign of Good Health. *FT.com. June 24.*

Timmer, C. P (1971). Using a Probabilistic Frontier Production Function yo Measure Technical Efficiency. *Journal of Political Economy, 79 (4): 776-94.*

Timmer, M. van Moergastel. T, Stuivenwold, E. Ypma, G. O'Mahony. Kangasniemi, M (2007). *EU KLEMS Growth and Productivity Accounts. Version 10, March:1.*

Toby, L (2008) Valuation Doubts Weigh on Buyout Stock. Private Equity, 5 Dec.

Tofallis, C (2001). Combining Two Approaches to Efficiency Assessment. *Journal of the Operational Research Society, 52 (11): 1225-1231.*

Trade Union Congress (2013). The UK's Low Pay Recovery.

Trade Union congress (TUC) (2007). Private Equity –a Guide for Pension Fund Trustees.

Treanor, J (2007). Unions Urges Regulators to Scrutinise Private Equity. *Guardian.co.uk, 15 March 2007.*

Tsionas, E.G. Papadognonas, T. A (2006). Firm Exit and Technical Efficiency. *Empirical Economics, 31 (2): 536-548.*

United States Government Accounting Office (2007). Report to Congressional Requesters. Private Equity. Recent Growth in Leverage Buyouts Exposed Risks that Warrant Continued Attention. GOA-08-885. September 2008

United States Government Accounting Office (2007). Report to Congressional Requesters. Private Equity. Recent Growth in Leverage Buyouts Exposed Risks that Warrant Continued Attention. GOA-08-885. September 2008. Volume I, Report Together With Formal Minutes.

Wallace, J, S (2003). Value Maximisation and Stakeholder Theory: Compatible or Not? *Journal of Applied Corporate Finance, 15 (3)*: 123-127.

Walsh, J. P. Kosnik, R. D (1993). Corporate Raiders and their Disciplinary Role in the Market for Corporate Control. *Academy of Management Journal*, *36* (4): 671-700.

Weir, C, Laing, D, Wright, M (2005b). Undervaluation, Private Information, Agency Costs and the Decision to go Private. *Applied Financial Economics*, *15 (13):* 947-961.

Weir, C. Laing, D. Wright, M (2005). Incentive Effect, Monitoring Mechanisms and the Market for Corporate Control: An Analysis of the Factors Affecting Public to Private Transactions in the UK. *Journal of Business Finance and Accounting 32 (5 & 6)* 909-943.

Weir, C. Wright, M (2006). Governance and Takeovers: Are Public to Private Transactions Different from Traditional Acquisitions of Listed Corporations? *Accounting and Business Research, 36 (4):* 289-307.

Weir, C. Wright, M. Scholes, L (2008). Public-to-Private Buy-Outs, Distress Costs and Private Equity. *Applied Financial Economics*, *18* (10): 801-819.

Weston, J.F, Mansinghka, S. K (1971). Tests of the Efficiency Performance of conglomerate Firms. *Journal of finance, 26 (4):* 919-936.

Wood, G. Wright, M (2010). Private Equity and Human Resources Management: An Emerging Agenda. *Human Relations 63 (9):* 1279-1296.

Worthington, A. C. (2001). Efficiency in Pre-merger and Post-merger Non-bank Financial Institutions. *Managerial and Decision Economics, 22 (8:,* 439-452.

Wright, M. Thompson, S. Robbie, K (1990). Leveraged Acquisitions and the Market for Corporate Control. *Economic Affairs*, *10* (3): 9-13.

Wright, C, J. Shaw, J. R, Guan, L (2006). Corporate Governance and Investor Protection: Earnings Management in the U.K. and U.S. *Journal of International Accounting Research, 51 (1):* 25-40.

Wright, M, Weir, C, Burrows, A (2007). Irrevocable Commitments, Going Private and Private Equity. *European Financial Management, 13 (4):* 757-775.

Wright, M. Amess, K. Weir, C. Girma, S (2009). Private Equity and Corporate Governance: Retrospect and Prospect. *Corporate Governance; An International Review, 17 (3):* 353-375.

Wright, M. Burrors, A. Ball, R. Scholes, L. Burdett, M. Tune, L (2007). Management Buyouts 1986-2006. Past Achievements, Future Challenges. Centre for Management Buyout Research. 20th Anniversary Year.

Wright, M. Coyne, J (1985). Management Buyouts. *Beckenham. Croom Helm.*

Wright, M. Renneboog. L. Simons. T. Scholes, L (2006). Leverage Buyouts in the UK and Continental Europe: Retrospect and Prospect. Journal of Applied Corporate Finance, 18 (3): 38-55.

Wright, M. Wilson, N. Robble, K (1996). The Longer Term Effects of Management led Buyouts. *Journal of Entrepreneurial and Small Business Finance, 5 (3)213-234.*

Wruck, K. H (2008). Private Equity, Corporate Governance, and the Reinvention of the Market for Corporate Control. *Journal Of Applied Corporate Finance*, *20*(3): 8-21.

Wu, Y. W (1997). Management Buyouts and Earnings Management. *Journal of Accounting, Auditing and Finance, 12 (4)*: 373-389.

Zelenyuk, V, Zheka, V (1992). Corporate Governance and Firm's Efficiency: The Case of a Transitional Country, Ukraine. *Journa klof Productivity Analysis, 25 (1-2):* 142-157.

Zwiebel, J (2002). Review of Shleifer's Inefficient Markets. *Journal of Economic Literature*, *40 (4):* 1215-1220.

Webb-Sites:

www.bvca.co.uk - corporate governance and value creation: evidence from private equity

www.bvca2.co.uk/publications/guide/intro.html

http://www.canadianbusiness.com/managing/strategy/article.jsp?content=20070323_101616_5352(accessed 27.11.08 @12.15pm)

http://www.iht.com/articles/2007/03/23/yourmoney/mprivate.php?page=3)has success spoiled private equity: 2 - 3? (accessed 27.11.08 @12.50pm).

http://money.cnn.com/magazines/fortune/fortune_archive/2006/11/27/8394344/index.htm (private equity, private lives, accessed 28.11.08 @ 3.30pm)

http://www.penews.com1/today/index/content/3352631016 bankers predicts casualties as downturn bites (accessed 1.12.08 @ 10.25am)

http://www.penews.com2/today/largecap/content/3352622649 (LBO France Portfolio company defaults on ING loan) (accessed 1.12.08 at 10.55am)

http://www.telegraph.co.uk(1)/finance/2811043/Footsie-bossesandrsquo-verdict-on-private-equity.html (accessed 2.12.08 @ 9.39am)

www.canadian business.com/Private Equity, the Theory Canadian Business Online, March 22, 2007: interview with, Steve Dent, a partner at Birch Hill: (accessed 3.12.08 @7.08am)

www.iht.com/Sharon Reir/ 23/3/2007 (accessed 3.12.08 @7.24am)

www.penews.com/today/debt/contents/3352676696 Equity moves to fore as buyout debt slips (accessed 4.12.08 @10.08am)

http://www.penews.com101/today/index/content/3452671646 BVCA appoints board to boost research credibility (accessed @ 11.04am 5.12.08)

http://www.penews.com102/today/index/content/2449913390 BVCA vows to improve research after Moulton attack (accessed 5.12.08 @ 11.00am)

http://www.ft.com/cms/s/0/294ff1f2-0f27-11de-ba10-0000779fd2ac.html (Welch condemns share price focus accessed. 13.3.09@11.12am)

www.value basemanagement.net/methods-valuecreationindex.html (accessed 19.3.09 @ 15.19 pm)

http://www.guardian.co.uk/business/2004/nov/03/politics.politicalnews (accessed 914.20312 @ 12.55pm).

http://www.rolandberger.com/media/pdf/rb_press/RB_Value_creation_in_private_equity _20060915.pdf (accessed 20.3.09 @13.40pm)

http://www.capman.com/En/AboutCapMan/PrivateEquityInvestments/Privateequityfund s/ (accessed 26.3.09@1545pm)

http://www.independent.co.uk/news/business/news/aa-boss-admits-to-cutting-too-many-jobs-426063.html (accessed 7.4.09 @17.50pm).

www.business.guardian.co.uk/print/0,,329739645-108725.html (accessed 17.7.07 @ 2.29pm)

www.newsvote.bbc.co.uk/mpapps/pagetools/print/nes.bbc.co.uk/1/hi/business/4566710.s tm (accessed 25.6.07 @ 6.42pm).

www.open2.net/blogs/money/index.php/money/2007/06/05/private_equity (accessed 25.6.07 @ 6.42pm)

http://www.personneltoday.com/articles/2007/05/15/40578/private-equity-deals-are-catalyst-for-change-in-business-buyouts.html (accessed 26.6.07 @11.26)

http://www.personneltoday.com/articles/article.aspx?liarticleid=41222&printerfriendly=t rue (accessed 7.5.09)

www.icaew.com/index.cfm/route/127640/icaew_ga/en/Technical_and_Business_Topics/
Topics/Corporate_governance/Corporate_governance (accessed, 28.5.09)

http://www.valuebasedmanagement.net/faq_shareholder_stakeholder_perspective.html
(Accessed 29.5.09)

http://www.macabacus.com/valuation/lbo/creating-value   (accessed: 23.06.09   @
20.50pm).

http://myvesta.org/history/history_keepingtrack.htm (accessed 23.06.09 @ 21.00pm)

http://www.fool.co.uk/news/investing/investing-strategy/2007/06/14/asset-stripping-isnt-
evil.aspx

http://seekingalpha.com/article/147094-entrust-shareholders-likely-to-vote-down-
private-equity-buyout-friday (accessed 6.7.09 @ 13.08pm).

http://www.kpmg.co.uk/pubs/sale_and_leaseback.pdf

http://business.scotsman.com/retail/Tchenguiz-calls-for-property-sale.3276324.jp

http://www.hmrc.gov.uk/international/risk-assessment.pdf

http://www.hmrc.gov.uk/international/acting-together.pdf

http://www.hmrc.gov.uk/international/transferpricing.pdf

http://www.pinsentmasons.com/media/1623592274.pdf

http://www.hmrc.gov.uk/manuals/CG1manual/CG28000.htm

http://www.nottingham.ac.uk/business/cmbor/ (accessed 8/12/09) @ 13.45
http://www.hmrc.gov.uk/helpsheets/2008/hs340.pdf

http://press.comet.co.uk/company-history (accessed 11/11/201 @ 11.17am).

http://www.efinancialnews.com/story/2008-11-27/buyout-firms-queue-up-for-woolworths (accessed 15.11.201. @ 1056am).

http://news.bbc.co.uk/1/hi/business/7811048.stm (accessed 15.11.2012 @11.23am).
http://www.independent.co.uk/news/business/news/aa-boss-admits-to-cutting-too-many-jobs-426063.html (accessed 16.11.2012 @ 19.17pm).

http://www.retailresearch.org/whosegonebust.php (accessed 16.11.2012 @ 20.56pm).
http://www.ukbusinessgrants.org/government-relocation-incentives.php (accessed 7.2.2013 @ 18.49pm).

https://workspace.imperial.ac.uk/businessschool/Public/CMBOR/Q2%20UK%20press%20release.pdf (accessed 14.7.2013 @ 10.40am).

http://en.wikipedia.org/wiki/Alliance_Boots (accessed 14.7.2013 @ 12.16pm).
http://www.guardian.co.uk/business/2004/nov/03/politics.politicalnews (accessed 914.20312 @ 12.55pm).

http://swick.co.uk/index.php/2012/11/10-biggest-financial-scandals-in-history/ (accessed 23.6.2013 @ 16.18pm).

http://www.penews.com/today/index/content/4072307265/41904/restricted (accessed 26.6.2013 @ 16.42 pm).

http://www.allianceboots.com/our-history.aspx (accessed 6.7.2013 @ 13.43).

http://www.dailymail.co.uk/debate/article-2162092/Boots-Walgreens-takeover-Buy-poison-Britains-best-loved-firms.html (Accessed 14.7.2013 @ 16.28).

http://www.ft.com/cms/s/0/668b3192-bdf4-11e1-83ad-00144feabdc0.html#axzz2Z2ECy5ld (Accessed 14.7.2013 @ 16.44)

http://www.guardian.co.uk/business/2012/jun/24/walgreens-boots-private-equity-best-medicine (Accessed 14.7.2013 @ 16.52)

http://ec.europa.eu/internal_market/investment/docs/conference/rasmussen_en.pdf (accessed 24.7.2013 @ 18.25).

http://www.theguardian.com/business/2008/feb/27/privateequity (accessed 1.8.2013 @ 10.29am).

http://www.telegraph.co.uk/finance/migrationtemp/2803017/Banks-struggle-to-refinance-Debenhams-1bn-debt.html (21.1.2007 accessed 13.8.2013 @ 18.24).

http://www.telegraph.co.uk/finance/newsbysector/banksandfinance/privateequity/9963037/Britains-private-equity-titans-have-tumbled.html (accessed 13.9.2013 @ 12.45pm).

http://www.thisismoney.co.uk/money/news/article-2294108/sunderland-saturday-Damaging-legacy-private-equity.html (accessed 13.9.2013 @ 13.20pm).

http://www.ft.com/cms/s/0/d354562c-d9d3-11e2-bab00144feab7de.html#axzz2em5wnBah (accessed 13.9.2013 @ 13.25pm).

http://www.iufdocuments.org/buyoutwatch/2007/02/privateequity_buyouts_in_the_h.html (accessed 30.10.2013 @ 10.58am).

http://www.ft.com/cms/s/2/be98d9dc-203f-11dc-9eb1-000b5df10621.html#axzz2kKuYq6tm (Accessed 11.11.2013 @ 1353pm). 101.

http://www.netlawman.co.uk/d/casual-employment-contract?gclid=CIGs3_OT5b0CFSjpwgodAy0AKw

http://www.ft.com/cms/s/2/be98d9dc-203f-11dc-9eb1-000b5df10621.html#axzz2kKuYq6tm