Downsizing and firm performance: evidence from German firm data

— **Source link** ↗

Tim Goesaert, Matthias Heinz, Stijn Vanormelingen

Institutions: Katholieke Universiteit Leuven, University of Cologne

Related papers:

- Causes and Effects of Employee Downsizing: A Review and Synthesis

- Dumb and Dumber: The Impact of Downsizing on Firm Performance as Moderated by Industry Conditions

- The Effects of Downsizing on Operating Performance

- Employee downsizing and organizational performance: What do we know?

- Does downsizing improve organisational performance? An analysis of Spanish manufacturing firms

Downsizing and firm performance: Evidence from German firm data[1]

Version: January 2015

Tim Goesaert[2], Matthias Heinz[3] and Stijn Vanormelingen[4]

[2] KU Leuven, tim.goesaert@kuleuven.be
[3] Goethe University Frankfurt, heinz@econ.uni-frankfurt.de
[4] KU Leuven, stijn.vanormelingen@kuleuven.be

Downsizing and firm performance: Evidence from German firm data

Abstract: This paper uses a unique dataset to study the short term effects of downsizing on operational and financial performance of large German firms. In general, productivity and profitability after downsizing are – at the best – comparable to their pre-downsizing levels. During the downsizing event, the performance even drops. Moreover we make a distinction between firms downsizing because of a business downturn and firms downsizing to increase efficiency. Especially downsizing for the latter firms appears to be unsuccessful.

1   Introduction

Early 2005, the Deutsche Bank reported at a press conference the highest profits for years. Moreover, they announced a reorganization of the company including 6,400 layoffs in order to achieve higher profitability in the future. In the same period, Opel announced a record loss and decided to shed 12,000 jobs to decrease their production capacities and rescue the company. Both CEOs stated that there was no alternative to their decision. The two firms face a different financial situation, but share one common goal: to increase their performance through downsizing. How effective is their plan? Do firms end up with better productivity and profitability after shedding jobs?

Economic theory states several advantages and disadvantages to downsizing. On the one hand, it can be expected that productivity will increase through a form of Schumpeterian creative destruction (Schumpeter, 1942): redundant workers get eliminated, less productive workers replaced with more productive ones and labor disciplines become more strengthened. On the other hand, employment cutbacks may disrupt relationship networks in a company, destroy firm-specific human capital and social contracts between employers and employees. This could potentially undermine the morale of the workforce (Baumol, Blinder and Wolff, 2003; Dong and Xu, 2008;

Drzensky and Heinz, forthcoming). Despite economic theory on the matter, the intense public debate on downsizing[5] and the importance of those questions for firms, workers, political decision makers and the society as a whole, it is an open question whether firms really improve their operational or financial performance after downsizing. Many empirical studies have tried to shed light on this question, but the results are often contradictory.

The main reason for this inconsistency is the level of information that is needed to make clear statements. First, one needs to have access to a detailed, preferably micro-level dataset, containing various performance indicators. As firm-level datasets are becoming more widespread, this first requirement has become less troublesome. The second, more complicated, issue lies in identifying the downsizing firms. One approach, which is often used, is to define downsizing as a drop in total annual employment. The main advantage of this procedure is its simplicity: employment figures are readily available from company accounts. However, whether this change in the number of workers truly reflects downsizing or other activities, such as mergers or spin-offs, remains unclear. A second approach is to use announcements issued by the firms or reported in the media or press on downsizing. This is the more informative option of the two. However, access to these sources can be limited. There are other caveats: it could be that firms use statements on layoffs as a signal to the capital market or to put pressure on various stakeholders, such as governments and unions, but do not shed any jobs at all. This implies that careful monitoring and examination of these announcements is necessary. One issue regarding both identification strategies is that, quite often, no detailed information on the timing of the downsizing process is available.

We contribute to the existing literature in two ways. First, we employ a micro-level dataset of the 500 largest German firms. We calculate various indicators of a firm's operational and

_____

[5] According to Friebel and Heinz (2014), roughly two articles per day report on downsizing in Germany in *Die Welt,* one of the leading national newspapers.

financial performance using firm-level company accounts from the commercial database Amadeus.[6] Second, by collecting roughly 50,000 articles from German newspapers we are able to identify downsizing firms with great precision. The articles contain information on the timing of the downsizing events and the number of jobs getting lost. In addition, they provide details regarding the reason behind the downsizing decision. We are, to the best of our knowledge, the first to analyze the short-term performance of downsizing firms in such a detailed and systematic way. Overall, we find little evidence of an improvement in firm productivity and profitability. If anything, these performance indicators seem to drop during the downsizing event, and certainly do not surpass their pre-downsizing levels after the downsizing event. Differentiating on the reason behind the downsizing decision, we obtain one subset of firms that have responded to a business downturn and a second subsample of firms that have reduced their workforce to increase staff efficiency. We note some differences between these two categories. Those firms that have tried to increase their efficiency witness a drop in – especially – the first year after downsizing, while the drop in productivity as well as profitability during downsizing is found only for the firms experiencing a business downturn. The status quo found for these firms after downsizing may suggest that downsizing succeeded in preventing productivity declines, although profitability does not fully recover.

The structure of the paper is as follows. We continue with a short literature overview on other empirical work related to the effect of job cuts. Section 3 contains the identification procedure of our data and the description of performance measures used in this study. Section 4 shows the empirical specification and the basic results. We present several robustness checks in Section 5. The last section discusses our findings.

---

[6] This database is published by Bureau Van Dijk.

2   Literature Overview

The effect of downsizing and layoffs is far from undocumented, but the scope of the research is quite heterogeneous: attention has been given to all the stakeholders in the debate (see e.g. Hallock, Strain and Webber, 2012, for an overview of the literature). A number of papers have looked at the effect of downsizing on the displaced workers. These tend to have a higher likelihood of future unemployment, experience significant long-term earnings losses and have a higher incidence of health and family problems (Huttunen, Moen, and Salvanes, 2011; LaLonde and Jacobson, 1993; Rege, Telle and Votruba, 2011; Schmieder, Wachter and Bender, 2009; Sullivan and Von Wachter, 2009). Other studies focus on the performance of the downsizing firms.

This literature can broadly be classified into two separate categories.[7] A first line of papers has looked at the impact of up- or downsizing on productivity and profitability defined at the aggregate industry-level. Baumol, Blinder and Wolff (2003) find that changes in the average establishment or firm size has no effects on industry productivity. However, they report a positive effect of downsizing on profitability. A second line of studies take on a more micro-oriented approach and analyze the performance defined at the plant- or firm-level. Using census data of manufacturing plants, Baily, Bartelsman and Haltiwanger (2001) provide evidence that US plants which decreased employment exhibit significant greater procyclicality of productivity than other, upsizing, firms. In other work, Baily, Bartelsman and Haltiwanger (1996) find that productivity tends to decline in plants that are downsizing.[8] Friebel, McCullough and Padilla Angulo (2014) study the impact of downsizing on firms in a single industry, the US railway sector. They show that downsizing per se does not yield performance benefits. However, downsizing has a positive impact

---

[7] A third, but smaller field, looks at case studies that investigate the effects of downsizing, like e.g. Dial and Murphy (1995) for General Dynamics.

[8] Baily, Bartelsman and Haltiwanger (1996) recognize the identification problem as well: "Identifying who did and did not downsize and whether they were successful cannot be done with any precision on the basis of the characteristics of the plants that are reported in the census data."

on performance when accompanied by particular changes in the output mix.[9] Using Chinese plant-level data across industries, Dong and Xu (2008) find that private firms that downsize end up with lower total factor productivity, lower wages and unchanged profits. A synthesis on the research is given in Datta, Guthrie, Basuil and Pandey (2010). The authors document additional contradictions: some studies find a positive impact of downsizing on profitability (Chen, Mehrotra, Sivakumar and Yu, 2001; Espahbodi, John and Vasudevan, 2000; Palmon, Sun and Tang, 1997); other studies find no or even negative effects (Cascio, Young and Morris, 1997; De Meuse, Vanderheiden and Bergmann, 1994; Guthrie and Datta, 2010).

To conclude, we note that a number of studies have analyzed how dismissed workers and firms are affected by downsizing. While these studies show a clear negative impact on displaced workers, there are contradicting findings on the effect of downsizing on firm performance. We state that this can, in part, be explained by measurement error and differences in the identification strategy. The approach we propose in this paper tries to shed more clarity on the identification problem.

3 Data Description

3.1 Identifying Downsizing Firms

Our identification strategy is based on the examination of German newspaper articles reporting on downsizing events between 2001 and 2007. In order to optimize this procedure, we

---

[9] Related to this, there are also studies that investigate how single sectors or industries have managed to increase their productivity. For example, Disney, Haskel and Heden (2003) analyze the productivity growth in establishments in the UK manufacturing sector between 1980 and 1992. Their main finding is that productivity growth comes mainly from more productive plants that enter the market, displacing less productive, exiting plants. Similar results for the US retail trade sector in the 1990s were found by Foster, Haltiwanger and Krizan (2006). Schmitz (2005) links the increase in productivity of US and Canadian iron ore producers in the early 1980s to changes in work practices.

restrict our attention to the 500 largest German firms in terms of 2002 turnover, as these companies receive coverage in the media. This selection is performed using firm-level company accounts from the Amadeus database, a commercial dataset from Bureau van Dijk containing company accounts of European firms. Although inclusion criteria for Amadeus can vary among countries, we feel that this will not affect our selection greatly: German regulations are more flexible for small and medium firms, leaving a better coverage level for larger firms.[10] From this sample, we exclude former state enterprises that have been privatized (six firms, e.g. Deutsche Telekom, Deutsche Post), public utility/state lottery companies (ten firms), investment/private equity companies (five firms) and the Ruhrkohle.[11]

In a next step, we check for the presence of downsizing events in these firms. This identification is based on German newspaper articles reporting on these events, made available by the media database LexisNexis.[12] We primarily employ the dataset from Friebel and Heinz (2014), who collected downsizing events for use in a media content study. Using the same algorithm, we expand their dataset to ensure that we correctly identify all downsizing firms.[13] A summary of this procedure is available in Appendix A.1.

In total, including the articles used in Friebel and Heinz (2014), around 50,000 press articles were checked. This strategy enables us to state that we only fail to identify a downsizing event if there is absolutely no coverage in almost all German national and local newspapers, magazines and agency reports or if all media misreport on downsizing within a specific firm. A further advantage of our media content analysis is that we know which firms exit the market. Two main reasons emerged: 13 firms went bankrupt and 42 firms were acquired by another firm and integrated in the

---

[10] Private companies are legally not required to file any form of accounts. For publicly traded companies this is not the case (Bureau Van Dijk, 2011)

[11] The Ruhrkohle (RAG) is a highly subsidized holding company that owns most of the German coal mines in the Ruhr area, founded in 1969 with the aim of closing the mines step by step. Besides the aforementioned firms we had to exclude one company (Brau und Brunnen), which was reported two times due to a data error. No irregularities were found for the other firms.

[12] LexisNexis offers a large selection of German periodicals, such as journals or specialized magazines.

[13] Note that we had to omit 15 firms as it was not clear whether they had really downsized.

company.[14] We omit these firms from the analysis. In addition, we are able to collect detailed information on the downsizing events, i.e. the number of jobs getting lost in Germany and abroad and the duration of the downsizing process. In the following, we define a downsizing firm as a company that sheds at least 3% of its jobs in Germany in one downsizing event at a given point in time.[15] We define the downsizing period as the full year(s) in which the companies shed some of these jobs, starting from the day of announcement.

One additional control is performed. Firm performance is analyzed using unconsolidated company accounts. The identification of downsizing events is based on the name of these firms, but may also involve affiliates of these firms. Consequently, these are not represented in the unconsolidated accounts. To what extent does this bias the identification strategy? We address this concern by comparing, where possible, the job cuts mentioned in the articles with the effective drop in employment, as stated in the unconsolidated company accounts from Amadeus, between the start and end of the downsizing event. We find that there is a correlation of .88 between both lists, which strengthen us in our belief that we are able to accurately identify downsizing firms and the timing of the event. A limited number of downsizing firms reveal positive employment growth, mainly because of the acquisition of new plants. These firms are dropped from the sample. To sum up, after all these adjustments, we obtain a dataset of 380 companies, out of which 131 firms have shed jobs in Germany between 2001 and 2007 and 249 did not.[16]

3.2 Identifying Downsizing Reasons

---

[14] Firm exits are observed both in downsizing as in non-downsizing firms.

[15] Some firms were mentioned in the articles after shedding only a very small number of jobs. As we cannot be sure whether the media will consistently report on these cases, we set the threshold value for a downsizing event at 3%. The majority of studies define this threshold for a downsizing event at either 5% or at 3% (Guthrie and Datta, 2010).

[16] We also detected some firms with negative employment growth, based on Amadeus company accounts, that have downsized after having acquired another firm. We keep these observations in our sample. We see no change in our main qualitative results when this selection is excluded.

In a second step we identify the reasons firms list to motivate the decision to downsize. Again, this will be based on an analysis of the media coverage of all downsizing firms. Our classification follows the American Management Association (Cappelli, 2000; Greenberg, 1990). We distinguish between business downturns, improved staff utilization and a miscellaneous category. Business downturn refers to downsizing associated with a shortfall in demand. It includes downsizing as a reaction to lower demand because of a slowdown of the economy, a weak demand in the whole industry or the loss of a major customer.[17] Improved staff utilization is defined as a reduction in jobs driven by the desire for operating efficiencies within the firm. It implies changes in the output mix, the introduction of new production technologies or changes in the composition of the labor force.[18] In addition, many of these firms mention that they dropped hierarchical levels or merged locations and subsidiaries.[19] Firms that are classified in the miscellaneous category downsized for other reasons, e.g. they relocated to other countries, shed jobs for more than one reason or provided no additional details on their decision.

In Appendix A.2, we provide a full list of keywords that were used to identify the various downsizing reasons in the press articles. In total, 80 firms downsize due to a shortfall in demand, 44 firms shed jobs to improve operating efficiency and 5 firms are classified in the miscellaneous category.[20] In the remainder of the paper, we will mainly focus on firms that have downsized due to a business downturn and the desire to improve staff utilization.

---

[17] Firms justify this type of downsizing with expressions as overcapacities (i.e. Überkapazitäten), economic slowdown (Konjunkturflaute), decline in turnover (Umsatzeinbruch), loss of major customers (Verlust von Großkunden) or industry crisis (Branchenkrise).

[18] Firms document this decision with expressions as group reorganization (Konzernumbau), increase in efficiency (Effizienzsteigerungen) or administrative simplification (Verwaltungsaufwand senken).

[19] Similar classifications have been used by Grosfeld and Roland (1995) and Friebel, McCullough and Padilla Angulo (2014). Often, these categories are labeled in the economic literature as defensive versus offensive downsizing (Cappelli, 2000). The former is in response to poor economic results and is predominantly associated with a shortfall in demand; the latter is implemented to increase firm performance and is often the consequence of a well-prepared management strategy.

[20] According to a survey of the American Management Association from 1990, 55% of firms in the U.S. that downsized reported a business downturn as their reason for downsizing and 24% wanted to improve their staff utilization (Greenberg, 1990). Interestingly, these proportions are similar to ours.

Table 11 in Appendix A.3 provides an overview of the different industries that have referred to a business downturn as a motivation for downsizing. We additionally present some specific details about the economic situation in these industries that caused the firms to downsize. For example, the largest group (15 firms) is the construction industry: after the reunification boom in the German construction industry at the beginning of the 1990s, the industry relapsed into a long recession which caused many firms to downsize. As a result, the number of employees in the industry declined from 1.41 million (1995) to 0.71 million (2007) (Statistisches Bundesamt, 2012). Table 12 provides more details on the firms that have shed jobs to improve their operating efficiency: 19 firms dismantled hierarchies or improved administrative processes, 19 others merged subsidiaries or reorganized the horizontal organizational structure of the firm in other ways and 13 firms reorganized the production process.

To ensure that the identification of the downsizing reasons is correct, we perform an additional test. As in Friebel and Heinz (2014), we ran an experiment with 14 undergraduate students from different fields of studies in the FLEX laboratory in Frankfurt.[21] Each of them received a fixed payment of 10 euros for a job that took them on average less than one hour. We confronted the students with 30 articles reporting on ten randomly chosen downsizing firms.[22] For each of the firms, we presented three articles from three different German newspapers covering the same downsizing event. Students were then confronted with our definition of the downsizing reasons and were asked to identify the motivation behind the decision. This resulted in a congruence of 93.5% between the classifications given by the students and our own, excluding the "do not know" and "no statement possible" answers. Including them we still had a congruence of 90%.

---

[21] Participants were recruited using the online recruiting system ORSEE® (Greiner 2004) and had no further information on the research project.
[22] The companies are Alcatel SEL, Armstrong DL, Balda, Deutsche Börse, Dyckerhoff, E-Plus International, E.on, Heidelberger Druckmaschinen, Nordex and MVV. These articles were also used in our analysis the downsizing reasons of the selected companies.

3.3 Analyzing Firm Performance

We relate the downsizing event to a number of firm level performance indicators. First, we focus on indicators of operational efficiency, namely total factor productivity, labor productivity and capital productivity. There exist a number of techniques to estimate total factor productivity, most notably non-parametric methods such as Data Envelopment Analysis, Free Disposable Hull and Index Numbers as well as parametric methods such as the Stochastic Frontier and various methods designed to estimate production functions (f.e. Olley and Pakes, 1996). Van Biesebroeck (2007) provides an overview of the most widely applied methods. For the main results, firm level total factor productivity is computed using the index numbers method. This method allows for a flexible and heterogeneous production technology and produces robust results when measurement error is small. This can be expected for datasets in developed countries with narrowly defined industries (Van Biesebroeck, 2007).[23] We do however perform a robustness check where we use another methodology to estimate total factor productivity, namely non-parametric order-m frontiers.

We calculate total factor productivity using the company accounts in Amadeus, which provides a good coverage level for large, German firms. The multilateral index of TFP is based on the methodology developed by Good, Nadiri and Sickles (1996). This index provides a consistent comparison of firm productivity within a panel structure. Transitivity between any two firm-year observations is guaranteed through the use of a single reference point, defined as the average firm

---

[23] The main advantage of this method compared to parametric methods is that it allows for heterogeneous production technologies for the different firms. Recall that the firms in our sample are taken from a wide range of industries. If we would want to use parametric methods and estimate production functions to infer firm level productivity, the most widely applied methodology are the semi-parametric estimators (for example Olley and Pakes, 1996 and Levinsohn and Petrin, 2003). To implement these methods, we would need to include a substantial number of firms in our estimation sample to estimate industry specific Cobb-Douglas production functions. Although this is feasible, we would have to take the assumption that the large (downsizing) firms in our dataset use the same production technology as the small(ler) firms in the industry.

(see Caves, Christensen and Diewert, 1982). We calculate this hypothetical firm by expanding our sample with a selection of very large firms from the Amadeus database.[24] This allows us to calculate the index for each two digit industry more accurately. Total factor productivity for firm i at time t is then defined as:

$$\ln TFP_{it} = (\ln Y_{it} - \overline{\ln Y_t}) + \sum_{s=2}^{t}(\overline{\ln Y_s} - \overline{\ln Y_{s-1}})$$

$$- \left[\sum_{j=1}^{m} \frac{1}{2}(S_{jit} + \overline{S_{jt}})(\ln X_{jit} - \overline{\ln X_{jt}}) \right.$$

$$\left. + \sum_{s=2}^{t}\sum_{j=1}^{m} \frac{1}{2}(\overline{S_{js}} + \overline{S_{js-1}})(\ln \overline{X_{js}} - \overline{\ln X_{js-1}}) \right]$$

The first line in this equation refers to firm output, Y_{it}. The first term contains the difference between the actual firm i and the reference point, calculated as the average output in year t. The second term chains the reference point back to the base time period. The second line performs similar operations for each input X_j, labor and capital. These are then summed, using the expenditure shares S_{jit} of the firm and the reference point as weights.[25] We measure output as deflated value added, labor as total number of employees and capital as the historical value of deflated tangible fixed assets. All variables are retrieved from the Amadeus BvD company accounts. Furthermore we define labor productivity as deflated value added per employee and capital productivity as the ratio of deflated value added over deflated capital stock.[26]

---

[24] Following the definition in Amadeus, very large firms have at least 100 million euros operating revenue, 200 million euros total assets, 1,000 employees or are listed firms. As a robustness check, we expanded this selection by introducing large German firms as well. These firms have at least 10 million euros operating revenue, 20 million euros total assets or 150 employees. This yielded the same main qualitative results: correlation between both measures is about .99.

[25] We assume constant returns to scale and define the expenditure share for capital as 1 minus the expenditure share of labor.

[26] The deflators for the output and capital variables are obtained from the EU-KLEMS database and are defined for most NACE 2-digit industries. We use the value added deflators and the gross fixed capital formation price

We also assess the impact of downsizing on profitability, measured by the EBITDA and profit margin. The former has the advantage that it is less affected by financial or fiscal optimization policies. The latter is defined as profit/loss after tax, includes extraordinary income and costs and has the advantage to be more inclusive. These profitability measures are retrieved directly from the company accounts. Finally, we relate downsizing as well with the average wage cost in the firm.

3.4 Descriptive Statistics

Table 1 and Table 2 conclude this section with a brief overview of our sample. After accounting for missing values in the company accounts we are left with 285 firms in our sample, of which 92 are identified as downsizing firms, 31 firms have downsized to increase their staff efficiency and 59 firms downsized to face a business downturn. Roughly 50% of all firms in our sample are manufacturing firms. It is clear that the sample is constructed using the 500 largest German companies: the average firm employs on average 3,700 employees, has sales of 1.5 billion euros and a profit margin of 5.74%.

Table 1 Descriptive Statistics: Full Sample

Variable	Mean	Std. dev.	Number
Employees	3,716.78	14,365.20	1322
Tangible fixed assets	298,384.70	764,764.70	1322
Sales	1,468,914	5,377,367	1319
Turnover	1,551,934	5,567,148	1322
Value added	438,822.70	1,621,187	1322
EBITDA-margin	9.02	14.95	1311
Profit Margin	5.74	13.84	1218

Summary statistics are for all firm/year observations. Tangible fixed assets, sales, turnover and value added in thousands of euros.

---

indices. Deflators are calculated for 32 industries. Detailed information is available at
http://www.euklems.net/index.html

Table 2 Descriptive Statistics: Types of Firms in the Sample

Variable	Number
Manufacturing	140
Downsizing Companies	92
Business Downturn	59
Staff Efficiency	31

Manufacturing firms have a two-digit classification (revision 1) between 15 and 37

4 Empirical Strategy and Results

4.1 Empirical Strategy

The effect of downsizing on firm i, active in sector k at time t is tested using the following equation:

$$y_{it} = \alpha_i + \beta_1 DURING_{it} + \beta_2 AFTER_{it} + \delta TREND_{kt} + \gamma_t + \varepsilon_{it}$$

An important part of our empirical strategy deals with the heterogeneity between downsizing and non-downsizing firms. The decision to lay off workers may be influenced by some initial characteristics of the firm that could, in turn, be correlated with its future performance. This seems especially to be the case for the category of firms which listed a business downturn as main motivation. We control for this selection bias by looking at the within-firm variation, introducing firm fixed effects α_i in all specifications.[27] These effectively control for all unobserved time-invariant firm characteristics. The selection decision may be equally driven by time-varying firm characteristics. However, as we restrict our sample to the observations that are maximum three years before the firm started downsizing, we relate any change in firm performance to the more recent characteristics of the downsizing firms. This limits the impact of time-varying variables on the selection bias. We focus on the short-term effect of downsizing by limiting ourselves to the

---

[27] A similar strategy to remove selection bias is performed in Guadalupe, Kuzmina and Thomas (2012), on the case of innovation decisions and foreign ownership.

firm observations that are maximum three years after the downsizing ended. Other specifications where we relax or strengthen these timing restrictions will be presented in the next section.

To measure the impact of downsizing on firm performance, we include two dummy variables in the estimation equation. The *DURING*-variable captures the firm performance during the downsizing event. It is a dummy equal to 1 during the downsizing period and set to 0 in all years before and after the event. The *AFTER*-dummy picks up the firm performance after the downsizing event. It is set to 1 in all years after the downsizing period and 0 in the years before and during. As we look at the within-firm variation, we exclude the downsizing companies for which these dummies do not change.[28]

We include year dummies to control for γ_t, which represents year-specific shocks, common to all firms and sectors. The sector specific trend $TREND_{kt}$ controls for idiosyncrasies in the performance evolution of sector k. Note that this estimation strategy is in fact a generalization of a Differences-in-Differences strategy (Duflo, 2002), cf. Konings and Vandenbussche (2008) among others for a similar approach. More precisely, we compare the change in the performance of downsizing firms during and after downsizing with the change in performance of a control group of firms over the same period. The *DURING-* and *AFTER*-dummy capture any changes in firm outcomes, the firm fixed effects make sure we only exploit within-firm performance differences, accounting for initial characteristics, and the year fixed effects capture any changes common to all firms in Germany. In all specifications we report standard errors that are robust against heteroskedasticity and intra-group correlation.

4.2 Results

---

[28] For example, when only information on one phase of the downsizing process is available. This lowers the number of downsizing firms in our sample, but does not change our main results.

Table 3 presents the results of the impact of downsizing on the various productivity measures. The first three columns report results for the complete sample of downsizing firms. For the full sample of downsizing firms, we find no clear evidence of an effect on productivity after the downsizing event: the coefficient on the *AFTER*-dummy is estimated to be negative but fails to be significant for all three measures of productivity. However, we do see a significant drop in productivity during the downsizing event, in terms of TFP, labor productivity as well as capital productivity. More precisely, the productivity measures drop by respectively 12%, 9.1% and 14.9%.[29] Note that the drop in capital productivity is as well larger than the drop in labor productivity reflecting the lower adaptability of capital compared to labor.

We use the extra information on the motivation for firms behind the downsizing and make a distinction between firms that adjust their labor stock because of a business downturn and firms that seek to improve their operational efficiency by downsizing. Results are reported in columns 4 to 6 and columns 7 to 9 respectively. The impact of downsizing appears to differ between the two subsamples. Firms that have listed a business downturn as their main motivation experience a drop in productivity during downsizing[30], but have similar productivity levels after the downsizing event as before its start. This might be an indication that the downsizing was effective. If the downturn is persistent, productivity would be as well persistently reduced in the absence of restructuring.[31]

Firms that try to improve their operational efficiency through downsizing fail to do so in the short run. On the contrary, we can even note a statistically significant negative sign on the *AFTER*-dummy for TFP. A possible explanation for the absence of productivity improvements is that the effect of downsizing may only be visible in the long run, due to e.g. technological reasons.

---

[29] To be correct, this is only an approximation, the precise drop in TFP is equal to $e^{-0.120} - 1 = -11.3\%$ and likewise for the other coefficients.

[30] The *p*-value of the coefficient for capital productivity is equal to 0.107 although the point estimate is the largest in absolute value.

[31] We find some evidence for persistence in the business downturn. Applying the same framework but with turnover as dependent variable, turnover of ``business downturn'' firms is lower during and 1 year after downsizing.

However, behavioral motives may also play a role. Psychological and behavioral economic studies indicate that downsizing undermines the morale and motivation of those who stay in firms after layoffs if the reasons are unclear (Baumol, Blinder and Wolff, 2003; De Meuse and Marks, 2003). Drzensky and Heinz (forthcoming) find proof for this so-called "survivor syndrome" using a laboratory experiment. Interestingly, survivors reduce their performance considerably after the decision to lay off a worker only if it concerns a voluntary decision of the principal. When the layoff occurs exogenously, the effect on the motivation of the workers vanishes. Our results are in line with Drzensky and Heinz (forthcoming) as a business downturn is most likely to be perceived as an exogenous factor leading to downsizing. Layoffs to improve efficiency may not be understood and supported by the employees and could, at least in the short run, destroy workforce morale and undermine firm productivity.

Table 3 Basic Results: Productivity

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	TFP	LabProd	CapProd	TFP	LabProd	CapProd	TFP	LabProd	CapProd
During	-0.120**	-0.0913*	-0.149*	-0.130*	-0.128**	-0.205	-0.116	-0.0829	-0.106
	[0.0554]	[0.0473]	[0.0762]	[0.0767]	[0.0630]	[0.127]	[0.0773]	[0.0648]	[0.0773]
After	-0.112	-0.0853	-0.120	-0.0908	-0.130	-0.111	-0.159*	-0.0694	-0.162
	[0.0688]	[0.0643]	[0.113]	[0.097]	[0.0882]	[0.188]	[0.0809]	[0.0747]	[0.109]
N	1059	1136	1136	948	1025	1030	913	973	962

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

Table 4 Basic Results: Profitability

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage
During	-1.934*	-2.394***	0.0200	-4.173***	-3.933***	-0.00302	0.123	-1.274*	0.0356
	[1.027]	[0.691]	[0.0215]	[1.076]	[1.023]	[0.0345]	[1.584]	[0.732]	[0.0289]
After	-1.747	-1.038	0.0282	-3.395**	-1.865	0.01	-0.652	-0.794	0.0335
	[1.132]	[0.853]	[0.0328]	[1.583]	[1.301]	[0.0535]	[1.339]	[0.894]	[0.0340]
N	1129	1048	1136	1021	943	1028	958	900	969

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

In Table 4 we turn to the effect of downsizing on financial performance and wages. This provides us with additional information on the changes taking place within the downsizing firms. Firm profitability may increase if the downsizing resulted in higher efficiency, keeping wages under control or, in the case of a negative effect on productivity, if there are substantial cost reductions. Profits may decline if, for instance, firms fail to increase productivity and experience an increase of labor compensations at the same time. Again, the first three columns show the results for the full sample. The third column of Table 4 looks at the effect of downsizing on the average wage. Firms may dismiss their least productive workers which may raise the average wage or may adjust the skill composition of the labor force impacting as well the average wage in the firm. However, wages in downsizing firms appear to remain unchanged during and after the downsizing event as the coefficients on the downsizing dummies are insignificant at any conventional confidence level. Columns 1 and 2 show the results for the EBITDA and profit margin (where profit is measured by profits after taxes and extraordinary costs).

We find a negative effect on profitability during downsizing and no significant effect after downsizing, both in terms of the EBITDA and the profit margin. More precisely, the EBITDA margin goes down by 1.9% points while the profit margin drops by 2.4% points during the

downsizing event. As part of the restructuring costs are expected to be included in the extraordinary costs, the impact on the profit margin is larger during the downsizing event compared to the impact on the EBITDA margin. The results are in line with our priors as we found a negative effect of downsizing on productivity during downsizing and no effect on the wages, leading to negative pressure on the profitability of firms.

For the firms that have experienced a business downturn, we observe – not surprisingly – a substantial drop in profitability, both in terms of EBITDA and profit margin during the downsizing event. After downsizing, the profitability appears to recover somewhat but remains lower than before downsizing, especially for the EBITDA margin. The subsample of firms that wish to improve operational efficiency experience no change in performance during the downsizing event in terms of the profit margin or wages. The profit margin however, drops significantly by 1.27% points during the downsizing event

Overall, our results show that there is a negative contemporaneous effect of downsizing on productivity and profitability, especially for the firms restructuring because of a business downturn. Firms that downsized to increase their efficiency did not achieve their goal. On the contrary they even report a drop in total factor productivity in the years after the downsizing. The firms that reacted to a business downturn appear to recover in terms of productivity after downsizing, but still report lower profitability. These results are consistent with Dong and Xu (2008) who report a deterioration in total factor productivity for downsizing firms in China. However, in their sample, the wages of employees drop as well, leaving profitability unaffected.

5 Robustness Checks

We perform a number of robustness checks, related to the measurement of total factor productivity, the dynamics of the performance indicators after the downsizing event and finally we control for possible autocorrelation in the error term.

5.1 Non-parametric Order- m Efficiency Scores

As a robustness check we compute firm specific efficiency using non-parametric frontier methods and relate these efficiency scores with the downsizing event. More precisely we apply the free disposable hull (FDH) approach (Deprins, Simar and Tulkens, 1984), where input-oriented efficiency is estimated by comparing each firm with all other firms in the data that produce at least as much value added. The input-oriented efficiency score for firm i is than computed as:

$$\hat{\theta}_i(x,y) = \inf\{\theta | \hat{F}_{X,i}(\theta x | y) > 0\} = \min_{j \in B_i}\left\{\max_{r=L,K}\left\{\frac{X_{rj}}{x_{ri}}\right\}\right\}$$

where x is a vector of inputs, namely labor and capital, y is value added and $\hat{F}_{X,i}(\theta x | y)$ is an estimate for $F_X(x|y) = \Pr(X \leq x | Y \geq y)$. B_i represents the set of firms producing more value added than firm i. The input efficiency score takes values between zero and one, where a score of one implies maximum efficiency. To solve for the problem that these efficiency scores are sensitive to outliers, we follow Cazals, Florens and Simar (2002) and compute partial frontier or more precisely robust order-m efficiency scores. The basic idea is to benchmark a firm with the expected best performing firm in a sample of m peers rather than benchmarking it with the best performing peer in the full sample. In practice, the computation of the order-m efficiency score for a particular firm follows four steps (Daraio and Simar, 2005):

1. From B_i, draw a sample of size m with replacement

2. Compute the pseudo FDH efficiency $\tilde{\theta}_{mi}^b$ using this artificial reference sample

3. Redo steps 1 and 2 B times

4. Calculate the order-m efficiency score as the average of the pseudo FDH efficiency score,

$$\hat{\theta}_{mi} = \frac{1}{B}\sum_{b=1}^{B} \tilde{\theta}_{mi}^{b}$$

These order-m efficiency scores may exceed the value of one as a firm may not be available as its own peer. Increasing B, improves accuracy but comes at the expense of higher computing time. The choice for m is less obvious. The smaller m, the larger the share of super-efficient firms – firms with efficiency scores larger than one – and the larger m, the more the results coincide with the non-robust full frontier results.

To estimate the impact of downsizing on efficiency of the firm, we follow Daraio and Simar (2005). They argue against the use of a so-called two-stage approach to estimate the impact of an external variable, z, on the efficiency of the production process. In this approach, the efficiency scores would be obtained in a first stage following a procedure outlined above. In the second stage these firm level efficiency scores are then regressed on the downsizing variables similar to the main empirical framework. Instead, they suggest to compute conditional efficiency scores

$$\hat{\theta}_i(x,y|z) = \inf\{\theta|\hat{F}_{X,i}(\theta x|y,z) > 0\} = \min_{\{j|Y_j \geq y,|Z_j-z|\leq h\}} \left\{ \max_{r=L,K} \left\{ \frac{X_{rj}}{x_{ri}} \right\} \right\}$$

and to compare these with the unconditional ones to infer the impact of the external variable, namely the downsizing event. Note that the downsizing variable is categorical and in practice the conditional efficiency scores are obtained by using only firms in the same subgroup, defined by the downsizing dummy, as a benchmark. To analyze the influence of downsizing on the production process, we compare the average ratio $\hat{\theta}_{mi}(x,y|z)/\hat{\theta}_{mi}(x,y)$ for each category defined by the downsizing variable (De Witte and Kortelainen, 2013). A higher value for the ratio for the group of downsizing firms means that downsizing has a negative effect on efficiency as conditioning on downsizing increases the efficiency score of these firms.

For the choices of *B* and *m*, we follow Daraio and Simar (2007) suggesting to set *B* equal to 200. We set *m* to be the same for all subsamples defined by the downsizing status and pick the value at which the decrease in the super-efficient units becomes small. More precisely, we set *m* equal to 30 but check the robustness of the results for different values of the parameter. To mimic the firm fixed effects specification in the main results, we divide the firms into four categories, namely firms that never downsize and downsizing firms before, during and after downsizing. This allows us to look at the change in the efficiency scores within the group of downsizing companies. The results are plotted in Figure 1. More precisely the average ratio of the conditional over unconditional input efficiency scores, $\hat{\theta}_{mi}(x, y|z)/\hat{\theta}_{mi}(x, y$, together with the 10% confidence intervals are displayed. To obtain standard errors for the efficiency scores, we apply a bootstrap. More precisely, we replicate the estimation procedure 500 times where we draw each time with replacement the complete time series of N firms, with N the number of firms in the original dataset.[32] We find that the ratio of efficiency scores is larger for downsizing companies compared to non-downsizing companies, which indicates that downsizing companies are less efficient, although only the difference between the non-downsizing companies and the *AFTER*-downsizing group is statistically significant (*p*-value = 0.016). Moreover, during and especially after the downsizing event, the efficiency is lower compared to the period before the downsizing event, but only the difference between *BEFORE* and *AFTER* is marginally significant.

---

[32] Daraio and Simar (2007) state that a naive bootstrap as described above, would not yield a consistent approximation of the desired sampling distribution for full frontier analysis due to its boundary estimation nature (Tauchmann, 2012). However, for relatively small values of m, the boundary nature vanishes and one can use the naive bootstrap. (Tauchmann, 2012). We did however check the robustness of our findings using a bootstrap procedure where we draw in each bootstrap sample $\frac{2}{3}N$ firms. The standard errors of the efficiency scores are estimated to be slightly larger, but the differences in efficiency scores between the *AFTER*-downsizing and non-downsizing group as well as the difference between *BEFORE* and *AFTER* for firms that try to improve their efficiency remain highly significant.

Conditional Order-m Efficiency Scores

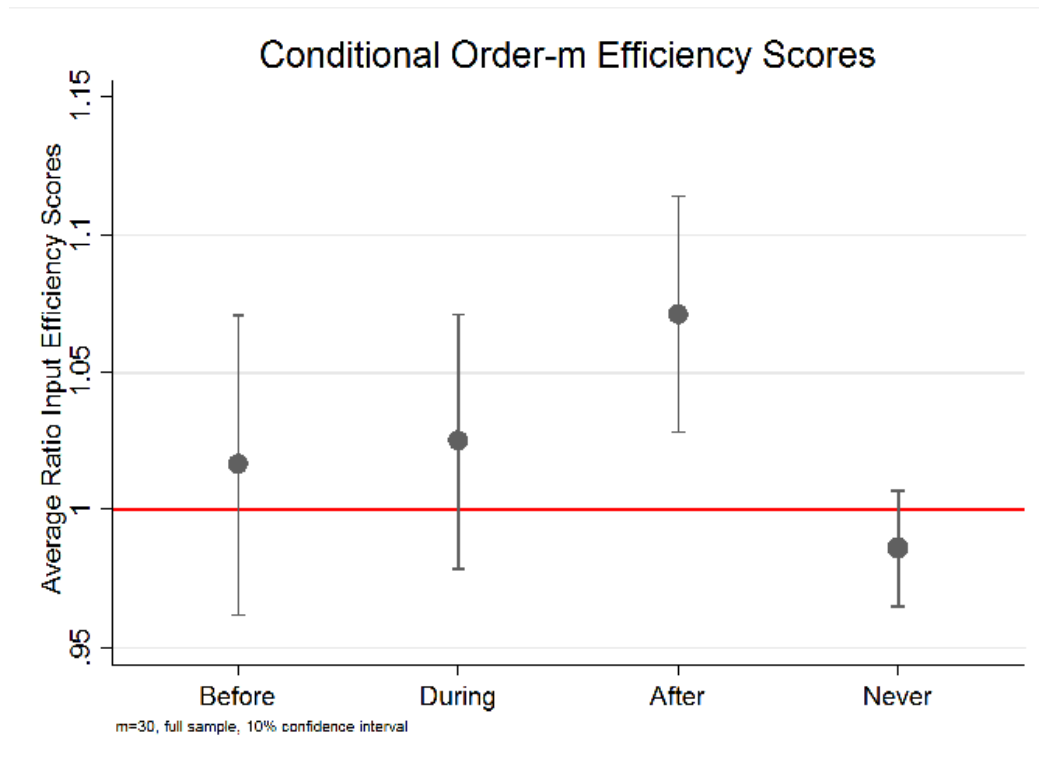m=30, full sample, 10% confidence interval

Figure 2 shows the results when we make a distinction between the different motivations for the downsizing event. Consistent with the main results, especially downsizing to improve efficiency appears to have a negative impact on the measured efficiency after the restructuring. The difference between *AFTER* and *BEFORE* is highly statistically significant (p-value = 0.002) for this category of companies while the difference is not statistically significant for the "business downturn" firms. All in all, the results are consistent with the main results in that – if anything – downsizing companies witness a decrease in efficiency after downsizing and this drop is most outspoken for the group of firms that listed efficiency reasons as motivation.[33]

---

[33] Note that the identification strategy used here is somewhat different from the main results. Here we basically look at the change in productivity for the downsizing firms, so this boils down to a basic "difference approach".

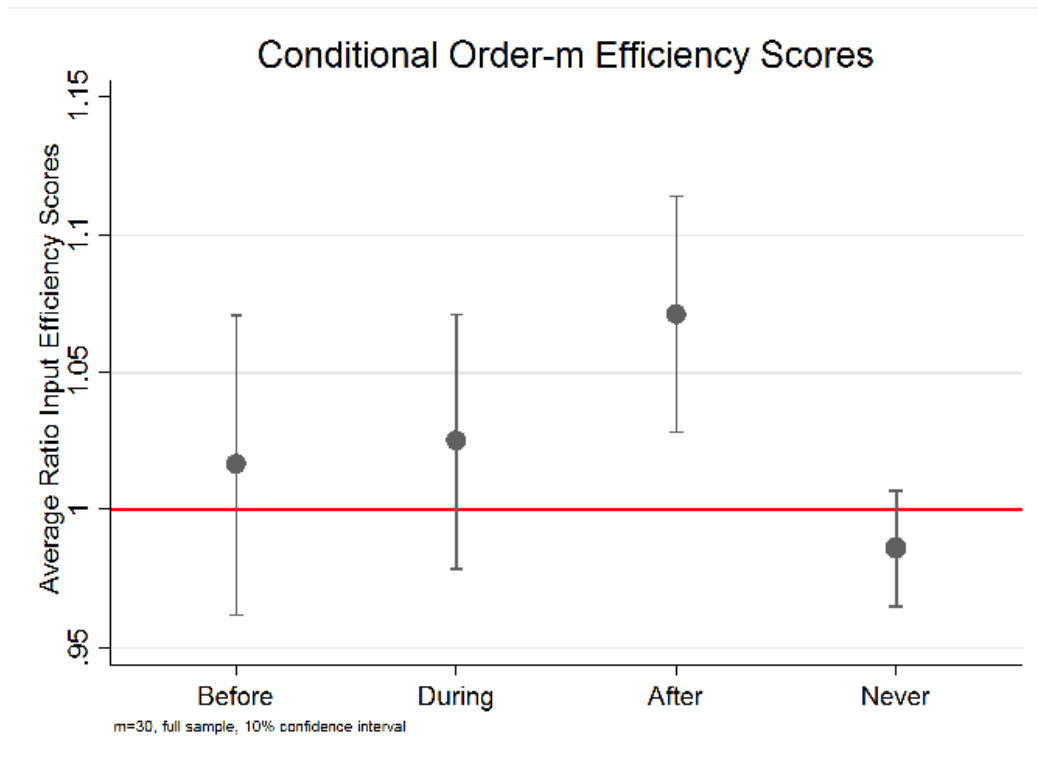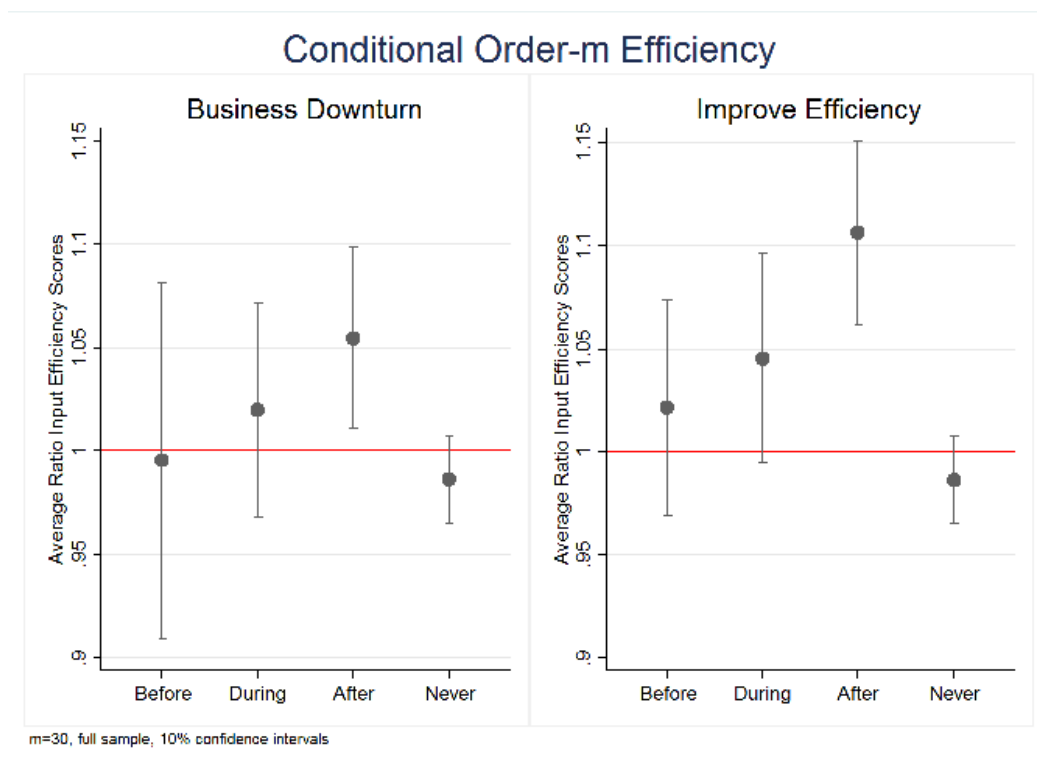**Figure 1 Non-parametric order-*m* Efficiency Scores**

Figure 2 Non-parametric Order-*m* efficiency Scores: Different Motivations for Downsizing

5.2 Short-term Dynamics

In addition, we explore the short-term dynamics of the post-downsizing outcomes. Is the change in performance temporary and are we able detect a recovery? We consider two new dummies to replace the *AFTER*-dummy: one variable to denote all firm/year observations that are one year after the downsizing event; one indicator to signal all observations that are two or three years after the downsizing event. Table 5 and Table 6 summarize our results. The results for the full sample, show that the efficiency of downsizing firms drops during and one year after the downsizing event, but they appear to recover afterwards and attain again the efficiency levels of before the downsizing event, 2 years after the restructuring. Making a distinction between the reasons for downsizing in columns 4 to 9, shows that firms that listed a reduction in demand as the main reason for downsizing, witnessed a drop in productivity during the downsizing event, but that already one year after the downsizing event the efficiency level is not significantly lower any more compared to the pre-downsizing period. The drop in post-downsizing productivity, for the firms that have listed increased efficiency as main motivation, only appears in the first year after the downsizing event. The effect in later years is not statistically significantly different from zero, which may suggest that the decrease in efficiency had a temporal nature. What is important however is that there are, even after 2-3 years, no signs of productivity rising to a higher level compared than in the pre-downsizing period although this was listed as the main motivation for the restructuring.

The results on profitability in Table 6 show that the profitability of firms experiencing a drop in demand decreases the most during the downsizing event and recovers already the first year after the downsizing event. Surprisingly, the coefficient on the EBITDA margin is again significantly negative two and three years after the downsizing event. We cannot check however whether this is a transitory effect due to the relatively short time span of our data set. The firms that listed an increase in efficiency as a motivation witnessed a drop in the profit margin during restructuring.

Moreover, there were no signs at all that profitability improved after the restructuring – compared to the pre-downsizing period – even not after two years.

Table 5 Productivity: Short Term Dynamics

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	TFP	LabProd	CapProd	TFP	LabProd	CapProd	TFP	LabProd	CapProd
During	-0.131**	-0.114**	-0.158**	-0.146**	-0.144**	-0.212*	-0.119	-0.105*	-0.108
	[0.0537]	[0.0455]	[0.0776]	[0.0711]	[0.0612]	[0.128]	[0.0773]	[0.0623]	[0.0771]
After 1 year	-0.128*	-0.088	-0.204*	-0.101	-0.0692	-0.195	-0.186**	-0.184**	-0.226**
	[0.0657]	[0.0596]	[0.120]	[0.0956]	[0.0815]	[0.192]	[0.0766]	[0.0814]	[0.105]
After 2+ years	-0.0557	-0.0341	0.0472	0.0172	-0.0889	0.165	-0.149	-0.00147	-0.115
	[0.0948]	[0.0830]	[0.137]	[0.146]	[0.116]	[0.224]	[0.0961]	[0.100]	[0.144]
N	1064	1144	1144	954	1033	1037	912	973	961

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

Table 6 Profitability: Short Term Dynamics

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage
During	-1.880*	-2.395***	0.0197	-4.085***	-3.912***	-0.00203	0.14	-1.272*	0.0342
	[1.026]	[0.693]	[0.0215]	[1.077]	[1.030]	[0.0344]	[1.592]	[0.735]	[0.0290]
After 1 year	-1.262	-0.823	0.025	-2.789	-1.416	0.0108	-0.289	-1.097	0.0261
	[1.258]	[0.999]	[0.0291]	[1.745]	[1.534]	[0.0473]	[1.506]	[0.746]	[0.0333]
After 2+ years	-2.036*	-0.85	0.0288	-3.727**	-1.581	0.00904	-0.938	-0.506	0.0333
	[1.154]	[1.078]	[0.0422]	[1.665]	[1.583]	[0.0714]	[1.355]	[1.370]	[0.0403]
N	1137	1057	1144	1028	952	1035	958	900	969

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

5.3 Definition of Downsizing

Next, we address the sensitivity of our estimates to the definition of downsizing we have used throughout the paper. Currently, a firm is considered to downsize if it sheds at least 3% of its jobs in Germany. We use this threshold as we cannot be sure whether the media reports consequently on downsizing cases involving only a limited number of employees. We refine our selection of downsizing firms by setting the threshold at 10%. This drops the number of downsizing firms from 92 to 56, which may affect the significance of our results. However, in setting a higher threshold, it could be the case that the effects of downsizing will be more outspoken. We present the results in Table 7 and Table 8. The results remain qualitatively the same. Considering all downsizing firms in our sample, we note a drop in productivity as well as profitability during the downsizing period. Firms that try to increase their efficiency seem to do all but improve their productivity. Firms that respond to a business downturn face their biggest drop in both productivity and profitability during the downsizing event.

Table 7 Productivity: Change Definition of Downsizing

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	TFP	LabProd	CapProd	TFP	LabProd	CapProd	TFP	LabProd	CapProd
During	-0.132**	-0.122**	-0.136	-0.170**	-0.162**	-0.213	-0.113	-0.114*	-0.0868
	[0.0594]	[0.0488]	[0.0849]	[0.0787]	[0.0665]	[0.145]	[0.0838]	[0.0668]	[0.0810]
After	-0.101	-0.076	-0.0855	-0.0727	-0.0959	-0.0626	-0.183*	-0.0956	-0.187
	[0.0779]	[0.0658]	[0.129]	[0.105]	[0.0904]	[0.203]	[0.0934]	[0.0816]	[0.126]
N	1026	1103	1103	929	1006	1011	899	959	948

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

Table 8 Profitability: Change Definition of Downsizing

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage
During	-1.771	-1.735**	0.0118	-4.396***	-3.803***	-0.0173	0.276	-0.781	0.0308
	[1.183]	[0.780]	[0.0248]	[1.382]	[1.171]	[0.0404]	[1.699]	[0.798]	[0.0313]
After	-2.119	-0.351	0.0253	-4.301**	-1.443	0.00176	-0.369	0.18	0.04
	[1.443]	[0.990]	[0.0375]	[2.067]	[1.319]	[0.0582]	[1.593]	[1.327]	[0.0391]
N	1098	1019	1103	1003	925	1009	945	889	953

Heteroskedasticity robust clustered standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. All specifications include firm fixed effects, year dummies and a sector specific time trend.

5.4 Serial Correlation

In a final robustness check we target the possible inconsistency of the estimated standard errors due to positive serial correlation. As Bertrand, Duflo and Mullainathan (2004) show, failing to account for serially correlated outcomes, such as firm productivity or health outcomes, in Differences-in-Differences studies may lead to overestimated significance levels and an underestimation of standard errors. Due to the similar nature of our outcome variables and methodology with regards to the examples above, we implement a correction proposed by Bertrand, Duflo and Mullainathan (2004): collapsing the time series information into three stages, a pre-, during- and post-period, succeeds largely in eliminating the serial correlation.[34] However, we require an additional adjustment. Ignoring the time series information by averaging the different outcomes in each stage works only for treatments that start at the same time. This is different in our context of downsizing firms: the start and ending of the downsizing event is defined for each

---

[34] Tests on our regression residuals reveal significant positive autocorrelation in a number of cases. Bertrand, Duflo and Mullainathan (2004) show that parametric AR(k) correction fairs poorly in correcting the standard errors; adjusting the Variance-Covariance matrix behaves well when a large number of groups are considered.

firm individually. Following Bertrand, Duflo and Mullainathan (2004), we first regress our different outcome variables on firm and year dummies, and additionally on industry-specific trends. The year fixed effects and time trends capture all common shocks between the downsizing firms and the control group; the firm dummies effectively capture all outcome variation across firms. Next, we group the corresponding residuals of all downsizing firms in 3 groups - before, during and after the downsizing event- and calculate by firm the average outcome in each period. Finally, we regress these averaged performance indicators on a *DURING*- and *AFTER*-dummy.[35] The results are presented in Table 9 and Table 10. Our main conclusions remain unchanged.

Table 9 Productivity: Account for Autocorrelation in the Outcome Variables

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	TFP	LabProd	CapProd	TFP	LabProd	CapProd	TFP	LabProd	CapProd
During	-0.0766**	-0.0454	-0.0541	-0.0961*	-0.0859*	-0.0619	-0.0647	-0.0182	-0.0654
	[0.0324]	[0.0313]	[0.0541]	[0.0523]	[0.0457]	[0.0907]	[0.0439]	[0.0406]	[0.0511]
After	-0.0395	-0.0482	-0.0299	-0.0284	-0.0836	-0.0169	-0.0879***	-0.0353	-0.0758
	[0.0377]	[0.0411]	[0.0636]	[0.0624]	[0.0596]	[0.102]	[0.0323]	[0.0362]	[0.0505]
N	123	133	141	68	78	87	55	55	54

Heteroskedasticity robust standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. Estimates are obtained in two stages. First, outcome variables are regressed on firm and year dummies as well as on an industry specific time trend. The residuals are subsequently regressed on a during and after downsizing dummy.

---

[35] Note that, due to a decrease in time periods, we only report robust standard errors.

Table 10 Profitability: Account for Autocorrelation in the Outcome Variables

	Full Sample			Business Downturn			Improve Efficiency		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage	EBITDA	ProfMarg	Wage
During	-1.420**	-1.815***	0.00757	-2.538***	-2.574***	-0.0195	-0.235	-1.142***	0.0362*
	[0.587]	[0.507]	[0.0173]	[0.819]	[0.836]	[0.0274]	[0.792]	[0.375]	[0.0196]
After	-0.882	-0.694	0.0176	-1.49	-1.097	0.00845	-0.461	-0.561	0.0168
	[0.753]	[0.492]	[0.0216]	[1.074]	[0.757]	[0.0328]	[0.758]	[0.374]	[0.0175]
N	140	128	138	86	76	83	54	52	55

Heteroskedasticity robust standard errors in parentheses. *, **, *** reports significance at the 10%, 5%, 1% level. Estimates are obtained in two stages. First, outcome variables are regressed on firm and year dummies as well as on an industry specific time trend. The residuals are subsequently regressed on a during and after downsizing dummy.

6 Conclusion

This paper studies the short-term performance of downsizing firms. We present a unique dataset, obtained by examining 50,000 newspaper articles reporting on the 500 largest German firms. The main advantage of our method is that it greatly reduces the possibility of a misclassification. In addition, it allows us to obtain further details on the start and duration of the downsizing event. Finally, this strategy helps us to shed more clarity on the reason behind the downsizing event. Following the classification used by the American Management Association, we are able to identify two main subsamples: firms that have downsized in response of a business downturn and firms that reduced their workforce in order to increase staff efficiency.

The operational and financial performance measures are retrieved and calculated from the Amadeus database, made available by Bureau van Dijk. We focus on various indicators of firm performance such as labor, capital and total factor productivity as well as average wage costs and the EBITDA and profit margin and we apply a Difference-in-Difference approach to identify the impact of downsizing on these indicators. Combining both subsamples, we find that productivity as well as profitability drop during downsizing and do not surpass their before-restructuring levels afterwards. Differentiating on the reason behind the downsizing decision, some differences emerge. Firms downsizing due to a business downturn witness a contemporaneous drop in productivity, while firms that tried to increase their efficiency witness a drop in productivity in – especially – the first year after downsizing. This could be explained by behavioral motives as, contrary to downsizing in response to a business downturn, layoffs to improve efficiency may not be understood and supported by all employees. This could, in the short run, destroy employee morale and undermine firm productivity.

Our results are robust against different ways to define the downsizing events, serial correlation and a non-parametric approach to identify the impact of downsizing on efficiency.

References

Baily, M., E. Bartelsman, and J. Haltiwanger (1996), 'Downsizing and productivity growth: myth or reality?', *Small Business Economics*, **8(4)**, 259-278.

Baily, M., E. Bartelsman, and J. Haltiwanger (2001), 'Labor productivity: structural change and cyclical dynamics', *Review of Economics and Statistics*, **83(3)**, 420-433.

Baumol, W., A. Blinder, and E. Wolff (2003), *Downsizing in America: Reality, causes, and consequences.* Russell Sage Foundation Publications.

Bertrand, M., E. Duflo, and S. Mullainathan (2004), 'How Much Should We Trust Differences-in-Differences Estimates?', *Quarterly Journal of Economics*, **119(1)**, 249-275.

Bureau van Dijk (2011), *Amadeus. A Database of Comparable Financial Information for Public and Private Companies across Europe*, Database, Bureau van Dijk.

Cappelli, P. (2000), 'Examining the incidence of downsizing and its effect on establishment performance', *NBER working papers.*

Cascio, W. F., C. E. Young, and J. R. Morris (1997): 'Financial Consequences of Employment-Change Decisions in Major U.S. Corporations', *Academy of Management Journal*, **40(5)**, 1175-1189.

Caves, D., L. Christensen, and W. Diewert (1982), 'Multilateral comparisons of output, input, and productivity using superlative index numbers', *Economic Journal*, **92(365)**, 73-86.

Cazals, C., J.-P. Florens, and L. Simar (2002), Nonparametric frontier estimation: a robust Approach', *Journal of Econometrics*, **106(1)**, 1-25.

Chen, P., V. Mehrotra, R. Sivakumar, and W. Yu (2001), 'Layoffs, shareholders' wealth, and corporate performance', *Journal of Empirical Finance*, **8(2)**, 171-199.

Daraio, C., and L. Simar (2005), 'Introducing Environmental Variables in Nonparametric Frontier Models: a Probabilistic Approach', *Journal of Productivity Analysis*, **24(1)**, 93-121.

Daraio, C., and L. Simar (2007), "*Advanced Robust and Nonparametric Methods in Efficiency Analysis: Methodology and Applications',* Springer, New York.

Datta, D., J. Guthrie, D. Basuil, and A. Pandey (2010), 'Causes and effects of employee downsizing: A review and synthesis', *Journal of Management,* **36(1)**, 281-348.

De Meuse, K., and M. Marks (2003), '*Resizing the Organization: Managing Layoffs, Divestitures, and Closings*, J-B SIOP Professional Practice Series. Wiley, San Francisco.

De Meuse, K., P. Vanderheiden, and T. Bergmann (1994), 'Announced layoffs: Their effect on corporate financial performance', *Human Resource Management*, **33(4)**, 509-530.

De Witte, K., and M. Kortelainen (2013), 'What explains the performance of students in a heterogeneous environment? Conditional efficiency estimation with continuous and discrete environmental variables', *Applied Economics*, **45(17)**, 2401-2412.

Deprins, D., L. Simar, and H. Tulkens (1984), 'Measuring Labor Efficiency in Post-Offices', in *The Performance of Public Enterprises: Concepts and Measurement,* ed. M. Marchand, P. Pestieau and H. Tulkens, 243-267. Elsevier, Amsterdam..

Dial, J., and K. Murphy (1995), 'Incentives, downsizing, and value creation at General Dynamics', *Journal of Financial Economics*, **37(3)**, 261-314.

Disney, R., J. Haskel, and Y. Heden (2003), 'Restructuring and productivity growth in uk manufacturing', *Economic Journal*, **113(489)**, 666-694.

Dong, X., and L. Xu (2008), ''The impact of China's millennium labour restructuring program on firm performance and employee earnings', *Economics of Transition*, **16(2)**, 223-245.

Drzensky, F. and M. Heinz (forthcoming), 'The Hidden Costs of Downsizing', *Economic Journal*, forthcoming.

Duflo, E. (2002), 'Empirical methods', *mimeo*, MIT.

Espahbodi, R., T. John, and G. Vasudevan (2000), 'The effects of downsizing on operating performance', *Review of Quantitative Finance and Accounting,* **15(2)**, 107-126.

Foster, L., J. Haltiwanger, and C. Krizan (2006), 'Market selection, reallocation, and restructuring in the US retail trade sector in the 1990s', *Review of Economics and Statistics*, **88(4)**, 748-758.

Friebel, G., and M. Heinz (2014), 'Media slant against foreign owners: Downsizing', *Journal of Public Economics*, **120**, 97-106.

Friebel, G., G. McCullough, and L. Padilla Angulo (2014), 'Patterns of Restructuring: The US Class 1 Railroads from 1984 to 2004', *Journal of Transport Economics and Policy*, **48(1),** 115-135.

Good, D., M. Nadiri, and R. Sickles (1996), 'Index number and factor demand approaches to the estimation of productivity', NBER Working Paper 5790.

Greenberg, E. (1990), 'The latest AMA survey on downsizing', *Compensation & Benefits Review*, **22(4)**, 66-71.

Greiner, B. (2004), 'The online recruitment system ORSEE 2.0-A guide for the organization ofexperiments in economics', University of Cologne, Working paper series in economics, 10(23).

Grosfeld, I., and G. Roland (1995), 'Defensive and Strategic Restructuring in Central European Enterprises', *CEPR Discussion Papers 1135.*

Guadalupe, M., O. Kuzmina, and C. Thomas (2012), 'Innovation and Foreign Ownership', *American Economic Review*, **102(7)**, 3594-3627.

Guthrie, J., and D. Datta (2008), 'Dumb and dumber: The impact of downsizing on firm performance as moderated by industry conditions', *Organization Science*, **19(1)**, 108-123.

Hallock, K., M. Strain, and D. Webber (2012), 'Job Loss and Effects on Firms and Workers', in Cooper, C. L., Pandey, A. and Quick, J. C., *Downsizing: Is Less Still More? Downsizing in a Global Retrenchment and Beyond.* Cambridge: Cambridge University Press, 3-50.

Huttunen, K., J. Men, and K. Salvanes (2011), 'How destructive is creative destruction? Effects of job loss on job mobility, withdrawal and income', *Journal of the European Economic Association*, **9(5)**, 840-870.

Konings, J., and H. Vandenbussche (2008), 'Heterogeneous responses of firms to trade protection', *Journal of International Economics,* **76(2)**, 371-383.

LaLonde, R., and L. Jacobson (1993), 'Earnings losses of displaced workers', *American Economic Review*, **83(4)**, 685-709.

Levinsohn, J., and A. Petrin (2003): Estimating Production Functions Using Inputs to Control for Unobservables', *Review of Economic Studies*, **70(243)**, 317-341.

Olley, G. S., and A. Pakes (1996), 'The Dynamics of Productivity in the Telecommunications Equipment Industry', *Econometrica*, **64(6)**, 1263-1297.

Palmon, O., H. Sun, and A. Tang (1997), 'Layoff Announcements: Stock Market Impact and Financial Performance', *Financial Management*, **26(3)**, 54-68.

Rege, M., K. Telle, and M. Votruba (2011), 'Parental Job Loss and Children's School Performance', *Review of Economic Studies*, **78(4)**, 1462-1489.

Schmieder, J., T. Wachter, and S. Bender (2009), 'The Long-Term Impact of Job Displacement in Germany During the 1982 Recession on Earnings, Income, and Employment', Discussion paper, Columbia University, Department of Economics.

Schmitz Jr, J. (2005), 'What determines productivity? Lessons from the dramatic recovery of the US and Canadian iron ore industries following their early 1980s crisis', *Journal of Political Economy*, **113(3)**, 582-625.

Schumpeter, J. (1942), 'Capitalism, Socialism and Democracy', *Economica*, **11(41)**.

Statistisches Bundesamt (2012): ,Bauhauptgewerbe/Ausbaugewerbe - Lange Reihen', *Discussion paper,* Statistisches Bundesamt, Wiesbaden.

Sullivan, D., and T. Von Wachter (2009), ,Job displacement and mortality: An analysis using administrative data' *Quarterly Journal of Economics*, **124(3)**, 1265-1306.

Tauchmann, Harald (2012), 'Partial Frontier Efficiency Analysis for Stata', *The Stata Journal,* **12(3)**, 461-478.

Van Biesebroeck, J. (2007): 'Robustness of Productivity Estimates', *Journal of Industrial Economics*, **55(3)**, 529-569.

Appendix

A.1 Identifying Downsizing Firms

Friebel and Heinz (2014) identified downsizing events by consulting the media database LexisNexis. In a first step they compiled a list of German synonyms for the word downsizing, based on careful reading of the articles. This involved both single words as composed terms. In a second step, they checked the list of synonyms by conducting two experiments with paid students from different fields of studies. A first group was asked to write down their own list of synonyms for downsizing. A second group was confronted with a list of words of which some were from the list of synonyms, some words that, depending on the context, would indicate a downsizing event and some that had nothing to do with downsizing. The students were asked to indicate to what extent these words would describe downsizing.[36] After defining the list of synonyms, they identified all articles from one of the leading German national newspapers, *Die Welt*, in which one or several of the synonyms appeared between December 2000 and September 2008. Next, they checked in detail all articles in which those firms were mentioned. All articles that reported on downsizing of these firms were included. This resulted in a dataset of 5,394 articles on a total of 424 companies. For most of these firms, the total number of jobs shed was mentioned in articles of *Die Welt*. To be sure that this number was correct, the authors checked the coverage in other prestigious German newspapers (e.g. *Frankfurter Allgemeine Zeitung, Handelsblatt*), in agency reports (e.g. *Reuters*) and with information from the company (e.g. annual reports, press communiqués).

Using the data from Friebel and Heinz (2014), we identified 108 out of 477 companies in our dataset as downsizing firms. As it is still possible that *Die Welt* did not report on some of the remaining companies, we extend our search to other German media. We identified all articles and reports in LexisNexis containing one of the downsizing synonyms identified by Friebel and Heinz

---

[36] For an overview of the details of the experiments, see Friebel and Heinz (2014).

(2014) and the name of the remaining 369 companies. For five firms with more than 1 billion euros sales per year we found further evidence of downsizing. We then read all articles in the *Handelsblatt* and the *Frankfurter Allgemeine Zeitung* in which one of these firms were mentioned between 2001 and 2007. We limited ourselves to these two newspapers as the media coverage for larger firms is quite extensive. For the firms with less than 1 billion euros sales, we read the reports in all newspapers, agency reports and magazines that are available in LexisNexis. Note that LexisNexis contains reports from 10,000 different sources. Our identification strategy enables us to state that a misclassification of downsizing is only possible if there was absolutely no coverage on a downsizing event in the German media or incorrect reports in all German media outlets. Our own search enabled us to additionally identify 52 downsizing firms, in addition to the 108 companies already identified by Friebel and Heinz (2014). 15 firms were omitted as it was unclear whether they really had shed jobs.

A.2 Identifying Downsizing Reasons

A.2.1 Panel A: Mentioned reasons for downsizing that are classified as business downturn

Überkapazitäten, Abbau von Kapazitäten, Kapazitäten verringern

Auslastung der Standorte, Auslastungsprobleme, nicht ausgelastete Standorte

Schrumpfkur(s), gesund schrumpfen, schrumpfende Leistung

Produktionskürzungen, Produktion kürzen, Reduktion der/reduzierte Produktion

Schleppende/schlechte Konjunktur, Konjunkturflaute, konjunkturelle Lage

Geringer/schwacher Auftragseingang, Abnahme der/mangels Aufträge

Halbierung des Auftragsvolumens, Auftragsflaute

Schwierige Geschäftslage/schwaches Geschäft

Absatz-/Umsatzeinbruch, Umsatzrückgang, Umsatzeinbußen

Nachfrageeinbruch, Rückgang/Einbruch der Nachfrage, schwache Nachfrage

Verlust von Großkunden, Auslaufen von Großauftrag

Konzentration auf/ Aus für [NAME OF PRODUCT] Produktion, Straffung der Produktpalette

Einstellung von [PRODUCT], Kürzung der Produktpalette

Rückläufiger Markttrend, Markteinbruch, desolater/schwacher/schrumpfender Markt

Abwärtstrend der Branche, Branchenkrise, Krise der/in/am [INDUSTRY], Branche leidet

Branchenweiter Stellen-/Personalabbau, [INDUSTRY]flaute, [INDUSTRY]krise

Sinkende Investitionen/Investitionszurückhaltung [OF THE CONSUMERS]

Schlechtes Marktumfeld

Wegfall von Großaufträgen von der Deutschen Bahn

Schwache Verfassung der Bauwirtschaft, sinkende Bauinvestitionen

Anhaltende Reiseflaute, Flaute im Reisegeschäft, Buchungsrückgänge

Aus der Zuckermarktderegulierung resultierende Produktionseinschränkungen

A.2.2 Panel B: Mentioned reasons for downsizing that are classified as improved staff utilization

Umstrukturierung, Restrukturierung, Neuausrichtung, Reorganisation

Konzernumbau, Verwaltungsumbau

Sparprogramm, Sparkurs, Sanierung, Kosten senken, Kostensenkung

Kostennachteile, Kostensenkung, Kostensenkungsmaßnahmen

Doppelstrukturen abbauen, ineffiziente Strukturen abbauen

Verbesserung interner Prozesse, Strukturen straffen, schlankere Strukturen

Betriebsabläufe gestrafft, schnellere Entscheidungswege, Managementebene soll wegfallen

Hierarchie- und Produktionsstrukturen vereinfachen, erhöhte Umsetzungsgeschwindigkeit

Ertragskraft steigern, Effizienz-/Produktionssteigerung, Wettbewerbsfähigkeit steigern

Zahl der Führungsgesellschaften schrumpft, [COMPANY] will sich neu ordnen

Zusammenlegung von [LOCATIONS, SUBSIDIARIES]

A.3 Overview of Downsizing Reasons

Table 11 Industry Overview of Downsizing Related to Business Downturn

Industry	Obs.	Specific reasons for downsizing
Construction of buildings (and suppliers)	15	After the reunification boom in the construction industry, the number of employees declined from 1.410 mio in 1995 to 0.71 mio in 2006. (Destatis, 2011)
Manufacture of motor vehicles (cars, trucks and suppliers)	12	Some of the German automobile manufacturers had to reduce their capacities due to decreasing market shares (e.g. Opel) or the lack of follow-up orders (e.g. Karmann, a contract manufacturer). This led the suppliers to reduce their capacities as well.
Retail trade	6	The weak consumption in Germany forced some retailers to downsize.
Manufacture of seminconductors	6	The demand for semiconductors is highly cyclical; after a boom in the late 1990s the demand collapsed in the early 2000s. Moreover, important German customers (Siemens mobile/BenQ) went bankrupt.
Manufacture of machines	5	After 9/11, the American market for machines declined. German export-oriented manufacturers of machines reduced their capacities.
Manufacture of computer	4	Weak demand in Germany and new competitors from Asia forced (especially smaller) manufacturers of computers to reduce their production capacities.
Airline industry, tourism	4	After 9/11, airlines and tourism providers in Germany reduced their capacities.
Manufacture of printing machines	3	After the breakthrough of the internet, newspaper sales declined worldwide. In the following the demand for printing machines declined as well.
Manufacture of tobacco products (and machines for tobacco producers)	3	Reduced tobacco consumption in Germany (and in Europe) forces tobacco producers to reduce their production capacities.
Manufacturing of telecommunication equipment	3	In the late 1990s, telecommunication equipment firms installed new mobile and internet networks in Europe; excess capacities in the market for the production of telecommunication equipment followed. In 2001/02 the market collapsed.
Manufacture of chemicals	3	New competitors from Asia expanded their production capacities of some basic chemical products, forcing some German competitors to reduce their capacities.
Newspaper publisher	2	After the breakthrough of the Internet, newspaper sales in Germany declined. In addition, advertising expenditures collapsed.
Manufacture of white goods	2	The weak German market for white goods and new competitors from Asia encouraged two household appliances manufactures to reduce their capacities
Manufacture of office machines	2	According to the statement of one of the two downsizing firms, the market for office machines in Germany declines by 15% after 9/11.
IT service provider	2	After the burst of the internet bubble, two IT service providers started to downsize.
Manufacture of wind turbines	2	After a new law heavily subsidizes the installation of wind turbines in Germany, the newly installed wind energy increased from 793 MW in 1998 to 3247 MW in 2002. Until 2004, the installed wind energy dropped to 2037 MW in 2004. (Bundesverband Windenergie e.V.)
Manufacture of steel	2	In 2001-2002, the steel industry got into a short crisis; two steel manufacturers in Germany reduced their capacities.
Manufacture of beverages	2	Per capita beer consumption in Germany decreased from 118.3 liter in 2001 to 109.5 liter in 2008. (Destatis)
Others	14	

Table 12 Overview of Downsizing Related to Improved Staff Utilization

Observations	Main type of internal reorganization (rough classification)
19	Internal hierarchies are dismantled or administrative processes are improved
19	Merger of subsidiaries or reorganizing of the organizational structure
13	Reorganization of the production process
4	Other reasons; multiple reasons