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Channels of Size Adjustment and Firm Performance

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Abstract

We use unique business register data for the United Kingdom to investigate the effects of different forms of firm expansion and contraction on firm-level performance indicators such as wages and productivity. We distinguish between adjustment of employment and turnover at existing establishments, expansions and contractions taking place via greenfield investment and disinvestment, and via acquisitions and sell-offs. We show that the choice of adjustment channel has important implications for the evolution of firm-level performance indicators. In terms of aggregate importance, we demonstrate that the two external adjustment forms (greenfield and M&A) account for at least 50% of the changes in aggregate wages, profits and productivity associated with firm expansions and contractions.

KEY WORDS: Adjustment channels, Mergers and Acquisitions, Greenfield Investment, Investment
JEL CLASSIFICATION: E22, G31, G32, G33, L25

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1 Introduction

Firms constantly adapt to changes in their market environment through changes in the scale and scope of their operations. The magnitude and consequences of the resulting micro-level adjustments have been extensively documented in the literature (see Davis et al., 2006, for a recent overview). Building on these empirical facts, a number of theoretical models have been developed over the past decades which have significantly improved our understanding of the growth processes of individual firms and how these map into aggregates such as industry-level employment, productivity or firm size distributions (e.g., Jovanovic, 1982; Hopenhayn, 1992; Hopenhayn and Rogerson, 1993; Asplund and Nocke, 2006).

In recent research (Breinlich, Niemann and Solomon, 2010), we have argued that only little attention has been paid to the *channels* through which firm growth and contractions take place. Using unique business register data for the United Kingdom, we presented a novel set of stylised facts related to how expanding and contracting firms choose between adjustments of employment or output at existing production facilities ("internal adjustment"), the opening or closure of entire establishments or divisions ("greenfield investment/disinvestment") and the buying and selling of parts or the entirety of their operations ("mergers and acquisitions", M&As). We showed that all three channels are quantitatively important in explaining aggregate firm growth and that firms choose between the available adjustment channels in clearly defined patterns, with basic variables such as initial firm size having substantial explanatory power in predicting a firm's choice.

In the present paper, we extend our earlier research and investigate the *consequences* of choosing one particular channel over another for firm-level variables such as wages or productivity. We present evidence that is suggestive of the choice of adjustment channel having important economic implications, both for the adjusting firm and for aggregate economic activity. For example, we show that plants which see their employment reduced, are sold off, or are closed down, subsequently show a number of negative performance characteristics, such as low productivity and profitability. Interestingly, while we find only weak evidence that M&As improve the productivity of acquired plants and basically leave firm-level productivity of the acquirer unchanged, we show that internal expansions actually lead to significant productivity reductions of the expanding firm. In terms of aggregate importance, we demonstrate that the two external adjustment forms (greenfield and M&A) account for at least 50% of the changes in aggregate wages, profits and productivity associated with firm expansions and contractions. As we discuss below, these findings have potentially important implications for the design of economic policy and the modelling of firm adjustment processes.

Our research relates most closely to contributions in industrial organisation and corporate finance. In industrial economics, a large number of papers have analysed the role of plant-level adjustments in explaining aggregate productivity growth (e.g., Disney et al., 2003; Foster et al., 2006). Because of their explicit and intentional focus on *plants*, however, the resulting findings are only of limited value for understanding the expansion and contraction decisions of *firms* and for how firm-level variables such as productivity are shaped by the choice of adjustment channel. Looking at the firm-level also allows to investigate additional issues such as the effect

of the choice of adjustment channel on a firm's incumbent plants.

In the corporate finance literature, researchers such as Jensen (1993) have previously argued that M&As present a more efficient form of resource transfer between expanding and contracting firms than bankruptcies or internal adjustment. However, we are not aware of any research that provides systematic evidence for or against this claim. There is of course a large literature on the consequences of mergers and acquisitions (e.g., Maksimovic and Phillips, 2001; Schoar, 2002) but these consequences are never compared to the effect of alternative forms of expansion or contraction such as internal adjustment or greenfield investment. Indeed, our comparisons of M&A and internal expansions show that the choice of an appropriate control group is essential for correctly estimating the effects of mergers and acquisitions on productivity and other firm-level variables as well.

The rest of the paper is structured as follows. Section 2 describes our data and methodology in more detail. Section 3, the core section of this paper, looks at the changes in firm-level variables such as wages or productivity associated with the choice of adjustment channel. Section 4 concludes.

2 Description of Data and Methodology

We use two sources of firm- and establishment-level data for the United Kingdom for the period between 1997 and 2005, both of which are maintained by the Office for National Statistics (ONS). The first is the Business Structure Database (BSD) which covers essentially the entire British economy, accounting for 99% of aggregate employment and turnover. The second database we use is the Annual Respondents Database (ARD). The ARD is based on a stratified sample of over 40,000 UK private sector companies per year and contains a large number of variables not available in the BSD, such as wages, investment and intermediate inputs. We will use information from the BSD to identify which adjustment channels firms use. We then merge the ARD with the newly constructed identifiers and look at the changes at the firm-level associated with the choice of adjustment channel.

2.1 The Business Structure Database (BSD)

The BSD is constructed from annual snapshots of the UK's business register, the Interdepartmental Business Register (IDBR). For each year between 1997 and 2005, it contains the universe of British companies which were either registered for Value Added Tax (VAT) purposes or operated a Pay as You Earn (PAYE) income tax scheme. In 2005 the BSD was comprised of 2.2 million live enterprises, representing an estimated 99% of economic activity in terms of employment and turnover (ONS, 2006).

The BSD captures the ownership structure of firms, plants and business sites that make up the British economy using three aggregation categories: the enterprise, enterprise group and local unit. According to the official definition (ONS, 2006), an enterprise "is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources". An enterprise group is "an association of enterprises bound together

by legal and/or financial links". Finally, a local unit is "an enterprise or part thereof (e.g., a workshop, factory, warehouse or office) situated in a geographically identified place".

Upon entry into the IDBR, each local unit, enterprise and enterprise group is allocated a unique reference number which remains with the unit for as long as it stays on the register. Furthermore, the ONS maintains a list of local units for each enterprise and combines enterprises to form enterprise groups by using information from Dun and Bradstreet, supplemented by the VAT system (ONS, 2006). Thus, every local unit also has an enterprise reference and every enterprise an enterprise group reference number.

Taken together, these identifiers allow the analysis of demographic events over time. We have developed an algorithm to identify these events, following a general typology provided by Eurostat (European Commission, 2003). In our methodology, the most basic event is a change in employment at a continuing enterprise ("internal adjustment"). This is easily observed from the entries of two adjacent years for the same enterprise.[1] If an enterprise identifier disappears from the data, we code this as an enterprise exit ("greenfield disinvestment"). Likewise, the appearance of a new identifier is coded as a firm entry ("greenfield investment"). Finally, the combination of enterprise and enterprise group references allows for the analysis of ownership changes. For example, if enterprise group A buys enterprise 1 from enterprise group B, the enterprise reference number of enterprise 1 would remain unchanged but its enterprise group identifier would change from A to B. Of course, an enterprise group can carry out several or all of these activities in a given year. For example, it might expand employment at one of its existing enterprises, create a new enterprise via greenfield investment and buy another one from another enterprise group ("M&A expansion"). Table 1 provides a summary of these definitions.[2]

Our methodology can be implemented at different levels of aggregation. In this paper, we take the enterprise group as the decision-making unit and analyse how it changes employment through adjustments at its existing enterprises and the acquisition/sale or creation/closure of new ones. Given that many of the expansion and contraction decisions we are interested in here are of first-order importance to a firm, it seems likely that they are made centrally and at the highest level of a firm.[3]

Another reason for working at the enterprise group/enterprise level (rather than at the enterprise group/local unit or enterprise/local unit level) is that there are a number of important data issues related to the local unit level of the BSD. First, the local unit structure of enterprises is updated much less frequently than the links between enterprise groups and enterprises, in particular for smaller enterprises.[4] This makes an implementation of the above methodology

[1]Note that we use information on employment rather than turnover (which is also available in the BSD) to classify internal adjustments into expansions and contractions. This is because the former is much more directly under the control of the firm than the latter.

[2]Note that we are not using the indicators of demographic events contained in the BSD itself. While these are also based on the typology outlined in European Commission (2003), there are a large number of inconsistencies in the preliminary version available so far.

[3]This is particularly true for the two external forms of adjustment, greenfield investment and M&As. While enterprises are defined above as "benefiting from a certain degree of autonomy in decision-making in the allocation of current resources", this definition does not include strategic investment decisions such as the acquisition or the opening up of new plants or operations.

[4]See ONS (2001, 2003) and Jones (2000, p.51). The local unit structure of enterprises is updated through the Annual Register Inquiry (ARI) which samples large enterprises (100 or more employees before 2003, 50 in later years) every year but only one in four of medium-sized enterprises (20-99 and 20-49 employees before and

problematic, in particular when looking at year-to-year changes in ownership structure, as we will do below. Second, most enterprises with multiple local units only report information on employment at the enterprise level, preventing the implementation of our methodology at the local unit level for these enterprises (see Criscuolo et al., 2003). Finally, local unit identifiers are considered by the ONS to be less stable over time than enterprise identifiers (ONS, 2006). That is, local units sometimes change their identifiers even though no corporate event has occurred, creating problems of false exit in our methodology. In view of these problems, we have abandoned the use of local unit data in our analysis, and focus on the enterprise group/enterprise level of analysis for the rest of this paper. Given this choice, we will use the expressions "enterprise group" and "firm", and "enterprise" and "establishment" interchangeably in the following.

2.2 The Annual Respondents Database (ARD)

The BSD contains information on turnover and employment at the enterprise level but not on wages, capital investment or production inputs. The fact that employment is updated less regularly than turnover data also implies that it is unsuitable for the calculation of even simple labour productivity measures.[5]

In order to analyse the consequences of the choice of adjustment channel on a number of firm-level variables, we merge the BSD with the Annual Respondents Database (ARD). The ARD is based on a stratified sample taken from the IDBR and covers over 40,000 UK private sector companies per year. Large businesses (those with more than 100 or 250 employees depending on the year) are included every year, whereas random sampling is used for smaller businesses. Among other variables, the ARD contains information on employment, wages, investment, intermediate inputs, value added, gross outputs and industry affiliation (see Partington, 2001, for a more detailed description). Table 2 presents a list of variables used in our analysis and additional details on their construction.[6]

3 Consequences of the Choice of Adjustment Forms

We now investigate how the choice of adjustment channel correlates with a number of firm characteristics commonly analysed in the literature, such as wages, profitability, or labour and

after 2003, respectively). For smaller enterprises, updating takes place on an ad-hoc basis only. In contrast, the ownership information linking the enterprise group and the enterprise level is updated at least once a year (see Dun & Bradstreet, 2001; ONS, 2006).

[5]See Criscuolo et al. (2003) and ONS (2001) for details. Employment information is frozen at the point at which an enterprise arrives on the IDBR. Afterwards, it is only updated through the Annual Register Inquiry (ARI) which mainly covers larger enterprises. To avoid underestimating the frequency of internal adjustments, all results below use employment data from the ARD for the definition of internal adjustment which is updated for all enterprises on a yearly basis. In practice, using BSD employment information for the definition of internal adjustments yields similar results, most likely because the merged ARD-BSD sample mainly contains larger firms for which the BSD updates employment regularly as well.

[6]Since the ARD sample is drawn from the IDBR (and thus the BSD), it is in principle straightforward to merge the two. A slight complication arises from the fact that reporting in the ARD takes place at the so-called reporting unit level, which is best thought of as being an intermediate level between local units and enterprises (see Criscuolo et al., 2003). In practice, however, less than 5% of enterprises have multiple reporting units. For such cases, we first aggregate the ARD information to the enterprise level before merging with the BSD.

total factor productivity.

To fix ideas for the following, it is helpful to decompose the change of a firm-level variable y_{wt} (wages, productivity, etc.) into the contributions of the different adjustment channels. In analogy to similar decompositions in the productivity literature (e.g., Foster et al., 2006), we write:

$$\begin{aligned}
\Delta y_{wt} \approx & \sum_{e\in C^+} s_{et-1}\Delta y_{et} + \sum_{e\in C^+} (y_{et-1} - y_{e^-t-1})\,\Delta s_{et} + \sum_{e\in C^+} \Delta y_{et}\Delta s_{et} \\
& + \sum_{e\in C^-} s_{et-1}\Delta y_{et} + \sum_{e\in C^-} (y_{et-1} - y_{e^-t-1})\,\Delta s_{et} + \sum_{e\in C^-} \Delta y_{et}\Delta s_{et} \\
& + \sum_{e\in N} s_{et}\,(y_{et} - y_{e^-t-1}) - \sum_{e\in X} s_{et-1}\,(y_{et-1} - y_{e^-t-1}) \\
& + \sum_{e\in A} s_{et}\,(y_{et} - y_{e^-t-1}) - \sum_{e\in S} s_{et-1}\,(y_{et-1} - y_{e^-t-1})
\end{aligned} \tag{1}$$

where Δ denotes log-changes between periods $t-1$ and t, and s_{et} the share of enterprise e in the total employment of enterprise group w in period t. The first two lines of (1) capture the contribution of internal adjustment (C^+ and C^- stand for continuing and expanding, and continuing and contracting, respectively). The first summand in each of these lines is the change in the variable y_{et} associated with internal expansion or contraction (Δy_{et}), holding the share (s_{et-1}) of the expanding or contracting enterprise constant. The second summand captures the effect of changes in the share of enterprise e, given its initial level of y relative to the average of the other enterprises which are part of the same enterprise group ($y_{et-1} - y_{e^-t-1}$). The third summand contains the covariance terms between changes in y_{et} and s_{et}.

The third and fourth line of (1) capture the contribution of greenfield investment, exit, acquisitions, and sales (N, X, A, and S, respectively). Specifically, the consequence of a greenfield investment or an acquisition for the overall enterprise-group-level of variable y will depend on the share of the new enterprise (s_{et}) and its level of y relative to the average of the other enterprises in the same enterprise group ($y_{et} - y_{e^-t-1}$). Likewise, whether an exit or sale leads to an improvement in y_{wt} will depend on how productive etc. the enterprise in question was relative to the remaining enterprises in the same group.

The above discussion suggests that the following quantities are of interest to our analysis:

- "Composition effects". Changes in y_{wt} due to changes in the composition of the set of, or the relative importance of, the enterprises making up an enterprise group. What matters for y_{wt} here is the *level* of variable y_{et} of the enterprise undertaking an adjustment, relative to all other enterprises in the same enterprise group (i.e., $y_{et} - y_{e^-t-1}$, $y_{et-1} - y_{e^-t-1}$).
- "Change effects". Changes in y_{wt} due to changes in y_{et} for existing and continuing enterprises. In the above decomposition, these are the *changes* in the enterprise-level variable y_{et} associated with internal expansion or contraction (Δy_{et}).

In addition to these direct effects, Section 3.3 below will investigate whether there are also *indirect* or spillover effects of the choice of adjustment channel of one enterprise on the remain-

ing enterprises of the group. For example, Schoar (2002) finds that companies undertaking acquisitions tend to neglect their existing plants whose productivity subsequently declines (the "new toy effect").

3.1 Composition Effects of the Choice of Adjustment Channel

We obtain estimates of the average difference between the enterprise undergoing a demographic event and the other enterprises of the same group as follows. We first calculate the employment-weighted average of y across all the enterprises of the enterprise group *not* undergoing the demographic event in question (i.e., y_{e^-t-1}). We then subtract these averages from the level of y of the enterprise group undergoing the demographic event (y_{et} or y_{et-1}), using an appropriate lag structure as indicated in (1). This procedure yields one difference for each of the enterprise groups and events for which we have sufficient data.

Table 3 shows estimates of the mean of these differences across enterprise groups, together with the corresponding standard error and the significance level for a two-sided tests of whether the mean is different from zero. We present results for a number of firm-level variables commonly analysed in the literature: employment, wages, capital and intermediate input intensity, labour and total factor productivity, unit labour costs and a measure of firm profitability (see Table 2 for details on variable definitions).[7]

As seen, new enterprises (column "birth") and those recently acquired are significantly smaller in terms of employment than the other enterprises in the same group. The same is true for enterprises that exit or are sold off to other enterprise groups. In contrast, enterprises undergoing internal expansions or contractions are 12% to 16% larger than the other enterprises within the same group. Enterprises undergoing one of the four external adjustment forms (birth, exit, acquisition, sale) also tend to be less productive, and have a lower intermediate input and capital intensity (with the exception of new enterprises, which tend to be significantly more capital intensive). There are no significant differences in profitability, however, with the exception of enterprises which are sold off – these report profits of 20% less than the remaining enterprises in the same group. Turning to the internal adjustment forms, contracting enterprises show performance characteristics comparable to those being sold off, such as low productivity and profitability. Expanding enterprises, on the other hand, tend to be slightly more productive, pay higher wages, and have lower unit labour costs than the other enterprises in the same group.

In view of the ample evidence that firm dynamics are subject to selection mechanisms which imply that unsuccessful enterprises decline and exit, these results strike us as very reasonable. In particular, enterprises which see their employment reduced, are sold off, or are closed down, show a number of negative performance characteristics, such as low productivity and profitability. The finding that acquired enterprises are comparatively smaller and less productive is also consistent with existing findings in the literature (e.g., Maksimovic and Philipps, 2001) and consistent with the view that the market for corporate control serves to reallocate assets to

[7]Note that we need information on the relevant firm-level variables for the enterprise undergoing a demographic event and at least one additional enterprise in the same enterprise group. The fact that the ARD is only approximately a 5% sample of the IDBR implies that this requirement leads to only a relatively small sample for the results presented in Table 3. We will come back to this issue below.

more productive owners.

3.2 Change Effects on Existing And Continuing Enterprises

Estimates of the average log-change in the enterprise-level variable y_{et} associated with internal expansion or contraction (Δy_{et}) can be obtained via simple dummy variable regressions of Δy_{et} on binary indicators for internal expansion/contraction. We use enterprises which neither expand nor contract employment between periods $t-1$ and t as the omitted category in these regressions, so that all changes are expressed relative to this group. For comparison with the existing literature, we also include enterprises undergoing an acquisition or sale. Panel A of Table 4 presents results for the same firm-level variables used previously. We control for industry-year fixed effects in all regressions, so that results rely on within-sector-year variation only. Similar to related contributions in the literature (Maksimovic and Philipps (2001) and Schoar (2002), in particular), we thus make the identifying assumption that, after controlling for industry-year fixed effects, enterprises with unchanged employment represent a suitable control group for the other demographic events.[8]

As seen, the average internal expansion increases employment by around 13%, whereas the average contraction decreases employment by 15%. Regarding the other variables, the general pattern is that internal expansions tend to reduce capital and intermediate input intensity, wages, profits and labour and total factor productivity (unit labour costs remain unchanged). Internal contractions have almost exactly the opposite pattern. They increase capital intermediate input intensity and all productivity measures. Profitability also improves, although an increase in wages means that unit labour costs actually increase slightly.

Patterns are less pronounced for both acquisitions and sales, but some interesting patterns emerge here as well. For example, similar to Maksimovic and Philipps (2001) and Schoar (2002) we find that acquired enterprises subsequently increase their productivity, although this effect is only significant for one of the TFP measures. Capital and intermediate intensity, wages and profits all increase as well, although again these effects are not always statistically significant. Not surprisingly, sales have similar effects but with lower levels of significance.[9]

Besides serving as input into the decomposition (1), these results allow for some interesting comparisons with the existing literature, which usually focuses on only a subset of the channels analysed here. For example, our results show that while asset transfers via M&As are not always associated with significant productivity gains, internal expansions actually reduce productiv-

[8]It is of course possible that there are pre-existing level or trend differences which make enterprise groups select into a particular adjustment channel. In this case, identifying truly causal effects would have to rely on sources of exogenous variation in the choice of adjustment channels. Unfortunately, finding suitable instruments which are both relevant and arguably exogenous proved to be very difficult with the data at hand. But even if the reader is sceptical about a causal interpretation of our results, we think that the results presented here should also be of interest when interpreted as correlations. We also note that papers such as Maksimovic and Philipps (2001) and Schoar (2002) face comparable problems but still (implicitly) insist on a causual interpretation of their results.

[9]Note that while both "acquisitions" and "sales" refer to enterprises which change owners, the underlying sets of observations are different, explaining the differences in Table 4. Acquisitions refer to the buying of enterprises or enterprise groups by existing enterprise groups, whereas sales only include selloffs by enterprise groups which continue to exist. This distinction implies, for example, that spin-offs will not be included under acquisitions, since they result in the creation of a new enterprise group. Likewise, whole-firm acquisitions result in the disappearance of the acquired enterprise group, and the acquired enterprises are thus not part of the definition of sales.

ity, with the difference between the two expansion forms being highly statistically significant. This demonstrates that when analysing the consequences of corporate events such as acquisitions, the choice of control group is crucial. In the previous example, both acquisitions and internal expansions serve the purpose of increasing overall firm size, and might imply similar adjustment processes to the operations of a firm. It would thus seem natural to use internally expanding enterprises as a control group in the estimation of the effects of acquisitions. As our results demonstrate, this choice would let acquisitions appear in a much better light than when compared to, for example, enterprises not undergoing any change.

One concern with the results presented in Panel A is that the effects for internal expansions and contractions might be driven by particularities of the data collection. In particular, employment in the ARD is measured at a given point in time, whereas sales, wages and value added are period averages. Given that we define expansions and contractions as an increase or decrease in employment, respectively, any measure which has employment in the denominator might change for purely mechanical reasons. For example, if an enterprise is sampled just after having expanded employment, its reported value added will still mainly refer to the previous period; it would thus not be surprising to detect a decrease in measured labour productivity.

To address this issue, Panel B reports change effects over a two-year period, i.e., from t-1 to t+1, which ensures that we measure genuine changes only. As seen, the magnitude of the estimated effects for internal expansion and contractions are indeed much reduced, even though the sign pattern remains the same as before. Since this might be a sign of the presence of purely mechanical effects in Panel A, we will work with these new estimates in the following.[10]

3.3 Indirect Effects on Existing And Continuing Enterprises

A further potential consequence of the choice of adjustment channel is the effect on other continuing enterprises within the same enterprise group. For example, Schoar (2002) presents evidence that companies undertaking acquisitions tend to neglect their existing plants, whose productivity subsequently declines (the "new toy effect").

To investigate such spillover effects, we run regressions of the following form:

$$\Delta y_{et} = \alpha + \beta_1 D_{C^+,et} + \beta_2 D_{C^-,et} + \Sigma_E EG_{E,et} + d_{st} + \varepsilon_{et} \tag{2}$$

where $E \in \{N, X, A, S, C^+, C^-\}$ denotes the set of demographic events and $EG_{E,et}$ the corresponding dummy variables, taking a value of one if any enterprise within an enterprise group undergoes the event in question. For example, if enterprise group A has five enterprises in period $t-1$ and opens an additional enterprise in period t, we will have $EG_{N,et} = 1$ for all of the original enterprises in period t. We also include additional dummies to control for the direct effect of demographic events affecting these enterprises. Since the regression sample underlying (2) contains only enterprises which are part of the same enterprise group in both periods $t-1$ and t, the set of relevant demographic events is limited to internal expansions/contractions

[10] An alternative explanation is that the stronger effect in Panel A might be due to adjustment frictions, i.e., the fact that enterprises require a certain amount of time to translate increases in employment into increases in sales, value added, etc. Since it is impossible to distinguish between these two effects in our data, we prefer to work with the more conservative estimates of Panel B.

($D_{C^+,et}$ and $D_{C^-,et}$; the omitted category are enterprises without changes in employment). We also include industry-year fixed effects to control for omitted sectoral-level variables determining both the choice of adjustment channel and the evolution of the variable y in question. Finally, to avoid purely mechanical effects due to the data collection process as discussed above, we also estimate effects over the longer period $t-1$ to $t+1$.

As the results in Table 5 indicate, the indirect effects of demographic events are only important for internal expansions and contractions. The former tend to reduce intermediate and capital intensity, wages, productivity, and profitability of enterprises in the same group, whereas the latter have exactly the opposite effect. Interestingly, the sign pattern for acquisition and sales is consistent with the "new toy effect"discussed by Schoar (2002). However, this effect and the effects of the other corporate events are very small, and mostly statistically insignificant. We also note that the sum of the direct and indirect effects reported in Table 5 for internal expansions and contractions is similar in magnitude to the direct effects reported in Table 4. Thus, we conclude that adding indirect effects is unlikely to change any of the subsequent results, and we therefore continue to focus on direct effect only.

3.4 Contribution of Adjustment Channels to Changes in Firm-Level Variables

We now combine the results from the previous sections with the decomposition proposed in (1) to shed light on the contribution of our adjustment channels to changes in the enterprise group level variables analysed here. These results will tell us, for example, what fraction of the average labour productivity growth of UK enterprise groups can be associated with the creation of new enterprises, as opposed to changes in existing enterprises.

Recall from (1) that we need the changes in the variable of interest (y) associated with the different adjustment channels, as well as the employment shares of the enterprises undergoing a given demographic event. A problem in this context is that the matching procedure between the ARD and the BSD only results in a small subset of enterprise groups with a complete set of enterprises – which is of course needed to calculate the employment shares in (1). The reason for this is that sampling in the ARD takes place at a scale equivalent to the enterprise level (not the enterprise group level), and the ARD covers less than 5% of the enterprises in the BSD in a given year. Consequently, we only have the full set of enterprises for less than 2% of enterprise groups.

To make progress, we thus use employment shares from the BSD (where coverage is close to complete, but we only have information on employment and turnover) with our earlier estimate of the average changes in y associated with the different adjustment forms. That is, we rewrite (1) as:

$$
\begin{aligned}
\widehat{\Delta y_{wt}} \;=\; & \sum_{e\in C^+} s_{et-1}\widehat{\Delta y_{et}} + \sum_{e\in C^+} \left(y_{et-1}\widehat{-y}_{e^-t-1}\right)\Delta s_{et} + \sum_{e\in C^+} \widehat{\Delta y_{et}}\Delta s_{et} \\
& + \sum_{e\in C^-} s_{et-1}\widehat{\Delta y_{et}} + \sum_{e\in C^-} \left(y_{et-1}\widehat{-y}_{e^-t-1}\right)\Delta s_{et} + \sum_{e\in C^-} \widehat{\Delta y_{et}}\Delta s_{et} \\
& + \sum_{e\in N} s_{et}\left(y_{et}\widehat{-y}_{e^-t-1}\right) - \sum_{e\in X} s_{et-1}\left(y_{et-1}\widehat{-y}_{e^-t-1}\right) \\
& + \sum_{e\in A} s_{et}\left(y_{et}\widehat{-y}_{e^-t-1}\right) - \sum_{e\in S} s_{et-1}\left(y_{et-1}\widehat{-y}_{e^-t-1}\right)
\end{aligned}
\tag{3}
$$

where hats above the variables indicate quantities estimated in the last sections. For example, we found that exiting enterprises have a labour productivity which is on average 14.5% lower than the remaining enterprises of the same enterprise group (see Table 3). We thus set

$$
-\sum_{e\in X} s_{et-1}\left(y_{et-1}\widehat{-y}_{e^-t-1}\right) = -\sum_{e\in X} s_{et-1}\times(-0.145)
$$

where s_{et-1}, the employment share of the exiting enterprise, is now calculated from the BSD data. Implicitly, we are thus making the assumption that the sample used for the estimations in the previous sections is representative of the BSD in terms of the effects associated with the different adjustment channels. To make this assumption more plausible, we only keep those enterprise groups in the BSD from which at least one enterprise can be matched to the ARD at some point in our sample. This makes the set of enterprise groups used in our analysis more comparable to the type of enterprise groups represented in the ARD.[11]

For each enterprise group in the BSD, and for each left-hand side variable y, the decomposition in (3) yields a predicted growth rate of y, as well as the contributions of the different adjustment channels. In the first panel of Table 6, we display the average across enterprise groups for each of the elements in (3). Note that if a given channel is not active for a given enterprise group, the corresponding entries are zero. Thus, the figures in Table 6 capture both the frequency of use of an adjustment channel, and its quantitative importance if it is used. To disentangle these two effects from each other, Table 7 presents averages excluding zero contributions. This demonstrates that external adjustments, if they take place, are at least as important as internal expansion and contraction. Indeed, the effect of enterprise sales and exits are usually an order of magnitude bigger. Thus, despite their relatively infrequent occurrence, they contribute to a large degree to the overall changes in our firm-level variables of interest, as shown in Table 8. This table normalises the individual entries of Table 6 by the sum (in absolute terms) of all adjustment forms. Depending on the variable in question, the external adjustment forms (in particular exits and sales) account for around 50% of the overall mean changes at the enterprise group level. External adjustment forms are particularly important for growth in total factor productivity, where they account for 70%-90% of the overall mean change. While there are of course important differences in terms of the underlying data and the

[11] Given that these groups tend to be relatively large in terms of employment, the following results are best thought to apply mainly to larger firms. As is true in the UK as in other countries, however, these firms make up the majority of economic activity.

decomposition approaches used, this dominance of external adjustment is reminiscent of recent findings in the productivity literature such as Disney et al. (2003) and Foster et al. (2006).

4 Conclusions

We investigated the consequences of firms' choices of expansion and contraction channels, using unique business register data for the United Kingdom between 1997 and 2005. In contrast to contributions in the existing literature, our data enabled us to distinguish between all three principal adjustment channels firms can use to expand or contract the scale and scope of their operations: changes at existing establishments ("internal adjustment"), greenfield investments and disinvestment, and acquisitions and sell-offs.

We documented that the choice of a particular adjustment channel is associated with substantial differences in firm-level performance. These differences arise from what we named composition effects (i.e., effects arising from performance differences between existing and new plants or plants shut down or sold off, respectively) and effects arising from the choice of adjustment channel on a firm's existing plants ("change effects"). In terms of aggregate importance, we show that the two external adjustment forms (greenfield and M&As) account for at least 50% of the changes in aggregate wages, profits and productivity associated with firm expansions and contractions.

We believe that these findings have potentially important implications for the design of economic policy and the modelling of firm adjustment processes. For example, the finding that external adjustments through M&As are an important driver of productivity growth provides suggestive evidence that an active market for corporate control plays the beneficial role claimed by authors such as Jensen (1993) and should thus not be unduly regulated. Likewise, our results also suggest that keeping open poorly performing plants (through subsidies and other state interventions) may remove an important contribution to productivity growth. Very interesting in this respect is also the finding that internal expansions seem to be associated with much stronger decreases in performance measures such as wages and productivity than expansions via the acquisition of new plants. This raises the obvious question why firms rely on internal expansions at all, and what type of barriers prevent more successful acquisitions from taking place. Finally, our results should also be helpful for the construction of more sophisticated models of firm dynamics which take into account the existence of multiple adjustment channels with different impacts on firm performance. Such models would of course also be useful to further address policy questions such as what effect an increased regulation of the use of certain adjustment channels might have (such as a more restrictive competition policy, to give but one example).

References

[1] Asplund, M. and V. Nocke (2006), "Firm Turnover in Imperfectly Competitive Markets", Review of Economic Studies, 73, 295-327.

[2] Breinlich, H., S. Niemann and E. Solomon (2010), "A Portrait of Firm Expansion and Contraction Channels", Essex Discussion Paper Series 693, November 2010.

[3] Criscuolo, C., J. Haskel, and R. Martin (2003), "Building the Evidence Base for Productivity Policies Using Business Data Linking", Economic Trends, 600, 39-51.

[4] Davis, S., R. Faberman and J. Haltiwanger (2006), "The Flow Approach to Labor Markets: New Data Sources and Micro–Macro Links", Journal of Economic Perspectives, 20(3), 3-26.

[5] Disney, R., J. Haskel and Y. Heden (2003), "Restructuring and Productivity Growth in UK Manufacturing", Economic Journal 113, 666-694.

[6] Dun and Bradstreet (2001). Presentation to the Office for National Statistics. November 2001.

[7] European Commission (2003), "A General Overview of Demographic Events: Business Register: Recommendations Manual".

[8] Foster, L., J. Haltiwanger and C.J. Krizan (2006), "Market Selection, Reallocation, and Restructuring in the U.S. Retail Trade Sector in the 1990s", Review of Economics and Statistics, 88(4), 748-758.

[9] Hopenhayn, H., "Entry, Exit, and Firm Dynamics in Long Run Equilibrium.", Econometrica 60 (September 1992): 1127-50.

[10] Hopenhayn, H. and R. Rogerson (1993), "Job Turnover and Policy Evaluation: A General Equilibrium Analysis", The Journal of Political Economy, Vol. 101, No. 5 (Oct., 1993), pp. 915-938.

[11] Jensen, M. (1993), "The Modern Industrial Revolution, Exit, and Control Systems". Journal of Finance 48, 831–880.

[12] Jones, G. (2000), "The Development of the Annual Business Inquiry", Economic Trends, 564, 49-57.

[13] Jovanovic, Boyan. "Selection and the Evolution of Industry.", Econometrica 50 (May 1982): 649-70.

[14] Maksimovic, V. and G. Phillips (2001), "The Market for Corporate Assets: Who Engages in Mergers and Asset Sales and Are There Efficiency Gains?", Journal of Finance 56, 2019-2065.

[15] Office for National Statistics (2001). Review of the Inter-Departmental Business Register. National Statistics Quality Review Series Report No. 2.

[16] Office for National Statistics (2003). Review of the Inter-Departmental Business Register, End of Project Report.

[17] Office for National Statistics (2006), "Business Structure Database User Guide".

[18] Partington, J. (2001), "The Launch of the Annual Business Inquiry", Labour Market Trends, Vol. 109 No. 5, pp 259–268.

[19] Schoar, A. (2002), "Effects of Corporate Diversification on Productivity", Journal of Finance 57, 2379-2403.

Table 1: Definition of Demographic Events

Event	Change in Enterprise Group Identifier, Period t-1 to t	Change in Enterprise Identifier, Period t-1 to t	Change in Enterprise Employment, Period t-1 to t	Change in Enterprise Group Employment, Period t-1 to t
Internal Expansion	None	None	Increased	Increased
Internal Contraction	None	None	Decreased	Decreased
Greenfield Investment	N/A (enterprise did not exist in t-1, so did not have an enterprise group identifier)	Enterprise identifier appears in data for the first time	N/A (enterprise did not exist in period t-1)	Increased
Greenfield Disinvestment	N/A (enterprise exits, so no enterprise group identifier in period t-1)	Enterprise identifier disappears from data	N/A (enterprise does not exist in period t)	Decreased
Acquisition	Changes to the enterprise group identifier of the new owner	Unchanged	Unchanged*	Increased
Sell-off	Changes to the enterprise group identifier of the new owner	Unchanged	Unchanged*	Decreased

Notes: Table shows the definition of demographic events used in the paper. See text for details.

(*) If employment changes during an acquisition or sell-off, this is coded as an internal expansion/contraction of the new owner (only the initial employment of the acquired/sold-off enterprise in period t-1 is counted as a size change through M&As).

Table 2: List of ARD Variables Used

Variables	Definitions and Sources
Gross output	Gross output (£ thousands) is deflated by 2-digit annual gross output price indices from the EUKLEMS project (base year=1995).
Gross value added	Gross value added at factor cost (£ thousands) is deflated using 2-digit annual value added price indices from the EUKLEMS project (base year=1995).
Employment	Employment is measured as the headcount of the number of employees.
Labour productivity	Defined as gross value added at factor cost in constant 1995 prices divided by employment.
Wages per employee	Defined as total labour costs divided by the number of employees. Total labour costs (£ thousands) is deflated using the average earnings index from the ONS (base year=1995).
Intermediate input intensity	Total intermediate input in constant 1995 prices divided by the number of employees. Total intermediate input is proxied by total purchases of goods materials / service (£ thousands), from the ARD. It is deflated using 2-digit annual intermediate input price deflators from the EUKLEMS project.
Capital intensity	Capital stock in constant 1995 prices divided by the number of employees. Data on capital stock was obtained from Criscuolo and Martin (2009).
TFP	TFP is obtained using two approaches: the factor cost approach and the OLS approach. The factor cost approach obtains TFP_{FS} as $logTFP_{FS} = logy - \alpha_L logL - \alpha_K logK - \alpha_I logI$, where Y is deflated gross output, L is employment, I is deflated intermediate input and α_L, α_K, and α_I are the factor shares of labour, capital and intermediate inputs, respectively, at the 3-digit industrial level; α_L is computed as the share of wages in gross output; α_I is computed as the share of intermediate inputs in gross output; α_K is computed as the residual factor share (i.e., $1- \alpha_L - \alpha_I$). The OLS approach obtains $logTFP_{OLS}$ from the residual of regressions of the log of deflated gross output on the logs of employment, deflated capital stock, deflated intermediate inputs and time fixed effects at the 2-digit industrial level.
Operating profits per employee	Defined as gross value added per employee minus wages per employee. Both gross value added and wages are in constant 1995 prices (see above).
Unit labour costs	Wages per employee divided by labour productivity. Both wages and labour productivity are in constant 1995 prices (see above).

Table 3: Composition Effects of the Choice of Adjustment Channel (1997-2005)

	Birth	Exit	Acquisition	Sale	Internal Expansion	Internal Contraction
Labour productivity	-0.050 (0.052)	-0.145 (0.034)***	-0.021 (0.015)	-0.146 (0.027)***	0.009 (0.017)	-0.065 (0.016)***
Employment	-1.143 (0.097)***	-1.099 (0.055)***	-0.665 (0.028)***	-0.913 (0.052)***	0.116 (0.035)***	0.159 (0.030)***
Wages per employee	0.025 (0.031)	-0.034 (0.020)*	-0.031 (0.009)***	-0.090 (0.016)***	0.022 (0.010)**	-0.038 (0.010)***
Intermediate input intensity	-0.310 (0.065)***	-0.217 (0.043)***	-0.083 (0.021)***	-0.115 (0.038)	0.018 (0.025)	-0.117 (0.023)***
Capital intensity	0.369 (0.079)***	-0.249 (0.055)***	-0.052 (0.026)**	-0.128 (0.043)***	-0.031 (0.029)	-0.108 (0.027)***
TFP (factor share)	-0.071 (0.029)**	-0.026 (0.019)	-0.018 (0.010)*	-0.059 (0.017)***	-0.023 (0.010)**	-0.054 (0.009)***
TFP (OLS)	-0.053 (0.026)**	-0.033 (0.014)**	-0.019 (0.007)***	-0.030 (0.012)**	0.013 (0.007)*	-0.012 (0.007)*
Operating profits per employee	-0.024 (0.111)	-0.079 (0.055)	-0.021 (0.026)	-0.198 (0.046)***	-0.023 (0.028)	-0.159 (0.026)***
Unit labour costs	-0.028 (0.046)	-0.012 (0.025)	-0.048 (0.012)***	-0.017 (0.020)	-0.054 (0.013)***	-0.032 (0.012)***
Observations	234 to 379	623 to 951	2336 to 3236	885 to 1205	2435 to 3301	2799 to 3842

Notes: Table shows average log differences between enterprises undergoing an adjustment form and other enterprises in the same enterprise group. They are derived from simple descriptive OLS regressions. Figures in brackets denote robust standard errors clustered at the enterprise level. The dependent variable in these regressions is computed as $\log(Y_e)$-$\log(\text{wmean}(Y_e^-))$, where Y_e refers to the value of the dependent variable Y of interest for the enterprise e undergoing a corporate event, and $\text{wmean}(Y_e^-)$ refers to the employment-weighted mean of Y across all other enterprises in the enterprise group apart from enterprise e. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 4 Change Effects on Existing and Continuing Enterprises (1997-2005)

Panel A: Change Effects from t-1 to t									
	Labour productivity	Employment	Wages per employee	Intermediate input intensity	Capital intensity	TFP (factor share)	TFP (OLS)	Operating profits per employee	Unit labor costs
Internal Expansion	-0.066	0.133	-0.067	-0.078	-0.098	-0.007	-0.017	-0.063	-0.005
	(0.005)***	(0.001)***	(0.003)***	(0.005)***	(0.003)***	(0.003)**	(0.003)***	(0.012)***	(0.005)
Internal Contraction	0.092	-0.152	0.100	0.102	0.148	0.015	0.031	0.075	0.010
	(0.006)***	(0.001)***	(0.003)***	(0.005)***	(0.003)***	(0.003)***	(0.003)***	(0.012)***	(0.005)*
Acquisition	0.013	-0.013	0.015	0.007	0.021	0.004	0.008	0.013	-0.003
	(0.009)	(0.003)***	(0.004)***	(0.007)	(0.005)***	(0.004)	(0.004)*	(0.017)	(0.008)
Sale	-0.001	-0.009	0.001	0.006	0.017	-0.001	0.002	0.028	0.003
	(0.009)	(0.004)***	(0.004)	(0.007)	(0.005)***	(0.004)	(0.004)	(0.018)	(0.008)
Observations	82321	87899	87138	86813	72726	70741	70593	65652	80395
Panel B: Change effects from t-1 to t+1									
	Labour productivity	Employment	Wages per employee	Intermediate input intensity	Capital intensity	TFP (factor share)	TFP (OLS)	Operating profits per employee	Unit labor costs
Internal Expansion	-0.020	0.118	-0.021	-0.021	-0.061	0.001	-0.002	-0.021	0.001
	(0.011)*	(0.006)***	(0.006)***	(0.010)**	(0.009)***	(0.006)	(0.006)	(0.023)	(0.010)
Internal Contraction	0.061	-0.138	0.047	0.068	0.127	-0.001	0.013	0.067	-0.005
	(0.011)***	(0.006)***	(0.006)***	(0.010)***	(0.009)***	(0.006)	(0.006)**	(0.023)***	(0.010)
Acquisition	0.015	0.000	0.014	0.007	0.021	0.008	0.016	0.009	-0.008
	(0.015)	(0.008)	(0.007)*	(0.013)	(0.012)*	(0.008)	(0.007)**	(0.029)	(0.013)
Sale	0.010	-0.018	0.003	0.035	0.019	-0.003	-0.000	0.054	-0.003
	(0.012)	(0.007)**	(0.006)	(0.010)***	(0.009)**	(0.006)	(0.006)	(0.025)**	(0.011)
Observations	36206	39206	38945	38940	31273	30273	30243	28358	35257

Notes: Table shows the effects of the corporate events listed in the first column on existing and continuing enterprises. Results are estimated using OLS regressions with industry-year fixed effects. Figures in brackets are robust standard errors clustered at the enterprise level. Each column denotes a separate regression, where the growth rates of the variables of interest are regressed on the event dummies. In panel A, the growth rate is computed as the log difference from the period before the event to the year of the event. In panel B, it is the log difference from the period before the event to one year after the event. The omitted group are enterprises that do not engage in any expansion or contraction activity. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 5: Indirect Effects on Existing and Continuing Enterprises (1997-2005)

Panel A: Indirect effects from t-1 to t									
	Labour productivity	Employment	Wages per employee	Intermediate input intensity	Capital intensity	TFP (factor share)	TFP (OLS)	Operating profits per employee	Unit labor costs
Internal Expansion (Enterprise)	-0.039	0.121	-0.046	-0.055	-0.076	0.003	-0.006	-0.010	-0.013
	(0.010)	(0.003)***	(0.005)***	(0.008)***	(0.006)***	(0.005)	(0.004)	(0.020)	(0.009)
Internal Contraction (Enterprise)	0.062	-0.142	0.083	0.092	0.137	0.008	0.025	0.062	0.013
	(0.010)***	(0.003)***	(0.004)***	(0.008)***	(0.005)***	(0.005)*	(0.004)***	(0.020)***	(0.009)
Birth (EG)	0.007	-0.002	-0.004	-0.012	0.014	0.002	0.001	0.014	-0.004
	(0.007)	(0.003)	(0.004)	(0.006)*	(0.005)***	(0.004)	(0.003)	(0.016)	(0.006)
Exit (EG)	-0.013	0.003	0.002	0.010	0.009	-0.004	-0.000	-0.010	0.004
	(0.007)*	(0.003)	(0.003)	(0.005)*	(0.004)**	(0.003)	(0.003)	(0.015)	(0.006)
Acquisition (EG)	-0.004	0.001	0.000	0.006	-0.001	-0.000	-0.000	-0.001	0.000
	(0.006)	(0.002)	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.012)	(0.005)
Sale (EG)	-0.007	-0.005	-0.003	-0.003	-0.001	-0.002	-0.005	0.000	-0.000
	(0.006)	(0.002)**	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)*	(0.013)	(0.005)
Internal Contraction (EG)	0.034	-0.012	0.018	0.011	0.012	0.008	0.009	0.022	-0.004
	(0.008)***	(0.003)***	(0.004)***	(0.006)*	(0.005)**	(0.004)**	(0.004)**	(0.017)	(0.007)
Internal Expansion (EG)	-0.029	0.011	-0.025	-0.026	-0.026	-0.011	-0.011	-0.049	0.006
	(0.008)***	(0.003)***	(0.004)***	(0.006)***	(0.005)***	(0.004)***	(0.004)***	(0.016)***	(0.007)
Observations	68247	72777	72170	71897	59210	57559	57437	54610	66703

Table continued on the next page

Panel B: Indirect effects from t-1 to t+1									
	Labour productivity	Employment (%)	Wages per employee (%)	Intermediate input intensity (%)	Capital intensity (%)	TFP (factor share) (%)	TFP (OLS) (%)	Operating profits per employee	Unit labor costs
Internal Expansion (Enterprise)	-0.029	0.128	-0.016	-0.003	-0.047	-0.000	-0.009	-0.024	0.011
	(0.017)*	(0.009)***	(0.008)*	(0.015)	(0.014)***	(0.009)	(0.008)	(0.034)	(0.015)
Internal Contraction (Enterprise)	0.046	-0.128	0.039	0.047	0.128	0.002	0.008	0.021	-0.008
	(0.017)***	(0.009)***	(0.008)***	(0.015)***	(0.014)***	(0.009)	(0.008)	(0.034)	(0.015)
Birth (EG)	0.012	-0.008	0.002	0.002	0.011	0.000	0.007	0.025	-0.009
	(0.011)	(0.007)	(0.006)	(0.009)	(0.009)	(0.006)	(0.005)	(0.024)	(0.010)
Exit (EG)	-0.003	0.010	-0.000	0.002	0.005	0.000	0.000	0.002	-0.002
	(0.010)	(0.006)*	(0.005)	(0.008)	(0.009)	(0.005)	(0.005)	(0.021)	(0.009)
Acquisition (EG)	-0.014	0.004	0.007	0.009	0.002	-0.002	-0.004	-0.032	0.014
	(0.009)	(0.005)	(0.005)	(0.007)	(0.007)	(0.005)	(0.004)	(0.018)*	(0.008)*
Sale (EG)	-0.003	-0.010	-0.007	-0.002	0.007	0.001	-0.004	0.003	-0.002
	(0.009)	(0.005)*	(0.005)	(0.007)	(0.008)	(0.005)	(0.004)	(0.019)	(0.008)
Internal Contraction (EG)	0.014	-0.009	0.007	0.020	0.005	0.003	0.004	0.047	0.004
	(0.012)	(0.007)	(0.006)	(0.010)**	(0.011)	(0.006)	(0.005)	(0.025)*	(0.011)
Internal Expansion (EG)	0.006	-0.010	-0.009	-0.024	-0.013	0.007	0.005	-0.010	-0.011
	(0.012)	(0.007)	(0.006)	(0.010)**	(0.010)	(0.006)	(0.006)	(0.024)	(0.011)
Observations	28519	30824	30646	30624	23909	23126	23115	22308	27800

Notes: Table shows the indirect effects of demographic events. The sample comprises plants that have been within an enterprise group (EG) for at least two consecutive periods surrounding the demographic event in question. Results are estimated using OLS regressions with industry-year fixed effects. Figures in brackets denote robust standard errors clustered at the enterprise level. See text for details of the estimated specification. The omitted group are enterprises that do not engage in any expansion or contraction activity. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6: Firm-Level Decompositions (1997-2005)
Average value for each decomposition term (including zeros)

Component	Labour productivity (%)	Wages per employee (%)	Intermed. input intensity (%)	Capital intensity (%)	TFP (factor share) (%)	TFP (OLS) (%)	Operating profits per employee (%)	Unit labor costs (%)
Within Effect (internal expansion)	-0.43	-0.45	-0.45	-1.31	0.02	-0.04	-0.45	0.02
Between Effect (internal expansion)	0.01	0.01	0.01	-0.02	-0.01	0.01	-0.01	-0.03
Cross (internal expansion)	-0.01	-0.01	-0.01	-0.02	0.00	0.00	-0.01	0.00
Within Effect (internal contraction)	0.98	0.76	1.09	2.01	-0.02	0.21	1.08	-0.08
Between Effect (internal contraction)	0.02	0.01	0.03	0.03	0.02	0.00	0.04	0.01
Cross (internal ontraction)	-0.01	-0.01	-0.01	-0.02	0.00	0.00	-0.01	0.00
Contribution of birth	-0.01	0.01	-0.06	0.08	-0.01	-0.01	0.00	-0.01
Contribution of exit	1.26	0.30	1.89	2.17	0.23	0.29	0.69	0.10
Contribution of acquisition	-0.15	-0.22	-0.59	-0.37	-0.13	-0.13	-0.15	-0.34
Contribution of sale	0.83	0.51	0.65	0.73	0.33	0.17	1.12	0.10
Avg. predicted change in decomposed variable	2.50	0.91	2.56	3.27	0.42	0.49	2.30	-0.23
Observations	445134	445136	445133	445135	445136	445138	445136	445135

Notes: Table shows the average contribution of each component in the first column to changes in the variables listed in the top row. Figures are in percentages. The computation of each component includes cases where the event in question does not take place (i.e., has a contribution of zero).

Table 7: Firm-Level Decompositions (1997-2005)
Average value for each decomposition term (excluding zeros)

Component	Labour productivity (%)	Wages per employee (%)	Intermed. input intensity (%)	Capital intensity (%)	TFP (factor share) (%)	TFP (OLS) (%)	Operating profits per employee (%)	Unit labor costs (%)	% of non-zero obs.
Within Effect (internal expansion)	-0.94	-0.98	-0.98	-2.89	0.05	-0.09	-0.98	0.05	45.49
Between Effect (internal expansion)	0.08	0.20	0.16	-0.28	-0.21	0.12	-0.21	-0.49	6.91
Cross (internal expansion)	-0.09	-0.10	-0.10	-0.28	0.00	-0.01	-0.10	0.00	6.91
Within Effect (internal contraction)	2.78	2.15	3.09	5.70	-0.05	0.60	3.05	-0.23	35.30
Between Effect (internal contraction)	0.29	0.17	0.52	0.48	0.24	0.05	0.71	0.14	6.29
Cross (internal contraction)	-0.13	-0.10	-0.15	-0.27	0.00	-0.03	-0.15	0.01	6.29
Contribution of birth	-0.81	0.40	-5.00	5.95	-1.14	-0.85	-0.39	-0.45	1.28
Contribution of exit	11.40	2.67	17.06	19.58	2.04	2.59	6.21	0.94	11.08
Contribution of acquisition	-1.58	-2.33	-6.25	-3.91	-1.35	-1.43	-1.58	-3.61	9.44
Contribution of sale	9.58	5.90	7.54	8.40	3.87	1.97	12.99	1.12	8.65
Avg. predicted change in decomposed variable	2.50	0.91	2.56	3.27	0.42	0.49	2.30	-0.23	100.00
Total number of observations (zeros and non-zeros)	445134	445136	445133	445135	445136	445138	445136	445135	

Notes: Table shows the average contribution of each component in the first column to changes in the variables listed in the top row. Figures are in percentages. The computation of each component *excludes* cases where the event in question does not take place.

Table 8: Firm-Level Decompositions (1997-2005)
(Average value for each decomposition term, expressed as a fraction of sum of all terms (in absolute values)

Component	Labour productivity (%)	Wages per employee (%)	Intermed. input intensity (%)	Capital intensity (%)	TFP (factor share) (%)	TFP (OLS) (%)	Operating profits per employee (%)	Unit labor costs (%)
Within Effect (internal expansion)	11.53	19.67	9.34	19.46	2.75	4.87	12.56	3.05
Between Effect (internal expansion)	0.15	0.61	0.24	0.29	1.87	0.94	0.41	4.88
Cross (internal expansion)	0.17	0.29	0.14	0.29	0.04	0.07	0.19	0.05
Within Effect (internal contraction)	26.54	33.33	22.77	29.79	2.12	24.28	30.20	11.77
Between Effect (internal contraction)	0.49	0.47	0.68	0.45	1.95	0.38	1.25	1.29
Cross (internal contraction)	0.23	0.28	0.19	0.25	0.02	0.21	0.26	0.10
Contribution of birth	0.28	0.23	1.33	1.13	1.90	1.25	0.14	0.83
Contribution of exit	34.16	13.01	39.41	32.12	29.36	32.98	19.30	15.05
Contribution of acquisition	4.03	9.67	12.29	5.47	16.58	15.48	4.18	49.09
Contribution of sale	22.41	22.44	13.61	10.76	43.41	19.53	31.52	13.89
Avg. predicted change in decomposed variable	2.50	0.91	2.56	3.27	0.42	0.49	2.30	-0.23
Observations	445134	445136	445133	445135	445136	445138	445136	445135

Notes: Table shows the average contribution of each component in the first column to changes in the variables listed in the top row. Contributions are expressed as the absolute value of the corresponding figure in Table 13, divided by the sum of (the absolute value of) all contributions.