

The Impact of Mergers and Acquisitions on Labour Productivity: The Role of Workforce Rationalisation

7640 words

ABSTRACT: Although there is evidence that mergers and acquisitions can improve labour productivity, it is not clear how extensive this is or how it is achieved. We empirically investigate these issues, focusing specifically on the role of workforce rationalisation via post-merger restructuring activities, such as redundancies and divestments. Our results show that acquirers achieve labour productivity improvements, relative to the performance of the non-acquiring firms. Our evidence also indicates that post-merger workforce growth is more likely associated with labour productivity improvement, while workforce reductions do not lead to post-merger performance improvement. This suggests that labour cost savings through merger-related workforce reductions negatively impact firm performance. The results are consistent with the view that takeovers of large firms can play an important disciplining role, but they also show that many takeovers do not lead to significant improvements in relative productivity.

Keywords: Corporate Governance, Mergers and Acquisitions, Labour Productivity, Corporate Restructuring, Workforce Rationalisation.

JEL classification: G34, D22, D24, M51, M54.

1. Introduction

The effects of mergers and acquisitions (M&A) on efficiency are important for business policy and practice. Theoretical predictions in the literature, however, vary substantially. Some bodies of theory predict enhancements in efficiency due to the disciplining of target firm managements (Manne, 1965) or to economies of scale and scope arising from synergy M&A (McGuckin and Nguyen, 1995). Contrary perspectives claim that M&A are often the outcome of empire-building strategies aimed at maximising company size rather than performance (Jensen, 1986; Morck, Shleifer and Vishny, 1990) or are ill-judged exercises in managerial hubris (Roll, 1986; Malmendier and Tate, 2008). The empirical evidence reflects these divergent predictions. Some studies show improvements in labour productivity (Haynes and Thompson, 1999; Lichtenberg and Siegel, 1992; McGuckin and Nguyen, 1995) whilst others report that labour productivity declines after M&A (Harris and Robinson, 2002; Hanley and Zervos, 2007).

This paper provides new evidence on the productivity effects of takeovers based on an investigation of UK M&A over the period 1990-2023, inclusive. It examines whether labour productivity increases post-takeover, relative to a wider group of similar firms. The aim is to clarify whether changes in productivity are due to workforce rationalisations achieved through post-acquisition restructuring activities.¹ Recent US evidence indicates that M&A are typically followed by rationalisation in the form of plant divestments, shut-downs, lay-offs, and restructuring of organisational hierarchies and divisions, all of which are associated with performance improvements (Maksimovic and Phillips, 2001; Maksimovic, Phillips and Prabhala, 2011). However, to the best of our knowledge, no study has investigated the

¹ It is widely recognised that M&A transactions can be driven by managerial desire to build empires and maximise firm size (Jensen, 1986). Managers have incentives to increase their workforce, but this can result in inefficiency (Bertrand and Mullainathan, 2003). Furthermore, incumbent management may develop loyalties to employees (Pagano and Volpin, 2005). So it is also possible that M&A transactions are a mechanism for resolving such agency problems. Thus, removal of 'empire building' and enjoyment of the 'quiet-life' may reduce employment levels which are sub-optimal.

specific link between labour productivity improvements and employment change post-merger, which is the central focus of this paper.

We apply the difference-in-differences methodology to analyse acquirers' labour productivity performance compared to non-merging control firms. The latter are selected according to several observed variables (Barber and Lyon, 1996, Li, 2013) and the propensity score (probability) of making acquisitions (Lehto and Böckerman, 2008, Egger and Hahn, 2010).

Our results show that in general acquisitions lead to labour productivity improvements, relative to the performance of the non-merging control firms. The results also indicate that post-merger workforce growth is more likely associated with labour productivity improvement, while workforce reductions do not lead to post-merger performance improvement. In contrast, labour cost savings through merger-related workforce reductions negatively impact firm performance. The results also show that workforce reductions are achieved through both employee layoffs and asset divestments, though it is difficult to quantify the relative importance of each. Nonetheless, our results highlight the importance of 'allocational takeovers' (Jovanovic and Rousseau, 2008).

This paper contributes to the literature in several respects. We add to the limited evidence on the effects of M&A on efficiency and suggest refinements to the view found in previous research that M&A generally lead to improved productivity (McGuckin and Nguyen, 2001, Maksimovic and Phillips, 2001, Li, 2013). Our results show that those M&A transactions that increase employment generate better labour productivity outcomes, but acquirers that make cost savings through workforce reductions do not achieve labour productivity improvement. Our findings reinforce one perspective found in the literature to date viz. that M&A can serve as a mechanism for 'dismantling' large inefficient firms (Lichtenberg and Siegel, 1992, McGuckin and Nguyen, 1995, and Harris and Robinson,

2002). Finally, the use of difference-in-difference econometric methodology, coupled with propensity score matching, represents an important innovation in the M&A literature because it overcomes two fundamental problems associated with analysing the performance consequences of M&A: missing counterfactual data and endogeneity due to self-selection of merging firms (Caliendo and Kopeinig, 2008; Eggar and Hahn, 2010). Consequently, we can identify the extent of productivity changes due to takeovers with a reasonable degree of confidence.

The remainder of this paper is organised as follows. The next section discusses the impact of M&A on labour productivity and the role of workforce adjustments in moderating this impact. In section 3 we explain our sample, data and research methods, before presenting our results in section 4. The final section summarises our main findings and discusses their theoretical implications.

2. Labour Productivity Consequences of Mergers and Acquisitions

The literature indicates that M&A may impact on productivity through transmission mechanisms that are linked to the motives for these transactions. The dominant economic perspective is that they are designed to improve efficiency by disciplining under-performing managers in targeted firms (Manne, 1965; Lichtenberg and Siegel, 1992; Jovanovic and Rousseau, 2008; Maksimovic, Phillips and Prabhala, 2011). Removal of under-performing incumbent management enables the transfer of assets to directors who can deploy them more efficiently. Lichtenberg and Siegel (1992) and Siegel and Simons (2010) argue that poor alignment between plants and their parent companies can adversely affect productivity which necessitates ownership change. These transactions often involve large firms with relatively low productivity (Lichtenberg and Siegel, 1992). Overall, the prediction is that post-acquisition performance will improve when ownership change transfers corporate assets to more efficient users.

An alternative theory suggests it is the quest for synergistic gains which motivates M&A.² According to this view, acquirers select targets with better performance, to enhance post-merger performance of the combined firm (McGuckin and Nguyen, 1995). Acquisition of more productive companies may facilitate rationalisation of production across the combined firms and/or may generate economies of scale. However, the productivity consequences of such transactions might be ambiguous: acquirers might be unable to further improve combined performance due to “difficulties associated with assimilating these established plants into the new organisation” (Harris and Robinson, 2002: 562). It is possible that difficulties in digesting the acquisition -- arising perhaps from cultural differences between the merging firms -- will inhibit productivity gains (Weber, 1996).

Other perspectives are consistent with the view that M&A have negative effects on productivity because, for example, managers undertake transactions to maximise their own welfare (Morck, Shleifer and Vishny, 1990). These private benefits might involve ‘empire building’ (Jensen, 1986), employment protection through corporate diversification (Morck, Shleifer and Vishny, 1990) or achievement of the ‘quiet-life’ (Bertrand and Mullainathan, 2003). Transactions motivated by these aims may lead to employment growth and inefficiencies because managers are unwilling to embark on post-transaction rationalisation. Schoar (2002), for instance, finds that acquirers pursuing a diversification strategy experience net reductions in their productivity.³

² In such cases, synergy effects may enable merging firms to use lower level of employment to produce their combined output, leading to decrease in labour demand and resulting workforce reductions post-merger. Thus, synergy created by merging two businesses could be another source of labour productivity improvement. Synergy – economies of scale or scope – could be achieved through altering the input-output relationship in the production process after merging two businesses. In particular, acquirers could achieve labour cost savings through merging departments, eliminating entire sub-units or tasks and increasing spans of direct control.

³ In addition to the above, some commentators have argued that takeovers may happen to facilitate wealth transfer from employees to shareholders (Shleifer and Summers, 1988; Pagano and Volpin, 2005). However, this view is related to hostile takeovers.

Finally, some scholars have suggested that mergers occur because of managerial hubris, whereby managers systematically over-estimate their own managerial capabilities or the gains resulting from their deals (Roll, 1986; Malmendier and Tate, 2008). Recouping of such overpayments may necessitate the implementation of more stringent labour policy, including substantial workforce reductions during the post-merger period, which may negatively affect labour performance (Krishnan, Hitt and Park, 2007).

Empirical evidence on the productivity consequences of M&A activity is similarly inconsistent. Most US studies report that plants subject to changes in ownership experience higher productivity growth rates compared to those that do not (Lichtenberg and Siegel, 1992; McGuckin and Nguyen, 1995; Maksimovic and Phillips, 2001 and Maksimovic, Phillips and Prabhala, 2011).⁴ Additional evidence suggests that bank mergers improve productivity (Haynes and Thompson, 1999; Egger and Nahn, 2010). Further afield, Bertrand and Zitouna (2008) and Siegel and Simmons (2010) show that ownership change leads to improvement in labour productivity, in France and Sweden, respectively, while in Germany Weche Gelubcke (2012) report that domestic acquisitions have a positive effect on company performance. Further studies, showing that M&A result in greater reductions in labour compared to output, provide additional indirect evidence that these transactions generate improvements in labour productivity (Conyon *et al.*, 2002, 2004; Gugler and Yurtoglu 2004).

Only a few studies have analysed in detail the mechanisms by which such gains are achieved. Devos, Kadapakkam and Krishnamurthy (2009) show that M&A generate efficiency gains through cutbacks in investment expenditure, which could be achieved with more efficient resource allocation. This result is supported by Li (2013) who reports that acquirers reduce capital expenditure, wages, and employment. Because output remains

⁴ Most of these studies analyse the performance of the acquired plants, not overall performance of the acquiring (combined) firms. As discussed below, other studies, which analyse the overall productivity of the acquiring (combined) firms, report decline in post-merger productivity (Schoar, 2002, Hanley and Zervos, 2007).

unchanged, these actions increase labour productivity. Maksimovic, Phillips and Prabhala (2011) show that acquirers undertake substantial corporate restructuring immediately after M&A: they selectively choose and retain only those plants in which they have comparative advantage.

Conversely, alternative evidence highlights productivity decline after mergers (Shoar 2002, Harris and Robinson, 2002). Shoar (2002) draws attention to the ‘new toy’ effect: transferring resources to improve performance in newly acquired plant has a deleterious effect on performance in existing plants. Harris and Robinson (2002) report that plants purchased by domestic acquirers experience productivity declines. Similarly, Hanley and Zervos (2007) find that acquisition in the UK leads to reductions in labour productivity, which they attribute to high adjustment costs of acquisitions, whilst Balsvik and Haller (2010) show that Norwegian plants acquired by domestic firms do not experience any productivity improvement.

Nonetheless, post-merger restructuring activities that lead to workforce rationalisation can be important sources of productivity gains (Siegel and Simons, 2010). One explanation is that M&A may alter input-output relations resulting in the combined firm producing the same output with less labour (Li, 2013). Organisational downsizing after M&A, including, for example, employee redundancies and divestment of unprofitable or low-productivity units, may compound these effects. Alternatively, acquirers may lay-off employees post-merger to realise synergistic gains (Conyon *et al.*, 2002), or to correct prior labour inefficiencies (Pagano and Volpin, 2005).

Sometimes M&A is the beginning of a broader reorientation strategy which resets the boundaries of the acquiring firm Maksimovic, Phillips and Prabhala (2011). Their results show that acquirers undertake substantial restructuring immediately after M&A, selling 27% and closing 19% of acquired plant, respectively. In so doing, firms retain assets in which

they have a comparative advantage, but sell (unproductive) assets in which they do not (Maksimovic and Phillips, 2002; Maksimovic, Phillips and Prabhala, 2011). Prior UK evidence also shows that acquirers undertake large scale asset restructuring including, asset divestments and sell-offs (Franks and Mayer 1996; Haynes, Thompson and Wright, 2000; Conyon *et al.*, 2004). Thus, although post-merger output declines compared to pre-merger output (Conyon *et al.*, 2002, Gugler *et al.*, 2003) labour productivity and overall firm performance improves because acquirers effect even more greater reductions in the workforce (Siegel and Simons, 2010).

In sum, different M&A transactions create varying degrees of scope for restructuring and efficiency improvement and these, in turn, depend on managerial objectives and the motives for takeover (Bower, 2001). Consequently, the direction and the extent of post-merger workforce adjustment depends on the factors driving these transactions: efficiency and synergy motives require proportionately greater reductions in the workforce compared to output, whereas the opposite can be expected to apply were ‘managerialist’ motives are paramount.

Research further indicates that target, deal, acquirer and industry characteristics are also important determinants of post-takeover employment reduction. Target firm characteristics include pre-takeover profitability and relative size. When profitability and/or labour productivity in the acquired firm is low, acquirers attempt to improve efficiency through corporate restructurings and undertake large workforce reductions (O’Shaughnessy and Flanagan, 1998, Krishnan, Hitt and Park, 2007). The evidence also suggests that target relative size determines the extent of post-takeover restructuring: small firms are more likely to be acquired for synergetic gains, whereas large firms are more likely to be purchased for disciplining motives (Lichtenberg and Siegel, 1992, McGuckin and Nguyen, 1995, and asset and Robinson, 2002). Deal characteristics include industry relatedness, target firm managers’

attitude towards the deal (hostility) and payment method. Conyon *et al.* (2002) and Gugler and Yurtoglu (2004) show that takeovers involving firms in related industries create higher scope for rationalisation, leading to larger workforce reductions. Hostility may arise as a result of target firm managers' disagreement with the acquirers' restructuring plans, which, if implemented, may lead to employment reductions (Franks and Mayer, 1996). Krishnan, Hitt and Park (2007) and Maksimovic, Phillips and Prabhala (2011) argue that merger-related cash payments lead to employee lay-off and divestment decisions by increasing the financial constraints on acquirers. Characteristics of acquirers include large premiums and high leverage, possibly arising from managerial objectives and hubris as well as debt-financed cash payments. Both large premium and high leverage have predicted post-merger restructuring (Krishnan, Hitt and Park, 2007). Finally, industry characteristics, such as capital intensity, and have also been implicated as determinants of workforce reductions (Maksimovic, Phillips and Prabhala, 2011).

The extant evidence on the determinants of post-merger workforce rationalisation highlights the role of takeover motives. For example, Krishnan, Hitt and Park (2007) distinguish between complementarity (expansion), efficiency (cost savings), and market power motives, and show that both complementarity and efficiency (contrary to the expectations) motives are negatively associated with workforce reductions. Other studies reach the conclusions based on post-transaction performance. For example, Lichtenberg and Siegel (1992) support the disciplining motive, while McGuckin and Nguyen (1995) suggest that a primary motive for takeovers is synergy. Some authors state that many takeovers are motivated by efficiency improvement objectives, though they do not specify whether this is due to disciplining or synergy (Harris and Robinson, 2002, Conyon *et al.*, 2002, Devos, Kadapakkam and Krishnamurthy, 2009). In contrast, Ouimet and Zarutskie (2012) conclude that some firms are motivated by growth to pursue M&A. The results of Morck, Shleifer and

Vishny (1990) suggest that takeovers could be undertaken for ‘empire building’ purposes, whereas Maksimovic, Phillips and Prabhala (2011) conclude that their own results are less consistent with ‘empire building’ motive.

In this paper we assess the extent to which workforce rationalisation during the post-merger restructuring process generates productivity gains. Specifically, we compare the labour productivity consequences of mergers that lead to *workforce reductions* (WFR), and *workforce growth* (WFG), the workforce, respectively. We also investigate explanations for possible variations in the labour productivity of the WFR and WFG subsamples, focusing particularly on the relative importance of employee layoffs and asset divestments in workforce rationalisation. Finally, we discuss the factors that lead to employee layoffs and asset divestments to better understand the relationship between the motives for takeover and their effects on workforce rationalisations. Empirical evidence from this analysis provides useful information on the disciplinary role of takeovers for large publicly listed firms.

3. Methodology

3.1 Sample and data

The initial population for the study is all takeovers of firms listed on the London Stock Exchange by London-listed companies during the period 1990-2023, inclusive. Within the population of UK domestic takeovers, we exclude those with the following characteristics: acquisitions of less than 50% of target shares; takeovers by private or newly established companies, including management buy-outs and acquisitions by private equity or venture capital firms; takeovers involving property management, financial (banks, insurance firms and investment trusts) and utility companies.⁵ Foreign acquisitions are excluded because of poor data availability after takeovers. Takeovers undertaken by serial or multiple acquirers

⁵ This follows the conventions in the finance literature. Financial and property companies are excluded because they are subject to different accounting requirements. Utilities are subject to special regulatory regimes, including the regulation of takeovers.

are also excluded.⁶ Consequently, any employment growth observed in the sample can be attributed to organic growth rather than further acquisition. This selection policy generated a final sample of 451 takeovers. Table 1 shows the descriptive analysis of the sample.⁷

Insert Table 1 about here

Data on takeovers were obtained from *the Workspace*. These data include the names of merging firms, takeover announcement dates, takeover completion dates and other relevant variables. Operational and financial data, including the number of workers, performance data, and company accounts, were retrieved from *Datastream*. Seven years of data comprising three years before and three years after the completion of the takeover, and the event itself, were collected for each case.

3.2 Difference-in-Differences Estimation

Our objective is to estimate the impact of M&A on productivity performance. As it is impossible to observe potential performance outcomes (with and without acquisition) for the same firm at the same time, we need to construct a counterfactual to proxy the expected outcome of the acquirer based on the assumption that its performance would have been equivalent to that of a similar, non-merging, control firm. This counterfactual can be constructed by using the performance of a firm which is similar to the acquiring firm, but which has not been involved in a merger around the time of the sampled M&A transaction.

We apply the differences-in-differences (DiD) method, by using Stata's *xtdidregress* command, to measure the effect of an acquisition on the acquirers' performance. This

⁶ Only one acquisition per acquirer within any three consecutive years has been allowed, and we excluded acquirers undertaking any further M&A (for example, acquisition of another UK publicly listed firm) during the three post-takeover years.

⁷ In the sample there are takeovers observed in 27 of 38 industrial sectors. 8 of the 11 sectors not present are those have been excluded by the sampling criteria (finance, property, and utilities). The three other sectors are alternative energy, forestry and paper, and tobacco. There were no takeovers in alternative energy in the 1990s. All other industries are represented in the sample.

technique estimates the relative performance change in the acquiring firm as the difference in performance between the acquirer and the control firm:

$$\Delta P_{t+s} = (y_{t+s}^A - y_{t-1}^A) - (y_{t+s}^C - y_{t-1}^C) \quad (1)$$

where ΔP_{t+s} indicates the performance change from pre-takeover period to post-takeover period (s years after the merger completion year); y_{t+s}^A indicates acquirers' performance during post-merger years; y_{t-1}^A indicates the joint performance of acquirer and acquired firm during the pre-takeover year; y_{t+s}^C indicates non-merging control firm' performance during post-merger years, and y_{t-1}^C indicates non-merging control firms' performance during the pre-takeover period.

The DiD method compares the difference in average behaviour for the merging firms, before and after M&A, with that of non-merging control firms over the same period. The DiD technique, therefore, takes into account both the differences between the acquiring and control firms and the differences within these two groups before and after acquisition. This method shows the average effect of acquisition on merging firms by removing unobservable individual effects and common macro effects.⁸ To estimate DiD with regression methods we create a merger dummy to differentiate between merging and non-merging control firms, and another dummy ($Post_t$) to distinguish between pre- and post-takeover periods for both merging and control firms. The interaction between the merger and post-merger dummies compares the difference in the pre- and post-takeover performances for merging firms with the similar difference in the pre- and post-takeover performances for control firms. The coefficients are estimated using the following regression model:

$$y_{it} = \alpha + \beta_1 Acquirer_i + \beta_2 Post_t + \beta_3 Acquirer_i * Post_t + BControl + \varepsilon \quad (2)$$

⁸ This method has been extensively used in M&A research, especially when analysing the employment and performance consequences of foreign acquisitions (Karpaty, 2007, Bandick and Karpaty, 2011; Bertrand and Zitouna, 2008).

where y_{it} is labour productivity, $Acquirer_i$ is a dummy variable that takes a value of 1 for the acquiring firms and 0 for control firms; $Post_t$ is a dummy variable that takes a value of 1 for post-merger years and 0 for pre-merger years, for both acquiring and control firms; $Acquirer_i * Post_t$ captures the interaction between acquirer dummy and post-merger period dummy, and $Control$ includes observable firm specific control variables.

In the regression models we control for the size of firms, their capital intensity, and market share. Size is measured by the firm's *Total Assets* value at the beginning of each year. *Capital intensity* is computed as the ratio of net book value of fixed assets to the average annual number of employees. In addition, we control for time effects by introducing a set of year dummies, as our sample data ranges from 1990 to 2023. The coefficient of primary interest in this regression is the coefficient (β_3) of the interaction term ($Acquirer_i * Post_t$), which captures differences in the pre and post-takeover performance of merging and control firms.⁹

3.3 Combining DiD with Matching Methods

The assumption that the performance outcome of a similar firm could be used to estimate the counterfactual outcome may not work within a non-experimental framework, such as M&A. Furthermore, the DiD approach by using the firm performance, size and industry matched firms may still produce biased results. It is well known that such transactions are not random: the decision to effect M&A depends on a range of pre-acquisition characteristics (for example, mergers may involve better-performing firms), which may also determine post-acquisition performance. This self-selection causes endogeneity problems because it is possible that productivity would have improved *irrespective* of the transaction. For example,

⁹ In order to investigate the dynamic effect of takeover on labour demand we use also interact the acquirer dummy with annual post-merger dummies.

if acquirers select better-performing targets, their improved post-transaction performance may be due simply to a selection effect rather than the actual M&A transaction.

To deal with these counterfactual and self-selection problems, we combine DiD estimation with the two different control firm matching methods (Blundell and Costa Dias 2000, Karpaty, 2007). We begin by selecting our matching firms on the basis of three dimensions: industry, size and operating performance one year prior to the takeover year (Barber and Lyon, 1996, Li, 2013).¹⁰ Then we exclude any matched firms involved in M&A transactions in the two years before the sample M&A transaction and three years afterwards. In total, we select a sample of 470 non-merging control firms.

It could be argued that the matching process needs to consider the full range of covariates to mitigate potential bias. Consequently, we also use an alternative approach - Propensity Score Matching (PSM) to select control firms. The propensity score is defined as the probability that a unit in the combined sample of treated and untreated units receives ‘the treatment’ (i.e. makes an acquisition of a large publicly listed firm), given a set of observable variables (Rosenbaum and Rubin, 1983). It is a single index which summarises all relevant observable variables. As the probability of assignment to ‘the treatment’ can substitute for the missing counterfactual, this method will produce valid matches for estimating the impact of ‘the treatment’ (Rosenbaum and Rubin, 1983).

3.5 Determinants of Post-merger Workforce Reductions

We identify the factors which affect the propensity of post-merger firms to reduce their workforce. To do this, we estimate a probit model in which the dependent variable is a binary variable that takes a value of 1 for the acquirers in the WFR subsample and 0 for the rest. We use a number of target, acquirer, and several deal characteristics among the regressors.

¹⁰ Pre-takeover operating performance is defined with Return on Assets, defined as Earnings before Interest, Taxes and Depreciation (EBITDA) scaled Total Assets.

Target and acquirer characteristics include pre-takeover firm profitability and labour efficiency. Firm profitability is measured with Return on Assets (ROA), and is defined as EBITDA divided by the book value of Total Assets at the beginning of the year. We adjust this measure with the relevant performance measure of the median firm in the same industry and use the median of three year pre-takeover performance. Labour efficiency is measured with RLP, as previously defined.

Furthermore, we control for pre-takeover wage, size, capital intensity and leverage. Average wage is computed by dividing each firm's total staff costs by the number of employees in the year prior to takeover completion. We control for target size, using the Target Relative Employment Size, which is the ratio of employment in the acquired firm to the acquiring firm in the year immediately prior to the takeover. At the same time, Acquirer Size is measured using total sales volume in the pre-takeover year. Acquisitions in capital-intensive industries may result in lower workforce reductions compared to those in labour-intensive industries; therefore we control for the acquirer's Capital Intensity, as indicated above. Higher levels of debt restrict free cash flows and may encourage greater workforce reductions, therefore it is important to control for the acquirer's Leverage -- defined as the ratio of total debt to total assets at the end of the takeover completion year.

We also analyse the ways by which workforce reductions are achieved, comparing employee layoffs or asset divestment. For this purpose we collected appropriate data from the *Financial Times* and other national newspapers, downloaded via the Nexis® database, following the methodology adopted in prior research (O'Shaughnessy and Flanagan, 1998; Krishnan, Hitt and Park, 2007).¹¹ Analysis of newspaper commentary up to three years after the takeover completion date resulted in media reports of employee lay-offs in 101 (43%)

¹¹ Other sources used include the *Times and Sunday Times*, *Guardian*, *Independent*, *Lloyd's List* and the *Observer*.

acquirers, and asset divestment in 66 acquirers (28%) out of 376 acquisitions. On average, acquirers laid off about 7.82% (median = 6.6%) of their post-merger workforce. The Employee Lay-offs dummy refers to acquirers that lay-off at least 1% of the workforce of the merged firms. Fifty four acquirers made significant divestments by the end of Year 1 and a further 12 acquirers made divestments by the end of Year 3.

Table 2 provides descriptive statistics for these variables and Appendix 1 provides a correlation matrix for these variables.

 Insert Table 2 here

4. Results

4.1 *Post-merger Change in Labour Productivity, Employment, and Output*

Table 4 reports changes in post-takeover productivity, employment, and output relative to their pre-takeover levels, where the latter was created by combining the acquired and acquiring firm variables at the end of the year before the takeover completion year. These initial results indicate that productivity change is positive but is not significant by the end of the first and third years. Meanwhile, output change is insignificant in all years whilst employment change is negative but significant only in the third year. Productivity change is positive and significant in the sub-sample of firms that reduce employment, with output falling less than employment. By contrast, in the sub-sample of firms where employment increases, productivity barely changes.

 Insert Table 3 here

4.2 *Matching control firms based on the PSM method*

The PSM method requires first the estimation of a propensity score which, in our case, measures the probability of making an acquisition conditional on a set of characteristics of the firms before takeover (such as firm size (measured with sales), profitability, labour productivity, capital (measured with total assets), average wage, leverage, labour cost over assets, capital intensity, and event year).¹² We use a programme proposed by Leuven and Sianesi (2006) which employs a kernel-based matching estimator (Heckman, Ichimura and Todd, 1998).¹³ This method estimates propensity scores derived from multiple matches to calculate a weighted mean which is then used as a counterfactual. Then we estimate the productivity impact of acquisition as the difference in performance change for these two groups. Because we are interested in changes in acquirers' performance, we report the Average Treatment Effect on the Treated (ATET) acquiring firms. This methodology has been extensively used in the M&A literature, especially to analyse the employment and performance effects of foreign acquisitions (Lehto and Böckerman, 2008, Egger and Hahn, 2010, Balsvik and Haller, 2010; Weche Gelubcke, 2012).

The results of the propensity score estimations and the results of efficiency tests are given in Table 4. Table 4 Panel A shows the results of corresponding logit estimates for the full sample and two subsamples. Table 4 Panel B reports the t-tests for the differences in the individual variables between merging and control firms before and after mating. These results suggest that there are no significant differences in the variables after matching and the PSM technique significantly reduces bias. Table 4 Panel C reports p-values from likelihood-ratio tests which test whether the variables jointly explain the propensity of making an acquisition.

¹² Because we are interested in performance change in acquiring firms, we should select those matched firms that are similar to acquirers.

¹³ We also use other approaches, such as nearest-neighbour and the results show qualitatively similar outcomes.

The large p-values after matching indicate the joint insignificance of covariates in explaining the propensity of making an acquisition.

As in other studies, the ATET was estimated in performance changes after takeovers: we compute performance changes from pre-takeover to post-takeover years for both acquirer and matched control firms and then find the difference in these changes (Bandick and Karpaty, 2011; Weche Gelubcke, 2012). The ATET could also be estimated in the performance levels, instead of performance changes. However, Barber and Lyon (1996) conclude that the test statistics using the change in a firm's operating performance relative to an appropriate benchmark consistently yield more powerful test statistics than do those based on the level of a firm's operating performance relative to the same benchmark. Therefore, we estimate the ATET in the performance changes, rather than in performance levels.

We check the efficiency of the matching process to verify the balancing property for each independent variable. This involves testing the difference for each independent variable between the acquirer and selected control firm and also their joint distribution (whether the variables are not jointly significant in explaining the propensity score).

Consistent with the results reported in Table 4, unmatched differences between the performance of acquirers and non-acquirers show that the former slightly outperforms the latter. However, when acquirers are matched with non-acquirers using propensity scores, the difference is not significant in any post-takeover year. Thus, our ATET estimates suggest that on average, M&A transactions do not improve labour productivity.

Insert Table 4 here

4.3 *The Labour Productivity Effects of Mergers*

Table 5 reports the results obtained by comparing acquirers' post-acquisition labour productivity with that of non-merging control firms, using DiD estimation.¹⁴ Models 1 and 2 show that interaction effects between the acquirer and post-takeover period dummy are highly significant when we use control firms matched based on the pre-takeover performance, size, and industry variables. This suggests that acquiring firms achieve significant improvement in the labour productivity performance in comparison to the performance of the control firms.

Models 3 and 4 of Table 5 report ATET estimates based on the PSM method. These regression results show similar results when we use the PSM method, though the significant level is lower when we use year dummy variables as the control variable (in Model 4).

Insert Table 5 here

4.4 *Labour Productivity changes in the WFR and WFG sub-samples*

To further investigate the impact of employment change on post-merger productivity performance, we analysed productivity changes in the two sub-samples – WFR and WFG. First, we divide our full sample into two sub-samples: WFR, in which post-merger combined employment levels decline relative to the pre-takeover employment level, and WFG, where post-merger employment levels grow relative to the pre-merger employment level one year after the takeover completion year. We compute employment change by comparing the pre-takeover combined employment of the acquired and the acquiring firm with the post-takeover level of employment of the acquiring firm. Following Davis et al. (2011), we divide the

¹⁴ Clustered standard errors are used to minimise the dangers of serial correlation that can arise when panel data is used to derive DiD estimates (Bertrand, Duflo and Mullainathan, 2004). We conduct these regressions by using *xtdidregress* command in Stata.

difference between post- and pre-takeover employment with their average value, to create a measure of percentage change that is symmetric on either side of zero. Tables 6 and 7 show the employment and sales size characteristics of target and acquiring firms in the WFR and WFG sub-samples.

Table 6 reports the results when WFR acquirers' productivity is compared with that of the control group. The results indicate that the interaction term between the WFR acquirer dummy and the post-merger period dummy is negative and significant (in Model 1) when we use control firms matched based on the pre-takeover performance, size, and industry variables. This suggests that acquiring firms achieve significant deterioration in the labour productivity performance in comparison to the performance of the control firms. This coefficient indicates that acquirers that reduce workforce achieve 1.4% decline in their labour productivity compared to non-merging control firms. When we control for the time period (by including year dummies) the interaction term between the WFR acquirer dummy and the post-merger period dummy becomes insignificant.

Models 3 and 4 report the results of the ATET estimates based on the PSM method. In contrast to the above results, Model 1 of Table 6 also indicates that mergers that reduce employment significantly improve labour productivity. It shows that workforce-reducing acquirers achieve 1.1% better performance in Year 1. However, Model 4 shows that this labour productivity difference is not significant, when we include year dummies in the regression.

Insert Table 6 here

Table 7 reports the corresponding results for the sub-sample that increased employment after the takeover. Here, the interaction term between the WFG dummy and the post-takeover period dummy is positive and significant (in Model 1), using DiD method with

the performance, size and industry-matched firms, suggesting labour productivity rationalisation may happen after such acquisitions. Such labour productivity could be due to an increase in sales growth as a result of synergetic gains. However, we control for the year dummy, this interaction becomes insignificant (Model 2).

The ATET results based on the PSM method (Models 3 and 4) also show productivity improvements for this group of acquirers; labour productivity increases by around 5% in the acquisitions with employment growth.

Insert Table 7 here

To summarise, our results indicate substantial differences in productivity outcomes between the WFR and WFG sub-samples, suggesting that workforce rationalisations are necessary to improve productivity after mergers. This finding is consonant with prior research that stresses the positive role of M&A transactions on efficiency gains (Maksimovic, Phillips and Prabhala, 2011). Our results are also consistent with the suggestion that productivity improvements result from the acquirers' more efficient use of various inputs, including labour input (Li, 2013). Additionally, our results further suggest that M&A transactions generate productivity gains only when combined with post-merger workforce rationalisation strategies. Thus, post-merger corporate restructuring could be one of the main sources of productivity gain.

Given these findings, it is useful to examine the determinants of post-takeover employment reduction; this will aid our understanding of the reasons for productivity enhancements and the context in which they occur. To achieve this we investigate the extent to which target, acquirer, and deal characteristics determine workforce reductions. Additionally, we assess the extent to which workforce reductions are due to employee layoffs (job losses) or asset divestments (job transfers).

5. Conclusions

This study shows that when M&A transactions are considered homogenous events, acquirers improve their productivity performance post-merger in comparison to non-merging control firms. However, when the full sample is split into two subsamples, the results show that the WFG acquirers achieve significant performance improvements, while, at best, the WFR acquirers' labour productivity does not change. The substantial differences in the performance of these two subsamples suggest that M&A which creates more scope for workforce rationalisation through post-merger restructuring generate more productivity gains.

The results suggest that the WFG acquirers achieve productivity gains through the rationalisation of their workforce and by generating synergetic gains. Consistent with Maksimovic, Phillips and Prabhala (2011), we found that WFR acquirers undertake extensive restructuring activities post-merger. In this process, they achieve larger workforce reductions relative to output decline during the post-merger period. The descriptive analysis (Table 4) shows that in the WFR subsample, post-merger employment reduction is larger in comparison to output reduction, while in the WFG subsample, both employment and output increase. Therefore, we conclude that post-merger restructuring activities, including employee redundancies and divestments, facilitate productivity improvements. This could be because acquirers keep (sell) those assets in which they have a comparative advantage (disadvantage) (Maksimovic, Phillips and Prabhala, 2011). The positive performance change in the WFR acquirers implies that these firms do engage in selective restructuring following M&A.

Because our results highlight the importance of workforce rationalisation to productivity improvement, we analyse the driving factors that generate such reductions and

the strategies employed to optimise labour input. Our results indicate that workforce reductions are made in larger and poorer-performing targets. Furthermore, consistent with Maksimovic, Phillips and Prabhala (2011), our results show that acquirers' financial constraints and cash shortages affect workforce reduction decisions. Acquirers with higher levels of debt, as well as those who pay with cash, are more likely to undertake workforce reductions. Furthermore, takeover objectives also determine restructuring decisions: for example, takeovers motivated by horizontal growth are less likely to result in workforce reductions.

We also consider the relative importance of strategies employed to achieve organisational downsizing -- employee redundancies and divestments. The literature recognises that new managers may be able to reduce labour demand post-merger (Conyon *et al.*, 2002; Gugler and Yurtoglu, 2004) by instituting better labour management practices (Pagano and Volpin, 2005), and by engaging in employee redundancy (Lehto and Böckerman, 2008). It is also recognised that M&A can initiate a rigorous restructuring process, involving divestment of under-performing units, by which a firm's boundaries are re-drawn to secure comparative advantage (Maksimovic, Phillips and Prabhala, 2011).

Our results are also consistent with other evidence which suggests that management disciplining motives are a key determinant of the acquisition of large under-performing firms; conversely, smaller firms (usually firms with good growth prospects), are acquired for synergy or growth purposes (Lichtenberg and Siegel, 1992; McGuckin and Nguyen, 1995). This suggests that workforce reductions are made in larger, but poorly performing firms, while workforce growth may occur after mergers that involve smaller, but better-performing, targets.

Overall, our results suggest that the impact of M&A transactions on labour productivity depends on the extent of corporate restructuring in general and post-merger

workforce adjustments in particular. Workforce reductions in larger, but poorer-performing targets, enable acquirers to achieve larger productivity gains. This evidence supports the view that the takeover activities could serve as an important corporate governance role - they discipline underperforming managers when necessary and reallocate assets to more efficient users. In particular, the need for downsizing may be inherent in the governance structure of acquired firms. In sum, our results refine prior research – which suggests that all mergers lead to labour efficiency improvements – because we highlight the importance of post-merger corporate restructuring to achieve observed productivity gains.

Table 1. Descriptive statistics of the merging firms

		<u>Acquiring firms</u>	<u>Matched acquiring firms</u>	<u>Acquired firms</u>	<u>Matched acquired firms</u>
Number of employees	Mean	13,088	9,214	3,313	2,088
	Median	2,975	2,661	770	706
Sales	Mean	1,425,712	989,708	339,693	248,979
	Median	338,215	270,639	77,965	80,022
Sales per worker	Mean	133.85	145.82	147.05	153.30
	Median	97.86	94.00	94.89	94.00
Value-added per worker	Mean	49.22	44.12	45.62	45.99
	Median	35.49	35.09	30.61	32.44
Profit per worker	Mean	26.17	23.60	22.41	20.85
	Median	12.29	11.84	9.30	10.17

Notes: All financial values are expressed in real terms (2015 pounds sterling) and in £'000. Number of employees represents the annual average number of both full- and part-time employees of the company. RLP indicates Relative Labour Productivity. The combined firm performance indicates weighted average performance for the acquired and acquiring firms during the pre-takeover years and the acquiring firm performance during the post-takeover years.

Table 2. Descriptive statistics for control variables

	<u>Full sample</u>			<u>WFR sub-sample</u>			<u>WFG sub-sample</u>		
	Mean	Med	SD	Mean	Med	SD	Mean	Med	SD
Panel A: Control variables									
Acquirer sales size (log transformed)	12.67	12.73	1.84	12.92	12.78	1.94	12.55	12.61	1.74
Acquirer pre-takeover ROA (unadjusted, %)	0.20	0.18	0.22	0.20	0.18	0.27	0.21	0.19	0.15
Acquirer pre-takeover average wage (£000)	23.04	22.11	9.77	22.77	21.68	10.53	23.44	22.96	8.57
Relative employment size (ratio)	0.81	0.35	1.78	1.05	0.44	2.27	0.52	0.21	0.83
Acquirer capital intensity (£000 per employee)	82	23	393	86	27	487	78	25	242
Acquirer leverage (ratio)	0.45	0.46	0.18	0.48	0.50	0.19	0.42	0.42	0.17
Panel B: Descriptive statistics on employee layoffs and divestments									
Percentage of laid off employees post-merger (%)	-7.82	-6.06	6.96	-5.40	-2.84	6.38	-0.75	0.00	2.79
Acquirers that announce employee lay-offs (number)	101			89			12		
Divestments by the end of Year 1 (number)	54			46			8		
Divestments by the end of Year 3 (number)	66			55			11		

Table 3. Post-takeover changes in employment, sales, labour productivity and RLP

Change from Year -1 to:	Full sample			WFR sub-sample			WFG sub-sample		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Employment change	-0.030	-0.058	-0.089**	-0.250***	-0.336***	-0.381***	0.229***	0.265***	0.264***
t-statistics	-1.28	-1.77	-2.36	-9.29	-8.25	-7.82	10.66	9.57	8.06
Sales change	-0.009	0.001	-0.042	-0.204***	-0.238***	-0.291***	0.220***	0.279***	0.259***
t-statistics	-0.37	0.04	-1.05	-6.32	-5.69	-5.21	8.13	8.03	6.22
Labour productivity change	0.020	0.059***	0.047	0.046	0.098***	0.090*	-0.010	0.014	-0.005
t-statistics	1.07	2.96	1.82	1.53	3.30	2.31	-0.47	0.54	-0.18
RLP change	0.008	0.046*	0.000	0.025	0.076**	0.034	-0.013	0.010	-0.041
t-statistics	0.43	1.96	0.02	0.71	2.56	0.92	-0.32	0.33	-1.05

Notes: This table reports percentage changes in the relevant variables in Years 1, 2 and 3, relative to the pre-takeover (Year -1) level. Labour productivity is defined as sales divided by employment. RLP indicates Relative Labour Productivity, which is defined as a firm labour productivity scaled by its industry median labour productivity. The percentage changes are computed as in Davis *et al.* (2011). Significance levels: *p<0.05, **p<0.01, ***p<0.001.

Table 4. Propensity score estimation results**Panel A:** Probit regressions to determine the PSM

	Full sample	WFR sample	WFG sample
Pre-takeover Sales	-0.401***	-0.553***	-0.402**
Pre-takeover ROA	1.036**	1.003	1.363*
Pre-takeover Total Assets	0.701***	0.820***	0.734***
Pre-takeover wage	0.085	0.276*	-0.053
Pre-takeover leverage	-1.371***	-1.496*	-1.331*
Pre-takeover labour cost over assets	-0.411	-0.899	-0.418
Capital intensity	-0.197***	-0.288**	-0.177*
Change in employment	0.006*	0.011**	0.004
Constant	-3.437***	-2.794**	-4.029***
Log-likelihood	-775.019	-381.451	-359.482
Restricted log-likelihood	-834.179	-423.492	-396.744
Chi-squared	118.320***	84.083***	74.525***
Pseudo-R squared	0.071	0.099	0.094
Number of observations	1312	646	638

Notes: The estimation method is logit regression method. These regressions include year dummies. Significance levels: *p<0.05, **p<0.01, ***p<0.001.

Panel B: Tests for the insignificance of the differences in the individual variables

Variable		Mean		%reduct		t-test		V(T)/V (C)
		Treated	Control	%bias	bias	t	p>t	
Pre-takeover Sales	Unmatched	12.72	11.95	35		6.09	0	1.24*
	Matched	12.72	12.74	-0.9	97.5	-0.13	0.9	1.04
Pre-takeover ROA	Unmatched	0.16	0.10	20.1		3.4	0.001	0.9
	Matched	0.16	0.14	7.2	64.4	1.25	0.211	2.00*
Pre-takeover Total Assets	Unmatched	12.51	11.60	45.5		7.91	0	1.23*
	Matched	12.51	12.55	-2.3	94.9	-0.32	0.746	0.96
Pre-takeover wage	Unmatched	3.53	3.52	2.2		0.38	0.702	1.19
	Matched	3.53	3.57	-5.7	-158.7	-0.83	0.409	1.07
Pre-takeover leverage	Unmatched	0.18	0.20	-12.7		-2.09	0.036	0.62*
	Matched	0.18	0.18	-1	92.4	-0.16	0.873	0.95
Pre-takeover labour cost over assets	Unmatched	0.28	0.46	-5.9		-0.87	0.385	0.00*
	Matched	0.28	0.31	-1.1	81.4	-1.28	0.202	0.31*
Capital intensity	Unmatched	3.42	3.36	4		0.68	0.494	1.11
	Matched	3.42	3.40	1.8	56	0.27	0.788	1.31*
Change in employment	Unmatched	7.27	4.21	12.6		2.12	0.034	0.82*
	Matched	7.27	7.28	-0.1	99.4	-0.01	0.99	0.97

Panel C: Tests for the insignificance of the differences in joint explanation of all variables

	Pseudo R2	LR chi2	p>chi2	Mean Bias	Median Bias
Panel A: Full sample					
Unmatched controls	0.04	33.13	0.00	18.40	12.10
Matched controls	0.01	3.42	0.75	6.10	5.30
Panel B: WFR sub-sample					
Unmatched controls	0.04	23.52	0.00	16.50	4.60
Matched controls	0.01	1.69	0.95	5.20	5.30
Panel C: WFG sub-sample					
Unmatched controls	0.06	29.01	0.00	23.90	25.10
Matched controls	0.02	4.89	0.56	8.80	6.50

Table 5. Labour Productivity Effects of M&A: the full sample results

	Full sample			
	Control firms matched based on pre-takeover performance, size and industry		Control firms matched based on the PSM method	
	Model 1	Model 2	Model 3	Model 4
ATET				
Acquiring firm versus Contor firm				
Labour Productivity during the post-acquisition period	0.022***	0.025**	0.037***	0.041*
Year dummy variables		Yes		Yes
Observations	6076	6076	8964	8964

Notes: This Table reports the Average Treatment Effects on the Treated (ATET) estimates using control firms selected based on (1) the pre-takeover performance, size, and industry matching method and (2) the propensity score matching (PSM) estimation method. Significance levels: *p<0.05, **p<0.01, ***p<0.001.

Table 6. Labour Productivity Effects of M&A: the WFR sub-sample results

	Workforce Reduction sub-sample			
	Control firms matched based on pre-takeover performance, size and industry		Control firms matched based on the PSM method	
	Model 1	Model 2	Model 3	Model 4
ATET				
Acquiring firm versus Contor firm				
Labour Productivity during the post-acquisition period	-0.014***	-0.012	0.011***	0.012
Year dummy variables		Yes		Yes
Observations	2997	2997	4419	4419

Notes: This Table reports the Average Treatment Effects on the Treated (ATET) estimates using control firms selected based on (1) the pre-takeover performance, size, and industry matching method and (2) the propensity score matching (PSM) estimation method. Significance levels: *p<0.05, **p<0.01, ***p<0.001.

Table 7. Labour Productivity Effects of M&A: the WFG sub-sample results

	Workforce Growth sub-sample			
	Control firms matched based on pre-takeover performance, size and industry		Control firms matched based on the PSM method	
	Model 1	Model 2	Model 3	Model 4
ATET				
Acquiring firm versus Contor firm				
Labour Productivity during the post-acquisition period	0.040***	0.042	0.052***	0.054*
Year dummy variables		Yes		Yes
Observations	3079	3079	4545	4545

Notes: This Table reports the Average Treatment Effects on the Treated (ATET) estimates using control firms selected based on (1) the pre-takeover performance, size, and industry matching method and (2) the propensity score matching (PSM) estimation method. Significance levels: *p<0.05, **p<0.01, ***p<0.001.

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