Cost Behavior

An Empirical Analysis of Determinants and Consequences of Asymmetries

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English Summary

The objective of this dissertation is to investigate determinants and consequences of asymmetric cost behavior. Asymmetric cost behavior arises if the change in costs is different for increases in activity compared to equivalent decreases in activity. In this case, costs are termed "sticky" if the change is *less* when activity falls than when activity rises, whereas costs are termed "anti-sticky" if the change is *more* when activity falls than when activity rises. Understanding such cost behavior is especially relevant for decision-makers and financial analysts that rely on accurate cost information to facilitate resource planning and earnings forecasting. As such, this dissertation relates to the topic of firm profitability and the interpretation of cost variability.

The dissertation consists of three parts that are written in the form of separate academic papers. The following section briefly summarizes the main research question, methodological design, data, findings and practical implications of each paper.

Paper I: Is Deliberate Cost Stickiness Economically Justifiable in the Presence of Adjustment Costs?

Research Question: Is deliberate cost stickiness economically justifiable in the presence of adjustment costs?

Methodological Design: Multiple linear regression and ANCOVA with focus on a firm-specific measure of asymmetrical cost behavior as well as an index capturing managerial intention when adjusting resources. Hypotheses are derived from adjustment cost theory and asymmetrical cost behavior theory.

Data: Financial statement line items from US and Canadian companies for the years 1998 to 2012.

Findings: Allowing for a higher cost-to-sales ratio due to cost stickiness when demand is temporarily decreasing is economically justifiable if adjustment costs can be avoided. Firms with sticky costs have a lower average cost-to-sales ratio than firms with anti-sticky costs if demand in the prior period decreases but rebounds in the current period. However, if activity decreases over two consecutive periods, the effects are strongly mitigated and yield no significant difference in the cost-to-sales ratio between both groups. Moreover, the positive economic consequence of avoiding adjustment costs during a temporary decline in demand diminishes with an increasing level of firm-specific cost stickiness.

Practical Implications: Contrary to conventional intuition, a temporary increase in the cost-to-sales ratio does not necessarily reflect costs getting out of control. Instead, it can reflect cost stickiness resulting from deliberate managerial decision-making in the presence of adjustment costs. Analysts can use this insight to improve the interpretation of common cost ratios as well as short-term earnings comparisons. In addition, findings highlight the economic importance of acknowledging adjustment costs when making resource adjustment decisions in response to fluctuations in demand.

Paper II: The Effect of Labor Supply Shortages on Asymmetric Cost Behavior

Research Question: How do labor supply shortages affect asymmetric cost behavior?

Methodological Design: Multiple linear regression with focus on the effect of supply shortages on cost behavior. Hypotheses are derived from dynamic labor demand theory and asymmetrical cost behavior theory.

Data: Combination of longitudinal survey data and financial statement line items from Danish companies for the years 1998 to 2013.

Findings: If the supply of resources is scarce it is more difficult for companies to build up capacity which reflects an increase in adjustment costs and in turn affects firm-specific cost behavior. Specifically, labor supply shortages are associated with a decrease in cost stickiness. Firms reduce cost stickiness by raising selling prices and react to high demand by increasing work pressure and expecting more effort from their employees. This leads to an increase in labor productivity and therewith reduces cost stickiness. The effect decreases with the length of the labor supply shock and is more pronounced for companies located in less populated regions.

Practical Implications: Costs are strongly influenced by the availability of resources. Thus, companies are advised to acknowledge the interplay between supply side effects in addition to demand side effects when taking resource adjustment decisions. This is particularly important for firms that rely to a greater extent on labor than capital resources. In addition, findings can help policy makers to evaluate the time lag and magnitude of policy changes that are likely to affect firms' access to the labor market and specific skills.

Paper III: Price Changes, Resource Adjustments and Rational Expectations

Research Question: How do managers adjust resources and prices in accordance with their expectations about future demand?

Methodological Design: Multiple linear regression with focus on the effect of managers' accuracy in predicting future demand on cost behavior. Hypotheses are derived from rational expectation theory and asymmetrical cost behavior theory.

Data: Combination of longitudinal survey data and financial statement line items from Danish companies for the years 1999 to 2013.

Findings: Cost stickiness decreases with increasing managerial expectation accuracy. Expectation accuracy captures the degree to which managers' beliefs about future demand coincides with the actual path of demand. Managers who correctly anticipate a negative demand shock lower cost stickiness by cutting resources and decreasing prices whereas managers who did not expect a fall in demand retain resources and do not change prices. Moreover, managerial forecast accuracy moderates the relationship between demand uncertainty and cost elasticity. Cost elasticity is higher when a demand decrease is expected among companies with similar exposure to demand uncertainty.

Practical Implications: A high accuracy in predicting future demand is beneficial for companies. In case of an anticipated fall in demand, managers can avoid losses through an early reaction by cutting costs and reducing capacity before the shock occurs. In case of an anticipated rise in demand, managers can build up capacity in advance to skim the market when demand is high. Thus, managerial competences in predicting future demand determine firms' profitability. This is particularly important when demand uncertainty is high or macroeconomic growth is declining.

Danish Summary

Formålet med denne afhandling er at undersøge determinanter og konsekvenser af asymmetrisk omkostningsadfærd. Asymmetrisk omkostningsadfærd opstår, hvis omkostningsændringer er anderledes for aktivitetsstigninger sammenholdt med omkostningsændringer ved tilsvarende fald i aktiviteten. Såfremt dette er tilfældet kan omkostningerne benævnes "sticky", hvis ændringen er mindre, når aktiviteten falder, end når aktiviteten stiger, mens omkostninger kan benævnes "anti-sticky", hvis ændringen er større, når aktiviteten falder, end når aktiviteten stiger. Forståelse af en sådan omkostningsadfærd er især relevant for beslutningstagere og analytikere, der er afhængige af nøjagtige informationer om omkostninger med henblik på at understøtte ressourceplanlægning og indtjeningsestimater. Denne afhandling relaterer sig således til emnerne rentabilitet og forståelse for variabilitet i omkostninger.

Afhandlingen består af tre dele, der er skrevet som akademiske papirer. I det følgende præsenteres forskningsspørgsmål, metodisk design, data, resultater og implikationer for hvert af de tre papirer.

Paper I: Is Deliberate Cost Stickiness Economically Justifiable in the Presence of Adjustment Costs?

Forskningsspørgsmål: Er bevidst "Cost Stickiness" økonomisk fordelagtigt, når der tages højde for omkostninger forbundet med at foretage tilpasninger?

Forskningsdesign: Multipel lineær regression og ANCOVA med fokus på virksomhedsspecifik måling af asymmetrisk omkostningsadfærd samt et indeks, der adresserer ledelsesmæssige hensigter når ressourcer tilpasses.

Hypoteser er afledt af teorier om omkostningstilpasning og asymmetrisk omkostningsadfærd.

Data: Årsregnskabsposter fra amerikanske og canadiske virksomheder for årene 1998 til 2012.

Resultater: En højere omkostning/salgs ratio, på grund af ”Cost Stickiness” når efterspørgslen falder midlertidigt, er økonomisk fordelagtigt, såfremt tilpasningsomkostninger kan undgås. Virksomheder med ”sticky” omkostninger har en lavere gennemsnitlig omkostning/salgs ratio end virksomheder med ”anti-sticky” omkostninger, såfremt efterspørgslen i den foregående periode falder, for derefter at vende tilbage i den indeværende periode. Såfremt aktiviteten falder over to på hinanden følgende perioder er effekterne dog stærkt formindskede og der er ingen signifikante forskelle i omkostnings/salgs ratioen mellem de to grupper. Derudover er den positive økonomiske konsekvens af at undgå tilpasningsomkostninger ved midlertidige efterspørgselsfald formindsket i takt med en stigende grad af virksomhedsspecifik ”Cost Stickiness”.

Praktiske implikationer: I modsætning til almindelig intuition, så betyder en midlertidig stigning i omkostning/salgs ratioen ikke nødvendigvis at omkostningerne er ude af kontrol. Dette kan forklares ved omkostningernes ”stickiness” som følge af bevidste ledelsesmæssige beslutninger, når der samtidig er tilpasningsomkostninger. Analytikere kan bruge denne forståelse til at forbedre fortolkningen af udbredte omkostningsnøgletal samt ved sammenligninger af indtjening på kort sigt. Derudover understreger resultaterne den økonomiske betydning af at tage højde for tilpasningsomkostninger, når der træffes beslutninger om ressourcejusteringer som reaktion på udsving i efterspørgslen.

Paper II: The Effect of Labor Supply Shortages on Asymmetric Cost Behavior

Forskningsspørgsmål: Hvordan påvirker knaphed i udbud af arbejdskraft den asymmetriske omkostningsadfærd?

Forskningsdesign: Multipel lineær regression med fokus på effekten af knaphed i udbud af arbejdskraft på omkostningsadfærd. Hypoteser er afledt af teorier om dynamisk efterspørgsel efter arbejdskraft og asymmetrisk omkostningsadfærd.

Data: Kombination af longitudinelle surveydata og årsregnskabsposter fra danske virksomheder i perioden mellem 1998 og 2013.

Resultater: Hvis der er knappe ressourcer, er det sværere for virksomhederne at opbygge en kapacitet, der afspejler en stigning i tilpasningsomkostninger og igen påvirker virksomhedsspecifik omkostningsadfærd. Knaphed i udbud af arbejdskraft er forbundet med et fald i omkostningernes ”stickiness”. Virksomheder reducerer omkostningernes ”stickiness” ved at hæve salgspriserne og reagerer på høj efterspørgsel ved at øge arbejdspres og ved at forvente øget indsats fra deres ansatte. Dette fører til en stigning i arbejdsproduktiviteten og dermed reduceres omkostningernes ”stickiness”. Effekten aftager med længden af det chok, der er forbundet med arbejdsudbuddet og er mere udtalt for virksomheder beliggende i områder med lav befolkningstæthed.

Praktiske implikationer: Omkostningerne er stærkt påvirket af tilgængeligheden af ressourcer. Virksomheder bør således være opmærksomme på samspillet mellem effekter på udbudssiden i tilknytning til effekter på efterspørgselssiden, når der tages beslutninger vedrørende ressourcetilpasning.

Dette er især vigtigt for virksomheder, der i højgere grad er afhængige af arbejdskraft frem for kapitalressourcer. Derudover kan resultaterne hjælpe politikere med at vurdere den tidsmæssige forskydning og omfanget af de politiske ændringer, der kan påvirke virksomheders adgang til arbejdsmarkedet og særlige kompetencer.

Paper III: Price Changes, Resource Adjustments and Rational Expectations

Forskningsspørgsmål: Hvordan tilpasser ledere ressourcer og priser i overensstemmelse med deres forventninger til den fremtidige efterspørgsel?

Forskningsdesign: Multipel lineær regression med fokus på effekten på omkostningsadfærd af hvor nøjagtigt ledelsen forudsiger den fremtidige efterspørgsel. Hypoteser er afledt af teorier om rationelle forventninger og asymmetrisk omkostningsadfærd.

Data: Kombination af longitudinelle surveydata og årsregnskabsposter fra danske virksomheder i perioden mellem 1999 og 2013.

Resultater: Omkostningernes "stickiness" falder i takt med en stigende nøjagtighed i ledelsens forventninger. Forventningernes nøjagtighed er udtryk for i hvilken grad ledernes opfattelser af fremtidig efterspørgsel falder sammen med den faktiske udvikling i efterspørgslen. Ledelser som korrekt forventer et negativt efterspørgselschok, nedbringer omkostningernes "stickiness" ved at skære i ressourcer og sætte priser lavere, mens ledere, der ikke forventer et fald i efterspørgslen, fastholder ressourcer og undlader at ændre priserne. Derudover påvirker nøjagtigheden af ledelsens prognoser forholdet mellem usikkerhed i efterspørgslen og omkostningernes elasticitet. Omkostningernes elasticitet er højere, når der forventes et efterspørgselsfald blandt virksomheder med ensartet eksponering overfor usikkerhed i efterspørgslen.

Praktiske implikationer: Det er til gavn for virksomhederne at være i stand til med stor nøjagtighed at forudsige den fremtidige efterspørgsel. I tilfælde af at der forventes en efterspørgselsnedgang, kan ledelsen undgå tab ved rettidigt at nedbringe omkostninger og reducere kapaciteten før chokket indtræffer. I tilfælde af at der forventes en stigning i efterspørgslen, kan ledere opbygge kapacitet på forhånd med henblik på at opnå fordele i markedet, når efterspørgslen er høj. Således er de ledelsesmæssige kompetencer til at forudsige den fremtidige efterspørgsel bestemmende for virksomhedernes rentabilitet. Dette er især vigtigt, når usikkerheden i efterspørgslen er høj, eller når den makroøkonomiske vækst er aftagende.

Table of Contents

A SYNOPSIS

1 Motivation and Contribution

This dissertation contributes to the understanding of determinants and consequences of asymmetric cost behavior. As such, it adds both practically as well as theoretically to the existing knowledge within the field of Management Accounting.

The practical relevance of this project is anchored in a better understanding of the way costs behave and therewith a better predictability of costs on a firm basis. Because firms' profitability is strongly influenced by the amount of costs incurred to provide products and services, effective cost management is on the top of most CEO's agenda (McKinsey&Company 2010). However, the complexity of the business and environmental uncertainties make it difficult for companies to predict future resource requirements and control costs accordingly. A Deloitte survey from April 2016 finds that the lack of understanding cost behavior represents a major barrier for effective cost management. Many firms therefore have dedicated cost management positions for executive personnel to address questions related to cost control and measurement (Deloitte 2016). Thus, effective cost management is vital for companies to stay economically competitive and of fundamental financial and strategic importance for managerial decision-making (Horngren 2015). This dissertation therefore picks up a central topic for practitioners as well as analysts. Specifically, findings offer the following insights that can be applied in a practical context:

1. If costs move less for decreases in activity (e.g., output volume) compared to equivalent increases in activity, they behave asymmetric. The magnitude of asymmetry is likely to capture adjustment costs that are incurred with the adaption of resources. This study shows how

adjustment costs can be estimated on a firm-basis by investigating the historical behavior of costs over time. Companies can use this information to improve the accuracy of cost forecasts or simply as a reference value when considering restructuring businesses or positioning the organization for growth.

2. Asymmetric cost behavior oftentimes reflects the retention of resources when demand declines. In this case costs are said to be sticky (Anderson, Banker, and Janakiraman 2003). Sticky costs lead to a rise in the cost-to-sales ratio which is commonly interpreted as a negative signal about managers' ability to control costs (Baumgarten, Bonenkamp, and Homburg 2010; Lev and Thiagarajan 1993). Managers who deliberately chose to maintain the current level of resources to avoid adjustment costs can refer to the findings of this dissertation in order to justify a short-term increase in the cost ratio. Results show that if a drop in demand is temporary, then sticky costs are positively associated with a cost reduction on average because the adjustment of resources is more costly than their short-term retention.

3. Costs are strongly influenced by the availability of resources. However, the supply of resources is beyond the direct control of most firms. Especially in times of increased specificity of knowledge and globalized labor markets, companies face difficulties in finding and recruiting skilled employees. This study shows how particularly the availability of labor influences cost behavior. Findings suggest that labor productivity increases if firms are unable to hire additional employees and therefore temporarily expect more effort from their workforce. This implies that economic benefits can be realized by adapting a conservative staffing approach rather than optimistically building up labor capacity.

4. With respect to changes in demand, resources are adapted proactively prior to either a positive or a negative demand shock or after the shock occurred initially. What determines the choice of action is managers' ability to predict future demand. This study shows that firms can prevent a decrease in profitability by increasing the accuracy of managerial expectations. In case of a foreseen drop in demand, companies can react early by cutting costs or lowering prices. In case of a foreseen rise in demand, companies can exploit purchasing power by building up capacity in advance. Both forms reduce adjustment costs as resources are adapted more gradually over time compared to a rapid and impulsive reaction.

The practical relevance of this dissertation is refined by empirical work that contributes to the academic literature on asymmetric cost behavior. Following a positivistic approach, this dissertation draws on economic concepts to specify testable hypotheses. By doing so, each finding is linked to theoretical propositions that help to fill research gaps or reveal important alternative explanations which are new to the literature. To gain an overview of the current state of research as well as gaps and overlaps, a systematic literature review has been conducted at the beginning of this dissertation. A brief summary of it is embedded in this introduction to explain the positioning of this project in the literature. In a nutshell, this dissertation contributes to the scientific literature on asymmetric cost behavior in three ways:

1. New theoretical concepts are introduced that help to explain inconsistencies and illuminate black boxes. For instance, this dissertation discusses the impact of labor hoarding in the context of labor productivity and shows how it affects asymmetric cost behavior. Moreover, it connects the notion of labor market thickness with research on asymmetric cost behavior in order to explain regional

differences in the degree of cost stickiness. Collectively, this allows investigating the interplay between supply and demand dynamics and directs promising areas for future research.

2. This dissertation provides an insightful analysis of the mechanisms through which managers adjust resources and selling prices in accordance with their expectations about future demand. Analyses are conducted based on a pooled dataset containing cost and sales information as well as survey responses on e.g., management demand expectations, factors limiting the current business and selling price changes. Contrary to most other papers that use merely archival data from financial statements, the rich information of this study allows to not only identify different channels through which companies respond to fluctuations in demand, but also specify the magnitude and trade-off between effects.

3. Drawing on adjustment cost theory, this dissertation estimates the economic consequences of asymmetric cost behavior. To do so, a firm-specific measure of cost stickiness is applied in order to evaluate the impact of either sticky costs (i.e. costs respond *less* sensitive to activity decreases than to activity increases) or anti-sticky costs (i.e. costs respond *more* sensitive to activity decreases than to activity increases) on the average cost-to-sales ratio. This allows specifying not only the drivers of cost asymmetries, but also its economic feasibility if the retention of resources is intended by the management.

The remaining part of this chapter is structured as follows. The next section explains the notion of asymmetric cost behavior and gives an introduction to the standard empirical model according to Anderson et al. (2003). In the following, the main assumptions in this field of research are discussed. Then, a literature review based on 28 selected articles is conducted that strongly contribute to the research on asymmetric cost behavior.[1] Findings are summarized by providing a graphical map of the theorized relationships in each study. The construction of the map follows the guidelines developed by Luft and Shields (2003) and serves as a basis to cluster the literature in different categories. Thereupon, the positioning of each paper within the frame of this dissertation is explained followed by an introduction to the theoretical approach as well as an explanation of data and methodological design. The last part of this synopsis discusses the main limitations of the dissertation and highlights areas of future research. Papers are enclosed as separate chapters in the following sections B, C and D of this document.

2 The Notion of Asymmetric Cost Behavior

2.1 Definition

Asymmetric cost behavior arises when the magnitude of a change in costs for increases in activity is different than the magnitude of a change in costs from decreases in activity. It implies that the cost-to-activity relationship is not symmetrical for positive compared to negative fluctuations in activity. Such cost behavior can occur in two forms: sticky costs or anti-sticky costs. On the one hand, if costs decrease less for a decrease in activity than they increase for an equivalent increase in activity, they are found to be sticky (Anderson, Banker, and Janakiraman 2003). On the other hand, if costs decrease more for a decrease in activity than they increase for an equivalent increase in activity, they are found to be anti-sticky (Weiss 2010). Both forms extend the traditional cost model by distinguishing not only between fixed and variable costs (as extreme cases), but also by the direction of change in activity (Banker and Byzalov 2014).

[1] Articles have been selected based on the number of citations since 2003, the impact factor of the journal in which they are published and relevance for this dissertation.

These differences are illustrated in Figure 1 in which the three main exemplary cost curves for either symmetrical ('regular costs') or asymmetric cost behavior ('stickiness' or 'anti-stickiness') are depicted corresponding to the change in activity. The middle graph illustrates the traditional mechanical cost function according to which costs move proportional to both a positive (from Y_0 to Y_H) and negative (from Y_0 to Y_L) variation in activity. However, if costs behave less sensitive to activity decreases than to activity increases, which is illustrated in the left graph, they will follow the solid cost line ('sticky cost curve') instead of the dotted one ('regular cost curve'). The area ACC' which spans across both slopes depicts the extent of cost stickiness. This implies a higher cost-to-sales ratio during revenue decreasing periods as comparably estimated with the application of traditional cost models. The opposite is the case for anti-sticky cost behavior which is shown in the very right graph of Figure 1.

Figure 1: Overview of different cost curves in relation to changes in activity

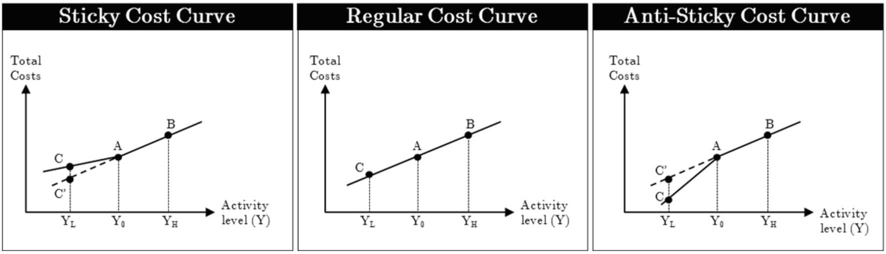


Figure 1 depicts three different cost functions which illustrate asymmetric cost behavior with sticky costs (left graph) and anti-sticky costs (right graph) as well as symmetrical cost behavior (middle graph). The dashed cost function illustrates the regular cost curve without conditioning on the direction of activity changes. Y refers to the activity level of the company in a range from low (Y_L) to high (Y_H).
Costs are sticky if they decrease less for decreases in activity than they increase for increases in activity. Thus, the cost function is flatter between Y_0 and Y_L than between Y_0 and Y_H. Costs are anti-sticky if they decease more for decreases in activity than they increase for increases in activity. Thus the cost function is flatter between Y_0 and Y_H than between Y_0 and Y_L.

2.2 Empirical Estimation

The empirical model according to Anderson et al. (2003) uses cross-sectional ordinary least squares regression in order to estimate cost behavior as a function of changes in sales. Sales are employed as a proxy for changes in activity. The statistical specification is as follows:

$$\Delta\ln COST_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\ln\text{SALES}_{i,t} + \varepsilon_{i,t}, \text{ where } \beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t}$$

$\Delta\ln COST_{i,t}$ and $\Delta\ln\text{SALES}_{i,t}$ capture the log-change between the current and the previous period in costs and sales respectively. $D_{i,t}$ is a dummy variable taking the value of one when sales decrease and zero otherwise. β_1 captures the elasticity of costs for a one percent increase in sales, while $\beta_1 + \beta_2$ can be interpreted as the elasticity of cost for a one percent decrease in sales. Thus,

β_2 is negative if costs are sticky (i.e. the change in costs for increases in sales is significantly greater than the change in costs for an equivalent decrease in sales).

2.3 Important Assumptions

The literature on asymmetric cost behavior makes several important assumptions in order to operationalize the theorized relationship.

First, most studies imply that cost fluctuations reflect managers' decisions on adapting resources in response to changes in demand. According to Anderson, Banker and Janakiraman (2003), cost stickiness arises because managers deliberately retain resources when a fall in demand is perceived to be only temporary. In this case adjustment costs can be avoided which arise as a consequence of cutting capacity when demand declines and adding capacity when demand rebounds. Those costs could be attributable, for instance, to the payment of severance packages as a consequence of dismissal of personnel or disposal costs of physical assets (Banker, Byzalov, and Chen 2013; Cooper and Haltiwanger 2006; Hamermesh and Pfann 1996).[2]

Second, it is assumed that changes in companies' activity occur as a response to changes in demand (Anderson, Banker, and Janakiraman 2003). Because changes in activity are not directly observable, many researchers use sales as an imperfect proxy for changes in activity (Anderson, Banker, and Janakiraman 2003; Banker and Chen 2006; Banker et al. 2014; Banker and Byzalov 2014; Chen, Lu, and Sougiannis 2012; Kama and Weiss 2013; Weiss 2010). However, this raises the concern that the estimated relationship is affected by selling price fluctuations (Anderson and Lanen 2009; Cannon 2014). Even though studies that use actual activity measures (rather than

[2] Next to the adjustment cost argument, some studies find that cost stickiness can also be ascribed to alternative explanations, such as empire building incentives (Chen, Lu, and Sougiannis 2012), managerial overconfidence (Chen, Gores, and Nasev 2013) or cultural differences between countries (Kitching, Mashruwala, and Pevzner 2016).

employing sales as an imperfect proxy of activity) also find evidence for asymmetric cost behavior (Balakrishnan, Petersen, and Soderstrom 2004; Cannon 2014; Dierynck, Landsman, and Renders 2012), results should be interpreted with caution if the model does not control for price changes.

Third, many studies examine the asymmetric behavior of selling, general and administrative costs (SG&A), because managerial discretion is expected to be high in managing components of this cost group (Anderson et al. 2007; Banker et al. 2013; Banker et al. 2014; Baumgarten, Bonenkamp, and Homburg 2010; Chen, Lu, and Sougiannis 2012). Contrary to the prevalent interpretation that understands a rise of the SG&A ratio as a negative signal about managers' ability to control costs (Bernstein and Wild 1998; Lev and Thiagarajan 1993), the latter is ascribed to the stickiness of SG&A costs, which is likely to reflect deliberate managerial decision-making instead of costs getting out of control. Some researchers also observe sticky and anti-sticky costs in other cost categories, such as total operating costs, labor costs or costs of goods sold (Balakrishnan and Gruca 2008; Banker and Byzalov 2014; Holzhacker, Krishnan, and Mahlendorf 2015a; Weidenmier and Subramaniam 2016; Weiss 2010).

2.4 Literature Overview

2.4.1 Selection of Studies

Although scholars recognized the cost stickiness phenomenon already in the 20th century (Brasch 1927; Hasenack 1925; Noreen 1991; Noreen and Soderstrom 1994; Rumpf 1966; Strube 1936), the work by Anderson, Banker and Janakiraman in 2003 set the stimulus for the flourishing of research on asymmetric cost behavior until today. The majority of studies investigate drivers of asymmetric cost behavior or test identified empirical relationships in different institutional settings. A less explored stream of literature focuses on the effects of cost behavior on for instance firm profitability or earnings forecast. To provide an overview of the main findings within the field, the following synopsis summarizes examined relationships in 28 studies. These are selected using the following criteria: number of citations since 2003, impact factor of the journal and relevance for this dissertation. All of the chosen scientific articles have contributed to the empirical understanding of asymmetric cost behavior and are published in one of the journals listed below:

- The Accounting Review (7)
- Journal of Management Accounting Research (5)
- Contemporary Accounting Research (3)
- Journal of Accounting Research (2)
- Journal of Accounting and Economics (2)
- Management Accounting Research (2)
- Journal of Accounting, Auditing and Finance (2)
- Other journals (5)

Selected studies are listed in Table 1. In the following, these studies are summarized in a structured framework that serves as basis to outline the positioning of this dissertation in the literature.

Table 1: Overview of Selected Studies

1	Anderson, Banker and Janakiraman (2003)	15	Cannon (2014)
2	Anderson et al. (2007)	16	Chen, Lu and Sougiannis (2012)
3	Balakrishnan and Gruca (2008)	17	Ciftci, Mashruwala and Weiss (2016)
4	Balakrishnan, Labro and Soderstrom (2014)	18	Dalla Via and Perego (2014)
5	Balakrishnan, Petersen and Soderstrom (2004)	19	Dierynck, Landsman and Renders (2012)
6	Banker and Chen (2006)	20	He, Teruya and Shimizu (2010)
7	Banker et al. (2016)	21	Holzhacker, Krishnan and Mahlendorf (2015b)
8	Banker and Byzalov (2014)	22	Holzhacker, Krishnan and Mahlendorf (2015a)
9	Banker, Byzalov and Chen (2013)	23	Kama and Weiss (2013)
10	Banker et al. (2014)	24	Kitching, Mashruwala and Pevzner (2016)
11	Banker, Byzalov and Plehn-Dujowich (2014)	25	Shust and Weiss (2014)
12	Banker, Fang and Metha (2013)	26	Venieris, Naoum and Vlismas (2015)
13	Baumgarten, Bonenkamp and Homburg (2010)	27	Weidenmier and Subramaniam (2016)
14	Calleja, Stelarios and Thomas (2006)	28	Weiss (2010)

Table 1 gives an overview of the literature used to construct the map in Figure 2.

2.4.2 Graphical Representation of Cause-And-Effect Relationships

Authors of academic articles select a set of operational variables in order to test the research question of the paper. The selection of variables is determined by the theoretical construct based on which the research question is examined. Nevertheless, depending on the research design and the available dataset, scholars may choose different variables even though the theorized relationships are similar (Evans et al. 2015). This can lead to contradictory interpretations and aggravates the comparison of findings. To address this issue, Figure 2 provides a graphical map of the theorized relationships within each of the selected articles. The construction of the map follows the guidelines developed by Luft and Shields (2003) and serves as a basis for the deduction of hypotheses which are tested within the frame of this dissertation.[3]

The objective underlying the portrayed relationships in Figure 2 is to give a graphical overview of the proposed treatises within current asymmetric cost behavior literature. The letter combinations in the map refer to the main research question of the respective paper as the answer to the question on "what the study is about". Table 2 provides the full definition of each letter combination. They do not necessarily represent the actual operationalization within the applied model itself, but rather refer to the underlying theoretical constructs. By following this approach it is possible to identify the cause-and-effect relationships of each study, even though different instruments and measures are used to empirically test the implied relationship. It moreover facilitates the identification of gaps, overlaps and possible inconsistencies and serves as a framework to position the individual papers of this dissertation.
Each number represents one of the selected studies which are listed in Table 1. Only core linkages between theoretical constructs are shown in the map; excluding control variables in certain empirical models or robustness checks that do not inherently support the theoretical and empirical contribution of the paper. However, if the authors highlight new influencing factors and elaborate on the individual analysis of each, then the specific element is

[3] With the publication of the paper "Mapping Management Accounting: Graphics and Guidelines for Theory-Consistent Empirical Research" in Accounting, Organizations and Society, Luft and Shields (2003) introduce a structured approach on how to analyze research studies in Management Accounting. The authors review 275 articles from various journals and examine the theories and methods employed as well as the underlying cause and effect relationships studied. In doing so, they focus on the following three main questions: First, they specify what is being researched according to the set of variables employed. Second, the direction and shape of the explanatory links are determined and third, they examine the level of analysis of each of the publications. Based on the previous exploration, the paper then provides a graphical illustration in form of a relational map of the causes and effects of Management Accounting research as referred to in each of the cited studies. The authors construct nine maps that provide a compact graphical summary of a specific area in Management Accounting and the applied theory. The latter most frequently relates to conceptualizations in the field of economics, organization, contingency, sociology or psychology.

embedded in the graphic. Furthermore, cause-end-effect relationships are illustrated with a dotted arrow in case of a negative impact of the independent on the dependent variable or if a moderator is included in the model according to which the associated link could be either negative or positive. The latter is displayed by a straight-line arrow in simple unilateral causal relations. In rare cases, a theorization of no causal relationship is indicated with a semi-dotted arrow between two letter combinations. A legend is also provided at the bottom right of Figure 2.

Notably, the displayed associations are not mutually exclusive. Several articles for instance predict a relationship between the magnitude of adjustment costs and asymmetric cost behavior. Nevertheless, the effect can be theorized on the firm-level as well as on the country level. Accordingly, some studies measure adjustment costs by using employee intensity (number of employees to sales) or asset intensity (total assets to sales), while other studies focus on national differences. Thus, the same letter combination can occur more than once on the map.

As can be seen on the left side of Figure 2, the map is divided into four different levels based on which theoretical linkages are displayed. The levels refer to the investigation of (1) external effects beyond the organization, (2) firm-specific effects within the organization, (3) effects on the sub-unit level of the organization, and (4) effects that arise on the individual level. Although most of the articles focus on one single level of analysis, there are few cross-level models which examine a causal relationship either top-down, e.g., from the macroeconomic level to the organizational level or bottom-up, e.g., from the individual level to the organizational level.

Figure 2: Overview of Explanatory Links of Selected Studies in the Field of Asymmetric Cost Behavior

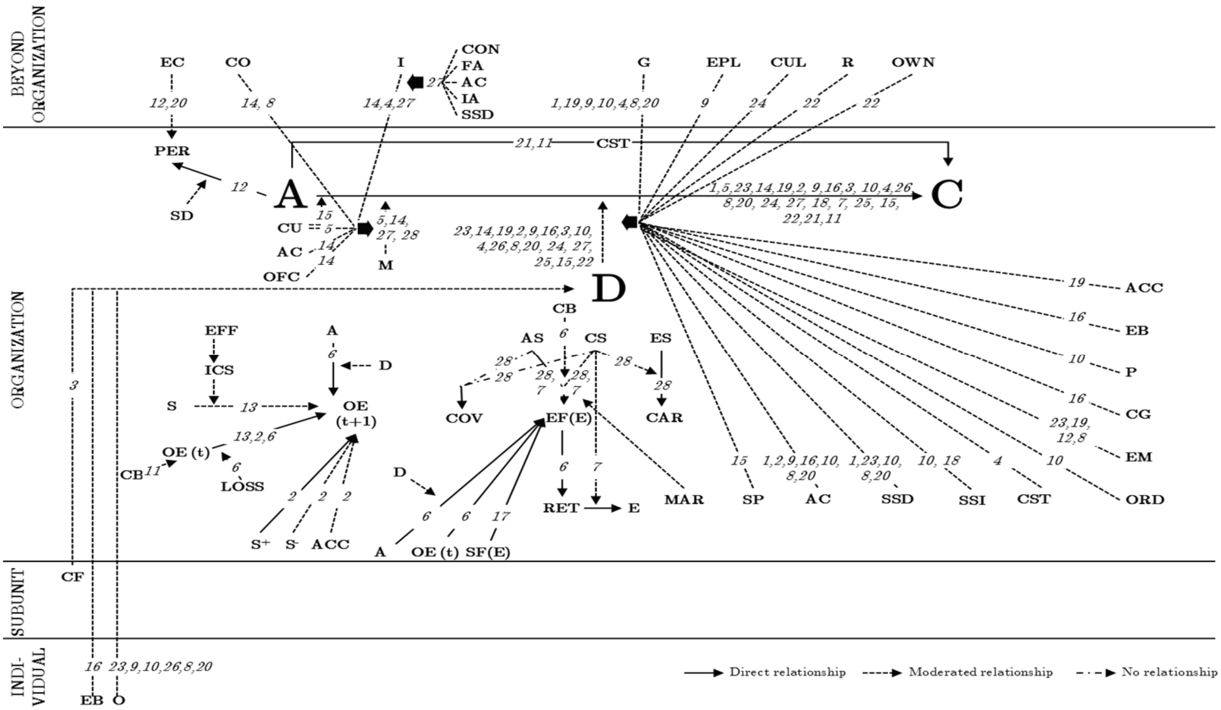


Figure 2 represents a map of cause-and-effect relationships that are investigated within the frame of selected studies on asymmetric cost behavior. Each number refers to one of the studies listed in Table 1. Letter combinations represent the theoretical constructs of every study (see Table 2 for the meaning of letter combinations).

Table 2: Letter Combinations

A	Activity	FA	Fixed Asset Intensity
AC	Adjustment Costs	FC	Fixed Costs
ACC	Abnormal Accruals	G	Macroeconomic Growth
AS	Anti-Stickiness	I	Industry
C	Costs	IA	Inventory Intensity
CAR	Market Response	ICS	Intention (Intended Cost Stickiness)
CB	Cost Behavior	LOSS	Negative Earnings in the Prior Year
CF	Core Function	M	Magnitude of Change
CG	Corporate Governance	MAR	Margin
CO	Country	O	Managerial Optimism/ Expectations
CON	Industry Concentration Intensity	OC	Organizational Capital
COV	Analyst Coverage	OE	Operating Earnings
CS	Cost Stickiness	OFC	Other Firm-Specific Characteristics
CST	Cost Structure	ORD	Order Backlog
CU	Capacity Utilization	P	Pessimism
CUL	Culture	PER	Performance
D	Direction of Activity Change	R	Regulation
E	Earnings	RET	Contemporaneous Annual Stock Returns
EB	Empire Building Incentives	S^-	SGA Signal when Sales Decrease
EC	Economic Crisis	S^+	SGA Signal when Sales Increase
EF(E)	Earnings Forecast (Error)	SF(E)	Sales Forecast (Error)
EFF	Operating Efficiency	SP	Selling Prices
EM	Earnings Management	SSD	Successive Decrease
EPL	Employment Protection Laws	SSI	Successive Increase
ES	Earnings Surprises		

Table 2 gives an overview of the variables used to construct the map in Figure 2.

2.4.3 Description of Explanatory Links

In their seminal study (#1), Anderson, Banker and Janakiraman (2003) estimate the magnitude of cost stickiness by using a regression model that captures a one percent change in costs relative to a one percent change in activity conditional on the direction of change in activity (see section 2.2 for a description of the empirical model). Figure 2 illustrates this relationship with bold capital letters. A refers to the level of activity, C represents the cost category applied (e.g., SG&A costs) and D denotes the direction of change depending on whether activity increased or decreased. Because D is used as a moderator, the arrow pointing from D to the connection between A and C is dotted. The majority of successive studies follow this approach and measure asymmetric cost behavior as the difference in the percentage change in costs (dependent variable) for decreasing compared to increasing activity (independent variable).

The following paragraphs briefly summarize the current literature. Studies on the organizational level are discussed first, as they represent the bulk of papers. Next, papers that examine external factors beyond the organization are laid out, followed by research on the subunit and individual level.

2.4.3.1 Level of Analysis: Organization

With progressing research on asymmetric cost behavior, scientists have focused on the various *firm-specific* factors that can explain the magnitude of cost stickiness or anti-stickiness on the organizational level. Those variables are generally included as additional moderators which interact with the degree of cost decreases during periods of falling demand. Dierynck, Landsman and Renders (2012) for instance show that managers of firms that meet or beat the zero earnings benchmark adjust to activity decreases by laying off employees instead of managing earnings (EM) through accrual adjustments (ACC). Similarly, Kama and Weiss (2013) find that earnings management reduces asymmetric cost behavior when executives are incentivized to meet earnings targets. Moreover, Chen, Lu and Sougiannis (2012) document that cost stickiness is more pronounced when corporate governance (CG) is low which entices managers to engage in empire building activities (EB) for their own benefits. Additionally, Banker et al. (2014) suggest that costs are stickier if decision-makers are very pessimistic (P) with respect to future sales due to low order backlog (ORD) or prior period sales decreases (SSD). On the contrary, the authors argue that managers are more optimistic if prior period sales increased (SSI) which results in a higher level of cost stickiness (Banker et al. 2014). Drawing on the adjustment cost literature (Cooper and Haltiwanger 2006; Hamermesh 1989; Hamermesh and Pfann 1996; Pfann and Palm 1993; Rothschild 1971), some studies estimate the effect of different magnitudes of adjustment costs (AC) on asymmetric cost behavior. Anderson, Banker and Janakiraman (2003) for instance use proxies such as employee intensity (ratio of total number of employees to revenue) and asset intensity (ratio of total assets to revenue) to measure the impact of adjustment costs on asymmetric cost behavior. In agreement with other studies (Anderson et al. 2007; Banker et al. 2013; Banker and Byzalov 2014; Banker et al. 2014), they find that an increase in adjustment costs leads to an increase in cost stickiness. Likewise, Cannon (2014) provides evidence for the influence of *selling price changes* (SP) on asymmetric cost behavior. He identifies three mechanisms which give rise to sticky costs. First, he confirms prior research which shows that costs are sticky because managers retain idle capacity as demand falls and add capacity as demand rises. Second, he ascribes sticky costs to managers lowering selling prices to utilize existing capacity when demand falls but adding capacity (rather than increasing prices) when demand rises. Third, he documents the counterintuitive result indicating that costs are sticky because firms incur more costs when they build up resources as demand rises than they incur costs when they build up resources as demand falls.

Another research field that conceptualizes relationships on the organizational level focuses on the *consequences* of asymmetric cost behavior. In this respect it differs from previously discussed approaches. While the majority of studies follows Anderson, Banker and Janarikaman (2003) and examine moderators that affect the relationship between changes in activity on changes in costs, this stream of literature focuses on the impact of asymmetric cost behavior itself. Thus, instead of applying a unidirectional model which specifies cost behavior as the dependent variable, these researchers use a firm-specific (instead of a cross-sectional) measure of asymmetric cost behavior. This allows making actual predictions on the effect of sticky and anti-sticky costs on e.g., earnings forecasts (EF) or contemporaneous annual stock returns (RET). Banker et al. (2016) for instance argue that cost stickiness is an important alternative explanation for the piecewise linear relation between earnings and stock returns. While conservatism research usually ascribes this phenomenon to the asymmetric timeliness of earnings (recognizing bad news more quickly than good news), the authors show that a significant portion is actually driven by cost stickiness. Moreover, Weiss (2010) distinguishes between sticky cost firms (CS) and anti-sticky cost firms (AS) and finds that analysts' earnings forecast is less accurate for companies with greater cost stickiness. In addition, the author documents that cost stickiness is associated with lower analyst coverage (COV) and a lower market response (CAR) to earnings surprises (ES). Also Banker and Chen (2006) and Baumgarten, Bonenkamp and Homburg (2010) investigate the association between asymmetric cost behavior and earnings forecast (EF). Findings show that an intended increase (ICS) in the SG&A ratio (S) due to cost stickiness leads to an increase in future earnings (Baumgarten, Bonenkamp, and Homburg 2010),[4] while the earnings forecast error (EFE) is substantially reduced using

[4] An increase in the SG&A ratio is regarded as intended if the company's past SG&A ratio was below its industry average, representing efficiency in SG&A cost management (Baumgarten, Bonenkamp, and Homburg 2010).

models that incorporate information about cost variability as well as cost stickiness (Banker and Chen 2006).[5] Based on the latter result, Ciftci, Mashruwala and Weiss (2016) investigate whether analysts in fact incorporate information on cost stickiness when predicting earnings. By modeling the process of earnings prediction as a forecast of sales (SF), the authors find that analysts incorporate cost variability and cost stickiness on average. This, however, induces a systematic bias in predicting earnings which is stronger when sales miss expectations than if sales beat expectations.

In addition to the consequences of asymmetric cost behavior, Balakrishnan, Petersen and Soderstrom (2004) examine the interplay between different levels of *capacity utilization* and the magnitude of asymmetric cost behavior. Using a data from physical therapy clinics in the US, capacity utilization is measured as the average staff time available per patient visit. Results show that cost stickiness is more pronounced if capacity utilization (CU) is strained, and less pronounced if the company operates with excess capacity. The authors find no significant association when the firm's capacity utilization is at 'normal' levels. Next to capacity utilization, Balakrishnan, Petersen and Soderstrom (2004) examine the influence of the magnitude of activity changes. In agreement with findings reported by Dalla Via and Perego (2014), results indicate that cost behavior is asymmetric for moderate and large changes in activity, but not for small changes in activity. However, other research shows that the effect of the magnitude of activity changes on asymmetric cost behavior strongly depends on the industry and the country in which the company is operating in (Calleja, Steliaros, and Thomas 2006; Weidenmier and Subramaniam 2016).

[5] Cost variability refers to the proportion of total costs that are variable. The latter relates to the so called traditional cost behavior model which does not distinguish between increases and decreases in activity (Banker and Chen 2006)

2.4.3.2 Level of Analysis: Beyond Organization

The investigation of drivers of cost stickiness on the organizational level is extended by studies that examine asymmetric cost behavior from a broader perspective outside the boundaries of one company (*external factors* beyond the organization). Some studies for instance investigate firms' cost behavior during the economic crisis (EC) or as a function of macroeconomic growth (G) (Anderson, Banker, and Janakiraman 2003; Banker, Fang, and Metha 2013; Banker and Byzalov 2014; He, Teruya, and Shimizu 2010), while others explore differences between countries (CO). Specifically, Calleja, Steliaros and Thomas (2006) find that operating costs of French and German companies are stickier than operating costs of UK and US companies. The authors claim differences in corporate governance and managerial oversight to cause variations in cost stickiness between countries. The common-law system of corporate governance in the US and UK puts more emphasis on shareholder value maximization, whereas the corporate governance system in Germany and France encompasses also other internal and external stakeholder interests. Subramaniam and Weidenmier (2016) moreover document that costs stickiness differs significantly among industries due to differences in production, operational and economic environments, e.g., the level of fixed assets and inventory. Results show that costs are most sticky in the manufacturing industry and least sticky in the merchandising industry. Additionally, Banker, Byzalov and Chen (2013) show how asymmetric cost behavior varies by the strictness of employee protection laws (EPL) between countries. Drawing on the adjustment cost argument, the authors posit that strong employee protection laws make it more difficult for companies to dismiss personnel when demand is decreasing. As a result, costs are stickier in countries where employee protection laws are relatively strict. Additionally, Kitching, Mashruwala and Pevzner (2016) examine whether culture (C) affects cost behavior. Findings suggest that cost stickiness is more pronounced in countries with low uncertainty avoidance, femininity and short-term orientation. Also Holzhacker, Krishnan and Mahlendorf (2015a) focus on factors that impact cost behavior from outside the organization. Their study shows that a change in regulation (R) as well as ownership structure (OWN) impacts cost behavior. The authors examine the German health sector and document that hospitals reduce the degree of cost stickiness after the introduction of a fixed-price reimbursement for diagnosis services; whereas the effect is stronger in for-profit hospitals compared to nonprofit hospitals. Holzhacker, Krishnan and Mahlendorf (2015a) argue that a fixed reimbursement restricts hospitals discretion over revenue generation which prompts administrators to bolster cost elasticity. Consequently, hospitals can react more flexible to a decrease in volume which then leads to a reduction of cost stickiness.

2.4.3.3 Level of Analysis: Subunit

Next to papers that investigate research questions on the level beyond the organization or within the organization, one of the selected studies particularly examines cause-and-effect relationships originating from the subunit level. Using data from hospitals in Ontario/US, Balakrishnan and Gruca (2008) hypothized that hospital managers are less willing to cut costs in departments that perform the hospital's core activities. In contrast to support services, these departments are critical for the hospital's mission and the adjustment of their resources yield higher adjustment costs. Finding support the authors' hypothesis and show that costs are stickier in core functions (CF) than in ancillary and support functions.

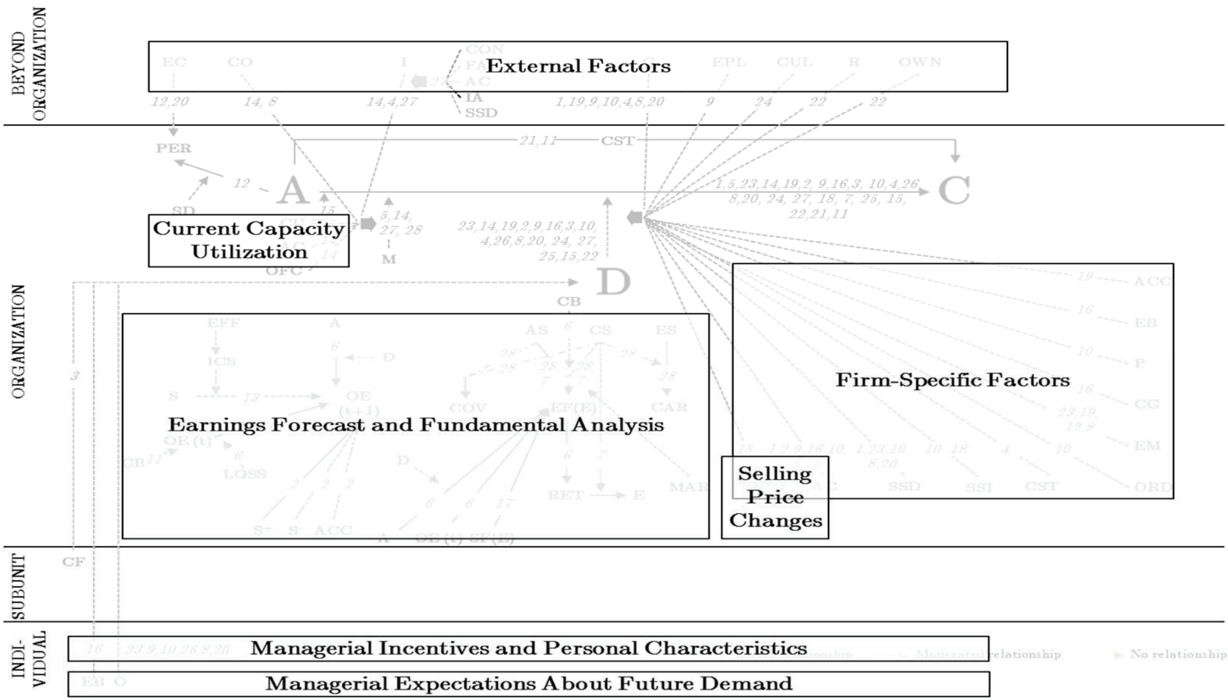
2.4.3.4 Level of Analysis: Individual

Studies that are depicted on the lowest level of Figure 2, investigate effects arising from individuals which usually refers to the manager of the organization. In this respect it is argued that *managers' expectations* about future demand influences their willingness to adjust resources. According to Banker et al. (2014), a manager is optimistic (O) that demand will increase in the future if the company experienced rising sales already in the prior period. Vice versa, managers are rather pessimistic if prior period sales decreased. Kama and Weiss (2013) use the two-period model introduced by Banker et al. (2014) to further investigate how managerial optimism affects managers' willingness to manage earnings. Also Verniers, Naoum and Vlismas (2015) build on this proposition and argue that the level of intangible assets of a company is an indicator of positive management expectations. Their study shows that companies with high intangible assets exhibit a stronger degree of cost stickiness. Other researchers find comparable results in line with the 'managerial expectation' argument, (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014; He, Teruya, and Shimizu 2010). Additionally, firm-specific cost behavior can be affected by *managers' incentive* to engage in empire building (EB). Because Chen, Lu and Sougiannis (2012) conceptualize the effect of empire building on firm-specific cost behavior on the organizational level as well as on the individual level, both links are depicted in the map.

Notably, the literature on asymmetric cost behavior is strongly related to the literate on cost elasticity. Cost elasticity captures the percentage change of costs for each percentage change in activity. Thus, it focuses on the link between A and C without conditioning the effect on the direction of change in activity (D). As such, a change in cost elasticity is most likely associated with a change in the magnitude of cost stickiness or anti-stickiness. Specifically, Banker and Byazlov (2014) provide evidence for the impact of demand uncertainty on cost elasticity, while Holzhacker, Krishnan and Mahlendorf (2015b) explain which mechanisms firms use to increase cost elasticity in response to financial risk and demand uncertainty. To indicate the link between the literature on asymmetric cost behavior and the literature on cost elasticity, these two studies are additionally incorporated in Figure 2.

Overall, the map in Figure 2 reveals a pattern according to which the literature can be clustered in seven categories. Depending on the theoretical constructs used and the level of analysis, studies focus on: (a) external factors, (b) firm-specific factors, (c) current capacity utilization, (d) earnings forecast and fundamental analysis, (e) selling price changes, (f) managerial incentives and personal characteristics or (g) managerial expectations about future demand. To illustrate, Figure 3 shows the grouping of cause-and effect-relationships according to these seven categories (each category is highlighted using italic letters in the previous paragraphs).

Figure 3: Classification of the Literature on Asymmetric Cost Behavior



The literature on asymmetric cost behavior is classified in seven different groups. These are depicted in the figure above.

2.4.4 Criticism to the Literature

The literature on asymmetric cost behavior also faces some criticism. Specifically, Balakrishnan, Labro and Soderstrom (2014) claim that because of the logarithmic specification of the empirical model, asymmetric cost behavior is more likely to arise due to (a) diseconomies of scale and (b) firm-specific cost structure, instead of deliberate managerial decision-making.

To provide evidence for their first argument, the authors examine the standard empirical model introduced by Anderson, Banker and Janakiraman (2003) (see section 2.2) and show how long-run decisions in fixed capacity influence the magnitude of stickiness. In doing so, they transform the standard log-log model in a linear specification by assuming a cost function that consists of fixed (FC) and variable costs (VC). Thus, total costs (TC) are equivalent to $FC + VC \cdot Sales$. If the elasticity of costs is similar across companies in the sample, then the linear model specification should produce the same cost elasticity estimate as the logarithmic model specification. However, Balakrishnan, Labro and Soderstrom (2014) show that the estimate depends on the growth rate in sales that is likely to be different for every firm. Collectively, this suggests that the empirical estimation of cost stickiness based on a logarithmic model can be driven by diseconomies of scale if the proportion of fixed costs to total costs varies across the sample.

With respect to their second argument, Balakrishnan, Labro and Soderstrom (2014) claim that the logarithmic specification induces cost stickiness due to differences in firms' cost structure. Because the likelihood of sales increases is higher for bigger companies than for smaller companies (measured by sales revenue), the empirical estimate of cost stickiness is more pronounced if the sample is dominated by big firms. This is oftentimes the case if researchers work with Compustat data which provides financial information on public companies. Larger organizations have higher absolute fixed costs that are captured by the intercept in the standard regression model. Thus, if the intercept is held constant across firms, then the effect of cost structure on the empirical estimate of cost stickiness is stronger for companies with relatively higher sales.

To avoid spurious findings of cost stickiness due to the logarithmic specification of the empirical model, Balakrishnan, Labro and Soderstrom (2014) therefore suggest researchers to consider the following aspects (section 3.3 and section 3.4 discuss how these points are acknowledged within the frame of this dissertation):

- Application of linear Fama-Macbeth type regressions
- Focus on a narrowly defined industry
- Usage of control variables as fixed effects and as moderators

In the same issue of the Journal of Management Accounting Research, Banker and Byzalov (2014) respond to the previously described criticism by stating that "[…] these claims are unfounded both theoretically and empirically" (p. 60). Specifically, the authors argue that the usage of a cost function that distinguishes between fixed and variable cost is in line with the traditional mechanical cost model, but not with the perception of asymmetric cost behavior. The latter implies that even though some resources might be classified as variable, their adjustment is associated with significant adjustment costs that can be managed by the decision-maker. In support of this argument, Banker and Byalov (2014) use a flexible version of the traditional cost function in the form of $TC = FC + v \cdot Sales^{y}$. The elements are: fixed costs (FC), variable cost ratio (v) and a positive parameter that determines the curvature of the cost function (y). Drawing on the alternative functional form, Banker and Byzalov (2014) show that irrespective of whether a linear or a logarithmic model is applied, both forms would imply a lower cost response for sales decreases than for sales increases. This contradicts the argumentation by Balakrishnan, Labro and Soderstrom (2014) who claim that cost stickiness arises because of the logarithmic specification of the empirical model. Additionally, Banker and Byzalov (2014) emphasize that even if the criticism would be valid, Balakrishnan, Labro and Soderstrom's (2014) argumentation does not explain anti-stickiness which is an equally important aspect of asymmetric cost behavior.

In their article, Banker and Byzalov (2014) moreover address another issue which is raised in an unpublished paper by Anderson and Lanen (2009). The authors claim that cost stickiness can be ascribed to what they call "unusual observations" which occur if costs and sales move in the opposite direction. Banker and Byzalov (2014) object that by excluding these observations, only one tail of the sample is discarded while the influence of very strong increases in costs in accordance with increasing sales and very strong decreases in costs in accordance with decreasing sales becomes stronger. An exclusion of these observations is therefore not feasible. Furthermore, Banker and Byzalov (2014) argue that the opposite movement of costs to sales does not necessarily reflects unusual behavior. Rather, costs can for instance decrease when managers pre-adjust resources in anticipation to a decline in demand although current sales are rising.

3 The Dissertation

3.1 Positioning

The three papers which represent the body of this dissertation are all framed within the asymmetric cost behavior literature. Nevertheless, each paper focuses on different aspects that either explain contradictory findings or fill gaps in the theoretical development of the scientific field. To illustrate, Figure 4 shows the positioning of each paper within the present research of asymmetric cost behavior.

Figure 4: Positioning of the Papers in the Literature

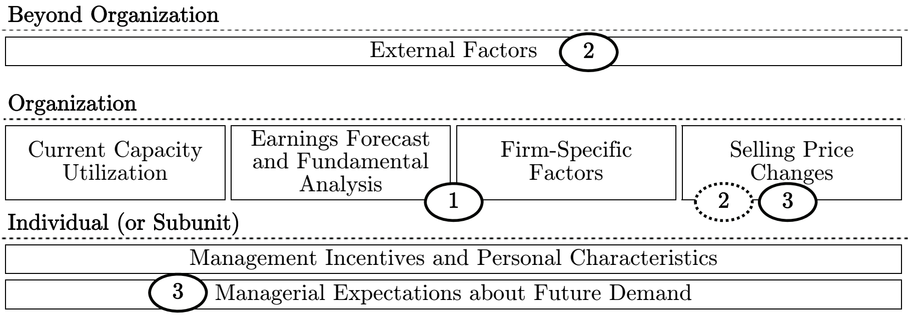


Figure 4 illustrates how the papers of this dissertation are positioned within the literature on asymmetric cost behavior. The numbers refer to the first, second and third paper respectively.

The first paper investigates the research question "What are the economic consequences of asymmetric cost behavior?". To do so, an index is constructed which captures factors that other researchers identified to drive the deliberate retention of resources. These factors are derived from firm-specific characteristics, such as employee intensity or asset intensity. Thus, this part of the paper is strongly related to the category 'Firm-Specific Factors'. In a next step, the index is incorporated in an empirical model that predicts the economic consequences of both sticky costs as well as anti-sticky costs. This approach follows the literature related to the category 'Earnings Forecast and Fundamental Analysis'. By using a firm-specific measure of cost stickiness according to Weiss (2010) it is possible to investigate the economic consequences on the average SG&A ratio between the current period and the next period. The incorporation of the index moreover facilitates the differentiation between intended cost stickiness, with the objective to generate future value for the firm, and unintended cost stickiness which reflects costs getting out of control. Overall, results show that even though cost stickiness induces a temporary increase in the costs-to-sales ratio, the deliberate retention of resources is economically feasible if adjustment costs can be avoided and demand recovers quickly. Accordingly, paper one is positioned between the two categories 'Firm-Specific Factors' and 'Earnings Forecast and Fundamental Analysis' on the organizational level.

The second paper investigates the research question "Do labor supply shortages affect asymmetric cost behavior?". In this respect it is the first study that examines the impact of variations in supply on managers' resource adjustment decisions. As labor supply constitutes an external factor that is not controllable by the company, the paper is positioned on the upper level of Figure 4. Thus, it relates to the literature category that focuses on 'External Factors'. In addition to the impact of restricted labor supply, the paper examines whether the magnitude of cost stickiness varies by geographical region. A significant difference is ascribed to diverging magnitudes of labor adjustment costs. The latter represents another external factor which so far has only been considered on the national level, but not across different regions in one country. Results show that cost stickiness is lower if labor supply is scarce and the company operates in rural areas. The effect decreases with the length of the supply shock.

The paper further investigates which mechanisms managers use in response to labor supply shortages. Findings suggest that companies react to restricted labor supply by leveraging current capacity and expecting more effort from their employees. This increases labor productivity and reduces cost stickiness. The effect is amplified if companies also increase selling prices. Because the latter does not represent the core analysis of this study the positioning of the second paper in Figure 4 is indicated with a dotted border within the category 'Selling Price Changes'.

The third paper investigates the research question "How do managers adjust resources and prices in accordance with their expectations about future demand?". Because managers form their expectations prior to a change in demand, the ex-post accuracy of their expectations determines how closely aligned resource and price adjustments are with the actual path of demand. As such, the paper relates to the literature that focuses on 'Managerial Expectations about Future Demand' as well as 'Selling Price Changes'. Findings show that the accuracy of managerial expectations is positively related to the symmetry of cost behavior. Hence, the more accurate mangers predict future demand, the lower the magnitude of cost stickiness. Results reveal that the reduction of cost stickiness is realized by decreasing selling prices and downsizing resources. While managers who did not foresee a drop in demand do not change prices and adjust resources to a lesser extent than those companies that expected demand to fall.

Notably, only one other study specifically investigates how changes in selling prices affect firm-specific cost behavior (Cannon 2014). By focusing on the interplay between selling price changes, resource adjustment decisions and managerial expectations this paper therefore provides valuable insights on the causes of asymmetric cost behavior and identifies promising ideas for future research.

3.2 Theoretical Approach

Although a common consensus of what theory is, seems to be troublesome to develop (Sutton and Staw 1995), most social scientists agree upon theory as means to providing answers to why certain cause and effect relationships exist (Malmi and Granlund 2009). In order to explain such associations, cost stickiness researchers frequently embrace economic theory to underpin their hypotheses.

Economic theory represents an important ground for Management Accounting research. Mensah, Hwang and Wu (2004) estimate that nearly every second article published in Accounting journals between 1986 and 2000 is related to economic theory. Robbins (1945) draws back on Cannan (1914) and Marshall (1890) and defines economics as "[…] the science that studies human behavior as a relationship between ends and scarce means which have alternative uses". This definition encompasses an important interest in Management Accounting that is related to the valuation of alternatives by weighing opportunity costs of unrealized benefits. In contrast to micro-economic theory which explains how markets obtain equilibriums, Management Accounting research focuses on the optimal allocation of input bundles usually implying perfect and complete competition (Bromwich 2007). In this sense, firm-specific (endogenous) solutions to profit-maximization problems are generally determined by referring to the underlying cost function of a company. A cost function defines the relation between input prices and output according to the limitation of the available technology. As such, cost models describe the economic structure of a firm and are the starting point for analyzing the "economic consequences of resource consumption in an organization" (Christensen and Hemmer 2006).

Economic theory is oftentimes criticized for its key assumptions with respect to: decision-making by rational and profit-maximizing individuals, limited uncertainty and freely available information (Bromwich 2007; Smith 2015).[6] But if researchers are aware of the main assumptions and important limitations, economic theory serves as a useful framework to explain empirical relationships. Hodgson (2012) goes so far as to write:

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[6] Loomes (1998) for instance argues that "[…] much of the effort that has gone into developing formal decision models to explain individual decision making under risk and uncertainty may to some (possibly considerable) extent have been misdirected" (p. 477).

> *"[…] the mainstream theory is not wrong because it is empirically inaccurate. It is not unrealistic in the sense that it fails to fit the data. Any data can be fitted into it. Hence no data can refute the theory. It cannot be displaced simply by an appeal to the evidence. The experimental evidence of preference reversals and other choice 'anomalies' may lead us to search for a different and better theory, but it does not in principle refute the old version based on utility and rational choice" (p. 103).*

Similarly, Bromwich (2007) concludes that the positivistic perspective of economic theory satisfies the fundamental objective of organizations. It seeks output bundles that maximize overall efficiency and thereby secures long-term sustainability. Allowedly, it does not provide satisfactory results for e.g., distribution or ethical issues, but economic theory facilitates many decision-making problems which are difficult to solve using normative approaches.

Following this line of reasoning, the three papers of this dissertation are framed in the light of economic theory. Thus, results provide valuable insights for economic decision-making and can be used to direct future research using alternative theories that are not underlying the discussed constraints.

3.3 Data

This dissertation is based on data from three different sources. The following table provides an overview of the main information:

Table 3: Overview of Data Sources

Dataset	**Standard & Poor's Compustat**	**Orbis**	**Danish business survey** (conducted as part of an EU survey program)
Source	Wharton Research Data Services https://wrds-web.wharton.upenn.edu/wrds/	Bureau Van Djik http://www.bvdinfo.com/en-gb/our-products/company-information/international-products/orbis)	Denmark Statistics http://www.dst.dk/en/Statistik/emner?subject=07
Access	Access through CBS library data services	Access through CBS library data services	Access through server of Denmark Statistics (purchased)
Coverage	North American and Canadian companies	Danish companies	Danish companies
Aggregation	Annual	Annual	Monthly
Used Information	- SG&A costs - Operating costs - Sales - Number of employees - Total assets - Operating cash flow - Dividends - Firm market value - Net income	- Operating costs - Costs of goods sold - Sales - Number of employees - Total assets - Personnel expenses - Operating profit - Depreciation - Region	- Geographical regions - Order backlog in months - Managerial expectations - Limiting factors - Selling price development
Deployment	Paper I	Paper II Paper III	Paper II Paper III

Table 3 provides an overview of the different data sources which are used in each of the papers. The row 'used information' does not refer to the general data availability of the data base, but refers to the main items that are processed within the frame of each paper of this dissertation.

The first paper uses Standard and Poor's Compustat data obtained from Wharton Research Data Services for public US and Canadian companies. The second and the third paper use a merged dataset from two sources: financial statement information from Orbis and survey results from a Danish business survey. In contrast to S&P Compustat data, the latter covers mainly private companies that are significantly smaller in total number of employees as well as sales. As costs are sticky on average in all of the three papers, this rules out the argument raised by Balakrishnan, Labro and Soderstrom (2014) who claim that cost stickiness is mainly driven by the prevalence of large companies in the sample.

A potential concern of using a cross-sectional dataset is that accounting choices are not uniform across different industries and countries or are adapted over time. This complicates the comparison of findings and can mislead conclusions. To address this issue, industry fixed effects and slopes are included in all of the empirical models (except for paper two which only focuses on one industry). Moreover, a clustering by firm and year according to Petersen (2009) is performed which mitigates a potential correlation of residuals. To restrict biases due to different company sizes all independent variables are scaled by total sales while the logarithmic specification additionally alleviates heteroscedasticity (Anderson, Banker, and Janakiraman 2003).

In line with previous studies (Anderson, Banker, and Janakiraman 2003; Anderson et al. 2007; Banker et al. 2014; Chen, Ni, and Wu 2014) all of the papers investigate the behavior of SG&A costs as the dependent variable. SG&A costs are calculated without including depreciation expenses which could otherwise lead to spurious findings of asymmetric cost behavior (Shust and Weiss 2014). The Standard and Poor's Compustat data base provides information on the amount of SG&A costs specifically which are standardized to ensure the comparability between similar types of data items across firms (Standard & Poor's 2011). However, SG&A costs are not provided as separate line items in the Orbis database. They are therefore calculated indirectly from the available information by subtracting operating income, depreciation and costs of goods sold (for non-service firms) from operating sales per company. Because companies can aggregate indirect costs differently (i.e. allocation to direct costs or reporting as SG&A), robustness checks are moreover performed using total operating costs instead of SG&A costs. Results remain unchanged. Thus, potential concerns with respect to the internal validity of findings are mitigated, while external validity is high due to the large sample size (Evans et al. 2015; Johnson and Wichern 2014).

Also the reliability which requires an overall consistency of research instruments does not seem to be a concern in this dissertation. All of the models use established instruments in the literature and yield sufficiently high coefficients of determination which indicates that a vast proportion of the variance of the dependent variable is explained by the predictors. Sample selection procedures are consistent throughout the dissertation and correspond to the approach used in most other studies (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014).

Furthermore, the usage of survey data from Denmark statistics in paper two and three allows to incorporate selling price changes as endogenous variable and does not require specifying proxies for managerial demand expectations or price changes. Consequently, construct validity, i.e. the degree to which the study actually measures what it intends to measure, is strongly improved compared to other work that aims to investigate the asymmetric behavior of costs (Smith 2015).

The combination of the (longitudinal) survey data together with the archival data obtained from Bureau Van Djik and Wharton Research Data Services has two more advantages. First, it allows testing the standard cost stickiness model introduced by Anderson, Banker and Janakiraman (2003) and therewith facilitates a comparison of empirical estimates with other studies. The latter requires a lot of information on one company at different times (e.g., current and prior year sales changes, current and prior year cost changes) which is only available using a relatively large dataset that covers a longer time-frame. Second, it facilitates the comparison of sub-groups that are generated based on the merged survey information and ensures that statistical relevance is maintained.

3.4 Methodological Approach

Pursuing a quantitative approach, all hypotheses are tested based on longitudinal panel data using multiple linear regressions. Because cost behavior is determined by many more factors than only the direction of sales, multiple linear regression allows to incorporate several predictors while maintaining the interpretability of results.[7] This approach moreover helps to identify interrelations between independent variables which are especially important when examining trade-offs between e.g., labor supply shortages and the degree of cost increases during periods of rising demand. Specifically, the hypothized relationships are estimated using ordinary least squares regressions by minimizing the sum of squared residuals under the following assumptions: strict exogeneity (residuals have a mean of zero), no correlation among predictors or residuals, homoscedasticity (residuals have a constant variance), no autocorrelation and normal distribution of residuals. For each regression, these assumptions are tested and imposed by e.g., computing the variance inflation factor according to Belsley (1980) to spot potential multicollinearity, clustering the residuals according to Petersen (2009) to reduce potential autocorrelation and homoscedasticity, and trimming the top and bottom values of the sample to reduce the influence of outliers (Chen and Dixon 1972).[8] Because the empirical tests within the frame of the first paper include many interactions among continuous predictors, variables are furthermore

[7] It is of course possible to do similar analyses using crosstab tables with categorical data to split the sample. This approach however has strong practical limitation related to the interpretation of the tables with increasing number of variables (Lee and McKinney 2013).
[8] Because the sample of companies is different for each of the three papers of this dissertation, the treatment of outliers varies accordingly. While for instance in the first paper extreme observations at the 0.5 percent bottom and top of the distribution are deleted, the cut off is set at two percent for the third paper. Mahalanobis distance and distribution plots are used to detect outliers and specify where to trim the data.

mean-centered prior to the computation of the product to mitigate multicollinearity (Aiken and West 1991).

Overall, the chosen methodological approach has several advantages of which some are listed below (Lee and McKinney 2013):

- It is possible to determine the combined effect of all predictor variables in explaining the variance of the dependent variable. The statistical outcome is captured with the (adjusted) coefficient of determination.
- It is possible to determine the individual effect of one predictor variable by controlling for other influencing factors (holding them constant). The statistical outcome is captured with the estimated regression coefficients.
- It is possible to determine the relative importance of each predictor variable and comparing them between each other. The statistical outcome is captured with the standardized regression coefficient.
- It is possible to determine the relationship among predictor variables by identifying moderating or mediating effects. The statistical outcome is usually captured by incorporating interactions in the regression model.

In line with the standard cost stickiness model introduced by Anderson, Banker and Janakiraman (2003), all of the applied regression models use dependent variables that capture the change in costs and not the absolute level of costs. Notably, using a change model instead of a level model aggravates the discovery of significant effects. In case of an absolute model specification, the regression coefficient captures either an increase or a decrease in the dependent variable (e.g., a one percent increase of sales leads to a 0.2 percent increase of costs). In case of a change model, a regression coefficient is only significant if it predicts how the independent variable influences the *change* of the dependent variable (i.e. a one percent increase of sales leads to a 0.2 percent increase in the percentage change of the dependent variable between the current period and the prior period). Hence, the change specification strongly improves the robustness of the model and is most suitable to investigate short-run cost behavior (Banker, Byzalov, and Plehn-Dujowich 2014; Noreen and Soderstrom 1994). As such, it estimates the *change in the variability of costs* rather than merely estimating the *change in the level of costs.*

The implied relationships are tested using a logarithmic specification. The latter has two main advantages over the linear model (as suggested by Balakrishnan, Labro and Soderstrom (2014); see section 2.4.4): First, the log-transformation alleviates heteroscedasticity and makes variables more comparable across firms. Second, the logarithm facilitates an interpretation of the regression coefficients as elasticities so that the relationship between costs and sales can be described in percentages.

To control for differences between industries, all regression models moreover include industry-specific intercepts (i.e. fixed effects) as well as slopes.

3.5 Limitations and Future Research

This dissertation starts by investigating the consequences of cost stickiness and anti-stickiness. Specifically, the first paper analyzes whether the average SG&A cost-to-sales ratio between the current period and the previous period is smaller for sticky cost companies than for anti-sticky cost companies. The intuition is based on the argumentation by Anderson, Banker and Janakiraman (2003) who claim that managers deliberately retain resources when demand is temporarily declining to avoid adjustment costs incurred in the adaption of resources. Thus, if adjustment costs are higher than the costs of maintaining slack capacity and demand recovers quickly, then cost stickiness is economically justifiable. This is an important finding for the academic world as well as for practitioners who are oftentimes heavily pressured to maintain cost control without considering long-term consequences (Deloitte 2016; McKinsey & Company 2005). It also highlights how additional research can contribute to the understanding of cost behavior in line with Whatts and Zimmerman (1986) who contend that one crucial criterion for a theory's success is the value of the theory to its applicants. Nevertheless, the paper uses a firm-specific measure of asymmetric cost behavior that distinguishes between sticky costs and anti-sticky costs, but does not consider fairly low parameter values as regular costs. Instead, small values of the measure are ascribed to either sticky costs or anti-sticky costs even though resource adjustments are likely to differ for firms that exhibit relatively symmetrical cost behavior. Hence, future research could look into alternative ways to split the sample with less aggregation of costs as dependent variable.

Knowing that the consideration of adjustment costs can yield economic benefits leads over to the question of what determines their magnitude and how adjustment costs become manifested in the form of cost stickiness. Figure 3 shows that the existing stream of literature predominately investigates the drivers of asymmetric cost behavior on the organizational level, but rarely incorporates external factors from outside the organization. To fill this gap, paper two focuses on the important aspect of labor supply shortages and their impact on managers' resource adjustment decisions. Information on labor supply shortages are obtained from the Danish business survey described in section 3.3 which are merged with quantitative data from financial statements from the same companies. One potential concern in this respect is that even though the survey is conducted in a professional and standardized environment, it can be subject to response or conformity bias (Lee and McKinney 2013). It could for instance be the case that respondents did not accurately answer the survey questions (response bias) or aligned their answers over time to achieve high conformity between e.g., demand expectations and actual demand development (conformity bias). To address this issue, extreme observations or observations with relatively low variability over time are identified and if necessary excluded from the sample. On this basis, paper two generates meaningful knowledge on the effect of labor supply shortages and describes how it can lead to an increase in labor productivity. Understanding the extent to which the interplay between supply and demand dynamics on managers' resource adjustment decisions varies across countries and between industries is a promising avenue for future research.

The last paper of this dissertation focuses on the individual level by investigating the relationship between the accuracy of managerial demand expectations and their resource and price adjustments. Just as the second paper, this perspective is less explored in the current state of literature but yields important insights. One of the reasons for an underrepresentation of studies that investigate factors on the individual level is the limited availability of data. However, the importance of managerial demand expectations with respect to resources adjustment decisions is acknowledged in many articles (Anderson, Banker, and Janakiraman 2003; Banker et al. 2014; Chen, Kama, and Lehavy 2015). As such, the third paper contributes by showing that managers adjust resources differently in response to expected compared to unexpected changes in demand. If a drop in demand is anticipated, mangers will cut resources and lower selling prices to avoid a decrease of profitability. Consequently, cost stickiness is less pronounced compared to companies where managers did not foresee a change in demand.
At first glance it seems that the intuition behind these findings contradicts the main argument of the first paper of this dissertation. The latter provides evidence that cost stickiness can be economically viable if demand recovers quickly. Nevertheless, two aspects help to reconcile the discrepancy. First, a proactive adjustment of resources implies that executives actually make adaptions prior to the actual shock. In that way, the company has time to prepare and will be able to compensate either a fall or a rise in demand.

However, if the shock is unexpected and the firm did not pre-adjust, then it proves to be better to avoid high adjustment costs associated with a rapid adaption of resources by maintaining the current level and allowing for cost stickiness. Thus, the time-frame of the underlying decision-making process is crucial in evaluating the consequences as well as the drivers of asymmetric cost behavior. Second, it is possible that some companies react to an anticipated fall in demand by merely lowering selling prices instead of cutting resources. Because resources are maintained, these companies will exhibit cost stickiness which is expected to pay off in the next period if demand recuperates. This implies that the disentangling of price effects and resource-adjustment decisions is essential when examining asymmetric cost behavior. It is left to future research to examine not only the direction, but also the relative timing of mangers' pricing decisions and resource adjustments according to their expectations about future demand.

In summary, the collection of papers in this dissertation contributes to the literature by, first, measuring the economic consequences of asymmetric cost behavior, second, evaluating the impact of labor supply shortages and, third, showing which mechanisms firms use to respond to expected or unexpected changes in demand. These findings do not only add to the empirical knowledge about asymmetric cost behavior from an academic perspective, but can also help executives when taking decisions on resource and price adjustments. However, the generalizability of results and application in the organizational context is limited due to the high level of cost aggregation. Even though large archival datasets render many statistical analyses possible, it is difficult to outline practical solutions for the adaption of specific cost items. Future research can help to overcome this limitation by for instance conducting case studies together with a more granular analysis of the behavior of individual components of SG&A costs. Ideally, the latter would be complemented by measuring real output instead of using sales as an imperfect proxy. In this regard, it suggests itself to investigate the interplay between supply dynamics and resource and price adjustments in an empirical setting that not only determines the magnitude, but also the consequences of asymmetric cost behavior. This addresses the request directed towards Management Accounting researchers as to attach more importance to the performance implications of various practices and strengthens the practical implications of findings which are derived from economic theory (Bromwich 2007; Malmi and Granlund 2009).

4 References

Abel, A., and J. Eberly. 1996. Optimal Investment with Costly Reversibility. *The Review of Economic Studies* 63 (4): 581-593.

Acemoglu, D. 1996. A Microfoundation for Social Increasing Returns in Human Capital Accumulation. *The Quarterly Journal of Economics* 111 (3): 779-804.

Aiken, L., and S. West. 1991. *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks, CA: Sage Publications.

Akram, Q., and R. Nymoen. 2006. Econometric Modelling of Slack and Tight Labour markets. *Economic Modelling* 23 (4): 579-596.

Anderson, M., R. Banker, R. Huang, and S. Janakiraman. 2007. Cost Behavior and Fundamental Analysis of SG&A Costs. *Journal of Accounting, Auditing & Finance* 22 (1): 1-28.

Anderson, M., R. Banker, and S. Janakiraman. 2003. Are Selling, General, and Administrative Costs "Sticky"?. *Journal of Accounting Research* 41 (1): 47-63.

Anderson, S. and Lanen, W. 2009. *Understanding Cost Management: What Can We Learn from the Empirical Evidence on Sticky Costs?* Working paper, University of Michigan, Stephen M. Ross School of Business, Ann Arbor.

Anthony, J., and K. Ramesh. 1992. Association Between Accounting Performance Measures and Stock Prices. *Journal of Accounting & Economics* 15 (2): 203-227.

Balakrishnan, R., and T. Gruca S. 2008. Cost Stickiness and Core Competency: A Note. *Contemporary Accounting Research* 25 (4): 993-1006.

Balakrishnan, R., M. Petersen, and N. Soderstrom. 2004. Does Capacity Utilization Affect the Stickiness of Cost?. *Journal of Accounting, Auditing & Finance* 19 (3): 283-300.

Balakrishnan, R., E. Labro, and N. Soderstrom. 2014. Cost Structure and Sticky Costs. *Journal of Management Accounting Research* 26 (2): 91-116.

Banker, R., S. Basu, D. Byzalov, and J. Chen. 2016. The Confounding Effect of Cost Stickiness on Conservatism Estimates. *Journal of Accounting and Economics* 61 (1): 203-220.

Banker, R., D. Byzalov, and L. Chen. 2013. Employment Protection Legislation, Adjustment Costs and Cross-Country Differences in Cost Behavior. *Journal of Accounting and Economics* 55 (1): 111-127.

Banker, R., Byzalov, D. and Threinen, L. 2013. *Determinants of International Differences in Asymmetric Cost Behavior*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and L. Chen. 2006. Predicting Earnings Using a Model Based on Cost Variability and Cost Stickiness*. The Accounting Review* 81 (2): 285-307.

Banker, R. and Fang, S. 2013. *Loan Financing and Real Cost Management*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., Basu, S., Byzalov, D. and Chen, J. 2013. *Asymmetries in Cost-Volume-Profit Relation: Cost Stickiness and Conditional Conservatism*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and D. Byzalov. 2014. Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 43-79.

Banker, R., D. Byzalov, M. Ciftci, and R. Mashruwala. 2014. The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 221-242.

Banker, R., D. Byzalov, and J. Plehn-Dujowich. 2014. Demand Uncertainty and Cost Behavior*. The Accounting Review* 89 (3): 839-865.

Banker, R., Fang, S. and Metha, M. 2013. *Anomalous Financial Performance Ratios during Economic Downturns*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and H. Johnston. 2006. Cost and Profit Driver Research*. Handbooks of Management Accounting Research* 2: 531-556.

Bauer, D., and P. Curran. 2005. Probing Interactions in Fixed and Multilevel Regression. *Multivariate Behavioral Research* 40 (3): 373-400.

Baumgarten, D., U. Bonenkamp, and C. Homburg. 2010. The Information Content of the SG&A Ratio. *Journal of Management Accounting Research* 22: 1-22.

Belsley, D. 1980. *Regression Diagnostics*. New York: John Wiley & Sons.

Bennedsen, M., K. Nielsen, F. Perez-Gonzalez, and D. Wolfenzon. 2007. Inside the Family Firm: the Role of Families in Succession Decisions and Performance. *Quarterly Journal of Economics* 122 (2): 647-691.

Bentolila, S., and G. Bertola. 1990. Firing Costs and Labour Demand: How Bad is Eurosclerosis?. *The Review of Economic Studies* 57 (3): 381-402.

Bernstein, L., and J. Wild. 1998. *Financial Statement Analysis: Theory, Application, and Interpretation*. Boston, Mass: McGraw-Hill.

Bhojraj, S., and R. Libby. 2005. Capital Market Pressure, Disclosure Frequency-Induced Earnings/Cash Flow Conflict, and Managerial Myopia. *The Accounting Review* 80 (1): 1-20.

Biddle, J. E. 2014. Retrospectives: The Cyclical Behavior of Labor Productivity and the Emergence of the Labor Hoarding Concept. *The Journal of Economic Perspectives* 28 (2): 197-211.

Blanchard, O. 2011. *Macroeconomics*. Boston: Pearson Education.

Brasch, H. 1927. Zur Praxis der Unkostenschwankungen und ihrer Erfassung. *Betriebswirtschaftliche Rundschau* 4 (4/5): 65-72.

Bromwich, M. 2007. Economics in Management Accounting. In *Handbooks of Management Accounting Research*, eds. C. S. Chapman, A. G. Hopwood, and M. D. Shields, 137-162. Oxford: Elsevier.

Caballero, R., E. Engel, and J. Haltiwanger. 1995. Plant-Level Adjustment and Aggregate Investment Dynamics. *Brookings Papers on Economic Activity* (2): 1-54.

Calleja, K., M. Steliaros, and D. Thomas. 2006. A Note on Cost Stickiness: Some International Comparisons. *Management Accounting Research* 17 (2): 127-140.

Cannan, E. 1914. *Wealth: A Brief Explanation of The Causes of Economic Welfare*. London: P.S. King and Son.

Cannon, J. 2014. Determinants of ''Sticky Costs'': An Analysis of Cost Behavior using United States Air Transportation Industry Data. *The Accounting Review* 89 (5): 1645-1672.

Chen, C., Gores, T. and Nasev, J. 2013. *Managerial Overconfidence and Cost Stickiness*. Working paper, University of Cologne, Cologne.

Chen, C., H. Lu, and T. Sougiannis. 2012. The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research* 29 (1): 252-282.

Chen, E., and W. Dixon. 1972. Estimates of Parameters of a Censored Regression Sample. *Journal of the American Statistical Association* 67 (339): 664-671.

Chen, J., Kama, I. and Lehavy, R. 2015. *Management Expectations and Asymmetric Cost Behavior*. Working paper, University of Michigan - Stephen M. Ross School of Business, Ann Arbor.

Chen, S., Ni, S. and Wu, D. 2014. *Corporate Governance and the Asymmetrical Behavior of Selling, General and Administrative Costs: Further Evidence from State Antitakeover Laws*. Working paper, China Europe International Business School, Shanghai.

Chen, S., X. Chen, and Q. Cheng. 2008. Do Family Firms Provide More or Less Voluntary Disclosure?. *Journal of Accounting Research* 46 (3): 499-536.

Christensen, J., and T. Hemmer. 2006. Analytical Modeling of Cost in Management Accounting Research. In *Handbooks of Management Accounting Research*, eds. C. S. Chapman, A. G. Hopwood, and M. D. Shields, 557-571: Elsevier.

Ciftci, M., R. Mashruwala, and D. Weiss. 2016. Implications of Cost Behavior for Analysts' Earnings Forecasts. *Journal of Management Accounting Research* 28 (1): 57-80.

Cooper, R., and J. Haltiwanger. 2006. On the Nature of Capital Adjustment Costs. *The Review of Economic Studies* 73 (3): 611-633.

Dalla Via, N., and P. Perego. 2014. Sticky Cost Behaviour: Evidence from Small and Medium Sized Companies. *Accounting & Finance* 54 (3): 753-778.

De Medeiros, O. and De Souza Costa, P. 2004. *Cost Stickiness in Brazilian Firms*. Working paper, University of Brasilia, Brasilia.

Degeorge, F., J. Patel, and R. Zeckhauser. 1999. Earnings Management to Exceed Thresholds. *The Journal of Business* 72 (1): 1-33.

Dierynck, B., W. Landsman, and A. Renders. 2012. Do Managerial Incentives Drive Cost Behavior? Evidence About the Role of the Zero Earnings Benchmark for Labor Cost Behavior in Private Belgian Firms. *The Accounting Review* 87 (4): 1219-1246.

Douglas, P. 1976. The Cobb-Douglas Production Function Once Again. *Journal of Political Economy* 84 (5): 903-916.

Durbin, J., and G. S. Watson. 1950. Testing for Serial Correlation in Least Squares Regression: I. *Biometrika* 37 (3/4): 409-428.

Durbin, J., and G. S. Watson. 1951. Testing for Serial Correlation in Least Squares Regression. II. *Biometrika* 38 (1/2): 159-177.

Eisner, R., and R. Strotz. 1963. *Determinants of Business Investment*. Englewood Cliffs, N.J.: Prentice-Hall.

European Commission. 2014. The Joint Harmonised EU Programme of Business and Consumer Surveys.

Evans, J., M. Feng, V. Hoffman, D. Moser, and W. Van der Stede. 2015. Points to Consider When Self-Assessing Your Empirical Accounting Research. *Contemporary Accounting Research* 32 (3): 1162-1192.

Fama, E., and J. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3): 607.

Glaeser, E., and D. Mare. 2001. Cities and Skills. *Journal of Labor Economics* 19 (2): 316-342.

Goex, R. 2002. Capacity Planning and Pricing under Uncertainty. *Journal of Management Accounting Research* 14: 59.

Hamermesh, D. 1989. Labor Demand and the Structure of Adjustment Costs. *The American Economic Review* 79 (4): 674-689.

Hamermesh, D., and G. Pfann. 1996. Adjustment Costs in Factor Demand. *Journal of Economic Literature* 34 (3): 1264-1292.

Hamermesh, D. 1993. *Labor Demand*. Princeton, N.J.: Princeton University Press.

Hasenack, W. 1925. *Betriebskalkulationen im Bankgewerbe*. Berlin: Springer Verlag.

Hayashi, F. 1982. Tobin's Marginal q and Average q: A Neoclassical Interpretation. *Econometrica* 50 (1): 213-224.

Hayes, A. 2013. *Introduction to Mediation, Moderation, and Conditional Process Analysis*. New York: The Guilford Press.

He, D., J. Teruya, and T. Shimizu. 2010. Sticky Selling, General, and Administrative Cost Behavior and its Changes in Japan. *Global Journal of Business Research (GJBR)* 4 (4): 1-10.

Helsley, R., and W. Strange. 1990. Matching and Agglomeration Economies in a System of Cities. *Regional Science and Urban Economics* 20 (2): 189-212.

Hodgson, G. 2012. On the Limits of Rational Choice Theory 1 (1): 94-108.

Holt, C., F. Modigliani, J. Muth, and H. Simon. 1960. *Planning Production, Inventories, and Work Force*. Englewood Cliffs, N.J.: Prentice-Hall.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015a. The Impact of Changes in Regulation on Cost Behavior. *Contemporary Accounting Research* 32 (2): 534-566.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015b. Unraveling the Black Box of Cost Behavior: An Empirical Investigation of Risk Drivers, Managerial Resource Procurement, and Cost Elasticity. *The Accounting Review* 90 (6): 2305-2335.

Homburg, C. and Nasev, J. 2008. *How Timely are Earnings when Costs are Sticky?* Working paper, University of Cologne, Cologne.

Horngren, C. 2015. *Cost Accounting: A Managerial Emphasis*. Harlow, Essex, England.

Jaramillo, F., F. Schiantarelli, and A. Sembenelli. 1993. Are Adjustment Costs for Labor Asymmetric? An Econometric Test on Panel Data for Italy. *The review of economics and statistics* 75 (4): 640-648.

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

Johnson, R., and D. Wichern. 2014. *Applied Multivariate Statistical Analysis: Pearson New International Edition*. Essex: Pearson.

Johnson, P., and J. Neyman. 1936. Tests of Certain Linear Hypotheses and their Application to some Educational Problems. *Statistical Research Memoirs* 1: 57-93.

Kama, I., and D. Weiss. 2013. Do Earnings Targets and Managerial Incentives Affect Sticky Costs?. *Journal of Accounting Research* 51 (1): 201-224.

Kitching, K., R. Mashruwala, and M. Pevzner. 2016. Culture and Cost Stickiness: A Cross-Country Study. *The International Journal of Accounting* 51 (3): 402-417.

Lee, M., and J. McKinney. 2013. *Understanding and Applying Research Design*. Hoboken: John Wiley & Sons, Inc.

Lev, B., and R. Thiagarajan. 1993. Fundamental Information Analysis. *Journal of Accounting Research* 31 (2): 190-215.

Loomes, G. 1998. Probabilities vs Money: A Test of Some Fundamental Assumptions about Rational Decision Making. *The Economic Journal* 108 (447): 477-489.

Lucas, R. 1967. Optimal Investment Policy and the Flexible Accelerator. *International Economic Review* 8 (1): 78-85.

Luft, J., and M. Shields. 2003. Mapping Management Accounting: Graphics and Guidelines for Theory-Consistent Empirical Research. *Accounting, Organizations & Society* 28 (2): 169-249.

Lynch, P. 2000. *One Up On Wall Street*. New York: Simon and Schuster.

Ma, M. 2014. *Are We Really Doing What We think We are doing? A Note on Finite-Sample Estimates of Two-Way Cluster-Robust Standard Errors*. Working paper, American University, Washington.

Malmi, T., and M. Granlund. 2009. In Search of Management Accounting Theory. *European Accounting Review* 18 (3): 597-620.

Mankiw, G. 1985. Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly. *The Quarterly Journal of Economics* 100 (2): 529-537.

Marshall, A. 1890. *Principles of Economics*. London: Macmillan and Co., Ltd.

Mensah, Y., R. Hwang, and D. Wu. 2004. Does Managerial Accounting Research Contribute to Related Disciplines? An Examination Using Citation Analysis. *Journal of Management Accounting Research* 16: 163-181.

Nassirzadeh, F., J. Samei, M. Salehi, and A. Bayegi. 2013. A Study of the Stickiness of Cost of Goods Sold and Operating Costs to Changes in Sales Level in Iran. *Studies in Business & Economics* 8 (2): 79-89.

Nickell, S. 1986. Dynamic Models of Labour Demand. In *Handbook of Labor Economics*, eds. O. C. Ashenfelter, and R. Layard, 473-521. Amsterdam: North-Holland.

Nickell, S. 1978. Fixed Costs, Employment and Labour Demand Over the Cycle. *Economica* 45 (180): 329-345.

Noreen, E. 1991. Conditions under which Activity-Based Cost Systems provide Relevant Costs. *Journal of Management Accounting Research* 3 (4): 159-168.

Noreen, E., and N. Soderstrom. 1997. The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments. *Review of Accounting Studies* 2 (1): 89-114.

Noreen, E., and N. Soderstrom. 1994. Are overhead Costs Strictly Proportional to Activity?. *Journal of Accounting & Economics* 17 (1): 255-278.

Oi, W. Y. 1962. Labor as a Quasi-Fixed Factor. *Journal of Political Economy* 70 (6): 538-555.

Pervan, M., and I. Pervan. 2012. Analysis of sticky costs: Evidence from Croatian food and beverage industry. *International Journal of Mathematical Models and Methods in Applied Sciences* 6 (2): 963-970.

Petersen, M. 2009. Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies* 22 (1): 435-480.

Pfann, G., and F. Palm. 1993. Asymmetric Adjustment Costs in Non-linear labour Demand Models for the Netherlands and U.K. Manufacturing Sectors. *The Review of Economic Studies* 60 (2): 397-412.

Pfann, G., and B. Verspagen. 1989. The structure of adjustment costs for labour in the Dutch manufacturing sector. *Economics Letters* 29 (4): 365-371.

Popescu, C., K. Phaobunjong, and N. Ovararin. 2003. *Estimating building costs*. New York: Marcel Dekker.

Preacher, K., P. Curran, and D. Bauer. 2006. Computational Tools for Probing Interaction Effects in Multiple Linear Regression, Multilevel Modeling, and Latent Curve Analysis. *Journal of Educational and Behavioral Statistics* 31: 437-448.

Rajgopal, S., T. Shevlin, and M. Venkatachalam. 2003. Does the Stock Market Fully Appreciate the Implications of Leading Indicators for Future Earnings? Evidence from Order Backlog. *Review of Accounting Studies* 8 (4): 461-492.

Rappaport, A. 1981. Selecting Strategies that create Shareholder Value. *Harvard Business Review* 59 (3): 139-149.

Richardson, P., and J. Gordon. 1980. Measuring Total Manufacturing Performance. *Sloan Management Review* 21 (2): 47-58.

Robbins, L. 1945. *An Essay on the Nature and Significance of Economic Science*. London: Macmillan and Co.

Rotemberg, J. 1982. Sticky Prices in the United States. *Journal of Political Economy* 90 (6): 1187-1211.

Rothschild, M. 1971. On the Cost of Adjustment. *Quarterly Journal of Economics* 85 (4): 605-622.

Roychowdhury, S. 2006. Earnings Management through Real Activities Manipulation. *Journal of Accounting and Economics* 42 (3): 335-370.

Rumpf, H. 1966. Die Kostenremanenz als betriebswirtschaftliches Phaenomen: Dargestellt am Industriebetrieb, University of Mannheim.

Schotter, A. 2009. *Microeconomics*. Mason: South-Western Cengage Learning.

Shust, E., and D. Weiss. 2014. Asymmetric Cost Behavior - Sticky Costs: Expenses versus Cash Flows. *Journal of Management Accounting Research* 26 (2): 81-90.

Smith, M. 2015. *Research Methods in Accounting*. London: SAGE.

Strube, E. 1936. Kostenremanenz und Beschaeftigungsschwankungen. *Zeitschrift fuer handelswissenschaftliche Forschung* 30 (10): 1-37.

Sutton, R., and B. Staw. 1995. What Theory is Not. *Administrative Science Quarterly* 40 (3): 371-384.

Treadway, A., B. 1969. On Rational Entrepreneurial Behaviour and the Demand for Investment. *The Review of Economic Studies* 36 (2): 227-239.

Uy, A. 2011. Modeling Cost Behavior: Linear Models for Cost Stickiness. *Academy of Accounting & Financial Studies Journal*: 25-34.

Varian, H. 1992. *Microeconomic analysis*. New York: Norton & Company.

Venieris, G., V. Naoum, and O. Vlismas. 2015. Organisation Capital and Sticky Behaviour of Selling, General and Administrative Expenses. *Management Accounting Research* 26: 54-82.

Weidenmier, M., and C. Subramaniam. 2016. Additional Evidence on the Sticky Behavior of Costs. In *Advances in Management Accounting*, eds. M. Epstein, and M. Malina, 275-305. Bingley: Emerald Group Publishing Limited.

Weiss, D. 2010. Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review* 85 (4): 1441-1471.

Wernerfelt, B. 1997. On the Nature and Scope of the Firm: An Adjustment-Cost Theory. *Journal of Business* 70 (4): 489.

Wharton Research Data Services, WRDS. 2014. *Compustat Data*. Available online at http://wrds-web.wharton.upenn.edu/wrds/, 2014.

White, H. 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 48 (4): 817-838.

Yuekcue, S., and H. Oezkaza. 2011. Cost Behavior in Turkish Firms: are Selling, General and Administrative Costs and Total Operating Costs "Sticky"?. *World of Accounting Science* 13 (3): 1-27.

B PAPER I

Is Deliberate Cost Stickiness Economically Justifiable in the Presence of Adjustment Costs?

Abstract:

If costs fall with a decrease in demand to a lesser degree than with an equivalent increase in demand, they are considered to be sticky. Stickiness can lead to a rise in the ratio of cost-to-sales which is oftentimes interpreted as a negative signal about future profitability. However, there exist contrasting explanations for this phenomenon. On the one side, managerial overconfidence or empire building might lead to sticky costs, on the other side, many researchers attribute cost stickiness to deliberate decision making in an attempt to avoid potential adjustment costs if the decline in demand is expected to be temporary. Only in the latter case, stickiness can be economically justifiable for profit-maximizing companies.

To test whether cost stickiness is driven by economic considerations or behavioral characteristics, this study analyzes firm-specific effects of asymmetric cost behavior on scaled selling, general, and administrative costs. All analyses are performed using ANCOVA and multivariate regression. Findings provide support for the economic theory of sticky costs. Results show that an under proportional adjustment of resources, either during a demand decline or during a demand increase, may be economically viable if managers consider adjustment costs in conjunction with expected future demand when adapting resources.

Keywords: Cost Stickiness, Cost Anti-stickiness, Resource Adjustment Costs, Asymmetric Cost Behavior, Managerial Decision Making.

JEL Classifications: D24; M41.

1 Introduction

An increase in the ratio of selling, general, and administrative costs (SG&A) to sales is frequently interpreted by fundamental analysts as a negative indicator of future economic performance. In periods of declining activity, this may be either due to the fixed proportion of SG&A costs which is distributed across a smaller sales volume or caused by decreases in operating efficiencies indicating managers' inability to control costs (e.g. Bernstein and Wild 1998; Lev and Thiagarajan 1993). However, recent evidence shows that a temporary rise in the SG&A ratio (SG&A costs divided by sales) during a fall in demand can be positively related to prospective profitability (Anderson et al. 2007). In this case, findings suggest that managers deliberately trade off costs associated with retained resources against potential adjustment costs. Consequently, a higher SG&A ratio during short-term decreases in sales may be economically viable, provided that a cutback and ramp-up of resources bears adjustment costs that can be avoided if demand recovers quickly. This proposition builds on recent studies which recognize that in fact SG&A costs fall to a lesser extent with a decrease in activity than compared to an equivalent increase in activity, which is referred to as c*ost stickiness.* Specifically, costs are considered to be sticky if "the magnitude of the increase in costs associated with an increase in volume is greater than the magnitude of the decrease in costs associated with an equivalent decrease in volume" (Anderson, Banker, and Janakiraman 2003, p. 48) (hereafter, ABJ 2003).

According to this line of reasoning, cost stickiness may be economically justifiable if resource levels are kept stable during a short-term fall in activity, and the potential cost of the adjustment of those resources is eluded. However, in contrast to the economic explanation, other researchers find that sticky costs are also driven by behavioral aspects, such as managerial overconfidence or empire building incentives (Chen, Lu, and Sougiannis 2012; Chen, Gores, and Nasev 2013).

Many analyses focus on extending the existing literature on the potential causes of cost stickiness without testing the actual consequences of either of the two main explanations. This study therefore investigates firm-specific effects of asymmetric cost behavior on the SG&A cost-to-sales ratio using an alternative empirical approach, which has so far not been applied in existing studies. By doing so, this paper incorporates both the aspect of managerial intent *and* monetary consequences of asymmetric cost behavior. It moreover acknowledges recent findings according to which cost stickiness arises conditional on a prior sales increase, but anti-stickiness conditional on a prior sales decrease (Banker et al. 2014). The latter builds on the conceptualization by Weiss (2010, p. 1442) who terms costs as *anti-sticky* if “they increase less when activity rises than they decrease when activity falls by an equivalent amount”. Accordingly, the subsequent analysis incorporates both forms, addressing the important question of whether asymmetric cost behavior, from either sticky or anti-stickiness, may in fact contradict or reinforce the prevalent proposition that a higher SG&A ratio during demand decreases necessarily always reflects a lack of cost control, which leads to an increase in the SG&A ratio on average.

To test the research question, this study uses a longitudinal dataset covering 4,911 US and Canadian companies from 1998 to 2012. Operationally, economic consequences of firm-specific cost asymmetry are estimated constructing a two-year average ratio of SG&A cost-to-sales as the dependent variable. By doing so, the projected relationship covers both the effect of adjustment costs as well as costs of retained resources between the current and forthcoming period. Within the frame of the following analysis, the term “SG&A cost-to-sales ratio” is used to describe the dependent variable in the empirical models of this study which is calculated as the log-ratio of SG&A costs in t plus t+1 divided by sales in t plus t+1. The empirical examination is facilitated by a composite measure of managerial intention when adjusting,

or rather *not* adjusting, resources as opposed to unintended cost stickiness which might reflect cost escalation beyond managerial control (Baumgarten, Bonenkamp, and Homburg 2010).
To render comparisons possible, all analyses in this study focus solely on SG&A costs as this cost category is predominantly employed in related research. Because asymmetric cost behavior is caused by deliberate decision-making, it is feasible to focus on non-production costs where managerial discretion is assumed to be high (Bernstein and Wild 1998; Lev and Thiagarajan 1993).

Drawing on the concept of adjustment cost, findings are consistent with expectations showing a negative effect of cost stickiness on the SG&A cost-to-sales ratio if stickiness arises as a consequence of deliberate managerial decision-making during a temporary decline in demand. The SG&A cost-to-sales ratio is significantly smaller for sticky cost firms compared to anti-sticky cost firms. However, if activity decreases over two consecutive periods, the effects are strongly mitigated and yield no significant difference in the SG&A cost-to-sales ratio between both groups. Moreover, the results indicate that the positive economic consequence of avoiding adjustment costs during a temporary decline in demand diminishes with an increasing level of firm-specific cost stickiness. The effect is significant for moderate levels of cost stickiness but almost zero for highly sticky SG&A costs. Findings complement the work of Anderson et al. (2007) who find a general association between cost stickiness and future earnings, but neither compare sticky and anti-sticky cost companies nor estimate the direct effect of a percentage change in cost asymmetry on the SG&A cost-to-sales ratio.

This study contributes by demonstrating that, contrary to prevalent interpretations that consider a rise in the SG&A ratio as a negative signal with respect to future profitability, asymmetric cost behavior can be positively related to a decrease in the mean level of SG&A costs if adjustment costs are avoided. Because SG&A costs represent a significant proportion of sales, amounting to 27 percent on average in this sample, these findings are particularly important to researchers, analysts, and practitioners for the evaluation of alternatives in the event of demand variations.

The remainder of the paper is structured as follows. The next section provides a literature review on central articles related to the cost stickiness phenomenon. Section three elaborates on the theoretical foundation with respect to the economic rationale of sticky costs and the adjustment cost theory from which the main hypotheses are derived. Section four introduces the empirical models and a measure used in the analysis, and describes sample characteristics. Empirical results and additional robustness tests are presented in section five, and the last part of this study concludes the main findings.

2 Prior Research

Already in the 1920s, researchers had observed unusual patterns of cost behavior in relation to changes in activity (Brasch 1927; Hasenack 1925). In this respect, the term "cost remanence" has been introduced in German literature, which relates to the English meaning of sticky costs. A first analysis of potential reasons and characteristics of cost stickiness has been undertaken by Strube (1936), who examined cost behavior in six companies from the year 1933 to the year 1936 and was followed by other researchers such as Rumpf (1966), Malagoli (1985), and Noreen and Soderstrom (1994; 1997). Over more than a decade scientific interest in this subject has gained increased attention in management accounting research with the introduction of an empirical model that facilitates the examination of cost stickiness on large-scale panel data conditioning on the direction of change in activity. Results reported by ABJ (2003) indicate that the rate of an increase in costs with rising activity is greater compared to the rate of a decline in costs with an equivalent fall in activity.[9] Thus, costs are said to move *asymmetrical* with respect to increasing and decreasing demand. In addition to cost stickiness itself, a limited number of researchers focus on the analysis of "anti-sticky" costs. In this case, costs increase less in response to a surge in activity than they decrease in response to dwindling activity (Weiss 2010). Anti-sticky cost behavior can be observed during periods of strong and persistent sales decline, such as during the economic crisis between the years 2007 and 2009, when a quick recovery of the market was unexpected (Banker, Fang, and Metha 2013).

Empirical evidence for *both* stickiness and anti-stickiness challenges the general assumption in traditional cost accounting models that posit a linear relationship between changes in costs and changes in volume, independent of whether activity decreases or increases (Anderson, Banker, and Janakiraman 2003; Balakrishnan, Petersen, and Soderstrom 2004; Noreen 1991; Noreen and Soderstrom 1994; Noreen and Soderstrom 1997). In contrast to the traditional fixed/variable cost model, proponents of the cost stickiness theory argue that not only the current activity levels and the reversibility of resources determine the rate of adjustment but also deliberate managerial interventions (Banker and Byzalov 2014).[10]

[9] Because changes in activity are usually not directly observable, many studies follow ABJ (2003) and use sales as an imperfect proxy for activity. Although this might agitate potential biases because of fluctuations in output selling prices, other studies applying alternative direct measures instead of sales find similar results (Balakrishnan, Petersen, and Soderstrom 2004; Balakrishnan and Gruca 2008).

[10] The traditional cost function can be deducted from the Cobb-Douglas production which holds the following form: $P_t = b_t \cdot L_t^k \cdot C_t^j$ with P_t: total output, b_t: total factor productivity, L_t: total number of manual workers, C_t: fixed capital, j, k: output elasticities (Douglas 1976). If w_1 refers to the cost of capital and w_2 refers to the cost of labor, then the cost minimization problem (ignoring fixed costs) under a given output level is $Min_{(C,L)} = w_1 \cdot C_t + w_2 \cdot L_t$ s.t. $\overline{P}_t = P_t = b_t \cdot L_t^k \cdot C_t^j$. Deriving the first order conditions $\frac{\partial L}{\partial w_1}$ and $\frac{\partial L}{\partial w_2}$ for the corresponding Lagrangian $L(w_1, w_2, \lambda)$ and solving for C_t and L_t leads to the cost function (Schotter 2009). Let F_t be a function of w_1, w_1, b_t and k, j, then the cost

Growing empirical evidence contributes to the cost stickiness literature by examining the main drivers of variations in the degree of asymmetry. In particular, studies show that asymmetric cost behavior can be traced back to (1) the extent of resource adjustment costs in the form of country and industry-specific factors (Banker, Byzalov, and Chen 2013; Banker, Byzalov, and Threinen 2013; Calleja, Steliaros, and Thomas 2006), (2) managers expectations concerning future demand and demand uncertainty (Banker, Byzalov, and Plehn-Dujowich 2014; Banker et al. 2014; Holzhacker, Krishnan, and Mahlendorf 2015b), (3) current capacity utilization (Balakrishnan, Petersen, and Soderstrom 2004; Cannon 2014), and (4) managerial incentives and personal characteristics (Banker and Fang 2013; Chen, Lu, and Sougiannis 2012; Chen, Gores, and Nasev 2013; Dierynck, Landsman, and Renders 2012; Kama and Weiss 2013).[11]

Several studies build on the proposition formulated by ABJ (2003) and analyze the former, which likely represents the most prominent explanation for asymmetric cost responses, that is, cost stickiness induced by the magnitude of adjustment costs. These costs could be, for instance, attributable to the payment of severance packages as a consequence of personnel dismissal or disposal costs of physical assets (Cooper and Haltiwanger 2006; Hamermesh and Pfann 1996). In such cases, decision makers deliberately accept a higher cost-to-sales ratio to avoid additional

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function is given by: $C(\overline{P}_t) = F_t \cdot \overline{P}_t^{\frac{1}{k+j}}$. If $k = 1 - j$, constant returns to scale are assumed. Taking the log and using growth values between t-1 and t yields: $log\left(\frac{C_t}{C_{t-1}}\right) = \gamma_0 + \gamma_1 \cdot log\left(\frac{P_t}{P_{t-1}}\right) + \varepsilon_t$ with $\gamma_o = log\left(\frac{F_t}{F_{t-1}}\right)$ and $\gamma_1 = \frac{1}{k+1}$, which corresponds to the traditional cost model implying that the log-change in variable cost is independent from the direction of log-change in output (Varian 1992). The cost stickiness model, therefore, extends the standard cost function by a dummy variable that takes the value of 1 if $P_{t-1} > P_t$ and zero otherwise.

[11] Cost stickiness is likely to be mistaken with conditional conservatism (i.e., asymmetric timeliness of bad news compared to good news in earnings recognition). Therefore, researchers suggest controlling for the effect of sticky costs when estimating conservatism (e.g. Banker et al. 2016; Homburg and Nasev 2008).

costs for the readjustment of resources when demand recuperates from a temporary decline. Banker, Byzalov, and Chen (2013) refer to this explanation as the "economic theory of sticky costs," which emphasizes managers' role in evaluating the trade-off between short-term retention of resources and monetary adjustment costs. These might be determined by firm-specific factors incorporated into the type of resources, as well as structural factors due to industry or country differences. Some studies show, for instance, that cost stickiness exists on average but varies considerably across different components of SG&A costs (e.g. Anderson, Banker, and Janakiraman 2003; Weidenmier and Subramaniam 2016; Weiss 2010). Scholars analyzing data from the healthcare sector moreover document significant cost asymmetry for operating costs, therapists' hours, and total cost (Balakrishnan, Petersen, and Soderstrom 2004; Balakrishnan and Gruca 2008; Holzhacker, Krishnan, and Mahlendorf 2015a). Next to firm-specific parameters, a related field of research concentrates on contextual factors determining the degree of stickiness as a consequence of managers' ambition to avoid adjustment costs. Calleja, Steliaros, and Thomas (2006) document that stronger corporate governance mechanisms and external managerial oversight impede French and German managers' possibilities to cut resources in periods of falling sales compared to British and American decision makers. Additionally, national differences arise from employment protection legislation provisions that partially determine the extent of labor adjustment costs (Banker, Byzalov, and Chen 2013). Several other studies similarly examine the effect using country-specific data (e.g. De Medeiros and De Souza Costa 2004; He, Teruya, and Shimizu 2010; Nassirzadeh et al. 2013; Pervan and Pervan 2012; Uy 2011; Yuekcue and Oezkaza 2011), whereas Banker et al. (2013; 2014) show that cost stickiness is also a global phenomenon.

Another important driver of cost stickiness is related to managers' expectations about future sales. Although ABJ (2004) argue that cost stickiness prevails on average, Banker et al. (2014) document two opposing processes conditional on prior period sales changes. The authors assume that managers are more optimistic about a forthcoming increase in demand if sales in the *previous* year increased. This positively affects their willingness to acquire additional resources when *current* sales rise and negatively affects their willingness to cut resources when *current* demand declines. However, managers might fear a forthcoming fall in demand if they already experienced a downturn in the last period. This leads to the opposite effect in the form of anti-stickiness. Therefore, Banker et al. (2014) suggest a model that acknowledges the moderating effect of prior period sales changes when drawing conclusions on asymmetric cost behavior.

Some studies focus on the relevance of current capacity levels on the extent of cost stickiness. Based on a sample of physical therapy clinics in the US, Balakrishnan et al. (2004) show that excess capacity lowers the level of cost stickiness, whereas strained capacity increases cost stickiness. Yet, Banker et al. (2014) note that the maximum acceptable slack for managers of companies where sales are far below capacity depends on their expectations concerning future demand as well as downward and upward resource adjustment costs.

Complementing this line of research, which draws on the economic reasoning of cost stickiness, a less explored stream of literature conjectures managerial incentives as an enforcing factor of asymmetric cost behavior. Chen, Lu, and Sougiannis (2012) build on the principal agency theory, which focuses on the elaboration of optimal control mechanisms in the context of information asymmetry and presumably conflicting interests between managers (agents) and shareholders (principals) (Jensen and Meckling 1976). The authors' results indicate a significantly positive relationship between managerial empire building and SG&A cost asymmetry (Chen, Lu, and Sougiannis 2012). Further studies show that real earnings management incentives likewise moderate the extent of cost stickiness (Banker and Fang 2013; Dierynck, Landsman, and Renders 2012; Kama and Weiss 2013).

In addition to the drivers of asymmetric cost behavior in response to a decrease and increase in activity, some studies examine its consequences for the application of empirical models that so far have ignored the prevalence of cost stickiness. Banker and Chen (2006) find that acknowledging asymmetric cost behavior in predicting future return on equity yields significantly lower forecast errors compared to alternative models based on cash flow or income statement line items. These results are extended by Weiss (2010) who incorporates a firm-specific measure of cost stickiness. His results indicate that analysts' absolute consensus earnings forecasts are, on average, 25 percent less accurate if firms exhibit sticky costs. A publication by Cannon (2014) moreover finds evidence that asymmetric cost behavior arises because of retained idle capacity when demand falls but also because managers asymmetrically adjust selling prices in response to demand fluctuations. Using data from the US Air Transportation industry, the author shows that managers stimulate sales volume by lowering selling prices when demand falls. However, managers increase capacity (instead of selling prices) when demand rises.

3 Theory and Hypothesis

3.1 Adjustment Cost Theory

Central to the cost stickiness theory is the proposition modeled in the dynamic factor demand literature, which assumes that changing resource levels involve adjustment costs (Eisner and Strotz 1963; Lucas 1967; Treadway 1969). In this respect various researchers have studied optimal labor adjustment and capital investment decisions depending on the average magnitude of adjustment costs as well as the shape of the underlying cost function. The standard model introduced by Holt et al. (1960) has been frequently viewed as a quadratic symmetrical function for deviations in input factors implying strict convexity. From this, it follows that large and rapid changes of input factors are rather expensive because adjustment costs increase over proportional with activity changes (Hamermesh and Pfann 1996). Managers might therefore deliberately retain unused capacity associated with decreasing demand to avoid adjustment costs and therewith induce cost stickiness.

There are two influencing factors that reinforce the implied relationship. First, optimistic expectations for future sales might fortify managers' reluctance to reduce resources if a rapid recovery in demand is anticipated (Banker et al. 2014). Second, if resource adjustments are not equally costly for upward and downward changes, managers might be less willing to adjust. The latter factor is supported by a variety of researchers who have found evidence of asymmetric adjustment cost functions.[12] Although adjustment costs might also take alternative functional forms, such as piecewise linear (Nickell 1978; Nickell 1986), fixed (Hamermesh 1989), or any combination of these forms, the underlying intuition is similar. In addition to their functional shape, adjustment costs are likely to vary differently depending on the type of resource, such as the broad division between labor and capital (Caballero, Engel, and Haltiwanger 1995). Drawing on this proposition, while recognizing that adjustment costs are not directly observable, some studies attempt to examine this relationship based on a model that links measurable proxies of adjustment costs to their consequences in the form of cost stickiness. Anderson et al. (2003) document that both employee intensity (ratio of total number of employees to sales) and asset intensity (ratio of total assets to sales) increase the degree of sticky costs while Anderson and Lanen (2009) emphasize that labor costs might be sticky on average but the physical number of employees is not. Extending these findings, Balakrishnan and Gruca (2008) build on the presumed influence of adjustment costs on the

[12] Also Holt et al. (1960, p. 53) note, "It is not required that these costs be symmetrical."

hierarchical form of the organization by Wernerfelt (1997) and document a higher level of cost stickiness in departments that represent core competencies in firms with frequent, but uncertain activities.

3.2 Hypothesis Development

The cost stickiness literature predominately relates to the adjustment cost theory and sales expectations conjecturing economic incentives as one of the core reasons for an under proportional adaption of resources if demand falls compared to the corresponding change if demand rises. This implies that a relatively higher cost-to-sales ratio during periods of declining sales is economically beneficial if average adjustment costs in the current (t) and forthcoming year $(t + 1)$ are higher than steady costs from the retention of resources. Consequently, the amount of sticky costs must be smaller than average adjustment costs in t and $t + 1$, provided that demand recovers to a level not less than the original. Certainly, its economic feasibility depends on the magnitude of adjustment costs (slope of adjustment cost function) and decision makers' expectations towards subsequent sales development. According to the dynamic factor demand literature, an optimizing manager will cut resources as long as the marginal resource costs more to retain it than to reduce it. In the case of labor, personnel are laid off if the net present value of a worker's marginal sales minus her wages and costs of dismissal exceed firing costs (Bentolila and Bertola 1990). Similarly, in the case of capital, resources will be reduced if the net present value of the marginal sales of capital minus the costs of capital (e.g., interest expenses, physical depreciation) and net transaction costs is negative (Abel and Eberly 1996). When deciding on whether to adjust resources during a decline in demand, rational decision-makers will therefore take into consideration the shape of the underlying adjustment cost function as well as expected future sales. Thus, the economic theory of sticky costs implies the following predictions: On the one hand, if an anticipated quick recovery of sales in the next period $(t+1)$ is realized, managers taking into account unused capacity during a temporary demand decline in the current period (t) yield a lower SG&A cost-to-sales ratio across both years compared to organizations with anti-sticky costs. In this case, allowing for cost stickiness is economically beneficial. On the other hand, if sales unexpectedly continue to decrease in the next period $(t+1)$, companies with sticky costs during the current period (t) yield a higher cost-to-sales ratio across both years compared to organizations that proportionally adjust resource levels. Consequently, an accurate forecast of future sales will determine if cost stickiness leads to increasing or decreasing total SG&A costs in the long run. Of particular interest, however, is the comparison between companies that exhibit sticky costs and companies that are characterized by anti-sticky cost behavior. If managers who are optimistic about future sales will retain unused capacity during a sales decrease, pessimistic managers are likely to allow for under capacity during a sales increase (Banker et al. 2014). A lower cost-to-sales ratio of the former subsample will be expected if asymmetric cost behavior is predominantly driven by managers' expectations for future demand and positive long-term sales development.[13] Therefore, it is hypothesized that:

H1: If sales increase in period t + 1 following a decline in demand in period t, the SG&A cost-to-sales ratio across both periods is lower for sticky cost firms than for anti-sticky cost firms.

Reverse effects are projected if sales continue to decrease in the following period, contrary to managers' expectations.

[13] It is assumed that adjustment costs actually occur within the time frame of two periods.

H2: If sales decrease in period t +1 following a decline in demand in period t, the SG&A cost-to-sales ratio across both periods is higher for sticky cost firms than for anti-sticky cost firms.

However, the described relationship between the level of cost stickiness and the SG&A cost-to-sales ratio across two periods does not necessarily follow a linear functional form. Instead, it is expected that, up to a certain limit, managers will use idle time and assign employees to catch up on less prioritized tasks (Holt and others 1960). Workers and production machines are thus used efficiently. Yet, with an increasing degree of slack undesirable side effects, such as employee demotivation or a higher error rate, can occur. Resource use is then beyond its optimal range leading to decreasing returns to scale of cost stickiness. Because the modeled relationship builds on the conglomerate of SG&A costs and not on particular components, non-linearity in the effect of cost stickiness is likely to be observed. Accordingly, cost stickiness might yield a lower SG&A cost-to-sales ratio on average, but the effect is expected to diminish if the extent of cost asymmetry is too high. This leads to the third hypothesis:

H3: The negative relationship between the level of cost stickiness in period t and the SG&A cost-to-sales ratio across period t and t +1 diminishes after reaching a certain optimum.

4 Model Design and Data Characteristics

4.1 Model Components

To test previous hypotheses, a firm-specific measure of asymmetric cost behavior ($STICKY_{i,t}$) and the extent to which managers deliberately allow for asymmetric cost behavior ($Intention_{i,t}$,) are incorporated within the subsequent empirical models. To facilitate the interpretation, the following section therefore, first, explains the calculation of the two measures $STICKY_{i,t}$

and $Intention_{i,t}$ and, second, describes the regression models in which both measures are used as explanatory variables. The last part of this section provides an overview of the sample selection and descriptive statistics.

4.1.1 Firm-specific Measure of Asymmetric Cost Behavior

The majority of studies in the field of cost stickiness apply a longitudinal regression model that determines the factors influencing the level of cost asymmetry. Within this context, the magnitude and direction of sales changes serve as independent variables that predict the associated percentage variation in costs (dependent variable) and measure the level of cost asymmetry, that is, the elasticity of the cost response (Anderson, Banker, and Janakiraman 2003). However, to test the hypotheses which center on the economic consequences of maintaining resource levels in the presence of a negative demand shock, cost stickiness itself is employed as an explanatory variable. Therefore, a firm-specific measure of cost stickiness according to Weiss (2010) is applied that approximates the variable percentage of total SG&A costs by determining the change in costs over the change in activity, both from a high activity level to a low activity level. This implies the following analytical form in which $STICKY_{i,t}$ refers to the level of cost asymmetry of company i in period t with $\Delta SGA_{i,t} = SGA_{i,t} - SGA_{i,t-1}$ and $\Delta Sales_{i,t} = Sales_{i,t} - Sales_{i,t-1}$.

$$STICKY_{i,t} = log\left[\frac{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t,\underline{\tau}}}{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t,\overline{\tau}}}\right], \qquad \underline{\tau}, \overline{\tau} \in \{t, \ldots, t-3\}$$

$\underline{\tau}$ represents the most recent of the last four quarters with a decrease in sales $\left(Sales_{i,t-1} \geq Sales_{i,t}\right)$, and $\overline{\tau}$ is the most recent of the last four quarters with an increase in sales $\left(Sales_{i,t-1} < Sales_{i,t}\right)$. If costs change less with a sales decline compared to an increase in activity of the same extent, then $STICKY_{i,t}$

is negative. To differentiate between sticky cost companies and anti-sticky cost companies, a dummy variable $CS_{i,t}$ is used, which takes the value of one if $STICKY_{i,t} < 0$ and zero otherwise. For the subsequent analysis, quarterly estimates of $STICKY_{i,t}$ are transformed into a median capturing firm-specific cost asymmetry for each fiscal year across all companies with non-missing observations. This measure is then incorporated as an explanatory variable in a regression model that acknowledges the moderating effect of both the level of firm-specific cost stickiness ($STICKY_{i,t}$) and managerial deliberateness ($Intention_{i,t}$) with respect to cost retention. A detailed description of the measurement and assumptions underlying the $Intention_{i,t}$ index is provided in the next section.

4.1.2 Firm-specific Measure of Managerial Intention

The current state of research is acknowledged in the following empirical models according to which there exists two broad streams of literature that attribute sticky costs to either intended or unintended managerial decision-making. As described previously, intended cost stickiness can either be a result of economic factors, such as a trade-off against potential adjustment costs, or short-term non-economic reasons, such as an attempt to avoid negative effects on corporate culture or reputation. Additionally, a higher level of unused capacity might be unintended if it is ascribed to empire building motivations or real earnings management. The applied econometric model includes therefore an index variable $Intention_{i,t}$, which draws on the existing studies that find significant influencing factors with respect to the level of rationally motivated cost stickiness. Thus, $Intention_{i,t}$ is based on the following five components:

$EI_{i,t}$ = log-ratio of the number of employees to current sales according to Anderson et al. (2003).

$AI_{i,t}$ = log-ratio of total assets to current sales according to Anderson et al. (2003).

$SGA - Ratio_{i,t}$ = ratio of SG&A cost-to-sales in the previous period compared to the industry average,[14] according to Baumgarten et al. (2010). $SGA - Ratio_{i,t}$ takes the value of one if SG&A cost-to-sales were below the industry mean in t - 1 and zero otherwise.

GDP_t = percentage growth in real gross domestic product in the actual year, according to Anderson et al. (2003).[15]

$Increase_{i,t-1}$ = prior period sales change according to Banker et al. (2014). Takes the value of one if $Sales_{i,t-1} > Sales_{i,t-2}$ and the value of 0 otherwise.

The $Intention_{i,t}$ index is constructed as a combination of the five input factors above using multiple linear regression and weighted based on the estimated coefficients, each of which are theoretically ascribed to economically motivated asymmetric cost behavior. Because the individual analysis of the variables with respect to cost stickiness is not the focus of this study, the particular advantage of this approach is that both parsimonious modeling and best-fit aspects are considered. The resulting $Intention_{i,t}$ index serves as a composite measure capturing the information of the five variables explained above, without an unnecessary extension of models (2) and (3).

The applied regression model (1) is based on the econometric specification introduced by ABJ (2003) in which cost stickiness is measured as the percentage change of SG&A costs with a one percent change in sales in periods of declining activity compared to increasing activity. The above variables are included as moderators in the following linear regression:

[14] All SIC codes have been classified in 49 industry groups according to Fama and French.
[15] GDP growth rates are obtained from Penn World Tables (WRDS), World Bank, and the International Monetary Fund.

$$log\left(\frac{SGA_{i,t}}{SGA_{i,t-1}}\right) = \alpha + \beta_a + \beta_b \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_c \cdot Decrease\_Dummy_{i,t} + \beta_d \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) \cdot Decrease\_Dummy_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where:

$\beta_a =$ $\beta_1 \cdot Decrease\_Dummy_{i,t} + \beta_2 \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_3 \cdot EI_{i,t} + \beta_4 \cdot AI_{i,t} + \beta_5 \cdot GDP_t + \beta_6 \cdot SGA - Ratio_{i,t} + \beta_7 \cdot Inc\_Dummy_{i,t-1}$

$\beta_b =$ $\beta_8 \cdot EI_{i,t} + \beta_9 \cdot AI_{i,t} + \beta_{10} \cdot GDP_t + \beta_{11} \cdot SGA - Ratio_{i,t} + \beta_{12} \cdot Inc\_Dummy_{i,t-1}$

$\beta_c =$ $\beta_{13} \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_{14} \cdot EI_{i,t} + \beta_{15} \cdot AI_{i,t} + \beta_{16} \cdot GDP_t + \beta_{17} \cdot SGA - Ratio_{i,t} + \beta_{18} \cdot Inc\_Dummy_{i,t-1}$

$\beta_d =$ $\beta_{19} \cdot EI_{i,t} + \beta_{20} \cdot AI_{i,t} + \beta_{21} \cdot GDP_t + \beta_{22} \cdot SGA - Ratio_{i,t} + \beta_{23} \cdot Inc\_Dummy_{i,t-1}$

$Decrease\_Dummy_{i,t}$ is a dichotomous variable that takes the value of one if $Sales_{i,t-1} \geq Sales_{i,t}$ and zero otherwise. If the regression coefficient of one of the three-way interaction terms (β_d) is negative, then the respective variable contributes to an increase in cost stickiness by negatively affecting the relative change in SG&A costs with a one percent drop in activity. Relating to the correlation between the resulting $Intention_{i,t}$ index and the firm-specific measure for cost asymmetry $\left(STICKY_{i,t}\right)$, the sign of the association is expected to be negative. The underlying rationale is such that an increasing level of $STICKY_{i,t}$ implies increasing anti-stickiness for anti-sticky cost companies and a decreasing level of stickiness for sticky cost companies $\left(STICKY_{i,t} \uparrow: anti-stickiness \uparrow, cost\ stickiness \downarrow\right)$.

To address concerns due to potentially omitted variables, model (1) contains all first and second order effects between the explanatory variables. However, only the regression coefficients of β_d are used as weights to construct the $Intention_{i,t}$ index, because these three-way-interactions capture the magnitude of asymmetric cost behavior (i.e. the significant difference in the change of SG&A costs between increasing and decreasing activity).[16] Accordingly, the following signs of the regression coefficients of β_d are predicted:

With respect to employee intensity $(EI_{i,t})$ and asset intensity $(AI_{i,t})$, findings by ABJ (2003) suggest that a higher degree of both ratios may imply greater adjustment costs that lead to greater asymmetric cost behavior in periods of declining activity. Consequently, β_{19} and β_{20} should be negative. Similarly, the degree of stickiness is expected to be greater in periods of high economic growth (GDP_t) during which a fall in demand is perceived to be only temporary. This implies $\beta_{21} < 0$. Baumgarten et al. (2010) furthermore hypothesize that cost stickiness is intended if the firm-specific SG&A ratio $(SGA - Ratio_{i,t})$ in the previous period was below the industry mean, which indicates managers' ability to control costs. Accordingly, the sign of the regression coefficient β_{22} should be negative. The last component of the econometric model refers to the change in sales between $t-1$ and $t-2$, where $Inc\_Dummy_{i,t-1} = 1$ reflects manager optimism towards future demand. If this is the case, manager willingness to retain unused resources increases, which would be reflected in $\beta_{23} < 0$ (Banker et al. 2014). Based on

[16] β_a captures the fixed effects for sales increases, β_b captures the percentage increase in costs per one percent increase in sales, β_c captures the fixed effects for sales decreases, β_d captures the percentage decrease in costs per one percent decrease in sales (i.e. the magnitude of cost stickiness if regression coefficient is negative).

model (1), the $Intention_{i,t}$ index is constructed as the weighted sum of all negative significant ($\alpha = 0.05$) components.[17]

4.2 Description of Empirical Models

To test H1, the relationship between asymmetric costs (either sticky or anti-sticky costs) and the average SG&A cost-to-sales ratio is conceptualized in the following functional form:

$$log\left[\frac{SGA_{i,t} + SGA_{i,t+1}}{Sales_{i,t} + Sales_{i,t+1}}\right] = \alpha + \beta_1 \cdot CS_{i,t} + \beta_2 \cdot STICKY_{i,t} + \beta_3 \cdot Intention_{i,t} + \beta_4 \cdot CS_{i,t} \cdot STICKY_{i,t} + \beta_5 \cdot CS_{i,t} \cdot Intention_{i,t} + \beta_6 \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_7 \cdot CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_8 \cdot FCF_{i,t} + \beta_9 \cdot PE_{i,t} + \beta_{10} \cdot Growth_{i,t} + \beta_{11} \cdot Stagnant_{i,t} + \sum_{z=12}^{41} \beta_z \cdot Industry_{i,t,z} + \varepsilon_{i,t} \tag{2}$$

The dependent variable is measured as the average SG&A cost-to-sales ratio across the current and subsequent year, which refers to the total amount of SG&A costs in both periods relative to the sales volume in each year. Possible adjustment costs from an adaption of resources in the case of declining sales are contained in this measure. The difference between the SG&A cost-to-sales ratio for sticky costs compared to anti-sticky cost firms is then reflected by a significant regression estimate for β_1 which is negative if the SG&A cost-to-sales ratio is smaller for sticky cost companies than for anti-sticky cost companies. Thus, H1 implies that $\beta_1 < 0$ (see Figure 1 below). Additionally, it is assumed that the difference of the average SG&A cost-to-sales ratio between sticky cost and anti-sticky cost firms increases with increasing cost

[17] Regression coefficients are transformed to absolute values to facilitate interpretability.

stickiness and increasing deliberateness of managers' resource adjustment decisions. Accordingly, $\beta_4 < 0$, $\beta_5 < 0$ and $\beta_7 < 0$. The direction of effects for anti-sticky cost firms ($\beta_2, \beta_3, \beta_6$) are not predicted as they are assumed to countervail each other in one period with decreasing sales followed by one period with increasing sales (conditions of H1).

Figure 1: The difference of the SG&A cost-to-sales ratio between sticky cost firms and anti-sticky cost firms (H1)

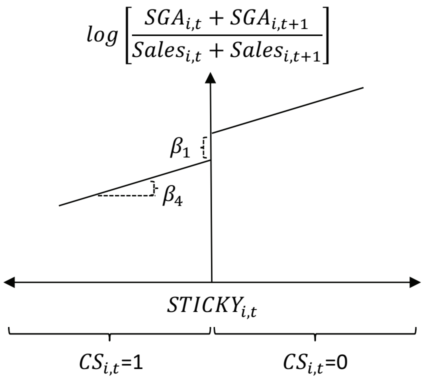


Figure 1 illustrates the expected signs of the regression coefficients. A significant β_1 would capture the difference in the SG&A cost-to-sales ratio at the mean value of STICKY. A significant β_4 corresponds to the change in the SG&A cost-to-sales ratio with increasing cost stickiness.

H1 implies that the SG&A cost-to-sales ratio is smaller for sticky cost firms ($CS_{i,t}$=1) than for anti-sticky cost firms ($CS_{i,t}$=0). Thus, $\beta_1 < 0$. If this effect is additionally moderated by the level of STICKY then $\beta_4 < 0$. The effect would be even stronger if the intention index is associated with a further reduction of the SG&A cost-to-sales ratio which implies that also $\beta_7 < 0$.

All of the models are tested based on a specification with and without control variables. Results for both are shown in separate columns within each table.

To control for cost stickiness that is presumably not attributable to deliberate managerial decisions but to opportunistic behavior (e.g., empire building), the variable $FCF_{i,t}$ is additionally included in all of the econometric models. According to Chen et al. (2012), high levels of free cash flow incentivize managers to delay cuts in SG&A costs as a response to declining activity and therewith induce cost stickiness which is not economically justifiable. Thus, by incorporating $FCF_{i,t}$ as control variable the effect of potential opportunistic managerial behavior cannot influence the predicted relationship between economically intended cost stickiness and the average SG&A cost-to-sales ratio. $FCF_{i,t}$ is calculated as the cash flow from operating activities minus common and preferred dividends scaled by total assets and measures managers' empire building incentives.

To control for deviating future growth prospects of each company, all regression models include a dummy variable $PE_{i,t}$. It takes the value of one if the price-to-earnings ratio is greater than zero and zero otherwise. The price-to-earnings ratio is defined as the market value of the company at the end of the fiscal year divided by net income for the most recent 12-month period (Lynch 2000).

Moreover, the following hypotheses are tested considering implications from life cycle theory. This frame of literature suggests that accounting performance measures differ across organizational life cycle stages positing that growth and capital expenditure strategies are partially determined by a company's development phase (Rappaport 1981; Richardson and Gordon 1980). For the subsequent analysis, firms are classified according to their life cycle stage using the median of the last three years of sales growth, consistent with Anthony and Ramesh (1992). First, firm-specific sales growth (SG_t) is computed as follows: $SG_t = \left((Sales_{i,t} - Sales_{i,t-1})/Sales_{i,t-1}\right) \cdot 100$. The median value of the past three periods in sales growth is calculated from this figure in the second step. Third, for each firm, the individual distribution of the median sales growth development is derived. Prior to testing H1, H2 and H3 a company is assigned to the early life cycle stage (growth) if the indicator is in the highest third of its firm-specific sales growth distribution. It is assigned to the mature stage if the median three-year sales growth lies in the middle third of its distribution and to the stagnant stage if it is in the lowest third. A dummy variable for the two extremes $Growth_{i,t}$ and $Stagnant_{i,t}$ is used in all of the regression models while companies classified as mature serve as the control group. Furthermore, all of the regression models control for industry fixed-effects according to the classification by Fama and French. A detailed description of all variables is provided in Table 11 in the appendix.

H2 predicts that the SG&A cost-to-sales ratio is higher for sticky cost firms than for anti-sticky cost firms if sales decrease in the current and in the next period. This implies that $\beta_1 > 0$. Also, the effect is assumed to be stronger with increasing cost stickiness and increasing managerial intention. Hence, $\beta_4 > 0$, $\beta_5 > 0$ and $\beta_7 > 0$. As before, the direction of effects for anti-sticky cost firms are not predicted ($\beta_2, \beta_{3,} \beta_{6)}$. These companies would cut resources in accordance with a drop in demand which does not necessarily induce a change in the average SG&A cost-to-sales ratio.

To test H3, the effect of diverging magnitudes of cost stickiness requires the adaption of model (2). Operationally, the effect of increasing levels of cost stickiness is captured by portioning the measure for firm-specific cost symmetry into three groups: one group for a symmetry ratio greater than 65 percent (LOW), one group with levels of stickiness between 65 percent and 32 percent (MODERATE), and one group for high asymmetry at the boundary of 32 percent (HIGH).[18] Companies with anti-sticky costs serve as the control group. Intending to achieve equal group sizes, the sampling is performed according to the 33rd and 67th percentiles of the distribution of the $STICKY_{i,t}$ estimator. Dummy variables for each group are incorporated both in the interaction terms, as well as single effects in regression model (3):

$$\begin{aligned} log\left[\frac{SGA_{i,t}+SGA_{i,t+1}}{Sales_{i,t}+Sales_{i,t+1}}\right] = \; & \alpha + \beta_1 \cdot LOW_{i,t} + \beta_2 \cdot MODERATE_{i,t} + \beta_3 \cdot HIGH_{i,t} + \\ & \beta_4 \cdot STICKY_{i,t} + \beta_5 \cdot Intention_{i,t} + \beta_6 \cdot STICKY_{i,t} \cdot \\ & Intention_{i,t} + \\ & \underline{\text{“LOW” Interactions}} \\ & \beta_7 \cdot LOW_{i,t} \cdot STICKY_{i,t} + \beta_8 \cdot LOW_{i,t} \cdot \\ & Intention_{i,t} + \beta_9 \cdot LOW_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} + \\ & \underline{\text{“MODERATE” Interactions}} \\ & \beta_{10} \cdot MODERATE_{i,t} \cdot STICKY_{i,t} + \beta_{11} \cdot \\ & MODERATE_{i,t} \cdot Intention_{i,t} + \beta_{12} \cdot MODERATE_{i,t} \cdot \\ & STICKY_{i,t} + \\ & \underline{\text{“HIGH” Interactions}} \\ & \beta_{13} \cdot HIGH_{i,t} \cdot STICKY_{i,t} + \beta_{14} \cdot HIGH_{i,t} \cdot \\ & Intention_{i,t} + \beta_{15} \cdot HIGH_{i,t} \cdot STICKY_{i,t} \cdot \\ & Intention_{i,t} + \\ & \underline{\text{Controls and Residual}} \\ & \beta_{16} \cdot FCF_{i,t} + \beta_{17} \cdot PE_{i,t} + \beta_{18} \cdot Growth_{i,t} + \beta_{19} \cdot \\ & Stagnant_{i,t} + \textstyle\sum_{z=20}^{49} \beta_z \cdot Industry_{i,t,z} + \varepsilon_{i,t} \end{aligned} \qquad (3)$$

[18] The level of cost symmetry refers to the ratio of changes in cost to changes in sales for decreasing activity compared to increasing activity. That is, the STICKY measure without logarithmic transformation.

H3 implies that the slopes for the three groups decrease in effect size as the level of firm-specific cost stickiness increases $\left(LOW_{i,t} \rightarrow MODERATE_{i,t} \rightarrow HIGH_{i,t}\right)$. Conditional upon the mean level of $Intention_{i,t}$, this leads to the following expectations with respect to the total effect of cost stickiness at low, moderate, and high levels. Where $\theta_{(STICKY \rightarrow \hat{Y})}$ denotes the total effect of $STICKY_{i,t}$ on the SG&A cost-to-sales ratio $\left(\hat{Y}\right)$.[19]

$$LOW_{i,t}: \theta_{(STICKY \rightarrow [\widehat{Y}|\overline{Intention_{i,t}}])} = (\beta_4 + \beta_6 + \beta_7 + \beta_9)$$

$$MODERATE_{i,t}: \theta_{(STICKY \rightarrow [\widehat{Y}|\overline{Intention_{i,t}}])} = (\beta_4 + \beta_6 + \beta_{10} + \beta_{12})$$

$$HIGH_{i,t}: \theta_{(STICKY \rightarrow [\widehat{Y}|\overline{Intention_{i,t}}])} = (\beta_4 + \beta_6 + \beta_{13} + \beta_{15})$$

Where $(\beta_4 + \beta_6 + \beta_7 + \beta_9) < (\beta_4 + \beta_6 + \beta_{10} + \beta_{12}) > (\beta_4 + \beta_6 + \beta_{13} + \beta_{15})$, i.e. $\beta_7 < \beta_{10} > \beta_{13}$, with $\beta_9, \beta_{12}, \beta_{15} = 0$ at the mean level of $Intention_{i,t}$ ($Intention_{i,t} = 0$ after mean-centering). This implies an increase in the conditional effect from low to moderate levels of cost stickiness and a decrease of the conditional effect from moderate to high cost stickiness among companies with managers taking deliberate resource-adjustment decisions.

A log-log specification rather than a (semi)-linear form of model (1), (2), and (3) is employed that facilitates the economic interpretation of regression results and alleviates potential heteroscedasticity. Because of the cross-sectional nature of the data across a variety of industries, the ratio form of the dependent variable furthermore improves comparability between firms. Moreover, because the White test (1980) and the Durbin t-test (1950; 1951)

[19] $LOW_{i,t}: \theta_{(STICKY \rightarrow [\widehat{Y}|\overline{Intention_{i,t}}])}$ is interpreted as the effect of STICKY on the average SG&A cost-to-sales ratio conditional on the mean level of intention.

for lagged dependent variables indicate potential autocorrelation and heteroscedasticity of the residuals, a clustering by firm and year is performed as suggested by Petersen (2009). Moreover, multicollinearity diagnostic tests according to Belsley (1980) are conducted. Because the variance inflation factor (VIF) for all of the independent variables is far below the recommended threshold of 10 with a tolerance (1/VIF) higher than 0.1, multicollinearity is not a significant concern in regression models. Regression models (2) and (3) are estimated using ordinary least squares after winsorizing the top and bottom 0.5 percent of each of the variables to alleviate potential biases caused by outliers (Chen and Dixon 1972). Additionally, continuous predictors included in the interaction terms are mean-centered prior to the computation of the product (Aiken and West 1991). For the purpose of further analyses, the comparison of total effects and means between the two clusters is conducted using multivariate regression complemented by ANCOVA. This approach has two advantages. First, the Johnson-Neyman technique can be applied, which does not require a homogeneity of regression slopes between sticky cost and anti-sticky cost firms (Johnson and Neyman 1936). Second, potential arbitrariness is avoided when the sample is separated into different groups according to predetermined boundaries along the continuum of $STICKY_{i,t}$ and $Intention_{i,t}$. Rather, mean differences and transaction levels for significance can be conducted for the entire sample instead of creating separate subgroups (Hayes 2013).

4.3 Sample Selection and Descriptive Statistics

Standard & Poor's Compustat Data as provided by Wharton Research Data Services is used for the following analysis. The dataset includes 4,911 US and Canadian companies from the year 1998 to the year 2012. Cases from the years 2008 and 2009 are excluded from the study because companies' operational behavior might have been affected during the financial crisis. The dataset includes annual figures of non-financial industries while all monetary values are converted to real 2010 US dollars to control for inflation.[20] Additionally, observations are deleted if either SG&A costs or sales in the current or subsequent financial period are missing, or if SG&A costs exceed sales. Acknowledging the objection by Anderson and Lanen (2009), “unusual” observations that prevail when sales and costs move in opposite directions are excluded from the sample. The total number of remaining observations is 18,636 with an average of 3.8 observations per firm. Further adjustments to the dataset because of the specific requirements to test the respective hypotheses are reported in the subsequent section.

Table 1 provides descriptive statistics on the dataset (panel A) and an overview of periodic negative (panel B) and positive sales and costs development (panel C). The average company generates sales of approximately three billion US dollars and 600 million US dollars in SG&A costs. However, the standard deviation for both sales and costs is relatively high, which shows heterogeneity across firms. With respect to the percentage of SG&A costs to sales, there is only a marginal difference of 0.93 percentage points compared to reported results by ABJ (2003).

Panel B provides an overview on annual cost and sales changes between two periods. Because “unusual observations” have been eliminated to acknowledge the objections by Anderson and Lanen (2009), descriptive statistics on cost and sales fluctuations display similar patterns with nearly 34 percent of the observations representing decreasing costs and sales. The mean (median) value of sales decreases is 12 percent (ten percent) while the mean negative

[20] Due to differences in interpreting income statements in the financial and insurance industry, observations with SIC codes (Standard Industrial Classification) from 6000 to 6999 were deleted. The consumer price index (2010 = 1) provided by St. Louis Federal Reserve Bank is used for the conversion of nominal to real monetary values.

change in SG&A costs is 11 percent (nine percent). Panel C shows complementary figures for increasing sales.

Table 1: Descriptive Statistics

Panel A: Distribution of sales and SG&A costs

	Mean	Standard Deviation	Median	Lower quartile (25%)	Upper quartile (75%)
Sales	3,068.51	13,733.05	402.09	87.01	1,563.70
SG&A costs	600.15	2,535.30	78.13	20.60	304.10
SG&A costs as percentage of sales	27.34%	17.57%	23.92%	14.06%	36.51%

Panel B: Periodic decrease in sales and SG&A costs

	% firms with negative change from previous period	Mean percentage decrease across periods	Standard deviation of percentage decrease across periods	Median percentage decrease across periods	Lower quartile (25%) of percentage decrease across periods	Upper quartile (75%) of percentage decrease across periods
Sales	33.83%	12.06%	42.23%	10.01%	22.25%	3.70%
SG&A costs	33.83%	10.72%	29.10%	9.14%	19.50%	3.20%

Panel C: Periodic increase in sales and SG&A costs

	% firms with positive change from previous period	Mean percentage increase across periods	Standard deviation of percentage increase across periods	Median percentage increase across periods	Lower quartile (25%) of percentage increase across periods	Upper quartile (75%) of percentage increase across periods
Sales	66.17%	27.65%	96.61%	12.76%	5.52%	27.81%
SG&A costs	66.17%	26.32%	139.00%	11.96%	5.20%	24.59%

All reported numbers are in millions of 2010 US dollars. The distribution of sales and SG&A costs is for a population of 18,636 firm-year observations from 4,911 firms in the dataset that satisfy the following selection criteria: no missing, zero, or negative values of sales or SG&A costs for the current and preceding year, no firm-years in which SG&A costs exceeded sales or sales, SG&A costs move in opposite directions, and non-missing values for all other variables are included in models (1), (2), and (3).

5 Empirical Results

5.1 Results of Estimating STICKY

A simple regression model to test for the prevalence of cost stickiness is performed based on the cleansed dataset, which is described in the previous section following the specification by ABJ (2003). In doing so, extreme observations of the top and bottom 0.5 percent tail of the distribution were eliminated (Chen and Dixon 1972) resulting in a further reduction of the dataset by 307 observations. As expected, SG&A cost behavior in the underlying data is asymmetric with 7.04 percent stickiness.[21] Specifically, SG&A costs rise by 0.75 percent in the event of a one percent sales increase but decrease only 0.69 percent per one percent decrease in sales. Compared to ABJ (2003), who estimate a degree of SG&A cost asymmetry of 35 percent, the respective results are relatively low. However, when the regression is repeated based on a sample that disregards adjustments according to Anderson and Lanen (2009) and the deletion of missing observations of additional predictors, then the level of SG&A cost asymmetry in the dataset amounts to 13 percent. The specific time frame and additional data

[21] ABJ (2003) apply a regression model of the following form: $log\left(\frac{SGA_{i,t}}{SGA_{i,t-1}}\right) = \alpha + \beta_1 \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_2 \cdot Dec\_Dummy_{i,t} \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \varepsilon_{i,t}$, where the dichotomous dummy variable takes the value of one for sales decrease and zero otherwise. The degree of cost symmetry can then be calculated by dividing the slope for a one percent sales decrease by the slope for a one percent sales increase $\left(\frac{\beta_1+\beta_2}{\beta_1}\right)$.

requirements help to reconcile the remaining difference. Next to the examination of whether SG&A costs are remanent based on the standard regression model introduced by ABJ (2003), cost stickiness is also evident according to the $STICKY_{i,t}$ measure by Weiss (2010). The average value is significantly different from zero at -0.02 across all companies.[22] Table 2 shows the descriptive statistics of the measure for firm-specific cost stickiness.

Table 2: Descriptive Statistics of Firm-Specific Cost Stickiness

	Percent	Mean	Standard deviation	Median	Lower quartile (25%)	Upper quartile (75%)
$STICKY_{i,t}$		-0.02	0.70	-0.02	-0.33	0.28
Sticky cost firms: $STICKY_{i,t} < 0$	52.48%	-0.45	0.56	-0.31	-0.60	-0.13
Anti-sticky cost firms: $STICKY_{i,t} \geq 0$	47.52%	0.45	0.52	0.31	0.13	0.62

$STICKY_{i,t} = log\left[\frac{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t,\underline{\tau}}}{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t,\overline{\tau}}}\right]$, $\underline{\tau}, \overline{\tau}\, \varepsilon\, \{t, \dots, t-3\}$, where $\underline{\tau}$ is the most recent quarter with a sales decrease and $\overline{\tau}$ is the most recent of the last four quarters with a sales increase.

5.2 Results of Estimating INTENTION

To evaluate the tendency of managers to deliberately allow for a higher cost level instead of cutting resources during a temporary sales decline, a corresponding index is constructed composed of five explanatory variables. Individual components are derived from previous research and weighted based on the regression coefficients $\beta_{19}, \beta_{20}, \beta_{22}$ and β_{23} in model (3). Four out of five interaction terms have a significant negative effect on the change in

[22] The annual average according to Weiss (2010) is deducted as the median from the quarterly estimations of cost stickiness for each company, which corrects for extreme observations.

SG&A costs, indicating a stronger SG&A cost asymmetry. Consistent with the findings reported by ABJ (2003), the null hypothesis of no relationship between labor intensity and changes in SG&A costs during activity decreases can be rejected ($\beta_{19} = -0.15$). Also, the effect of asset intensity is highly significant ($\beta_{20} = -0.19$). However, cost asymmetry is not influenced by stronger macroeconomic growth. The effect is insignificant ($\beta_{21} = 0.03, p = 0.1315$). Macroeconomic growth is therefore not used in the final computation of the index, which is calculated in the following way (based on the regression results depicted in table 3):

$$Intention_{i,t} = 0.15 \cdot EI_{i,t} + 0.19 \cdot AI_{i,t} + 0.13 \cdot SGA - Ratio_{i,t} + 0.20 \cdot Inc\_Dummy_{i,t-1}$$

Consistent with the model assumptions, the resulting variable correlates significantly negatively with the firm-specific measure of cost asymmetry for sticky cost firms (r = -0.08, $p \leq 0.001$) while the association for anti-sticky cost firms is positive (r = 0.04, $p \leq 0.001$). Thus, an increase in the index value of $Intention_{i,t}$ indicates increasing deliberate firm-specific cost stickiness ($STICKY_{i,t} \downarrow$).

Table 3: Regression Coefficients for Index Construction of Managerial Intention

Model (1): $$log\left(\frac{SGA_{i,t}}{SGA_{i,t-1}}\right) = \alpha + \beta_a + \beta_b \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_c \cdot Decrease\_Dummy_{i,t} + \beta_d \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) \cdot Decrease\_Dummy_{i,t} + \varepsilon_{i,t}$$

Table 3 continued:

Where:

$$\beta_a = \beta_1 \cdot Decrease\_Dummy_{i,t} + \beta_2 \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_3 \cdot EI_{i,t} + \beta_4 \cdot AI_{i,t} + \beta_5 \cdot GDP_t + \beta_6 \cdot SGA - Ratio_{i,t} + \beta_7 \cdot Inc\_Dummy_{i,t-1}$$

$$\beta_b = \beta_8 \cdot EI_{i,t} + \beta_9 \cdot AI_{i,t} + \beta_{10} \cdot GDP_t + \beta_{11} \cdot SGA - Ratio_{i,t} + \beta_{12} \cdot Inc\_Dummy_{i,t-1}$$

$$\beta_c = \beta_{13} \cdot log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) + \beta_{14} \cdot EI_{i,t} + \beta_{15} \cdot AI_{i,t} + \beta_{16} \cdot GDP_t + \beta_{17} \cdot SGA - Ratio_{i,t} + \beta_{18} \cdot Inc\_Dummy_{i,t-1}$$

$$\beta_d = \beta_{19} \cdot EI_{i,t} + \beta_{20} \cdot AI_{i,t} + \beta_{21} \cdot GDP_t + \beta_{22} \cdot SGA - Ratio_{i,t} + \beta_{23} \cdot Inc\_Dummy_{i,t-1}$$

			Model (1)
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)
α	Intercept	±	0.00 (-0.02)
β_1	$Dec\_Dummy_{i,t}$	±	-0.02* (-1.69)
β_2	$\Delta Sales_{i,t}$	±	0.91*** (9.39)
β_3	$EI_{i,t}$	±	-0.01*** (-2.63)
β_4	$AI_{i,t}$	±	0.02*** (5.10)
β_5	$GDP_{i,t}$	±	0.00 (-0.47)
β_6	$SGA - Ratio_{i,t}$	±	0.00** (2.09)
β_7	$Inc\_Dummy_{i,t-1}$	±	0.00 (0.79)
β_8	$\Delta Sales_{i,t} \cdot EI_{i,t}$	+	0.16*** (4.25)
β_9	$\Delta Sales_{i,t} \cdot AI_{i,t}$	+	0.00 (0.08)

Table 3 continued:

			Model (1)
β_{10}	$\Delta Sales_{i,t} \cdot GDP_{i,t}$	+	0.01 (0.83)
β_{11}	$\Delta Sales_{i,t} \cdot SGA-Ratio_{i,t}$	+	0.07** (2.56)
β_{12}	$\Delta Sales_{i,t} \cdot Inc\_Dummy_{i,t-1}$	+	0.08** (2.4)
β_{13}	$Dec\_Dummy_{i,t} \cdot \Delta Sales_{i,t}$	-	-0.33** (-2.25)
β_{14}	$Dec\_Dummy_{i,t} \cdot EI_{i,t}$	±	0.01*** (3.13)
β_{15}	$Dec\_Dummy_{i,t} \cdot AI_{i,t}$	±	-0.03*** (-5.12)
β_{16}	$Dec\_Dummy_{i,t} \cdot GDP_{i,t}$	±	0.00* (1.68)
β_{17}	$Dec\_Dummy_{i,t} \cdot SGA-Ratio_{i,t}$	±	0.00 (1.31)
β_{18}	$Dec\_Dummy_{i,} \cdot Inc\_Dummy_{i,t-1}$	±	0.00 (0.8)
$\boldsymbol{\beta_{19}}$	$\boldsymbol{\Delta Sales_{i,t} \cdot Dec\_Dummy_{i,t} \cdot EI_{i,t}}$	-	**-0.15***** **(-2.64)**
$\boldsymbol{\beta_{20}}$	$\boldsymbol{\Delta Sales_{i,t} \cdot Dec\_Dummy_{i,t} \cdot AI_{i,t}}$	-	**-0.19***** **(-2.64)**
$\boldsymbol{\beta_{21}}$	$\boldsymbol{\Delta Sales_{i,t} \cdot Dec\_Dummy_{i,t} \cdot GDP_{i,t}}$	-	**0.03** **(1.51)**
$\boldsymbol{\beta_{22}}$	$\boldsymbol{\Delta Sales_{i,t} \cdot Dec\_Dummy_{i,t} \cdot SGA-Ratio_{i,t}}$	-	**-0.13***** **(-3.16)**
$\boldsymbol{\beta_{23}}$	$\boldsymbol{\Delta Sales_{i,t} \cdot Dec\_Dummy_{i,} \cdot Inc\_Dummy_{i,t-1}}$	-	**-0.20**** **(-4.49)**
n			13,725
Adj. R^2			0.71

*,**,*** Indicate two-sided significance at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).

5.3 Results for H1

Table 4 shows the regression results based on model (1). The difference between the SG&A cost-to-sales ratio for sticky cost firms compared to anti-sticky cost firms is significant with $\beta_1 = -0.02$ among companies with an average asymmetry in SG&A costs. The dependent variable is approximately two percent lower for sticky cost firms than for anti-sticky cost firms. This indicates preliminary support for H1. Moreover, the difference between sticky cost firms and anti-sticky cost firms is not affected by the level of cost asymmetry itself among those companies that have an average intention when adjusting resources. β_4 as well as β_7 are insignificant (p = 0.12, p = 0.23). Consequently, neither managerial intention nor the level of cost asymmetry moderate the difference in the SG&A cost-to-sales ratio between sticky cost and anti-sticky cost firms. Following the recommendations by Aiken and West (1991), the three-way interaction between $CS_{i,t}, STICKY_{i,t}$ and $Intention_{i,t}$ is still retained in the forthcoming analysis to facilitate a comparison of regression results for all of the tested hypotheses.

To strengthen the conclusion, factorial ANCOVA is additionally applied, first, to the average level of $STICKY_{i,t}$ and, second, to $STICKY_{i,t} = \pm$ one standard deviation. To do so, $STICKY_{i,t}$ is transformed to its absolute values with mean $(STICKY_{i,t}) = 0.44$. Consistent with H1, the difference in the SG&A cost-to-sales ratio between the two groups is statistically significant at the mean level of $STICKY_{i,t}$ with p = 0.05 as well as for $STICKY_{i,t} = \pm 1\, STD$ with p = 0.05 (see Table 5).

Table 4: Regression Results for Hypothesis 1

Model (2): $log\left[\frac{SGA_{i,t} + SGA_{i,t+1}}{Sales_{i,t} + Sales_{i,t+1}}\right] = \alpha + \beta_1 \cdot CS_{i,t} + \beta_2 \cdot STICKY_{i,t} + \beta_3 \cdot Intention_{i,t} + \beta_4 \cdot CS_{i,t} \cdot STICKY_{i,t} + \beta_5 \cdot CS_{i,t} \cdot Intention_{i,t} + \beta_6 \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_7 \cdot CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_8 \cdot FCF_{i,t} + \beta_9 \cdot PE_{i,t} + \beta_{10} \cdot Growth_{i,t} + \beta_{11} \cdot Stagnant_{i,t} + \sum_{z=12}^{41} \beta_z \cdot Industry_{i,t,z} + \varepsilon_{i,t}$

			Model (2)	
			Without control variables	With control variables
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)
α	Intercept	±	-0.55*** (-10.90)	-0.55*** (-11.10)
$\boldsymbol{\beta_1}$	$\boldsymbol{CS_{i,t}}$	-	**-0.02* (-1.53)**	**-0.02** (-1.65)**
$\boldsymbol{\beta_2}$	$\boldsymbol{STICKY_{i,t}}$	±	**-0.01 (-0.66)**	**-0.02 (-1.31)**
$\boldsymbol{\beta_3}$	$\boldsymbol{Intention_{i,t}}$	±	-0.19*** **(-3.55)**	-0.18*** **(-3.46)**
$\boldsymbol{\beta_4}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t}}$	-	**0.01 (0.44)**	**0.03 (1.2)**
$\boldsymbol{\beta_5}$	$\boldsymbol{CS_{i,t} \cdot Intention_{i,t}}$	-	**-0.06 (-0.83)**	**-0.06 (-0.8)**
$\boldsymbol{\beta_6}$	$\boldsymbol{STICKY_{i,t} \cdot Intention_{i,t}}$	±	-0.26*** **(-3.06)**	-0.23*** **(-2.75)**
$\boldsymbol{\beta_7}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	**0.12 (0.99)**	**0.09 (0.74)**
β_8	$FCF_{i,t}$	±		-0.37*** (-8.25)
β_9	$PE_{i,t}$	±		-0.05*** (-4.11)
β_{10}	$Growth_{i,t}$	±		0.00 (0.11)
β_{11}	$Stagnant_{i,t}$	±		0.00 (-0.33)

$\sum_{z=12}^{41} \beta_z$	Industry fixed effects	yes	yes
n		2,540	2,540
Adj. R^2		0.35	0.36

*,**,*** Indicate two-sided and one-sided significance (corresponding to the predicted sign of the effect) at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).
Regression is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.
All variables are calculated as defined in Table 11.

Table 5: Factorial ANCOVA (Hypothesis 1)

Panel A: Factorial ANOVA for $\text{STICKY}_{i,t}$ = mean

	SG&A cost-to-sales ratio	Pr > $\|t\|$, H0: LSMean 1 = LSMean2	Difference in mean SG&A cost-to-sales ratio
Sticky cost firms: $STICKY_{i,t} < 0$	21.82%	0.05	-5.28%
Anti-Sticky cost firms: $STICKY_{i,t} \geq 0$	23.03%		

Panel B: Factorial ANCOVA for $\text{STICKY}_{i,t}$ = mean $\pm$ 1 STD

	SG&A cost-to-sales ratio	Pr > $\|t\|$, H0: LS Mean1 = LSMean2	Difference in mean SG&A cost-to-sales ratio
Sticky cost firms: $STICKY_{i,t} < 0$	21.52%	0.05	-3.76%
Anti-Sticky cost firms: $STICKY_{i,t} \geq 0$	22.36%		

n = 2,540.
P-values represent one-sided level of significance.
Factorial ANCOVA is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.

5.4 Results for H2

With respect to the assumptions underlying the previous section, testing H2 requires adapting the main conditions prior to the estimation of model (2). In this case, a higher SG&A cost-to-sales ratio for sticky cost companies is expected if sales decline in the current and *also* in the next period. The strong decrease in the regression coefficient of β_1 from -0.02 (Table 4) to 0.00 (Table 6) provides initial support for this expectation. However, group differences in the SG&A cost-to-sales ratio across the current and subsequent periods are insignificant ($\beta_1 = 0.00$, p = 0.42) if the extent to which managers deliberately take resource adaption decisions based on economic considerations is not considered ($\beta_7 = -0.25, p = 0.02$). ANCOVA results depicted in Table 7 as well as regression estimates in Table 6 show a significant interaction between $CS_{i,t}$, $STICKY_{i,t}$, and $Intention_{i,t}$.[23] To identify the critical level of managerial intention between which no significant differences in the dependent variable can be ascribed to either one of the samples, the Johnson-Neyman technique is applied (Bauer and Curran 2005; Johnson and Neyman 1936).[24] From this it follows that at either very low values of the index $(Intention_{i,t} \leq -0.02)$ or at very high values of the index $(Intention_{i,t} \geq 0.60)$, there is a significant difference in the SG&A cost-to-sales ratio between sticky cost companies and anti-sticky cost companies. Particularly, the SG&A cost-to-sales ratio is significantly *lower* for sticky cost companies if managerial intention is *low* and significantly *higher* if managerial

[23] Type III SS $(CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t})$: 0.2797, p = 0.0235.

[24] To ascertain at which values of $Intention_{i,t}$ the three-way-interaction becomes insignificant, an inferential test is conducted that tests the null hypotheses of no independent variable effect ($STICKY_{i,t}$) on the dependent variable at CS = 1. This is processed by calculating the ratio of the total slope of the conditional effect $\theta_{STICKY_{i,t} \rightarrow \hat{Y}} = (\beta_2 + \beta_4 \cdot CS_{i,t} + \beta_6 \cdot Intention_{i,t} + \beta_7 \cdot CS_{i,t} \cdot Intention_{i,t}) \cdot STICKY_{i,t}$ to its standard error (Aiken and West 1991; Preacher, Curran, and Bauer 2006).

intention is *high*. This implies that if managers of sticky cost companies incorrectly anticipate future demand (instead of an expected increase in sales, sales are actually decreasing), then the increase in the SG&A cost-to-sales ratio is exacerbated if the managers deliberately decide not to adapt resources because of high adjustment costs. Because only ten percent of all firm-year observations fall into the second category with a high level of managerial intention, H2 is not supported.

Table 6: Regression Results Hypothesis 2

Model (2): $$log\left[\frac{SGA_{i,t}+SGA_{i,t+1}}{Sales_{i,t}+Sales_{i,t+1}}\right] = \alpha + \beta_1 \cdot CS_{i,t} + \beta_2 \cdot STICKY_{i,t} + \beta_3 \cdot Intention_{i,t} + \beta_4 \cdot CS_{i,t} \cdot STICKY_{i,t} + \beta_5 \cdot CS_{i,t} \cdot Intention_{i,t} + \beta_6 \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_7 \cdot CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} + \beta_8 \cdot FCF_{i,t} + \beta_9 \cdot PE_{i,t} + \beta_{10} \cdot Growth_{i,t} + \beta_{11} \cdot Stagnant_{i,t} + \sum_{z=12}^{41} \beta_z \cdot Industry_{i,t,z} + \varepsilon_{i,t}$$

			Model (2)	
			Without control variables	With control variables
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)
α	Intercept	±	-0.58*** (-13.95)	-0.59*** (-14.46)
$\boldsymbol{\beta_1}$	$\boldsymbol{CS_{i,t}}$	+	0.00 (-0.29)	0.00 (-0.21)
$\boldsymbol{\beta_2}$	$\boldsymbol{STICKY_{i,t}}$	±	0.01 (0.37)	0.00 (0.28)
$\boldsymbol{\beta_3}$	$\boldsymbol{Intention_{i,t}}$	±	-0.40*** (-6.90)	-0.38*** (-6.63)
$\boldsymbol{\beta_4}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t}}$	+	-0.01 (-0.49)	0.00 (0.03)
$\boldsymbol{\beta_5}$	$\boldsymbol{CS_{i,t} \cdot Intention_{i,t}}$	+	0.08 (1.03)	0.07 (0.91)
$\boldsymbol{\beta_6}$	$\boldsymbol{STICKY_{i,t} \cdot Intention_{i,t}}$	±	0.05 (0.57)	0.06 (0.63)

Table 6 continued:

			Model (2)	
			Without control variables	With control variables
$\boldsymbol{\beta_7}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	+	**-0.24** **(-1.92)**	**-0.25** **(-2.11)**
β_8	$FCF_{i,t}$	±		-0.35*** (-9.35)
β_9	$PE_{i,t}$	±		-0.04*** (-4.03)
β_{10}	$Growth_{i,t}$	±		0.02 (1.52)
β_{11}	$Stagnant_{i,t}$	±		-0.02 (-1.58)
$\sum_{z=12}^{41} \beta_z$	Industry fixed effects		yes	yes
n			2,966	2,966
Adj. R^2			0.36	0.39

*,**,*** Indicate two-sided and one-sided significance (corresponding to the predicted sign of the effect) at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).
Regression is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} \geq Sales_{i,t+1}$.
All variables are calculated as defined in Table 11.

Table 7: Factorial ANCOVA (Hypothesis 2)

Panel A: Factorial ANCOVA for $STICKY_{i,t}$ = mean

	SG&A cost-to-sales ratio	Pr > $\|t\|$, H0: LSMean 1 = LSMean2	Difference in mean SG&A cost-to-sales ratio
Sticky cost firms: $STICKY_{i,t} < 0$	23.70%	0.39	-0.86%
Anti-Sticky cost firms: $STICKY_{i,t} \geq 0$	23.91%		

Panel B: Factorial ANCOVA for $STICKY_{i,t}$ = mean $\pm$ 1 STD

	SG&A cost-to-sales ratio	Pr > $\|t\|$, H0: LS Mean1 = LSMean2	Difference in mean SG&A cost-to-sales ratio
Sticky cost firms: $STICKY_{i,t} < 0$	23.86%	0.32	-1.04%
Anti-Sticky cost firms: $STICKY_{i,t} \geq 0$	24.11%		

N = 2,540.
P-values represent one-sided level of significance.
Factorial ANCOVA based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} \geq Sales_{i,t+1}$.

5.5 Results for H3

Table 8 reports the estimated regression coefficients based on model (3) which operationalize the effect of different levels of firm-specific cost stickiness and incorporate indicator variables splitting the sample into three groups. Panel A shows corresponding descriptive statistics for sticky cost companies, which represent 48 percent of all firms. As with H1, observations that do not exhibit a current decrease in activity (t) followed by an increase in the next year $(t+1)$ are excluded from the sample. Findings documented in panel B support H3. The parameter estimates for β_1 and β_2 increase with rising levels of cost stickiness ($Low \rightarrow Moderate$), which indicates increasing differences between the control group (anti-sticky cost firms) and the subgroups. Moreover, the slopes at the mean level of $Intention_{i,t}$ are consistent with predictions and take a positive value of 0.18 ($\beta_4 + \beta_6 + \beta_7 + \beta_9$) for companies in the lowest group, 0.26 ($\beta_4 + \beta_6 + \beta_{10} + \beta_{12}$) for moderate cost stickiness firms and 0.03 ($\beta_4 + \beta_6 + \beta_{13} + \beta_{15}$) for high levels of firm-specific cost stickiness.[25] Consequently, if SG&A cost stickiness remains at a moderate level, there is a significantly positive effect on the SG&A cost-to-sales ratio ($p = 0.04$).[26] The findings are consistent with previous reasoning, for example, Banker and Byzalov (2014, p. 46), who note that "the maximum acceptable slack depends on expectations about whether sales will increase in the future to absorb the slack, and also on the downward and upward adjustment costs."

Table 8: Descriptive Statistics and Regression Results for Hypothesis 3

Panel A: Distribution of firm-specific cost stickiness for $STICKY_{i,t} < 0$

	N	% of sticky cost firms	Symmetry – Ratio (%)
Low	543	33.01	90.70
Moderate	560	34.04	70.44
High	542	32.95	39.57

[25] Because $STICKY_{i,t}$ is included as continuous variable and not only as dummy variable (such as $CS_{i,t}$ previously), the effect is here positive for all three groups, i.e. an increasing level of $STICKY_{i,t}$ reflects a decreasing level of cost stickiness which induces a higher SG&A ratio.

[26] The test for whether the slope differs from zero has been obtained by dividing the value of the slope$\left(\beta_4 + \beta_6 \cdot Intention_{i,t} + \beta_{10} \cdot MODERATE_{i,t} + \beta_{12} \cdot MODERATE_{i,t} \cdot Intention_{i,t}\right) \cdot STICKY_{i,t}$ by its standard error with (n-k-1) degrees of freedom, where n is the number of cases, and k is the number of predictors (Aiken and West 1991).

Table 8 continued:

Panel B: Regression results H3:

$$\log\left[\frac{SGA_{i,t}+SGA_{i,t+1}}{Sales_{i,t}+Sales_{i,t+1}}\right] = \alpha + \beta_1 \cdot LOW_{i,t} + \beta_2 \cdot MODERATE_{i,t} + \beta_3 \cdot HIGH_{i,t} + \beta_4 \cdot STICKY_{i,t} + \beta_5 \cdot Intention_{i,t} + \beta_6 \cdot STICKY_{i,t} \cdot Intention_{i,t} +$$

"LOW" Interactions

$$\beta_7 \cdot LOW_{i,t} \cdot STICKY_{i,t} + \beta_8 \cdot LOW_{i,t} \cdot Intention_{i,t} + \beta_9 \cdot LOW_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} +$$

"MODERATE" Interactions

$$\beta_{10} \cdot MODERATE_{i,t} \cdot STICKY_{i,t} + \beta_{11} \cdot MODERATE_{i,t} \cdot Intention_{i,t} + \beta_{12} \cdot MODERATE_{i,t} \cdot STICKY_{i,t} +$$

"HIGH" Interactions

$$\beta_{13} \cdot HIGH_{i,t} \cdot STICKY_{i,t} + \beta_{14} \cdot HIGH_{i,t} \cdot Intention_{i,t} + \beta_{15} \cdot HIGH_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t} +$$

Controls and Residual

$$\beta_{16} \cdot FCF_{i,t} + \beta_{17} \cdot PE_{i,t} + \beta_{18} \cdot Growth_{i,t} + \beta_{19} \cdot Stagnant_{i,t} + \sum_{z=20}^{49} \beta_z \cdot Industry_{i,t,z} + \varepsilon_{i,t}$$

			Model (3)	
			Without control variables	With control variables
Coeff.	**Variable**	**Pred. Sign**	**Estimate (t-statistic)**	**Estimate (t-statistic)**
α	Intercept	$\pm$	-0.56*** (-11.10)	-0.56*** (-11.29)
β_1	$LOW_{i,t}$	-	0.00 (-0.01)	0.00 (-0.03)
β_2	$MODERATE_{i,t}$	-	0.08* (1.51)	0.07* (1.38)
β_3	$HIGH_{i,t}$	-	-0.02 (-0.65)	-0.01 (-0.46)
β_4	$STICKY_{i,t}$	$\pm$	-0.01 (-0.66)	-0.02 (-1.33)
β_5	$Intention_{i,t}$	$\pm$	-0.19*** (-3.56)	-0.18*** (-3.47)
β_6	$STICKY_{i,t} \cdot Intention_{i,t}$	-	-0.26*** (-3.07)	-0.23*** (-2.76)
β_6	$STICKY_{i,t} \cdot Intention_{i,t}$	-	-0.26*** (-3.07)	-0.23*** (-2.76)

Table 8 continued:

			Model (3)	
			Without control variables	With control variables
$\boldsymbol{\beta_7}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t}}$	-	0.14 (0.68)	0.20 (1.00)
$\boldsymbol{\beta_8}$	$\boldsymbol{LOW_{i,t} \cdot Intention_{i,t}}$	-	-0.36** (-2.29)	-0.34** (-2.25)
$\boldsymbol{\beta_9}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	-2.41** (-2.09)	-2.37** (-2.13)
$\boldsymbol{\beta_{10}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t}}$	-	0.28** (2.01)	0.28** (2.13)
$\boldsymbol{\beta_{11}}$	$\boldsymbol{MODERATE_{i,t} \cdot Intention_{i,t}}$	-	-0.88*** (-2.46)	-0.85*** (-2.53)
$\boldsymbol{\beta_{12}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	-2.01** (-2.28)	-2.00*** (-2.40)
$\boldsymbol{\beta_{13}}$	$\boldsymbol{HIGH \cdot STICKY_{i,t}}$	+	0.03 (0.69)	0.05 (1.17)
$\boldsymbol{\beta_{14}}$	$\boldsymbol{HIGH_{i,t} \cdot Intention_{i,t}}$	+	0.06 (0.37)	0.04 (0.26)
$\boldsymbol{\beta_{15}}$	$\boldsymbol{HIGH_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	+	0.24* (1.41)	0.18 (1.14)
β_{16}	$FCF_{i,t}$	±		-0.36*** (-8.05)
β_{17}	$PE_{i,t}$	±		-0.05*** (-4.28)
β_{18}	$Growth_{i,t}$	±		0.00 (0.17)
β_{19}	$Stagnant_{i,t}$	±		-0.01 (-0.49)
$\sum_{z=12}^{41} \beta_z$	Industry fixed effects	±	yes	yes
n			2,540	2,540
Adj. R^2			0.35	0.38

*,**,*** Indicate two-sided and one-sided significance (corresponding to the predicted sign of the effect) at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).
Regression is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.
All variables are calculated as defined in Table 11.

5.6 Robustness Checks

Acknowledging the objections of Balakrishnan, Labro, and Soderstrom (2014), who note the potential influence of cost structure effects on sticky cost findings, hypotheses tests have been replicated for H1 and H3 using Fama-Macbeth regressions. Following the suggestions, regression coefficients and significance levels were obtained based on robust standard errors after grouping all firms in five industry clusters according to Fama and French (consumer products, manufacturing, high tech, health, other).[27]

The data in Table 9 show that using Fama-Macbeth regressions do not alter previous findings. The significant coefficient β_1 in panel A supports the original results of H1 indicating a higher SG&A cost-to-sales ratio for sticky cost companies compared to anti-sticky cost companies. Moreover, the diminishing returns to scale reflected in H3 according to increasing levels of cost stickiness are supported. Nevertheless, the optimal level of cost stickiness is smaller with a turning point already in the moderate group. The slope reflecting the effect of $STICKY_{i,t}$ on the SG&A cost-to-sales ratio for low, moderate, and high cost stickiness transits from 0.57 to 0.17 to 0.14, respectively (panel B).

[27] Replicating the analysis with a more detailed industry cluster based on Fama-French 17 or 38 industry portfolio induces in some cases a transition from significant to insignificant results because of the high standard deviations in SG&A costs and sales. However, the direction of effects is not effected.

Table 9: Fama-Macbeth Regressions[28]

Panel A: Fama-MacBeth Regression based on Conditions for Hypothesis 1

			Model (2)	
			Without control variables	With control variables
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)
α	Intercept	±	-0.62*** (-7.72)	-0.59*** (-7.39)
$\boldsymbol{\beta_1}$	$\boldsymbol{CS_{i,t}}$	-	**-0.03** (-1.71)**	**-0.04** (-1.89)**
$\boldsymbol{\beta_2}$	$\boldsymbol{STICKY_{i,t}}$	±	**-0.01 (-0.40)**	**-0.03** (-2.29)**
$\boldsymbol{\beta_3}$	$\boldsymbol{Intention_{i,t}}$	±	**-0.17 (-1.57)**	**-0.17 (-1.58)**
$\boldsymbol{\beta_4}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t}}$	-	**0.01 (0.30)**	**0.04* (1.29)**
$\boldsymbol{\beta_5}$	$\boldsymbol{CS_{i,t} \cdot Intention_{i,t}}$	-	**-0.06 (-0.52)**	**-0.02 (-0.18)**
$\boldsymbol{\beta_6}$	$\boldsymbol{STICKY_{i,t} \cdot Intention_{i,t}}$	±	**-0.45** (-2.18)**	**-0.39** (-2.29)**
$\boldsymbol{\beta_7}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	**0.41* (1.35)**	**0.37 (1.28)**
β_8	$FCF_{i,t}$	±		-0.39*** (-4.59)
β_9	$PE_{i,t}$	±		-0.04** (-2.42)
β_{10}	$Growth_{i,t}$	±		0.00 (-0.18)
β_{11}	$Stagnant_{i,t}$	±		0.00 (-0.26)
n			2,540	2,540
Adj. R^2			0.08	0.13

[28] Regression results represent the Fama-MacBeth estimates by conducting the average of individual regressions for each industry. Separate industry fixed effects are therefore not necessary.

Table 9 continued:

Panel B: Fama-MacBeth Regression based on Conditions for Hypothesis 3

Coeff.	Variable	Pred. Sign	*Model (3)* Without control variables Estimate (t-statistic)	With control variables Estimate (t-statistic)
α	Intercept	±	-0.62*** (-7.72)	-0.59*** (-7.46)
β_1	$LOW_{i,t}$	-	0.00 (0.03)	0.01 (0.45)
β_2	$MODERATE_{i,t}$	-	0.03 (0.65)	0.02 (0.44)
β_3	$HIGH_{i,t}$	-	0.09 (0.98)	0.08 (0.87)
β_4	$STICKY_{i,t}$	±	-0.01 (-0.40)	-0.03** (-2.31)
β_5	$Intention_{i,t}$	±	-0.17 (-1.57)	-0.18 (-1.60)
β_6	$STICKY_{i,t} \cdot Intention_{i,t}$	±	-0.45** (-2.18)	-0.39** (-2.29)
$\boldsymbol{\beta_7}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t}}$	-	**0.50* (1.94)**	**0.60** (2.11)**
$\boldsymbol{\beta_8}$	$\boldsymbol{LOW_{i,t} \cdot Intention_{i,t}}$	-	**-0.38** (-2.46)**	**-0.33** (-2.01)**
$\boldsymbol{\beta_9}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	**-2.25 (-1.33)**	**-2.25 (-1.31)**
$\boldsymbol{\beta_{10}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t}}$	-	**0.19** (2.24)**	**0.21*** (2.61)**
$\boldsymbol{\beta_{11}}$	$\boldsymbol{MODERATE_{i,t} \cdot Intention_{i,t}}$	-	**-0.48 (-0.71)**	**-0.52 (-0.82)**
$\boldsymbol{\beta_{12}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	**-0.90 (-0.49)**	**-1.15 (-0.68)**
$\boldsymbol{\beta_{13}}$	$\boldsymbol{HIGH \cdot STICKY_{i,t}}$	+	**0.15* (1.77)**	**0.17* (1.82)**
$\boldsymbol{\beta_{14}}$	$\boldsymbol{HIGH_{i,t} \cdot Intention_{i,t}}$	+	**0.20 (0.48)**	**0.27 (0.66)**
$\boldsymbol{\beta_{15}}$	$\boldsymbol{HIGH_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	+	**0.71 (1.12)**	**0.72 (1.15)**
β_{16}	$FCF_{i,t}$	±		-0.39*** (-4.85)

Table 9 continued:

			Model (3)	
			Without control variables	With control variables
β_{17}	$PE_{i,t}$	±		-0.04** (-2.07)
β_{18}	$Growth_{i,t}$	±		0.00 (-0.11)
β_{19}	$Stagnant_{i,t}$	±		0.00 (-0.27)
n			2,540	2,540
Adj. R^2			0.11	0.16

*,**,*** Indicate two-sided and one-sided significance (corresponding to the predicted sign of the effect) at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).
Panel A regression (H1) and panel B regression (H3) are based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.
All variables are calculated as defined in Table 11.

However, it is likely that not only the life cycle stage, as captured by the control variables $Growth_{i.t}$ and $Stagnant_{i.t}$, affect the estimated empirical associations but also previous sales fluctuations in particular. The robustness of the implications drawn from the regression results under H1 and H3 are therefore, further investigated based on the particular sales development for each company. Thus, each of the regressions under the different conditional requirements for the three hypotheses is replicated separately for companies identified as either "sales growth" firms or "sales decline" firms. Companies are allocated to each group based on the median sales increase of the past three years prior to the fulfillment of all conditions under H1 and H3. If the respective indicator is above zero, firms are assigned to the "sales growth" subsample and the "sales decline" subsample otherwise. Table 10 shows respective regression results for both groups under the conditions of H1 (panel A) and H3 (panel B). Sticky cost companies in the "sales decline" group of panel A have a four percent lower SG&A cost-to-sales ratio compared to anti-sticky cost companies in the same group if managers are average in their intentions concerning resource adjustment decisions. β_1 is significant and negative. For companies in the "sales growth" group, the effect is moderated by the level of $Intention_{i,t}$. As indicated by the insignificant coefficient $\beta_1 = -0.01$ (p = 0.41) and the significant coefficient $\beta_7 = 0.43$ (p = 0.03), only if managerial intention is above average is there a significant difference in the SG&A cost-to-sales ratio between sticky cost companies and anti-sticky cost companies. Consequently, H1 results are robust for companies with declining sales in the past, whereas for companies with increasing sales, the results are only supported when $Intention_{i,t}$ and $STICKY_{i,t}$ is high.

The robustness test for H3 endorses no deviating results from previous findings. According to expectations $\beta_7 < \beta_{10} > \beta_{13}$ for companies in the "sales growth" and "sales decline" group. However, the magnitude and significance of effects differs heavily between both groups.

Overall, additional tests show that previous findings are robust to alternative specifications of the statistical models employed in this study. However, the degree to which managers deliberately consider adjustment costs matters if effects are estimated under different settings of prior firm-specific sales development.

Table 10: Regression Results for "Sales Growth" and "Sales Decline" Companies

Panel A: Sales growth/decline regression based on conditions for Hypothesis 1

			Model (2)			
			"Sales growth" companies		*"Sales decline" companies*	
			Without control variables	With control variables	Without control variables	With control variables
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
α	Intercept	±	-0.66*** (-6.27)	-0.64*** (-6.07)	-0.51*** (-9.16)	-0.54*** (-10.03)
$\boldsymbol{\beta_1}$	$\boldsymbol{CS_{i,t}}$	-	0.00 (-0.02)	-0.01 (-0.22)	-0.04** (-2.18)	-0.04** (-2.1)
$\boldsymbol{\beta_2}$	$\boldsymbol{STICKY_{i,t}}$	±	-0.05* (-1.77)	-0.07** (-2.15)	0.00 (-0.02)	-0.01 (-0.72)
$\boldsymbol{\beta_3}$	$\boldsymbol{Intention_{i,t}}$	±	-0.08 (-0.68)	-0.07 (-0.6)	-0.18*** (-2.78)	-0.18*** (-3.08)
$\boldsymbol{\beta_4}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t}}$	-	0.09** (1.96)	0.11** (2.32)	-0.02 (-0.53)	0.00 (-0.1)
$\boldsymbol{\beta_5}$	$\boldsymbol{CS_{i,t} \cdot Intention_{i,t}}$	-	-0.20* (-1.4)	-0.21* (-1.47)	-0.10 (-0.89)	-0.07 (-0.68)
$\boldsymbol{\beta_6}$	$\boldsymbol{STICKY_{i,t} \cdot Intention_{i,t}}$	±	-0.65*** (-3.94)	-0.64*** (-3.86)	-0.17** (-1.92)	-0.12* (-1.35)
$\boldsymbol{\beta_7}$	$\boldsymbol{CS_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	0.43** (1.89)	0.43** (1.92)	-0.01 (-0.03)	-0.07 (-0.45)
β_8	$FCF_{i,t}$	±		-0.19** (-2.09)		-0.42*** (-8.25)
β_9	$PE_{i,t}$	±		-0.03 (-1.64)		-0.05*** (-3.89)
$\sum_{z=12}^{41} \beta_z$	Industry fixed effects		Yes	Yes	Yes	Yes
n			1,121	1,121	1,658	1,658
Adj. R^2			0.39	0.40	0.34	0.38

Panel B: Sales growth/ decline regression based on conditions for Hypothesis 3

			Model (3)			
			"Sales growth" companies		*"Sales decline" companies*	
			Without control variables	With control variables	Without control variables	With control variables
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
α	Intercept	±	-0.67*** (-6.33)	-0.65*** (-6.10)	-0.52*** (-9.51)	-0.53*** (-10.19)
β_1	$LOW_{i,t}$	-	0.02 (0.41)	0.02 (0.37)	-0.04 (-0.85)	-0.04 (-0.84)
β_2	$MODERATE_{i,t}$	-	0.15** (1.87)	0.13** (1.68)	0.04 (0.72)	0.04 (0.68)
β_3	$HIGH_{i,t}$	-	-0.02 (-0.4)	-0.02 (-0.54)	-0.03 (-0.81)	-0.02 (-0.42)
β_4	$STICKY_{i,t}$	±	-0.05* (-1.76)	-0.07** (-2.13)	0.00 (-0.02)	-0.01 (-0.41)
β_5	$Intention_{i,t}$	±	-0.08 (-0.72)	-0.08 (-0.63)	-0.18*** (-2.82)	-0.18*** (-3.11)
β_6	$STICKY_{i,t} \cdot Intention_{i,t}$	±	-0.02 (-0.07)	-0.03 (-0.09)	0.23 (0.87)	0.32 (1.27)
$\boldsymbol{\beta_7}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t}}$	-	-0.13 (-0.56)	-0.17 (-0.74)	-0.65*** (-2.47)	-0.56** (-2.16)
$\boldsymbol{\beta_8}$	$\boldsymbol{LOW_{i,t} \cdot Intention_{i,t}}$	-	-0.64*** (-3.91)	-0.64*** (-3.84)	-0.17** (-1.92)	-0.12* (-1.36)
$\boldsymbol{\beta_9}$	$\boldsymbol{LOW_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	0.08 (0.05)	-0.16 (-0.1)	-3.70** (-1.98)	-3.36** (-1.85)
$\boldsymbol{\beta_{10}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t}}$	-	0.54 (1.26)	0.54 (1.27)	-0.04 (-0.14)	-0.12 (-0.42)
$\boldsymbol{\beta_{11}}$	$\boldsymbol{MODERATE_{i,t} \cdot Intention_{i,t}}$	-	-0.36 (-0.48)	-0.36 (-0.49)	-0.51 (-1.26)	-0.52* (-1.3)
$\boldsymbol{\beta_{12}}$	$\boldsymbol{MODERATE_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	-	-0.12 (-0.05)	0.01 (0.00)	0.84 (0.43)	0.63 (0.33)
$\boldsymbol{\beta_{13}}$	$\boldsymbol{HIGH \cdot STICKY_{i,t}}$	+	0.13 (0.37)	0.16 (0.44)	-0.24 (-0.92)	-0.32 (-1.26)
$\boldsymbol{\beta_{14}}$	$\boldsymbol{HIGH_{i,t} \cdot Intention_{i,t}}$	+	-0.15 (-0.45)	-0.12 (-0.36)	0.75*** (2.36)	0.63** (2.04)
$\boldsymbol{\beta_{15}}$	$\boldsymbol{HIGH_{i,t} \cdot STICKY_{i,t} \cdot Intention_{i,t}}$	+	0.23 (0.15)	0.48 (0.31)	3.89** (2.07)	3.46** (1.89)

Table 10 continued:

			Model (3)			
			"Sales growth" companies		*"Sales decline" companies*	
			Without control variables	With control variables	Without control variables	With control variables
β_{16}	$FCF_{i,t}$	±		-0.19** (-2.01)		-0.41*** (-8.01)
β_{17}	$PE_{i,t}$	±		-0.03* (-1.66)		-0.05*** (-3.92)
$\sum_{z=12}^{41} \beta_z$	Industry fixed effects		Yes	Yes	Yes	Yes
n			1,121	1,121	1,658	1,658
Adj. R^2			0.39	0.39	0.35	0.39

*,**,*** Indicate two-sided and one-sided significance (corresponding to the predicted sign of the effect) at the 10, 5, 1 percent levels respectively. The numbers in parentheses are the t-statistics calculated based on time- and firm-clustered standard errors (Petersen 2009). To obtain unbiased estimates in finite samples, the clustered standard errors are adjusted by $(N-1)/(N-P) \cdot G/(G-1)$, where N is the sample size, P is the number of independent variables, and G is the number of clusters (Ma 2014).
Panel A regression (H1) is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.
Panel B regression (H3) is based on the condition that $Sales_{i,t-1} \geq Sales_{i,t} < Sales_{i,t+1}$.
All variables are calculated as defined in Table 11.

6 Conclusion

An increasing number of studies devote considerable attention to the cost stickiness phenomenon while the majority of analyses conjecture economic incentives as a core explanation for sticky costs. The underlying reasoning implies that managers deliberately take into account a short-term increase in the SG&A cost-to-sales ratio if a fall in demand is perceived to be only temporary. By doing so, potential adjustment costs are countervailed by higher relative resources costs, e.g., due to an increase in asset or employee turnover. Nevertheless, the particular economic consequences of asymmetric cost behavior have so far not been tested, and the implied positive relationship concerning average cost levels remains unfathomed. To fill this gap, this study proposes an econometric model which allows examining the research question in focus while particularly considering the effects of cost stickiness as well as anti-stickiness. The latter relates to an under proportional adjustment of resources with an increase in activity compared to an equivalent decrease in activity (Weiss 2010).

Findings indicate that cost stickiness may be economically viable if a fall in demand is temporary. Because of the avoidance of adjustment costs during a decline in demand, sticky cost firms yield a significantly lower SG&A cost-to-sales ratio compared to organizations with anti-sticky costs. Does this generally imply that managers of sticky cost firms are better decision-makers? Future research could make this contribution.

In this respect it should be considered that the conclusions suggested by this study are notwithstanding subject to limitations. Particularly it is important to acknowledge that the separation of sticky cost and anti-sticky cost companies according to the firm-specific measure suggested by Weiss (2010) potentially assigns firms with an almost regular cost function in either one of the groups (firms with very low values for $STICKY_{i.t}$). This aggravates the comparison of economic consequences between companies with asymmetric and symmetrical costs. Moreover, a first attempt has been made to differentiate between economically intended and economically unintended cost stickiness that might be ascribed to empire building incentives. However, the resulting index is restricted by its operational feasibility to capture all possible influencing factors that might occur. Finally, the generalizability of the presented findings is limited by the aggregate focus on SG&A costs in total, although the effects of individual components of SG&A costs are likely to differ.

7 References

Abel, A., and J. Eberly. 1996. Optimal Investment with Costly Reversibility. *The Review of Economic Studies* 63 (4): 581-593.

Aiken, L., and S. West. 1991. *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks, CA: Sage Publications.

Anderson, M., R. Banker, R. Huang, and S. Janakiraman. 2007. Cost Behavior and Fundamental Analysis of SG&A Costs. *Journal of Accounting, Auditing & Finance* 22 (1): 1-28.

Anderson, M., R. Banker, and S. Janakiraman. 2003. Are Selling, General, and Administrative Costs "Sticky"?. *Journal of Accounting Research* 41 (1): 47-63.

Anderson, S. and Lanen, W. 2009. *Understanding Cost Management: What Can We Learn from the Empirical Evidence on Sticky Costs?* Working paper, University of Michigan, Stephen M. Ross School of Business, Ann Arbor.

Anthony, J., and K. Ramesh. 1992. Association Between Accounting Performance Measures and Stock Prices. *Journal of Accounting & Economics* 15 (2): 203-227.

Balakrishnan, R., and T. Gruca S. 2008. Cost Stickiness and Core Competency: A Note. *Contemporary Accounting Research* 25 (4): 993-1006.

Balakrishnan, R., M. Petersen, and N. Soderstrom. 2004. Does Capacity Utilization Affect the Stickiness of Cost?. *Journal of Accounting, Auditing & Finance* 19 (3): 283-300.

Balakrishnan, R., E. Labro, and N. Soderstrom. 2014. Cost Structure and Sticky Costs. *Journal of Management Accounting Research* 26 (2): 91-116.

Banker, R., S. Basu, D. Byzalov, and J. Chen. 2016. The Confounding Effect of Cost Stickiness on Conservatism Estimates. *Journal of Accounting and Economics* 61 (1): 203-220.

Banker, R., D. Byzalov, and L. Chen. 2013. Employment Protection Legislation, Adjustment Costs and Cross-Country Differences in Cost Behavior. *Journal of Accounting and Economics* 55 (1): 111-127.

Banker, R., Byzalov, D. and Threinen, L. 2013. *Determinants of International Differences in Asymmetric Cost Behavior.* Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and L. Chen. 2006. Predicting Earnings Using a Model Based on Cost Variability and Cost Stickiness. *The Accounting Review* 81 (2): 285-307.

Banker, R. and Fang, S. 2013. *Loan Financing and Real Cost Management.* Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and D. Byzalov. 2014. Asymmetric Cost Behavior. *Journal of Management Accounting Research* 26 (2): 43-79.

Banker, R., D. Byzalov, M. Ciftci, and R. Mashruwala. 2014. The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior. *Journal of Management Accounting Research* 26 (2): 221-242.

Banker, R., D. Byzalov, and J. Plehn-Dujowich. 2014. Demand Uncertainty and Cost Behavior. *The Accounting Review* 89 (3): 839-865.

Banker, R., Fang, S. and Metha, M. 2013. *Anomalous Financial Performance Ratios during Economic Downturns.* Working paper, Temple University - Fox School of Business, Philadelphia.

Bauer, D., and P. Curran. 2005. Probing Interactions in Fixed and Multilevel Regression. *Multivariate Behavioral Research* 40 (3): 373-400.

Baumgarten, D., U. Bonenkamp, and C. Homburg. 2010. The Information Content of the SG&A Ratio. *Journal of Management Accounting Research* 22: 1-22.

Belsley, D. 1980. *Regression Diagnostics*. New York: John Wiley & Sons.

Bentolila, S., and G. Bertola. 1990. Firing Costs and Labour Demand: How Bad is Eurosclerosis?. *The Review of Economic Studies* 57 (3): 381-402.

Bernstein, L., and J. Wild. 1998. *Financial Statement Analysis: Theory, Application, and Interpretation*. Boston, Mass: McGraw-Hill.

Brasch, H. 1927. Zur Praxis der Unkostenschwankungen und ihrer Erfassung. *Betriebswirtschaftliche Rundschau* 4 (4/5): 65-72.

Caballero, R., E. Engel, and J. Haltiwanger. 1995. Plant-Level Adjustment and Aggregate Investment Dynamics. *Brookings Papers on Economic Activity* (2): 1-54.

Calleja, K., M. Steliaros, and D. Thomas. 2006. A Note on Cost Stickiness: Some International Comparisons. *Management Accounting Research* 17 (2): 127-140.

Cannon, J. 2014. Determinants of ''Sticky Costs'': An Analysis of Cost Behavior using United States Air Transportation Industry Data. *The Accounting Review* 89 (5): 1645-1672.

Chen, C., Gores, T. and Nasev, J. 2013. *Managerial Overconfidence and Cost Stickiness*. Working paper, University of Cologne, Cologne.

Chen, C., H. Lu, and T. Sougiannis. 2012. The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research* 29 (1): 252-282.

Chen, E., and W. Dixon. 1972. Estimates of Parameters of a Censored Regression Sample. *Journal of the American Statistical Association* 67 (339): 664-671.

Cooper, R., and J. Haltiwanger. 2006. On the Nature of Capital Adjustment Costs. *The Review of Economic Studies* 73 (3): 611-633.

De Medeiros, O. and De Souza Costa, P. 2004. *Cost Stickiness in Brazilian Firms*. Working paper, University of Brasilia, Brasilia.

Dierynck, B., W. Landsman, and A. Renders. 2012. Do Managerial Incentives Drive Cost Behavior? Evidence About the Role of the Zero Earnings Benchmark for Labor Cost Behavior in Private Belgian Firms. *The Accounting Review* 87 (4): 1219-1246.

Douglas, P. 1976. The Cobb-Douglas Production Function Once Again. *Journal of Political Economy* 84 (5): 903-916.

Durbin, J., and G. Watson. 1950. Testing for Serial Correlation in Least Squares Regression: I. *Biometrika* 37 (3/4): 409-428.

Durbin, J., and G. Watson. 1951. Testing for Serial Correlation in Least Squares Regression. II. *Biometrika* 38 (1/2): 159-177.

Eisner, R., and R. Strotz. 1963. *Determinants of Business Investment.* Englewood Cliffs, N.J.: Prentice-Hall.

Hamermesh, D. 1989. Labor Demand and the Structure of Adjustment Costs. *The American Economic Review* 79 (4): 674-689.

Hamermesh, D., and G. Pfann. 1996. Adjustment Costs in Factor Demand. *Journal of Economic Literature* 34 (3): 1264-1292.

Hasenack, W. 1925. *Betriebskalkulationen im Bankgewerbe*. Berlin: Springer Verlag.

Hayes, A. 2013. *Introduction to Mediation, Moderation, and Conditional Process Analysis*. New York: The Guilford Press.

He, D., J. Teruya, and T. Shimizu. 2010. Sticky Selling, General, and Administrative Cost Behavior and its Changes in Japan. *Global Journal of Business Research (GJBR)* 4 (4): 1-10.

Holt, C., F. Modigliani, J. Muth, and H. Simon. 1960. *Planning Production, Inventories, and Work Force*. Englewood Cliffs, N.J.: Prentice-Hall.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015a. The Impact of Changes in Regulation on Cost Behavior. *Contemporary Accounting Research* 32 (2): 534-566.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015b. Unraveling the Black Box of Cost Behavior: An Empirical Investigation of Risk Drivers, Managerial Resource Procurement, and Cost Elasticity. *The Accounting Review* 90 (6): 2305-2335.

Homburg, C. and Nasev, J. 2008. *How Timely are Earnings when Costs are Sticky?* Working paper, University of Cologne, Cologne.

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

Johnson, P., and J. Neyman. 1936. Tests of Certain Linear Hypotheses and their Application to some Educational Problems. *Statistical Research Memoirs* 1: 57-93.

Kama, I., and D. Weiss. 2013. Do Earnings Targets and Managerial Incentives Affect Sticky Costs?. *Journal of Accounting Research* 51 (1): 201-224.

Lev, B., and R. Thiagarajan. 1993. Fundamental Information Analysis. *Journal of Accounting Research* 31 (2): 190-215.

Lucas, R. 1967. Optimal Investment Policy and the Flexible Accelerator. *International Economic Review* 8 (1): 78-85.

Lynch, P. 2000. *One Up On Wall Street*. New York: Simon and Schuster.

Ma, M. 2014. *Are We Really Doing What We think We are doing? A Note on Finite-Sample Estimates of Two-Way Cluster-Robust Standard Errors.* Working paper, American University, Washington.

Nassirzadeh, F., J. Samei, M. Salehi, and A. Bayegi. 2013. A Study of the Stickiness of Cost of Goods Sold and Operating Costs to Changes in Sales Level in Iran. *Studies in Business & Economics* 8 (2): 79-89.

Nickell, S. 1986. Dynamic Models of Labour Demand. In *Handbook of Labor Economics*, eds. O. C. Ashenfelter, and R. Layard, 473-521. Amsterdam: North-Holland.

Nickell, S. 1978. Fixed Costs, Employment and Labour Demand Over the Cycle. *Economica* 45 (180): 329-345.

Noreen, E. 1991. Conditions under which Activity-Based Cost Systems provide Relevant Costs. *Journal of Management Accounting Research* 3 (4): 159-168.

Noreen, E., and N. Soderstrom. 1997. The Accuracy of Proportional Cost Models: Evidence from Hospital Service Departments. *Review of Accounting Studies* 2 (1): 89-114.

Noreen, E., and N. Soderstrom. 1994. Are Overhead Costs Strictly Proportional to Activity?. *Journal of Accounting & Economics* 17 (1): 255-278.

Pervan, M., and I. Pervan. 2012. Analysis of Sticky Costs: Evidence from Croatian Food and Beverage Industry. *International Journal of Mathematical Models and Methods in Applied Sciences* 6 (2): 963-970.

Petersen, M. 2009. Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches. *The Review of Financial Studies* 22 (1): 435-480.

Preacher, K., P. Curran, and D. Bauer. 2006. Computational Tools for Probing Interaction Effects in Multiple Linear Regression, Multilevel Modeling, and Latent Curve Analysis. *Journal of Educational and Behavioral Statistics* 31: 437-448.

Rappaport, A. 1981. Selecting Strategies that Create Shareholder Value. *Harvard Business Review* 59 (3): 139-149.

Richardson, P., and J. Gordon. 1980. Measuring Total Manufacturing Performance. *Sloan Management Review* 21 (2): 47-58.

Schotter, A. 2009. *Microeconomics*. Mason: South-Western Cengage Learning.

Treadway, A., B. 1969. On Rational Entrepreneurial Behaviour and the Demand for Investment. *The Review of Economic Studies* 36 (2): 227-239.

Uy, A. 2011. Modeling Cost Behavior: Linear Models for Cost Stickiness. *Academy of Accounting & Financial Studies Journal*: 25-34.

Varian, H. 1992. *Microeconomic Analysis*. New York: Norton & Company.

Weidenmier, M., and C. Subramaniam. 2016. Additional Evidence on the Sticky Behavior of Costs. In *Advances in Management Accounting*, eds. M. Epstein, and M. Malina, 275-305. Bingley: Emerald Group Publishing Limited.

Weiss, D. 2010. Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review* 85 (4): 1441-1471.

Wernerfelt, B. 1997. On the Nature and Scope of the Firm: An Adjustment-Cost Theory. *Journal of Business* 70 (4): 489.

Wharton Research Data Services, WRDS. 2014. *Compustat Data*. Available online at http://wrds-web.wharton.upenn.edu/wrds/, 2014.

White, H. 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 48 (4): 817-838.

Yuekcue, S., and H. Oezkaza. 2011. Cost Behavior in Turkish Firms: are Selling, General and Administrative Costs and Total Operating Costs "Sticky"?. *World of Accounting Science* 13 (3): 1-27.

8 Appendix

Table 11: Variable Description

Variable Name	Description	Calculation
$\Delta Sales_{i,t}$	Log-change in sales between t and t-1.	$log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right]$
$AI_{i,t}$	Log-ratio of total assets to sales.	$log\left[\frac{Total\ Assets_{i,t}}{Sales_{i,t}}\right]$
$CS_{i.t}$	Dummy variable indicating cost stickiness.	$\begin{cases}1\ if\ STICKY_{i.t} < 0\\0\ \ if\ STICKY_{i.t} \geq 0\end{cases}$
$Dec\_Dummy_{i,t-1}$	Indicator for sales decreases between t-1 and t.	$\begin{cases}1\ if\ Sales_{i,t} < Sales_{i,t-1}\\0\ \ if\ Sales_{i,t} \leq Sales_{i,t-1}\end{cases}$
$EI_{i,t}$	Log-ratio of total number of employees to sales.	$log\left[\frac{Number\ of\ Employees_{i,t}}{Sales_{i,t}}\right]$
$FCF_{i.t}$	Free cash flow as a measure of managerial empire building incentives.	$\frac{Operating\ Cash\ Flow_{i.t} - Common\ \&\ Preferred\ Dividends_{i.t}}{Total\ Assets_{i.t}}$
$GDP_{i,t}$	Growth in real gross domestic product.	$\frac{Real\ GDP_t}{Real\ GDP_{t-1}}$;
$Growth_{i.t}$	Indicator for a firm's life cycle stage calculated for each firm-year as the median values of sales growth based on the last three years sales distribution. (pct=percentile)	$\begin{cases}1\ if\ \omega \geq 67th\ pct\\0\ if\ 33th\ pct > \omega < 67th\ pct\\0\ if\ \omega \leq 33th\ pct\end{cases}$ $\omega =$ $Media\ \ \left[\frac{Sales_{i.t\_}Sales_{i.t-1}}{Sales_{i.t-1}}\right]_{i.\ t.t-1.t-}$

$Inc\_Dummy_{i,t-1}$	Indicator for sales increases between t-2 and t-1.	$1\ if\ Sales_{i,t-1} > Sales_{i,t-2}$ $0\ \ if\ Sales_{i,t-1} \leq Sales_{i,t-2}$
$Industry_{z}$	Fama French 49 industry portfolios. Excluding banking (45), insurance (46), real estate (47), and trading (48).	
$Intention_{i.t}$	Index that captures the level of managerial intention when taking resource adjustment decisions.	$0.1851 \cdot AI_{i.t}$ $+ 0.0749 \cdot SGA - Ratio_{i.t}$ $+ 0.1533 \cdot Inc\_Dummy_{i.t-1}$
$Mature_{i.t}$	Indicator for a firm's life cycle stage calculated for each firm-year as the median values of sales growth based on the last three years sales distribution. (pct=percentile)	$\begin{cases} 0\ if\ \omega \geq 67th\ pct \\ 1\ if\ 33th\ pct > \omega < 67th\ pct \\ 1\ if\ \omega \leq 33th\ pct \end{cases}$ $\omega = Median\left[\frac{Sales_{i.t\_}Sales_{i.t-1}}{Sales_{i.t-1}}\right]_{i.\ t.t-1.t-}$
$PE\ \ _{.t}$	Indicator applied to price-earnings ratio	$PE_{i.t} = \begin{cases} 1\ if\ PE - Ratio > 1 \\ 0\ \ if\ PE - Ratio < 0 \end{cases}$
$SGA - Ratio_{i,t}$	Ratio of SG&A costs to sales	$\begin{cases} 1\ if\ \frac{SGA_{i,t-1}}{Sales_{i.,t-1}} < \left[\frac{SGA_{i,t-1}}{Sales_{i.,t-1}}\right]_{SIC} \\ 0\ if\ \frac{SGA_{i,t-1}}{Sales_{i.,t-1}} \geq \left[\frac{SGA_{i,t-1}}{Sales_{i.,t-1}}\right]_{SIC} \end{cases}$
$STICKY_{i.t}$	Magnitude of firm-specific cost asymmetry, where $\underline{\tau}$ is the most recent quarter with sales decrease and $\overline{\tau}$ the most recent of the last four quarters with an increase in sales.	$\log\left[\frac{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t.\underline{\tau}}}{\left(\frac{\Delta SGA}{\Delta Sales}\right)_{t.\overline{\tau}}}\right]$ $\underline{\tau}.\overline{\tau}\ \varepsilon\ \{t. \ldots. t-3\}$

$Stagnant_{i.t}$	Indicator for a firm's life cycle stage calculated for each firm-year as the median values of sales growth based on the last three years sales distribution. (pct=percentile)	$\begin{cases} 0\ if\ \omega \geq 67th\ pct \\ 1\ if\ 33th\ pct > \omega < 67th\ pct \\ 1\ if\ \omega \leq 33th\ pct \end{cases}$ $\omega = Median\left[\frac{Sales_{i.t-}Sales_{i.\ \ -1}}{Sales_{i.t-1}}\right]_{i.\ t.t-1.t-}$

C PAPER II

The Effect of Labor Supply Shortages on Asymmetric Cost Behavior

Abstract:

This study examines the effect of shortages in labor supply on asymmetric cost behavior. Building on the labor demand literature, it is argued that labor supply shortages increase adjustment costs for hiring new employees. Consistent with this explanation, results provide evidence that companies facing restrictions in labor supply increase costs (and resources) less than companies operating with sufficient access to additional personnel. This leads to a more symmetrical cost behavior for increasing activity compared to decreasing activity. Additional analyses show that shortages in labor supply induce firms to increase selling prices but also to temporarily expect more effort from their current employees. The effect decreases with the length of the labor supply shock and is more pronounced for companies located in less populated regions. Results are robust to alternative explanations, such as prior period slack creation or pessimistic managerial expectations with respect to future demand.

Keywords: Labor Supply, Asymmetric Cost Behavior, Selling Prices, Management Expectations.

JEL Classifications: D24; M41; J23; J24.

1 Introduction

This study contributes to the understanding of asymmetric cost behavior in the presence of increasing adjustment costs. Different to most other approaches, it is assumed that adjustment costs are not constant and particularly determined by the availability of resources for each firm. Building on the dynamic labor demand literature (Akram and Nymoen 2006; Hamermesh and Pfann 1996; Hamermesh 1993; Pfann and Palm 1993), this paper predicts that if the supply of resources is scarce, it will be more difficult for companies to build up capacity which reflects an increase in adjustment costs and in turn affects firm-specific cost behavior.

Advocates of the economic theory of asymmetric cost behavior ascribe a rise in the cost-to-sales ratio to deliberate managerial decision-making instead of costs getting out of control. It is argued that if a decrease in demand associated with a decrease in a firm's output volume is perceived to be only temporary, managers deliberately choose to retain excess capacity to avoid adjustment costs related to the adaption of the company's recourses (Anderson, Banker, and Janakiraman 2003). Those costs could be attributable, for instance, to the payment of severance packages as a consequence of dismissal of personnel or disposal costs of physical assets (Cooper and Haltiwanger 2006; Hamermesh and Pfann 1996). In this stream of literature, costs are considered to be sticky if a change in costs is less for a decrease in activity compared with an equivalent increase in activity (Anderson, Banker, and Janakiraman 2003). Vice versa, costs are said to be anti-sticky if a change in costs is greater for a decrease in activity compared with an equivalent increase in activity (Weiss 2010). Both forms depict asymmetric cost behavior in response to fluctuations in demand (Banker and Byzalov 2014).

There are several factors that affect asymmetric cost behavior: (a) managerial expectations about future demand and demand uncertainty (Banker, Byzalov, and Plehn-Dujowich 2014; Banker et al. 2014; Holzhacker, Krishnan, and Mahlendorf 2015b), (b) current capacity levels (Balakrishnan, Petersen, and Soderstrom 2004; Cannon 2014), (c) management incentives and personal characteristics (Banker and Fang 2013; Chen, Lu, and Sougiannis 2012; Chen, Gores, and Nasev 2013; Dierynck, Landsman, and Renders 2012; Kama and Weiss 2013), and (d) country or industry-specific factors (Banker, Byzalov, and Chen 2013; Banker, Byzalov, and Threinen 2013; Calleja, Steliaros, and Thomas 2006). Other research investigates the effects of asymmetric cost behavior on e.g., firm profitability (Anderson et al. 2007; Baumgarten, Bonenkamp, and Homburg 2010) or earnings forecasts (Ciftci, Mashruwala, and Weiss 2016; Weiss 2010).

The main objective of this study is to investigate whether asymmetric cost behavior is affected by supply shortages in addition to variations in demand. To do so, this paper uses data from firms operating in the construction industry. The importance of the construction industry for the overall economy and the high pressure for cost efficiency make this setting particularly suitable for studying asymmetric cost behavior (Popescu, Phaobunjong, and Ovararin 2003). By focusing on one industry in one country, the validity of findings is moreover corroborated by accounting for cost structure and growth differences (Balakrishnan, Labro, and Soderstrom 2014).

All empirical tests are based on data from two sources. Quantitative information is obtained from the annual financial statement of private and public companies provided by Bureau Van Dijk. This dataset is merged with survey results from a long-term study which is part of an EU initiative to measure business trends (European Commission 2014). The latter contains information on managers' assessment on factors that limits business activity, future sales expectation and changes in selling prices. Notably, none of these datasets alone would allow for the research question to be studied, because resource adjustments in response to variations in demand are driven not only by company-specific requirements underlying the production function but also

by the overall market supply as well as the current level of capacity utilization in each firm. Consequently, some firms may report limits in labor supply and others do not, even though macroeconomic climate and industry affiliation is equal.
The impact of labor supply shortages on cost behavior within the construction industry is examined using selling, general and administrative (SG&A) costs. Labor-related costs represent a large proportion of SG&A costs (Popescu, Phaobunjong, and Ovararin 2003), such as the salary for project managers, experts and administrative staff. The hiring and firing of skilled employees is generally more difficult and costly than for less qualified personnel (Banker, Byzalov, and Chen 2013; Dierynck, Landsman, and Renders 2012; Hamermesh 1989; Jaramillo, Schiantarelli, and Sembenelli 1993; Oi 1962). Thus, SG&A cost behavior represents an important category to study the impact of shortages in labor supply, while facilitating the comparability to other studies which also focus on SG&A costs (Anderson, Banker, and Janakiraman 2003; Anderson et al. 2007; Banker et al. 2014; Weidenmier and Subramaniam 2016). Following prior research, a change in SG&A costs is assumed to reflect resource adjustment decisions.

By investigating the effect of adjustment costs with respect to changes in the company's total workforce, this study builds on the labor hoarding concept. It describes a less than proportional decrease in hours per employee in response to a fall in demand compared with a rise in demand (Hamermesh 1993). Embedded in this concept is the assumption that firms have two measures for varying their effective labor input: (observed) employment and (unobserved) labor effort. The notion was first formalized in 1962 by Walter Oi, who developed a model of labor demand considering costs of hiring and training employees. These costs represent labor adjustment costs that make it optimal for employers facing a temporary negative demand shock to retain more workers than actually necessary. Because companies have previously invested in their firm-specific human capital, employees are kept on the payroll and are assigned to maintenance or similar tasks irrespective of short-run decreases in real output productivity. Consequently, investments in hiring and training represent quasi-fixed employment costs that form a buffer absorbing temporary variations in the marginal product of labor. This situation leads to a short-term rise in the cost ratio during decreasing activity and, hence, induces cost stickiness. Only if the decrease in demand is sufficiently large will resources be cut by an optimizing manager (Bentolila and Bertola 1990). However, adjustment costs not only prevent firms from dismissing employees in response to decreases in demand. They may also explain a lower level of cost stickiness if the ramp up of resources is more costly than the marginal monetary benefit generated by hiring an additional employee. In this case, firms may decide to delay the expansion of the workforce and instead temporarily expect greater effort from their current employees (Hamermesh and Pfann 1996; Pfann and Verspagen 1989; Pfann and Palm 1993).

To test the association between shortages in labor supply and firm-specific cost behavior, the analysis is conducted in four steps:
The first part of the paper distinguishes between demand and supply side effects by assessing differences in cost behavior between firms that do and do not report limits in labor availability. Following the empirical tests proposed by Anderson et al. (2003), cost behavior is examined by regressing the change in costs on the change in sales between the current and last period, while controlling for known influencing factors. As expected, results show that labor supply shortages are associated with a strong decrease in cost stickiness.
The second part of the analysis examines the underlying mechanisms that describe *how* cost stickiness is reduced for companies operating in tight labor markets. In this respect, four explanations are investigated. On the one hand, costs are less sticky if the percentage increase in costs relative to a one

percent increase in sales is reduced. The latter can be ascribed to (1) an increase in capacity utilization by reemploying slack resources after a period of declining demand, (2) an increase in selling prices,[29] or (3) enhanced labor productivity. On the other hand, costs are also less sticky if the percentage decrease in costs relative to a one percent decrease in sales is amplified. The latter can occur if (4) managers initiate aggressive cost cutting actions because they expect a long-term decrease in demand. All four explanations are investigated separately. Collectivity, findings indicate that if labor supply is restricted, firms reduce cost stickiness by increasing selling prices and react to high demand by increasing work pressure and expecting more effort from their employees. Hence, employee effort is likely to decrease as a consequence of labor hoarding but also increases when demand is high and the availability of labor is scarce. This leads to an increase in labor productivity and therewith reduces cost stickiness.

The third part of this study examines cost behavior after two consecutive periods during which labor supply is restricted. Results show that the effect reverses, which supports the hypothesis that it takes time for companies to set up work contracts and specify requirements before new employees are actually recruited. Thus, the difference in SG&A cost behavior between firms that face shortages in labor supply and firms that do not experience a lack of labor availability decreases with the length of the supply shock.

The fourth part of this study investigates if the effect of limits in labor supply varies by geographical region. Because employee-firm matches are better and more likely in urban areas (Glaeser and Mare 2001; Helsley and Strange 1990), it is less difficult for companies located in highly populated regions to find and hire suitable workers. Upward labor adjustment costs are therefore lower in urban areas where the labor market is tight. As a consequence, results show that the reduction of cost stickiness is stronger for companies

[29] Because the behavior of costs is estimated as a function of sales, price increases lead to a reduction of the cost-to-sales ratio (irrespective of resource adjustments).

located in less populated regions where high adjustment costs prevent firms from hiring extra personnel when demand is rising.

Overall, this study makes three major contributions. First, it identifies the factor "limited availability of labor" as a source of adjustment costs that reduces cost stickiness during periods of macroeconomic growth. These findings are consistent with adjustment cost theory but contrast with prevalent interpretations reported in the literature on asymmetric cost behavior. The latter predominately argues that managers cut costs to a larger extent when their future sales expectations are pessimistic or the company is characterized by a large amount of slack resources (e.g. Banker et al. 2014; Banker and Byzalov 2014; Chen, Kama, and Lehavy 2015). However, this paper provides evidence that costs can be less sticky even though managers are not very pessimistic and slack is low. Second, it is the first study in the context of asymmetric cost behavior that empirically discriminates between variations in demand and supply and analyzes how these effects vary by geographical region of firms within the same country. This shows that adjustment costs differ not only on a country or industry level but also specifically for each company. Third, the study provides robust results with respect to key variables that have been either ignored or imperfectly operationalized in the literature (i.e. price changes, managerial expectations, industry differences of cost structures) and documents that a significant reduction in cost stickiness can also arise when expectations are positive and slack is low. These conditions have been previously recognized to drive sticky instead of anti-sticky costs (Banker and Byzalov 2014; Banker et al. 2014).

The remainder of the paper is structured as follows. Section two reviews the literature and develops the hypotheses. Section three comprises an overview of the construction industry, descriptive statistics and an explanation of the empirical models. Results are summarized in section four, followed by several robustness checks in section five. Section six concludes.

2 Theoretical Background and Hypotheses Development

Acknowledging that factors other than volume drive costs, scholars have dedicated considerable research to the analysis and identification of such, as well as their recognition in the management accounting literature (Banker and Johnston 2006). In particular, with respect to the development of activity-based-costing systems, the theoretical assumption frequently implied is based on a linear relationship between variable costs and their driver, independent of the direction of change in activity (Noreen 1991). However, cost stickiness research shows that variable costs do not respond equally proportionally for increases and decreases in activity.[30] Instead, theory suggests that companies exhibit sticky costs when demand is decreasing, but resources are retained to avoid potential adjustment costs incurred in the act of cutting or adding resources. Because adjustment costs are distinct in indirect, non-production costs where managerial discretion is high, the cost stickiness phenomenon is most frequently studied by examining the behavior of SG&A costs (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014; Banker et al. 2014).

Given that labor costs represent a significant proportion of SG&A costs, the conditional effect of prior period sales changes on asymmetric SG&A cost behavior can be ascribed to the labor hoarding concept. Economists rationalize labor hoarding as the optimal response in the presence of costs of adjusting labor to changes in demand (Biddle 2014; Blanchard 2011; Oi 1962). Because a firm invests in its labor force by offering training initiatives

[30] Cost stickiness is distinct from conditional conservatism (asymmetric timeliness of bad news as compared to good news in earnings recognition). However, standard proxies of conditional conservatism can be biased due to cost stickiness (Banker et al. 2016).

and hiring skilled employees, related monetary expenses represent fixed costs induced to improve a worker's productivity. Such gains in productivity impose a wedge between labor costs and sales generated by one employee who entices firms to keep current employees rather than laying them off when demand is falling. Hence, a negative demand shock has to be sufficiently large and persistent to economically justify the dismissal of trained and highly productive employees.[31]

While labor hoarding during periods of decreasing demand explains cost stickiness on average, the opposite effect arises when labor is scarce. In this case, firms that face limits in labor supply have to incur greater hiring costs of new personnel than those companies that operate without any labor constraints. As a consequence labor shortages raise employment adjustment costs and thereby influence how managers react to demand changes (Akram and Nymoen 2006).[32] In this case, an optimizing manager is reluctant to

[31] The seminal work by Oi (1962) builds on the dynamic labor demand literature and introduces the notion of labor as a quasi-fixed factor that comprises components of fixed and variable elements. If the total discounted costs of hiring an additional worker consist of the sum of the present value of expected wage payments (W), hiring costs (H) and training expenses (K), then a company will only employ an additional worker if her marginal product of labor (M) plus any productivity increases due to training (ΔM) is above her marginal costs (C). With Y indicating the total discounted sales generated by the marginal worker, i representing the discount rate and T the expected period of employment, this implies $C = \sum_{t=0}^{T} W_t (1+r)^{-t} + H + K$ and $Y = \sum_{t=0}^{T} (M_t + \Delta M_t)(1+i)^{-t}$. Profits are maximized if the total discounted cost of employing an additional worker is equal to the total discounted marginal sales. If R represents the period rent which must be earned by each worker to amortize the fixed employment costs (H+K) over the total period of employment (T), then the equilibrium condition can be reduced to $M^* + \Delta M^* = W^* + R$ with R=$(H+K)/\sum_{t=0}^{T} W_t (1+r)^{-t}$ based on the firm's expectations: $W_t = W^*$, $M_t = {M_t}^*$, $\Delta M_t = \Delta {M_t}^*$. Because for current employees the costs of hiring and training represent sunk costs, the company only dismisses personnel if $M^* + \Delta M^* < W^*$. In contrast, the firm expands its total work force if $M^* + \Delta M^* > W^* + R$.

[32] The shape of the adjustment cost function determines a firm's optimal reaction to positive or negative demand shocks. In the case of variable non-linear convex adjustment costs, the company would choose to increase its labor force gradually because average adjustment costs increase with the size of the adjustment. Consequently, changes are made slowly, lagging behind the shock in demand. In the case of lumpy fixed adjustment costs, labor capacity is adjusted in one step if the demand shock is sufficiently large (Hamermesh

expand the current workforce if the costs of recruiting and hiring an additional employee are higher than the marginal sales generated (Hamermesh and Pfann 1996). This reduces cost stickiness on average through a convergence of the magnitude of SG&A cost increases to the magnitude of SG&A cost decreases. Accordingly, H1 is formulated as follows:

H1: Restrictions in labor supply moderate SG&A cost behavior. SG&A costs are less sticky for companies facing restricted labor supply than for companies facing unrestricted labor supply.

To understand through which mechanisms labor supply shortages induce a reduction of cost stickiness, the following paragraphs elaborate on different explanations that are framed in hypotheses H1a to H1d.

First, if the economic trend is positive, companies that report labor shortages are likely to operate with higher capacity utilization than companies that do not report shortages in labor supply. Otherwise they would not require additional employees to cope with high demand. The higher level of capacity utilization is then reflected in a smaller ratio of cost-to-sales for those firms that report insufficient labor supply. This intuition follows Banker et al. (2014) who use prior period sales changes to investigate the conditional factors leading to cost stickiness or cost anti-stickiness. The authors show that the form of asymmetric cost behavior in the current year is determined by the direction of change in activity in the previous period. Because slack is carried over from one period to the next, retained resources during a previous year of declining activity can be used up in the following year if demand recuperates. Consequently, resources are adjusted less than proportional in response to a current increase in demand following a previous decrease in demand. This sequence of demand changes (demand decrease in t-1, demand

1993). Realistically, labor adjustment costs are composed of both variable and fixed components.

increase in t) leads to observed anti-stickiness. SG&A costs are sticky in the opposite case (demand increase in t-1, demand decrease in t) when a current decrease in activity follows a preceding increase in activity. More moderate forms of stickiness and anti-stickiness are expected for corresponding mixed cases in a three-period setting. Although Banker et al. (2014) do not specifically discuss productivity implications of their theoretical model; the explanation makes only sense if one assumes that the firm is operating inefficiently during a fall in demand. Otherwise, sticky SG&A costs would imply that resources remain unchanged with which the firm generates a constant output determined by its production function. Instead, it is argued that the company chooses to accumulate slack when demand falls and produces less output as its available resources would allow. Accordingly, the percentage of SG&A costs relative to current activity is higher during periods of declining demand than during periods of increasing demand. Consistent with this line of reasoning, anti-sticky SG&A costs are associated with higher capacity utilization when resources are reemployed if activity increases after a previous decrease.[33] Thus, if labor supply shortages reflect an increase in capacity utilization due to a previous decrease in demand, then cost stickiness is lower. In H1a this explanation is referred to as "Prior Period Sales Decrease":

H1a ("Prior Period Sales Decrease"): *For increases in demand, SG&A costs rise to a lower extent for companies facing <u>restricted</u> labor supply than for companies facing <u>unrestricted</u> labor supply due to a prior period sales decrease.*

[33] Notably, this increases output per employee-hour due to more efficient usage of current capacity and does not require increases in employees' effort.

Second, managers of firms that face labor supply shortages are likely to raise selling prices in order to absorb market demand instead of hiring extra employees. This can affect the measurement of cost stickiness if SG&A cost behavior is estimated as a function of changes in sales instead of actual output volume. Because companies are not required to disclose information on output volume in financial statements, most studies do so and use sales as a proxy for drivers in SG&A costs.[34] Cannon (2014) provides evidence that results can be driven by changes in selling prices irrespective of deliberate resources adjustment decisions. Specifically, if managers are optimistic, they reduce prices to stimulate demand during periods of macroeconomic decline but leave prices unchanged and increase capacity as demand rebounds. Vice versa, SG&A costs are found to be anti-sticky if prices are increased when demand grows (rather than building up capacity), but decision-makers leave prices unchanged and cut capacity when demand declines. Accordingly it is hypothized that a firm's willingness to increase selling prices is higher when labor is scarce. Because the ratio of SG&A cost-to-sales decreases with increasing prices, the level of cost stickiness is then lower for firms with restricted labor supply than for firms with unrestricted labor supply. In H1b this explanation is referred to as "Price Increases":

H1b ("Price Increases"): *For increases in demand, SG&A costs rise to a lower extent for companies facing <u>restricted</u> labor supply than for companies facing <u>unrestricted</u> labor supply due to an increase in selling prices.*

Third, costs increase at a lower level for companies reporting shortages in labor supply if labor productivity is rising. An increase in labor productivity

[34] Exceptions include Balakrishnan et al. (2004), Balakrishnan and Gruca (2008), Holzhacker et al. (2015a) and Cannon (2014).

can result from employees exerting more effort when demand is high if firms are restricted in hiring additional employees. Thus, companies can temporarily increase sales per unit of SG&A costs by leveraging capacity and allocating more projects to available employees. Complementary to the labor hoarding concept, an increase in labor effort is associated with the notion of procyclical labor productivity. It describes a rising output per employee during macroeconomic growth periods and a falling output per employee during macroeconomic decline periods (Biddle 2014; Blanchard 2011). Procyclical labor productivity contradicts conventional neoclassical thinking (which posits countercyclical productivity) in three respects: First, it is argued that during recessions, average productivity would rise because firms dismiss the least productive worker. Second, the fear of losing a job if unemployment is high presumably induces employees to work harder in times of economic distress. Third, one expects that during periods of economic expansions, high working pressure and overtime causes fatigue and leads to a loss in quality (Biddle 2014). In line with the theory of procyclical labor productivity, H1c predicts a reduction in cost stickiness due to an increase in labor effort when labor is scarce and demand is high.

H1c ("Labor Effort"): *For increases in demand, SG&A costs rise to a lower extent for companies facing <u>restricted</u> labor supply than for companies facing <u>unrestricted</u> labor supply due to an increase in labor effort.*

Labor supply shortages do not impact cost behavior for demand increases only. Additionally, one would expect that the lack of skilled employees also affects firms during periods of declining demand. Without qualified project managers and firm executives, companies might not be able to acquire enough clients for future business activities. Hence, firms reporting limits in labor supply are likely to lose tendering processes against competitors and are therefore more pessimistic with respect to future sales.

Previous literature shows that expectations with respect to future demand significantly influence the extent to which decision-makers are willing to either retain or cut resources during economic downturns (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014; Banker et al. 2014; Chen, Kama, and Lehavy 2015). If managers are optimistic that demand will rebound in the future, they are more willing to keep unused resources during a short-term contraction of demand. Thus, it is possible to avoid current and future adjustment costs if their expectations are correct. Using proxies such as historical sales development, GDP, order backlog or analyst's sales forecast, scholars document that cost stickiness is more pronounced if future sales expectations are high (Anderson, Banker, and Janakiraman 2003; Banker et al. 2014).[35] Conversely, if managers are rather pessimistic with respect to their prospective business situation, Banker et al. (2013) find that cost stickiness diminishes. Such cost behavior is observed during periods of strong and persistent sales decline, like the economic crisis in the years 2007 and 2008, when a quick recovery of the market was unexpected. Chen, Gores and Nasev (2013) extend the argument by focusing on managers' personal characteristics, which likewise may influence their sales expectations. The authors build on the psychology literature and find that SG&A resources are sticky if managers are overconfident with respect to their ability to assess and

[35] These studies use proxies based on archival data to operationalize managerial expectations with respect to future sales. However, such proxies may capture other effects that are unrelated to managers' anticipation of future sales or are not equally applicable for all firms in the sample. Unsurprisingly, studies that use, for instance, GDP growth to operationalize sales expectations obtain inconclusive results with respect to the effect on cost behavior (Banker and Byzalov 2014). Likewise, order backlog can be a suitable proxy for sales expectations for companies in the durable goods or computer industry (Rajgopal, Shevlin, and Venkatachalam 2003) but might not be a good measure for firms with short-term order contracts or different disclosure requirements. To overcome difficulties in finding suitable empirical proxies, this study uses a subset of data obtained from the Danish survey which includes direct information on managers' personal assessment about future demand.

restore future demand during a current economic downturn. In addition, managers are likely to be more inclined to form optimistic sales expectations if their performance horizon is rather long-term oriented. In light of intellectual capital theory, Venieris et al. (2015) predict that firms with high organizational capital (defined as the unique organizational structure and processes that facilitate the combination of human skills and physical capital) have a rather long-term focus because their previous investments are strongly determined by intangible assets that capitalize over time. They are therefore more willing to maintain unutilized resources during short-term demand fluctuations to avoid adjustment costs.

Following this explanation, H1d predicts that managers of firms reporting limits in labor supply are more pessimistic with respect to future sales. They are therefore more willing to cut SG&A costs during decreases in demand. Accordingly, H1d is formulated as follows:

H1d ("Pessimistic Expectations"):	*For decreases in demand, SG&A costs fall to a stronger extent for companies facing <u>restricted</u> labor supply than for companies facing <u>unrestricted</u> labor supply due to pessimistic future sales expectations.*

Next to the mechanisms through which companies that report shortages in labor supply realize a lower level of SG&A cost stickiness, H2 and H3 focus on the magnitude of the effect. The magnitude of the effect is expected to be impacted by, first, the length of the supply shock and, second, by the specific regional location of the firm.

Because managers cannot perfectly anticipate a shock to demand and it takes time to find and set up contractual arrangements with new hires, there is a lag between the actual decision to adjust resources and its realization.

Similarly to the observation made by Anderson et al. (2003), who document that stickiness reverses over time, it is therefore projected that the extent of SG&A cost anti-stickiness for companies facing shortages in the availability of labor decreases in the subsequent period. This argument leads to the second hypothesis:

H2: The difference in cost behavior between companies facing restricted labor supply and companies facing unrestricted labor supply decreases after two consecutive periods with labor shortages.

Furthermore, research on local labor market characteristics document that firms operating in dense geographical areas are more likely to find suitable employees by exerting less effort than firms located in rural regions (Helsley and Strange 1990). They can partly offset employee adjustment costs by benefiting from better employee-firm matches compared with their competitors located in less populated areas. The quality of the employee-firm match improves with the number of agents in the market (Helsley and Strange 1990). Hence, thick labor markets facilitate the search for the most suitable person and enable a quick occupancy of vacancies, which is likely to be reflected in higher productivity and salaries (Glaeser and Mare 2001). Moreover, firms located in geographical concentrated regions are more willing to invest in new technologies because they expect to easily find specialized employees. At the same time, individuals invest in human capital because they anticipate an increasing rate of return as their skills are valued by a number of potential employers (Acemoglu 1996). Likewise, people acquire skills by interacting with each other, whereas the probability to do so is higher in more dense urban areas (Glaeser and Mare 2001).

Collectively, these studies suggest that the magnitude of labor adjustment varies by geographical location and therefore moderates the degree of asymmetric SG&A cost behavior. Consistent with this line of reasoning, costs of recruiting and hiring additional employees when skilled labor is scarce are expected to be lower for companies based in areas with a high population. Thus, the thickness of the local labor market plays a role in determining the extent of cost asymmetry. Accordingly, the third hypothesis is:

H3: The degree of SG&A cost stickiness for companies with restricted labor supply is lower in less populated geographical regions.

3 Research Design

3.1 Setting

To examine the effect of upward biased adjustment costs on asymmetric SG&A cost behavior and its consequences for managerial decision-making, this study focuses on the Danish construction industry between 1998 and 2013. At 60 percent on average, labor-related costs represent the highest proportion of general and administrative overhead in construction companies (Popescu, Phaobunjong, and Ovararin 2003). Without qualified employees, contractors may not be able to successfully bid against their competitors and will be forced out of business in the long run. Contractors therefore compete heavily in the market for skilled workers. Thus, the construction sector at the beginning of the 21st century serves as a particularly suitable setting for studying adjustment cost variations for labor because many companies had a high demand for additional employees to accommodate the strong increase in residential investments. Using data from one industry in one country moreover facilitates firms' comparability with respect to cost structure and growth rates (Balakrishnan, Labro, and Soderstrom 2014) and rules out potential biases due to country-differences in labor laws or corporate governance (Banker, Byzalov, and Chen 2013; Calleja, Steliaros, and Thomas 2006).

The Danish setting of this study provides an additional advantage. Compared to other European countries that are characterized by strong labor protection laws and labor union power (Banker, Byzalov, and Chen 2013), Denmark established a so called "Flexicurity" system.[36] On the one side, the system provides employers with the flexibility to dismiss personnel if necessary. On the other side, the system safeguards a high level of unemployment benefits for people in need. As such, the Danish setting mitigates the objection that costs are sticky because labor protection laws do not allow firms to dismiss personnel if firms face economic problems.

3.2 Descriptive Statistics

This study is based on a merged dataset stemming from the Orbis database operated by Bureau Van Dijk and micro-data obtained from the Danish Statistical Institute (Statistics Denmark).[37] The latter has been used within the framework of the Joint Harmonized EU Program of Business and Consumer Surveys with the objective to provide information for economic surveillance and business climate in the EU.

Data collected from the construction industry are mostly qualitative and gathered on a monthly basis. Because private companies in Denmark are not required to disclose financial information more frequently than once a year, all observations from the business and consumer survey are aggregated based on their median per year for the subsequent cross-sectional regressions.[38] Following Anderson et al. (2003), firms are required to have valid sales data for the current and previous year as well as non-missing observations for components of SG&A costs, geographical region, managerial expectations, sales development and whether their labor availability is restricted. SG&A

[36] See http://denmark.dk/en/society/welfare/flexicurity.

[37] In Denmark, a CVR number is assigned to each company; this number is used as the single identifier to merge both datasets.

[38] The median splits the sample in two halves each representing 50 percent of the distribution. Thus, the median is less skewed due to extreme values than for instance the arithmetic mean.

costs are calculated from operating sales less operating profit, costs of goods sold and depreciation. Additionally, observations for which SG&A costs exceed sales are deleted, and all financial variables are deflated to real 2000 DKK. The final sample is winsorized at the top and bottom one percent to alleviate potential biases caused by outliers.

Descriptive statistics are presented in Table 1.

As shown in Panel A, the average firm generates 172 million DKK in operating sales (22 million USD) and 20 million DKK in SG&A costs (two million USD). The mean ratio of SG&A cost-to-sales is 26 percent, and the ratio of SG&A costs to operating costs is 27 percent. Compared with other descriptive statistics from listed companies in the Compustat database, a firm in this sample is fairly small with 243 employees on average but only 60 employees in median. The average construction firm in the underlying sample has contracted for approximately five months work at the time of the survey.
Pearson correlations are tabulated in Panel B of Table 1. The strong correlation between SG&A costs and sales indicates that sales are a good predictor for cost behavior. Other correlations are also significant, but smaller. One exception is the ratio of total assets to sales. Asset intensity is not significantly correlated with the level of sales per company, but varies marginally with the SG&A cost-to-sales ratio and with the SG&A cost-to-operating cost ratio.
Panel C summarizes the mean differences conditional on whether the firm reports limits in labor supply. The pattern of significance indicates that labor markets are more likely to be tight during periods of strong economic growth. Accordingly, construction firms that find themselves restricted in labor supply have greater operating sales along with higher personnel expenses and a

stronger workforce.[39] Nevertheless, labor profitability is not generally higher for firms limited in labor supply. The latter requires 0.0020 employees per one thousand DKK of operating sales, whereas the figure is slightly lower for construction firms that are not affected by a shortage of workers.

Finally, Panel D provides an overview of the frequency of prospective sales expectations and price changes conditional on whether the company reported limits in labor supply. Because labor demand is likely to be higher during periods of macroeconomic growth, it is not surprising that the percentage of optimistic expectations is higher for firms reporting a shortage in labor supply. Moreover, the distribution of price changes shows that nearly 20 percent of all firms in the sample decrease prices, whereas only a small fraction of three percent also report price increases. This pattern supports findings reported by Cannon (2014), who indicates that managers are more willing to decrease prices to stimulate current sales volume when demand falls but increase capacity (instead of prices) when demand rebounds.

Table 1: Descriptive Statistics

Panel A: Descriptive Statistics in Million DKK (Million 2000 USD)

		Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
Operating Sales	[1]	171.72 (21.65)	513.45 (64.75)	8.22 (1.04)	30.86 (3.89)	112.65 (14.21)
SG&A costs	[2]	19.68 (2.48)	53.61 (6.76)	1.79 (0.23)	4.74 (0.60)	14.22 (1.79)
Personnel expenses	[3]	45.56 (5.74)	133.30 (16.81)	2.83 (0.36)	9.35 (1.18)	27.06 (3.41)
SG&A costs/ Operating Sales	[4]	0.26	0.21	0.08	0.20	0.42
SG&A costs/ Operating Costs	[5]	0.27	0.22	0.08	0.21	0.44

[39] To rule out a potential self-selection bias of larger firms, hypothesis 1 is subjected to a robustness test based on a sample of firms that at least once reported limits in labor supply. All other observations are deleted from the sample. Results are robust to the alternative sampling.

Table 1 continued:

Personnel expenses/ Operating Sales	[6]	0.34	0.16	0.24	0.34	0.45
# Employees per 1000 DKK of Operating Sales	[7]	0.0024 (0.0192)	0.0015 (0.0119)	0.0014 (0.0109)	0.0021 (0.0166)	0.0032 (0.0251)
Total Assets/ Operating Sales	[8]	0.55	0.72	0.33	0.42	0.57
Number of Employees	[9]	243.27	634.24	24.00	60.00	152.00
Order backlog in months	[10]	5.23	4.90	2.00	4.00	6.00

Panel B: Pearson Correlation

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
[1]	1.00									
[2]	0.49***	1.00								
[3]	0.97***	0.57***	1.00							
[4]	-0.23***	0.07***	-0.19***	1.00						
[5]	-0.23***	0.07***	-0.19***	0.99***	1.00					
[6]	-0.17***	-0.02	-0.08***	0.60***	0.58***	1.00				
[7]	-0.22***	-0.14***	-0.19***	0.51***	0.49***	0.62***	1.00			
[8]	-0.02	0.00	-0.01	0.12***	0.13***	0.04	0.00	1.00		
[9]	0.90***	0.57***	0.90***	-0.20***	-0.20***	-0.13***	-0.13***	-0.01	1.00	
[10]	0.18***	0.20***	0.19***	-0.14***	-0.14***	-0.12***	-0.18***	-0.01	0.16***	1.00

*,**,*** Indicate significance at the 10, 5, and 1 percent levels, respectively.

Panel C: Descriptive Statistics Conditional on Labor Availability

(Mean)	No Limits in Labor	Limits in Labor	t-test for Difference
Operating Sales	192.95	426.68	***
SG&A costs	23.02	32.27	
Personnel expenses	51.15	106.65	***

Table 1 continued:

	No Limits in Labor	Limits in Labor	t-test for Difference
SG&A costs/ Operating Sales	0.23	0.21	
SG&A costs/ Operating Costs	0.24	0.22	
Personnel expenses/ Operating Sales	0.32	0.29	*
# Employees per 1000 DKK of Operating Sales	0.0018	0.0020	**
Total Assets/ Operating Sales	0.52	0.51	
Number of Employees	224	513	***
Order backlog in months	5.61	5.73	

*,**,*** Indicate significance at the 10, 5, and 1 percent levels, respectively.
Means are weighted by the number of sales increases per group.

Panel D: Descriptive Statistics for Sales Expectations and Price Changes

(Percent)	No Limits in Labor	Limits in Labor	All firms
Optimistic Expectations	8.41	25.81	9.43
Pessimistic Expectations	12.06	5.65	15.85
Neutral Expectations	79.53	68.54	74.72

(Percent)	No Limits in Labor	Limits in Labor	All firms
Price Increase	2.70	10.57	3.17
Price Decrease	19.53	10.57	19.89
Price Unchanged	77.77	78.86	76.94

3.3 Empirical Models

All of the hypotheses are tested based on empirical models derived from the general specification by Anderson et al. (2003):

$$\Delta \text{lnSG\&A}_{\text{i,t}} = \beta_0 + \beta_1 \cdot \Delta \text{lnSALES}_{\text{i,t}} + \beta_2 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t} \quad \text{(1a)}$$

$\Delta \text{lnSGA}_{\text{i,t}}$ is the log-change in SG&A costs for firm i in year t relative to year t-1 and $\Delta \text{lnSALES}_{\text{i,t}}$ is the equivalent of the log-change in operating sales. $D_{i,t}$ is a dummy variable taking a value of one if sales in the current period decreased and zero otherwise. Cost stickiness prevails on average if $\beta_1 > 0$ and $\beta_2 < 0$. Because of the logarithmic specification, regression coefficients can be interpreted as the elasticity of costs in response to changes in sales. Thus, β_1 indicates the percentage change in SG&A costs per one percent increase in sales and $\beta_1 + \beta_2$ the percentage change in SG&A costs per one percent decrease in sales. Sales are used as a proxy for changes in activity.

As in most other analyses, the data underlying this study does not contain information on actual variations in output per firm. Nevertheless, with the objective of investigating the relationship between labor adjustment costs and firm-specific cost behavior, price changes are included as either main effects or as control variables in all empirical tests. This approach allows disentangling price effects from actual resource adjustment decisions.

To estimate the effect of shortages in labor supply, model (1a) is refined by conditioning SG&A cost behavior on the perceived access to labor ($LIMITS_{i,t}$). $LIMITS_{i,t}$ is a dummy variable that takes a value of one if construction firms participating in the underlying survey reported restricted availability of labor.[40] Model (1b) serves as the empirical specification to test H1 as well as the general test for H1a to H1d (more specific tests are explained subsequently).

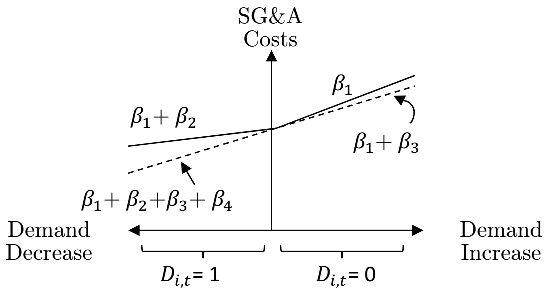
[40] See Table 9 for a more detailed description of the survey questions.

$$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_1 \cdot \Delta \ln SALES_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} + \left(\beta_3 \cdot \Delta \ln SALES_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}\right) \cdot LIMITS_{i,t} + \sum_{1}^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t} \tag{1b}$$

If SG&A costs are sticky on average, this would imply that $\beta_1 > 0$ and $\beta_2 < 0$ $(LIMITS_{i,t} = 0)$. However, in H1 it is hypothized that SG&A costs are less sticky if companies operate in tight labor markets $(LIMITS_{i,t} = 1)$. Hence, it is expected that $\beta_1 + \beta_2 < \beta_1 + \beta_2 + \beta_3 + \beta_4$. In addition, H1a, H1b and H1c predict that the increase in SG&A costs for companies reporting shortages in labor supply is smaller than the increase in SG&A costs for companies that do not report shortages in labor supply. Accordingly, $\beta_1 > \beta_1 + \beta_3$, i.e. $\beta_3 < 1$. H1d moreover posits that SG&A costs decrease more when firms face restrictions in labor supply because managers are pessimistic with respect to future sales. From this follows that $\beta_2 < \beta_2 + \beta_4$, i.e. $\beta_4 > 0$. Predicted effects are illustrated in Figure 1. All regressions are conducted controlling for price changes and managerial expectations,[41] regional differences, and whether the company is listed or not.

[41] Price changes $(PRICE^{Inc}{}_{i,t}, PRICE^{Dec}{}_{i,t})$ and managerial expectations $(EXPEC^{Pos}{}_{i,t}, EXPEC^{Neg}{}_{i,t})$ are indicator variables conducted within the framework of the Joint Harmonized EU Program of Business and Consumer Surveys. Because they have different effects depending on the direction of sales changes, they are interacted separately for increases and decreases in sales.

Figure 1: Illustration of Predicted Effects (model 1b)



The above figure illustrates predicted effects according to H1 and H1a to H1d. β_1 captures the percentage increase in SG&A costs per one percent increase in activity. The slope of the cost function for activity decreases is estimated through the sum of β_1 and β_2. If costs are sticky on average, then $\beta_1 > \beta_1 + \beta_2$. According to H1, the degree of cost stickiness is less for companies operating with limited labor supply. This implies that $\beta_1 + \beta_2 < \beta_1 + \beta_2 + \beta_3 + \beta_4$ with $LIMITS_{i,t} = 1$. If the increase in SG&A costs for increases in demand is less for companies facing limits in labor supply (H1a-c), then $\beta_1 + \beta_3 < \beta_1$. If also the decrease in SG&A costs for decreases in demand is greater for companies facing limits in labor supply (H1d) then $\beta_2 < \beta_2 + \beta_4$.

To yield a better understanding of the mechanisms through which companies achieve a lower level of cost stickiness, H1a to H1d are furthermore tested individually.

The following two-period model according to Banker et al. (2014) serves as the basis to test H1a after incorporating additional explanatory variables:

$$\Delta \ln SG\&A_{i,t} = \beta_0 + I_{i,t-1}\left(\beta_1^{PInc} \cdot \Delta \ln SALES_{i,t} + \beta_2^{PInc} \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}\right) + D_{i,t-1}\left(\beta_1^{PDecr} \cdot \Delta \ln SALES_{i,t} + \beta_2^{PDecr} \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}\right) + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t} \quad (2a)$$

Banker et al. (2014) extend the empirical specification according to Anderson et al. (2003) by conditioning SG&A cost behavior on the development of sales changes in the previous period. Correspondingly, $I_{i,t-1}$ ($D_{i,t-1}$) is a dummy variable taking a value of one if sales in the previous period increased (decreased) and zero otherwise.

On the one hand, if sales in the previous period increased $\left(I_{i,t-1} = 1\right)$, managers are expected to be rather optimistic about future sales and therefore more willing to keep slack resources when sales decrease in the current year; this leads to the observation of sticky SG&A costs in t, which is reflected in $\beta_1^{PInc} > 0$ and $\beta_2^{PInc} < 0$.

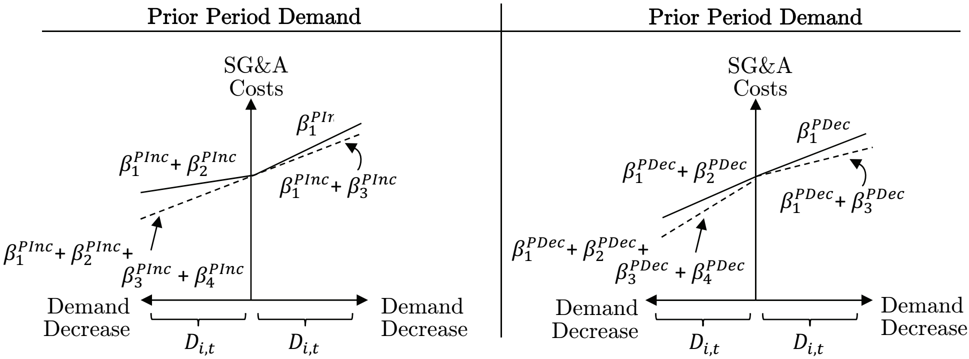
On the other hand, if sales in the previous period decreased $\left(D_{i,t-1} = 1\right)$, Banker et al. (2014) assume that executives are rather pessimistic and reluctant to employ more workers during a perceived temporary increase in demand. This implies that SG&A cost would be less sticky or even anti-sticky in t with $\beta_1^{PDec} > 0$ and $\beta_2^{PDec} > 0$. If for a given magnitude of current sales increase costs rise more conditional on a prior period sales increase than conditional on a prior period sales decrease, then $\beta_1^{PInc} > \beta_1^{PDec}$.

To test H1a, model (2a) is refined in the following manner to allow for the moderation by limits in labor supply:

$$\begin{aligned}\Delta\text{lnSG\&A}_{\text{i,t}} = \beta_0 + {} & I_{i,t-1}\left(\beta_1^{PInc} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PInc} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + \\ & D_{i,t-1}\left(\beta_1^{PDecr} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PDecr} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + \\ & I_{i,t-1}\left(\beta_3^{PInc} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_4^{PInc} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot \\ & LIMITS_{i,t} + D_{i,t-1}\left(\beta_3^{PDecr} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_4^{PDecr} \cdot D_{i,t} \cdot \\ & \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot LIMITS_{i,t} + \textstyle\sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}\end{aligned} \quad (2b)$$

H1a ("Prior Period Sales Decrease") predicts that companies exhibit a lower magnitude of sales increases if sales in the prior period decreased. In this case companies can utilize existing capacity by reemploying free resources when demand recuperates after a period of decline. This proposition is tested based on the two-period model specification according to Banker et al. (2014) which is adapted in the form of model (2b) to include the labor supply effect. According to H1a it is expected that $\beta_1^{PInc} + \beta_3^{PInc} > \beta_1^{PDec} + \beta_3^{PDec}$ with $\beta_3^{PInc} < 0$ and $\beta_3^{PDec} < 0$. The predictions for all other regression coefficients follow Banker et al. (2014). Specifically, SG&A costs are sticky conditional on a prior period sales increase with $\beta_1^{PInc} > 0$ and $\beta_2^{PInc} < 0$ and anti-sticky conditional on a prior period sales decrease with $\beta_1^{PDec} > 0$ and $\beta_2^{PDecr} > 0$. Because H1 posits that limits in labor supply $(LIMITS_{i,t})$ moderate the behavior of SG&A costs by reducing the magnitude of cost stickiness (or increasing the magnitude of anti-stickiness), it is expected that $\beta_1^{PInc} + \beta_2^{PInc} < \beta_1^{PInc} + \beta_2^{PInc} + \beta_3^{PInc} + \beta_4^{PInc}$ (i.e. $\beta_4^{PInc} > 0$) and $\beta_1^{PDec} + \beta_2^{PDec} < \beta_1^{PDec} + \beta_2^{PDec} + \beta_3^{PDec} + \beta_4^{PDec}$ (i.e. $\beta_4^{PDec} > 0$). The predicted signs of the regression coefficients in model (2b) are illustrated in Figure 2.

Figure 2: Illustration of Predicted Effects (model 2b)



The above figure illustrates predicted effects according to H1a separately for prior period sales increases (left panel) and prior period sales decreases (right panel). According to Banker et al. (2014), SG&A costs are sticky ($\beta_1^{PInc} + \beta_2^{PInc} < \beta_1^{PInc}$) if sales in the previous period increased and anti-sticky ($\beta_1^{PDec} + \beta_2^{PDec} > \beta_1^{PDec}$) if sales in the previous period decreased. The variable LIMITS significantly reduces SG&A cost stickiness conditional on prior period sales increases if $\beta_1^{PInc} + \beta_2^{PInc} < \beta_1^{PInc} + \beta_2^{PInc} + \beta_3^{PInc} + \beta_4^{PInc}$ and it significantly increases SG&A cost anti-stickiness if $\beta_1^{PDec} + \beta_2^{PDec} < \beta_1^{PDec} + \beta_2^{PDec} + \beta_3^{PDec} + \beta_4^{PDec}$. H1a furthermore implies that the increase of SG&A costs is less following a prior period sales decrease and less for companies facing restrictions in labor supply. Thus, $\beta_1^{PInc} + \beta_3^{PInc} > \beta_1^{PDec} + \beta_3^{PDec}$.

H1b ("Price Increases") predicts that companies facing restrictions in labor supply are more likely to increase prices which induces a reduction in the ratio of SG&A cost-to-sales for increases in demand. To test this prediction model (1b) is estimated separately for increased selling prices, decreased selling prices and unchanged selling prices while controlling for management expectations. If a reduction in the SG&A ratio is realized by increasing selling prices as a consequence of perceived restrictions to extend labor capacity, β_3 with $LIMITS_{i,t} = 1$ is expected to be significantly negative but insignificant for companies with no price changes or decreases in prices.

H1c ("Labor effort") predicts that companies facing restrictions in labor supply increase labor productivity by allocating more projects to available employees and leveraging current capacity. Analogue to H1b, this decreases the magnitude of SG&A cost increases when sales rise. Thus, β_3 in model (1b) is expected to be negative. Because labor effort is not directly observable, H1c is supported if the magnitude of SG&A costs increases can neither be ascribed to increases in selling prices (H1b) nor to an exploitation of capacity following a prior period decrease (H1a). In addition, a comparison of the ratio of personnel expenses per employee is conducted. According to H1c, the ratio is predicted to be lower for companies facing restrictions in labor supply.

H1d ("Pessimistic Expectations") predicts that managers of firms that report restrictions in labor supply are more pessimistic with respect to future sales because they do not have enough skilled employees who are able to acquire new projects and win tendering processes. Accordingly, they are more willing to cut SG&A resources when demand is falling. Hence, $\beta_4 > 0$ in model (1b). To further investigate this hypothesis, differences in SG&A cost behavior are tested separately for managers of firms that are indicating positive, neutral or negative managerial expectations. If managerial expectations induce a significant difference in SG&A cost behavior for demand decreases between companies facing restrictions in labor supply ($LIMITS_{i,t} = 1$) and companies that have sufficient labor available ($LIMITS_{i,t} = 0$), then β_4 would only be significantly positive for firms with pessimistic managerial expectations.

To test H2, the difference in SG&A cost behavior between companies with insufficient labor availability and companies with no restrictions is investigated after two consecutive periods of limited labor supply. To this end, the variable $LIMITS_{i,t-1}$, which captures reported shortages in labor supply during the previous period, is added to model (1b). Because it takes time for companies to write job descriptions, talk with recruiters and internally coordinate the specification of requirements for potential new employees, the effect is expected to be stronger at the beginning of the supply shock, but decreasing over time. Hence, H2 implies that β_5 is significantly positive and β_6 is significantly negative. The signs of all other regression coefficients were defined previously. H2 is tested using model (3) below:

$$\begin{aligned}\Delta\text{lnSG\&A}_{\text{i,t}} = \; & \beta_0 + \beta_1 \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \\ & \left(\beta_3 \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_4 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot LIMITS_{i,t} + \\ & \left(\beta_5 \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_6 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot LIMITS_{i,t} \cdot \\ & LIMITS_{i,t-1} + \textstyle\sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{3}$$

To test H3, parameter estimates in model (1b), which capture the association between SG&A cost behavior and sales for companies operating in a tight labor markets, are adapted to allow for a variation by geographical region in Denmark. Dummy variables show the differences between regions, with Zealand as the control group. A lower level of SG&A cost stickiness due to higher labor adjustment costs for construction firms operating in less dense geographical areas is reflected in a higher value of β_5. Based on the average size of the population between 1998 and 2013, it is therefore predicted that companies in North Denmark (0.58 million citizens) and South Denmark (1.19 million citizens) exhibit a lower degree of SG&A cost stickiness than construction firms located in the capital region (1.65 million citizens) and Central Denmark (1.22 million citizens). Accordingly, model (4) is specified as follows: [42]

[42] Due to an insufficient number of observations, it is not possible to differentiate the magnitude of cost changes per one percent *increase* in sales (β_3) by region.

$$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_1 \cdot \Delta \ln SALES_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} + (\beta_3 \cdot \Delta \ln SALES_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}) \cdot LIMITS_{i,t} + \beta_5 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot \sum_1^4 REGION_{i,t} + \sum_1^9 \lambda \cdot Controls_{i,t} + \varepsilon_{i,t} \quad (4)$$

4 Empirical Results and Discussion

4.1 SG&A Cost Asymmetry Conditional on the Availability of Labor (H1)

Regression coefficients based on the standard cost stickiness model according to Anderson et al. (2003) are shown in Table 2. The first column tabulates estimates based on model (1a) without control variables, while the second column tabulates estimates with control variables (1a').[43] A prime indicates that the regression is performed based on the latter which refers to the full model including all controls (this notation also used in all of the following tables). In line with predictions by Anderson et al. (2003), SG&A costs are therefore sticky on average. SG&A costs increase 0.95 (β_1) percent per one percent increase in sales but decrease only 0.77 ($\beta_1 + \beta_2$) percent per one percent decrease in sales (Table 2, model 1a).

Moreover, regression estimates conditioned on whether companies reported shortages in labor supply are consistent with H1. Results are depicted in Table 2, column four. On the one hand, firms with unrestricted access to labor exhibit sticky SG&A costs. β_1 is significantly positive and β_2 is significantly negative. On the other hand, SG&A cost stickiness is lower for firms facing restrictions in labor supply: $\beta_1 + \beta_2 = 0.75$ is smaller than $\beta_1 +$

[43] Because Anderson et al. (2003) do not use additional control variables in their main model; regression estimates based on model (1) without control variables are tabulated to facilitate a comparison of results.

$\beta_2+\beta_3+\beta_4=1.06$. The F-Test at the bottom of the table shows that the difference is statistically significant ($F(1{,}531)=3.40, Pr>F=0.03$).

Table 2 also provides initial support for H1a-H1c (specific results are discussed in the following section). SG&A costs increase significantly less for companies facing restrictions in labor supply than for companies operating with a sufficient number of employees ($\beta_3=-0.34$). The difference is statistically significant with $F(1{,}727)=2.72$, $Pr>F=0.05$. Furthermore, the positive and significant coefficient $\beta_4=0.65$ is in line with H1d. The latter implies that for demand decreases, SG&A resources are cut more by companies reported limits in labor supply than by companies with no labor supply restrictions.

Even though SG&A costs of construction firms are predominantly related to labor, contractors undoubtedly also incur capital costs to pursue their operations. As well, should the theoretical reasoning apply for capital intensive input factors. Hence, to additionally validate the hypothesis that companies face higher adjustment costs if they exhibit shortages in the supply of input factors, the behavior of SG&A costs is investigated conditional on shortages of equipment or other non-labor overhead. Because the percentage of capital related SG&A costs is relatively low and only very few companies actually report shortages in capital, substituting the variable "limits in labor" through the variable "limits in capital" is likely to affect the magnitude of the effect but not the direction. Untabulated results show that this intuition is empirically supported if additional controls for changes in managers' expectations and prices are excluded from the model. Otherwise, the effect diminishes due to price increases and negative sales expectations when sales decline.

Table 2: SG&A Cost Asymmetry Conditional on the Availability of Labor (H1)(One-Period Model)

Model (1a): $$\Delta \text{lnSG\&A}_{i,t} = \beta_0 + \beta_1 \cdot \Delta \text{lnSALES}_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} + \sum_{1}^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

Model (1b): $$\Delta \text{lnSG\&A}_{i,t} = \beta_0 + \beta_1 \cdot \Delta \text{lnSALES}_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} + \left(\beta_3 \cdot \Delta \text{lnSALES}_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{i,t}\right) \cdot LIMITS_{i,t} + \sum_{1}^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

			Model 1a	*Model 1a'*	*Model 1b*	*Model 1b'*
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_1	$\Delta \text{lnSALES}_{i,t}$	+	0.95*** (22.92)	0.93*** (19.81)	0.93*** (21.99)	0.92*** (19.01)
β_2	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t}$	-	-0.18** (-2.32)	-0.22** (-2.49)	-0.14** (-1.72)	-0.17** (-1.86)
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta \text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	-			**-0.37** (-2.73)**	**-0.34** (-2.37)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	+			**0.65** (3.38)**	**0.65** (3.22)**
λ_1	$\Delta \text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			-0.48** (-2.15)		-0.37* (-1.52)
λ_2	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			2.94 (0.82)		-0.44 (-0.15)
λ_3	$\Delta \text{lnSALES}_{i,t} \cdot PRICE^{Dec}{}_{i,t}$			0.05 (0.56)		0.04 (0.53)
λ_4	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot PRICE^{Dec}{}_{i,t}$			0.04 (0.32)		-0.01 (-0.06)
λ_5	$\Delta \text{lnSALES}_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$			0.01 (0.12)		0.09 (1.00)
λ_6	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$			0.06 (0.39)		-0.15 (-1.12)
λ_7	$\Delta \text{lnSALES}_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$			0.04 (0.35)		0.00 (0.02)
λ_8	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$			0.12 (0.89)		0.23* (1.55)
λ_9	$PUBLIC_{i,t}$			0.04 (0.57)		0.05 (0.56)

Table 2 continued:

		Model 1a	*Model 1a'*	*Model 1b*	*Model 1b'*
λ_{10-14}	Region Fixed Effects	No	Yes	No	Yes
n		1554	1547	1282	1282
Adj. R^2		0.48	0.48	0.52	0.52

		Model 1b	*Model 1b'*
$(DD = 0)$:	$H_0: \beta_1 + \beta_3 = 0$ vs. $H_1: \beta_1 + \beta_3 \neq 0$	$F(1{,}736) = 3.43$ $Pr > F = 0.03$	$F(1{,}727) = 2.72$ $Pr > F = 0.05$
$(DD = 1)$:	$H_0: \beta_1 + \beta_2 + \beta_3 + \beta_4 = 0$ vs. $H_1: \beta_1 + \beta_2 + \beta_3 + \beta_4 = 0 \neq 0$	$F(1{,}540) = 2.86$ $Pr > F = 0.05$	$F(1{,}531) = 3.40$ $Pr > F = 0.03$

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters.
All variables are calculated as defined in Table 10.

4.2 The Moderating Effects of Prior Period Sales, Price Changes, Labor Effort and Managerial Expectations (H1a-H1d)

Table 3 depicts regression results of model (2b) following the two-period model specification by Banker et al. (2014). In line with expectations, $\beta_1^{PInc} + \beta_3^{PInc} = 0.65$ is significantly greater than $\beta_1^{PDec} + \beta_3^{PDec} = 0.18$, with $\beta_3^{PInc}, \beta_3^{PDec} < 0$ (column four). However, the F-Test at the bottom of Table 3 shows that the magnitude of SG&A cost increases of companies facing restrictions in labor supply is not significantly different from the magnitude of SG&A cost increases of companies that operate without labor constraints. Inconsistent with H1a, it can therefore not be concluded that a decrease in the cost-to-sales ratio for companies reporting shortages in labor supply is merely a consequence of a reemployment of free capacity after a period of falling demand.

Except for the regression coefficient β_2^{PDec} which is insignificant, all other estimates are in line with results reported by Banker et al. (2014); i.e. $\beta_1^{PInc}, \beta_1^{PDec}, \beta_4^{PInc}, \beta_4^{PDec} > 0$ and $\beta_2^{PDec}, \beta_3^{PInc}, \beta_3^{PDec} < 0$.

Table 3: SG&A Cost Asymmetry Conditional on the Availability of Labor (H1a) (Two-Period Model)

Model (2a):

$$\Delta \text{lnSG\&A}_{\text{i,t}} = \beta_0 + I_{i,t-1}\left(\beta_1^{PInc} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PInc} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + D_{i,t-1}\left(\beta_1^{PDecr} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PDecr} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

Model (2b):

$$\Delta \text{lnSG\&A}_{\text{i,t}} = \beta_0 + I_{i,t-1}\left(\beta_1^{PInc} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PInc} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + D_{i,t-1}\left(\beta_1^{PDecr} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_2^{PDecr} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) + I_{i,t-1}\left(\beta_3^{PInc} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_4^{PInc} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot LIMITS_{i,t} + D_{i,t-1}\left(\beta_3^{PDecr} \cdot \Delta\text{lnSALES}_{\text{i,t}} + \beta_4^{PDecr} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}\right) \cdot LIMITS_{i,t} + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

Coeff.	Variable	Pred. Sign	*Model 2a* Estimate (t-statistic)	*Model 2a'* Estimate (t-statistic)	*Model 2b* Estimate (t-statistic)	*Model 2b'* Estimate (t-statistic)
β_1^{PInc}	$I_{i,t-1} \cdot \Delta\text{lnSALES}_{\text{i,t}}$	+	0.97*** (13.63)	0.97*** (12.75)	0.97*** (12.76)	0.96*** (11.86)
β_2^{PInc}	$I_{i,t-1} \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{\text{i,t}}$	-	-0.22** (-1.98)	-0.27** (-2.27)	-0.20** (-1.76)	-0.24** (-1.95)
β_1^{PDecr}	$D_{i,t-1} \cdot \Delta\text{lnSALES}_{\text{i,t}}$	+	1.02*** (19.99)	0.99*** (16.28)	0.98*** (20.42)	0.95*** (16.18)

Table 3 continued:

			Model 2a	*Model 2a'*	*Model 2b*	*Model 2b'*
β_2^{PDecr}	$D_{i,t-1} \cdot D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}}$	-	-0.29** (-1.92)	-0.31** (-1.94)	-0.18 (-1.15)	-0.18 (-1.08)
$\boldsymbol{\beta_3^{PInc}}$	$\boldsymbol{I_{i,t-1} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot LIMITS_{i,t}}$	-			**-0.32*** **(-1.57)**	**-0.31*** **(-1.48)**
$\boldsymbol{\beta_4^{PInc}}$	$\boldsymbol{I_{i,t-1} \cdot D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot LIMITS_{i,t}}$	+			**0.62**** **(2.45)**	**0.61**** **(2.36)**
$\boldsymbol{\beta_3^{PDecr}}$	$\boldsymbol{D_{i,t-1} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot LIMITS_{i,t}}$	-			**-0.79**** **(-1.8)**	**-0.77**** **(-1.66)**
$\boldsymbol{\beta_4^{PDecr}}$	$\boldsymbol{D_{i,t-1} \cdot D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot LIMITS_{i,t}}$	+			**1.63*** **(1.56)**	**1.70*** **(1.59)**
λ_1	$\Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot PRICE^{Inc}{}_{i,t}$			-0.24 (-1.21)		-0.08 (-0.37)
λ_2	$D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot PRICE^{Inc}{}_{i,t}$			0.14 (0.05)		-0.48 (-0.16)
λ_3	$\Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot PRICE^{Dec}{}_{i,t}$			0.15** (2.04)		0.16** (2.36)
λ_4	$D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot PRICE^{Dec}{}_{i,t}$			-0.09 (-0.68)		-0.11 (-0.88)
λ_5	$\Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot EXPEC^{Pos}{}_{i,t}$			-0.11 (-1.07)		-0.02 (-0.23)
λ_6	$D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot EXPEC^{Pos}{}_{i,t}$			0.28** (1.66)		0.02 (0.11)
λ_7	$\Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot EXPEC^{Neg}{}_{i,t}$			-0.06 (-0.58)		-0.10 (-0.95)
λ_8	$D_{i,t} \cdot \Delta \mathrm{lnSALES}_{\mathrm{i,t}} \cdot EXPEC^{Neg}{}_{i,t}$			0.26* (1.64)		0.36** (2.22)
λ_6	$PUBLIC_{i,t}$			0.01 (0.09)		0.03 (0.29)
λ_{10-14}	Region Fixed Effects		No	Yes	No	Yes
n			1220	1220	1064	1064
Adj. R^2			0.48	0.48	0.52	0.52

Table 3 continued:

		Model 2b	*Model 2b'*
$(DD = 0)$:	$H_0: \beta_1^{PInc} + \beta_1^{PDecr} + \beta_3^{PInc} + \beta_3^{PDecr} = 0$ vs. $H_1: \beta_1^{PInc} + \beta_1^{PDecr} + \beta_3^{PInc} + \beta_3^{PDecr} \neq 0$	$F(1{,}590) = 1.50$ $Pr > F = 0.11$	$F(1{,}581) = 1.31$ $Pr > F = 0.14$
$(DD = 1)$:	$H_0: \beta_1^{PInc} + \beta_2^{PInc} + \beta_1^{PDecr} + \beta_2^{PDecr} + \beta_3^{PInc} + \beta_4^{PInc} + \beta_3^{PDecr} + \beta_4^{PDecr} = 0$ vs. $H_1: \beta_1^{PInc} + \beta_2^{PInc} + \beta_1^{PDecr} + \beta_2^{PDecr} + \beta_3^{PInc} + \beta_4^{PInc} + \beta_3^{PDecr} + \beta_4^{PDecr} \neq 0$	$F(1{,}464) = 1.21$ $Pr > F = 0.15$	$F(1{,}455) = 1.22$ $Pr > F = 0.15$

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters.
All variables are calculated as defined in Table 10.

In agreement with H1b, column two in Table 4 shows that the mechanism through which a relative decrease in the SG&A cost-to-sales ratio is realized can be partially ascribed to price increases as a reaction to supply shortages. β_3(=-0.34) is marginally significant for firms that increased prices. Interestingly however, this is also the case for companies that did not change selling prices. As shown in the third column of Table 4, β_3 is still significantly negative with -0.42. Thus, selling price increases can only partially explain a lower increase in SG&A costs relative to sales for companies facing restrictions in labor supply than for companies operating with sufficient labor capacity.

Table 4: SG&A Cost Asymmetry Conditional on the Availability of Labor and Price Changes (H1b)

Model (1b): $\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_1 \cdot \Delta \ln SALES_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} + (\beta_3 \cdot \Delta \ln SALES_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}) \cdot LIMITS_{i,t} + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$

Coeff.	Variable	Pred. Sign	*Price Decrease* Estimate (t-statistic)	*Price Increase* Estimate (t-statistic)	*No Price Change* Estimate (t-statistic)	*No Price Change or Price Increase* Estimate (t-statistic)	*No Price Change or Price Decrease* Estimate (t-statistic)
β_1	$\Delta \ln SALES_{i,t}$	+	0.84*** (7.44)	0.74** (2.12)	0.93*** (18.33)	0.93*** (18.67)	0.92*** (19.75)
β_2	$D_{i,t} \cdot \Delta \ln SALES_{i,t}$	-	0.05 (0.23)	-0.31 (-0.64)	-0.20** (-2.05)	-0.21** (-2.16)	-0.17** (-1.83)
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta \ln SALES_{i,t} \cdot LIMITS_{i,t}}$	-	**0.25 (0.68)**	**-0.34* (-1.41)**	**-0.42** (-2.34)**	**-0.44** (-2.98)**	**-0.34** (-2.10)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t}}$	+	**0.08 (0.18)**	**0.32 (0.73)**	**0.74** (2.98)**	**0.76** (3.48)**	**0.64** (2.85)**
λ_1	$\Delta \ln SALES_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$		-0.09 (-0.42)	0.39 (1.13)	0.06 (0.58)	0.05 (0.54)	0.08 (0.77)
λ_2	$D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$		0.53** (1.69)	0.19 (0.39)	-0.16 (-1.08)	-0.13 (-0.95)	-0.15 (-1.06)
λ_3	$\Delta \ln SALES_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$		0.15 (0.99)		-0.14 (-1)	-0.14 (-0.96)	0.03 (0.34)
λ_4	$D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$		-0.06 (-0.28)		0.45** (2.13)	0.45** (2.12)	0.21* (1.58)
λ_5	$PUBLIC_{i,t}$		-0.13 (-0.56)		0.10 (1.19)	0.10 (1.18)	0.06 (0.62)
λ_6-λ_{10}	Region Fixed Effects		Yes	Yes	Yes	Yes	Yes
n			237	44	989	1033	1226
Adj. R^2			0.57	0.47	0.50	0.50	0.51

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters. All variables are calculated as defined in Table 10.

Building on the labor hoarding concept (Hamermesh 1993; Oi 1962), this finding suggests that firms who are unable to hire new employees temporarily cope with rising demand by exerting more effort instead of building up capacity. Similar to employees decreasing effort as a result of labor hoarding when demand falls, managers and administrative staff are inclined to work longer, reduce breaks and increase task efficiency when demand is high. Even though labor effort is not directly observable, differences in personnel expenses per employee presented in Table 5 provide support for this inference. The average amount of personnel expenses per employee is significantly smaller for companies facing limits in labor supply during sales increases, whereas the difference for firms with sufficient labor capacity is nearly equal and insignificant for sales decreases.

Personnel expenses represent the entire remuneration a company pays to its employees. Next to salaries, these expenses include holiday payments, pension contribution, and health insurance but also overtime premiums. Firms initially react by increasing hours per employee instead of hiring additional staff to avoid investments in the training and recruiting of extra people (Hamermesh 1993; Oi 1962). Increasing working hours is not without costs nonetheless. The average overtime premium in Denmark lies between 150 percent and 200 percent of the hourly wage plus overtime premiums.[44] However, as long as the marginal costs of hiring an additional employee dominates the marginal wage rate, companies will choose to comply with increasing demand without employing more people (Bentolila and Bertola 1990). The increase in personnel expenses through a rise in overtime payment consequently intensifies the level of cost stickiness because costs increase to a greater extent for a rise in demand than for a fall in demand. Nevertheless, the possibility to comply with strong macroeconomic growth by working overtime is restricted to a maximum number of hours per person. Moreover,

[44] See https://www.cfe-eutax.org/taxation/labor-law/denmark.

overtime is often not paid to general management or higher-level employees whose salaries would be included in SG&A costs. Thus, construction companies that are restricted in labor supply are likely to have reached the limit of overtime hours and might react by leveraging existing capacity and allocating more projects to existing employees. Consequently, an increase in SG&A costs per one percent increase in sales is not be reflected in an increase in personnel expenses of companies operating in tight labor markets.

Table 5: Ratio of Personnel Expenses per Employee (H1c)

	No Limits in Labor	Limits in Labor	t-test for Difference
Personnel expenses in thousand DKK per employee (all observations):	187.09	159.00	***
Personnel expenses in thousand DKK per employee (sales increases):	210.22	169.88	***
Personnel expenses in thousand DKK per employee (sales decreases):	155.68	141.78	

*,**,*** Indicate two-sided significance at the 10, 5, and 1 percent levels, respectively.

Table 6 depicts regression results estimated separately for companies where managers indicated pessimistic expectations (column one), neutral expectations (column two) or optimistic expectations (column three) with respect to future sales. Data on managers' expectations are obtained from the business and consumer survey conducted by Denmark Statistics.[45] Contrary to H1d, β_4 is not significantly positive for managers with pessimistic expectations. Even though this result could be ascribed to a lack of statistical power because of a low number of observations, β_4 is significant and positive

[45] http://www.dst.dk/en/

for firms with managers that do not expect demand to change in the future (third column). Thus, a decrease in cost stickiness when labor is scarce cannot be ascribed to heavy cost cutting initiates through managers that expect a long-term decline of sales in the future.

Collectively, these results indicate that firms increase labor productivity as well as selling prices when they face restrictions in labor supply.

Table 6: SG&A Cost Asymmetry Conditional on Availability of Labor and Future Sales Expectations (H1d)

Model (1b): $\Delta \text{lnSG\&A}_{i,t} = \beta_0 + \beta_1 \cdot \Delta \text{lnSALES}_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} + (\beta_3 \cdot \Delta \text{lnSALES}_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \text{lnSALES}_{i,t}) \cdot LIMITS_{i,t} + \sum_1^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$

Coeff.	Variable	Pred. Sign	*Pessimistic Expectations* Estimate (t-statistic)	*Optimistic Expectations* Estimate (t-statistic)	*Neutral Expectations* Estimate (t-statistic)	*Neutral Expectations or Optimistic Expectations* Estimate (t-statistic)	*Neutral Expectations or Pessimistic Expectations* Estimate (t-statistic)
β_1	$\Delta \text{lnSALES}_{i,t}$	+	0.75*** (4.36)	0.92*** (6.87)	0.93*** (18.29)	0.92*** (19.4)	0.91*** (18.62)
β_2	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t}$	-	0.25 (0.81)	-0.15 (-0.58)	-0.19** (-1.89)	-0.18** (-2)	-0.14* (-1.48)
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta \text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	-	**-5.30 (-0.92)**	**-0.08 (-0.3)**	**-0.43** (-2.36)**	**-0.29** (-1.97)**	**-0.47** (-2.62)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	+	**6.46 (1.11)**	**0.13 (0.4)**	**0.72** (2.77)**	**0.52** (2.58)**	**0.85** (3.34)**
λ_1	$\Delta \text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			-0.42 (-1.29)	-0.54* (-1.45)	-0.34* (-1.46)	-0.51* (-1.36)
λ_2	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			3.77 (1.00)	-1.75 (-0.43)	-0.32 (-0.11)	-2.15 (-0.54)
λ_3	$\Delta \text{lnSALES}_{i,t} \cdot PRICE^{Dec}{}_{i,t}$		0.26* (1.53)	0.09 (0.35)	-0.01 (-0.06)	0.00 (-0.05)	0.05 (0.63)
λ_4	$D_{i,t} \cdot \Delta \text{lnSALES}_{i,t} \cdot PRICE^{Dec}{}_{i,t}$		-0.38* (-1.44)	0.35 (1.25)	0.06 (0.39)	0.08 (0.59)	0.03 (0.29)
λ_5	$PUBLIC_{i,t}$			-0.32*** (-7.21)	0.11 (1.13)	0.07 (0.71)	0.09 (0.96)
λ_6-λ_{10}	Region Fixed Effects		Yes	Yes	Yes	Yes	Yes
n			146	129	1002	1131	1148
Adj. R^2			0.59	0.58	0.50	0.50	0.51

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters. All variables are calculated as defined in Table 10.

4.3 SG&A Cost Behavior Conditional on Two Subsequent Periods of Labor Shortage (H2)

H2 predicts that the difference in SG&A cost behavior between firms reporting limits in labor availability and firms not reporting limits in labor availability shrinks with the length of the labor supply shock. In line with expectations, Table 7 shows that β_4 is significantly positive and β_6 is significantly negative. Thus, firms experiencing two periods of restricted labor availability have higher cost stickiness than firms for which the supply shock dissolves quickly.

Table 7: SG&A Cost Asymmetry Conditional on Current and Prior Labor Availability (H2)

Model (3):

$$\Delta \text{lnSG\&A}_{i,t} = \beta_0 + \beta_1 \cdot \Delta\text{lnSALES}_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} + \left(\beta_3 \cdot \Delta\text{lnSALES}_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{i,t}\right) \cdot LIMITS_{i,t} + \left(\beta_5 \cdot \Delta\text{lnSALES}_{i,t} + \beta_6 \cdot D_{i,t} \cdot \Delta\text{lnSALES}_{i,t}\right) \cdot LIMITS_{i,t} \cdot LIMITS_{i,t-1} + \sum_{1}^{14} \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

Coeff.	Variable	Pred. Sign	*Model 3* Estimate (t-statistic)	*Model 3'* Estimate (t-statistic)
β_1	$\Delta\text{lnSALES}_{i,t}$	+	0.97*** (24.71)	0.95*** (20.32)
β_2	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t}$	-	-0.17** (-2.11)	-0.19** (-2.07)
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta\text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	-	**-0.57** (-3.42)**	**-0.51** (-3.08)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot LIMITS_{i,t}}$	+	**0.97** (3.19)**	**0.91** (2.87)**
$\boldsymbol{\beta_5}$	$\boldsymbol{\Delta\text{lnSALES}_{i,t} \cdot LIMITS_{i,t} \cdot LIMITS_{i,t-1}}$	+	**0.51** (1.78)**	**0.60** (2.10)**
$\boldsymbol{\beta_6}$	$\boldsymbol{D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot LIMITS_{i,t} \cdot LIMITS_{i,t-1}}$	-	**-0.69* (-1.48)**	**-0.73* (-1.53)**
λ_1	$\Delta\text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			-0.39* (-1.42)
λ_2	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot PRICE^{Inc}{}_{i,t}$			-0.31 (-0.11)

Table 7 continued:

		Model 3	*Model 3'*
λ_3	$\Delta \text{lnSALES}_{\text{i,t}} \cdot PRICE^{Dec}{}_{i,t}$		0.10* (1.62)
λ_4	$D_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} \cdot PRICE^{Dec}{}_{i,t}$		-0.05 (-0.46)
λ_5	$\Delta \text{lnSALES}_{\text{i,t}} \cdot EXPEC^{Pos}{}_{i,t}$		0.01 (0.12)
λ_6	$D_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} \cdot EXPEC^{Pos}{}_{i,t}$		-0.05 (-0.35)
λ_7	$\Delta \text{lnSALES}_{\text{i,t}} \cdot EXPEC^{Neg}{}_{i,t}$		0.03 (0.33)
λ_8	$D_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} \cdot EXPEC^{Neg}{}_{i,t}$		0.18* (1.35)
λ_9	$PUBLIC_{i,t}$		-0.04 (-0.46)
λ_{10-14}	Region Fixed Effects	No	Yes
n		1163	1163
Adj. R^2		0.58	0.58

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters.
All variables are calculated as defined in Table 10.

4.4 The Interplay between Labor Supply Shortages and Geographical Location of Firms (H3)

Estimation results of model 3 are displayed in Table 8. In accordance with H3, North and South Denmark are the regions with the smallest population and therefore are more strongly affected by a tightening labor market than other areas in Denmark. Companies located in North and South Denmark have a significantly lower SG&A cost stickiness (or higher anti-stickiness) than companies located around the capital and in Central Denmark. The respective regression coefficients are positive and significant with $\beta_5^{North} + \beta_5^{South} = \frac{(0.96+1.21)}{2} = 1.1$ compared to $\beta_5^{Capital} + \beta_5^{Central} = \frac{(0.61+0.59)}{2} = 0.6$.

The sequence according to population size is not as clear, however. For instance, construction firms in South Denmark exhibit the highest degree of SG&A cost anti-stickiness even though North Denmark has fewer citizens. These differences may arise considering that population density is unlikely to be a perfect representation of the potential labor market for construction companies.

Table 8: SG&A Cost Asymmetry Conditional on the Availability of Labor Differentiated by Geographical Region (H3)

Model (4): $$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_1 \cdot \Delta \ln SALES_{i,t} + \beta_2 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} + (\beta_3 \cdot \Delta \ln SALES_{i,t} + \beta_4 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t}) \cdot LIMITS_{i,t} + \beta_5 \cdot D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot \sum_1^4 REGION_{i,t} + \sum_1^9 \lambda \cdot Controls_{i,t} + \varepsilon_{i,t}$$

Coeff.	Variable	Pred. Sign	*Model 4* Estimate (t-statistic)	*Model 4'* Estimate (t-statistic)
β_1	$\Delta \ln SALES_{i,t}$	+	0.93*** (21.96)	0.92*** (19.04)
β_2	$D_{i,t} \cdot \Delta \ln SALES_{i,t}$	-	-0.15** (-1.79)	-0.19** (-2.03)
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta \ln SALES_{i,t} \cdot LIMITS_{i,t}}$	-	**-0.36** (-2.71)**	**-0.33** (-2.35)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t}}$	+	**-0.02 (-0.06)**	**-0.01 (-0.02)**
$\boldsymbol{\beta_5}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot REGION^{Capital}_{i,t}}$	+	**0.63* (1.58)**	**0.61* (1.52)**
$\boldsymbol{\beta_5}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot REGION^{Central}_{i,t}}$	+	**0.62* (1.46)**	**0.59* (1.44)**
$\boldsymbol{\beta_5}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot REGION^{North}_{i,t}}$	+	**0.96** (2.58)**	**0.96** (2.56)**
$\boldsymbol{\beta_5}$	$\boldsymbol{D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot LIMITS_{i,t} \cdot REGION^{South}_{i,t}}$	+	**1.17** (1.82)**	**1.21** (1.9)**
λ_1	$\Delta \ln SALES_{i,t} \cdot PRICE^{Inc}_{i,t}$			-0.35* (-1.47)
λ_2	$D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot PRICE^{Inc}_{i,t}$			0.31 (0.1)
λ_3	$\Delta \ln SALES_{i,t} \cdot PRICE^{Dec}_{i,t}$			0.04 (0.5)
λ_4	$D_{i,t} \cdot \Delta \ln SALES_{i,t} \cdot PRICE^{Dec}_{i,t}$			0.01 (0.05)

Table 8 continued:

		Model 4	*Model 4'*
λ_5	$\Delta\text{lnSALES}_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$		0.10 (1.02)
λ_6	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot EXPEC^{Pos}{}_{i,t}$		-0.16 (-1.17)
λ_7	$\Delta\text{lnSALES}_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$		0.00 (-0.01)
λ_8	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot EXPEC^{Neg}{}_{i,t}$		0.23* (1.58)
λ_9	$PUBLIC_{i,t}$		0.02 (0.17)
n		1282	1282
Adj. R^2		0.52	0.52

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels, respectively. T-statistics are calculated based on firm and time clusters. All variables are calculated as defined in Table 10.

5 Robustness Checks

This section addresses potential concerns with respect to the robustness of presented results. For the sake of brevity, regression estimates are not tabulated but available on request.

5.1 Alternative Measure of Labor Supply

To validate previous empirical results with respect to self-reported shortages in labor supply, main analyses are repeated using an alternative measure. This measure captures the variation in the mean level of employment in the construction industry as a percentage of overall employment in Denmark. In line with the theoretical reasoning, it is expected that if the level of employment rises (or unemployment falls), it is more difficult for companies to find and recruit potential employees. This trend reflects an increase in upward adjustment costs, which reduces cost stickiness. Results are robust when subjected to the alternative measure ($EMPLOY_t$).

5.2 Heterogeneity of Firms

The cross-sectional approach of this study entices the question whether the observation of anti-sticky SG&A costs arises due to restricted labor availability and the presumed increase in adjustment costs or the selection of companies that are more reluctant to build up resources irrespective of variations in labor supply. To rebut this concern, main analyses tested using models 1b and 2b are repeated based on a sample that contains only observations of companies that at least once over the entire time period indicated shortages in labor supply. Thus, firms that never reported labor supply shortages are excluded from the sample. Results continue to show that companies operating in tight labor markets exhibit significantly lower cost stickiness or even anti-sticky SG&A costs.

5.3 Substitution of Labor through Capital

Because depreciation can lead to spurious findings of asymmetric cost behavior (Shust and Weiss 2014), SG&A costs are calculated without including depreciation expenses. This can however be a challenge in identifying anti-stickiness if firms substitute labor through capital that is depreciated over time. In this case, a positive and significant regression coefficient for deceases in sales would reflect an increase in labor productivity due to an intensification of capital relative to labor and not a higher work load of current employees. Notably, Banker et al. (2014) also indicate that a change in labor productivity may explain findings inconsistent with their predictions.[46] To rule out this explanation, H1 is tested by regressing the

[46] "This does not mean that all cost categories are automatically expected to be sticky (anti-sticky) on average whenever a sample is dominated by prior sales increases (decreases). For example, if increases in labor productivity outpace average sales growth,

change in SG&A costs on the change in sales moderated by the dummy variable $LIMITS_{i,t}$ as well as asset and employee intensity.[47] Results show that the level of cost stickiness is still significantly lower for companies facing restrictions in labor supply. Hence, previous findings are unlikely to be driven by a substitution of labor through capital.

6 Conclusion

To summarize, this paper shows that a limited supply of labor can lead to an increase in adjustment costs, which induces a reduction in SG&A cost stickiness or even anti-sticky costs. Prior research does not establish a link between supply dynamics and the asymmetric change in SG&A resources. Rather, anti-stickiness is explained by examining managerial sales expectations and variations in selling prices irrespective of the underlying functional shape of adjustment costs.

Building on a sample of Danish construction firms, findings document that companies are more willing to increase selling prices if they face shortages in labor supply during periods of high demand. Moreover, results suggest that the scarcity of skilled labor partially induces contractors to comply with strong demand by leveraging current capacity and allocating more projects to available employees. Consequently, sales generated per DKK of SG&A costs are relatively higher for companies facing limits in labor supply. The effects are reversed after two years of consecutive labor shortage because firms have more time to establish contractual arrangements and expand their search for suitable employees.

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then labor resources can exhibit anti-stickiness on average even when prior sales increases in the data outweigh prior sales decreases." (Banker et al. 2014, p. 230).

[47] Asset and employee intensity are calculated as the logarithm of total assets to sales and the logarithm of the total number of employees to sales (Table 10).

Overall, this paper shows that a rise in adjustment costs can explain a significant reduction in cost stickiness irrespective of prior period sales decreases and despite optimistic managerial sales expectations.

Besides the limited generalizability due to the specific framing of this study, the conditions under which SG&A cost behavior is observed are likely to occur in other industries and countries as well. Hence, it is suggested that prospective studies acknowledge changes in adjustment costs due to supply shortages in a dynamic model that distinguishes variations in demand over time. Measurement of these effects may help to improve decision-making using methods that strongly depend on the accuracy of cost information.

Nevertheless it should be considered that this study focuses on the behavior of SG&A costs without examining individual components of these costs. Labor supply shortages might affect companies differently however, depending on the hierarchical positioning of vacancies and qualifications required from potential new employees. Insufficient labor capacity for specific types of employees can additionally affect other personnel, such as construction workers whose wages are not included in SG&A costs. A separate analysis of different cost categories at a more granular level and an unraveling of interdependencies offer a valuable approach for future research.

7 References

Acemoglu, D. 1996. A Microfoundation for Social Increasing Returns in Human Capital Accumulation. *The Quarterly Journal of Economics* 111 (3): 779-804.

Akram, Q., and R. Nymoen. 2006. Econometric Modelling of Slack and Tight Labour Markets. *Economic Modelling* 23 (4): 579-596.

Anderson, M., R. Banker, R. Huang, and S. Janakiraman. 2007. Cost Behavior and Fundamental Analysis of SG&A Costs. *Journal of Accounting, Auditing & Finance* 22 (1): 1-28.

Anderson, M., R. Banker, and S. Janakiraman. 2003. Are Selling, General, and Administrative Costs "Sticky"?. *Journal of Accounting Research* 41 (1): 47-63.

Balakrishnan, R., and T. Gruca S. 2008. Cost Stickiness and Core Competency: A Note. *Contemporary Accounting Research* 25 (4): 993-1006.

Balakrishnan, R., M. Petersen, and N. Soderstrom. 2004. Does Capacity Utilization Affect the Stickiness of Cost?. *Journal of Accounting, Auditing & Finance* 19 (3): 283-300.

Balakrishnan, R., E. Labro, and N. Soderstrom. 2014. Cost Structure and Sticky Costs. *Journal of Management Accounting Research* 26 (2): 91-116.

Banker, R., S. Basu, D. Byzalov, and J. Chen. 2016. The Confounding Effect of Cost Stickiness on Conservatism Estimates*. Journal of Accounting and Economics* 61 (1): 203-220.

Banker, R., D. Byzalov, and L. Chen. 2013. Employment Protection Legislation, Adjustment Costs and Cross-Country Differences in Cost Behavior*. Journal of Accounting and Economics* 55 (1): 111-127.

Banker, R., Byzalov, D. and Threinen, L. 2013. *Determinants of International Differences in Asymmetric Cost Behavior.* Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R. and Fang, S. 2013. *Loan Financing and Real Cost Management.* Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and D. Byzalov. 2014. Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 43-79.

Banker, R., D. Byzalov, M. Ciftci, and R. Mashruwala. 2014. The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 221-242.

Banker, R., D. Byzalov, and J. Plehn-Dujowich. 2014. Demand Uncertainty and Cost Behavior*. The Accounting Review* 89 (3): 839-865.

Banker, R., Fang, S. and Metha, M. 2013. *Anomalous Financial Performance Ratios during Economic Downturns*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and H. Johnston. 2006. Cost and Profit Driver Research. *Handbooks of Management Accounting Research* 2: 531-556.

Baumgarten, D., U. Bonenkamp, and C. Homburg. 2010. The Information Content of the SG&A Ratio. *Journal of Management Accounting Research* 22: 1-22.

Bentolila, S., and G. Bertola. 1990. Firing Costs and Labour Demand: How Bad is Eurosclerosis?. *The Review of Economic Studies* 57 (3): 381-402.

Biddle, J. E. 2014. Retrospectives: The Cyclical Behavior of Labor Productivity and the Emergence of the Labor Hoarding Concept. *The Journal of Economic Perspectives* 28 (2): 197-211.

Blanchard, O. 2011. *Macroeconomics*. Boston: Pearson Education.

Calleja, K., M. Steliaros, and D. Thomas. 2006. A Note on Cost Stickiness: Some International Comparisons. *Management Accounting Research* 17 (2): 127-140.

Cannon, J. 2014. Determinants of ''Sticky Costs'': An Analysis of Cost Behavior using United States Air Transportation Industry Data. *The Accounting Review* 89 (5): 1645-1672.

Chen, C., Gores, T. and Nasev, J. 2013. *Managerial Overconfidence and Cost Stickiness*. Working paper, University of Cologne, Cologne.

Chen, C., H. Lu, and T. Sougiannis. 2012. The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research* 29 (1): 252-282.

Chen, J., Kama, I. and Lehavy, R. 2015. *Management Expectations and Asymmetric Cost Behavior*. Working paper, University of Michigan - Stephen M. Ross School of Business, Ann Arbor.

Ciftci, M., R. Mashruwala, and D. Weiss. 2016. Implications of Cost Behavior for Analysts' Earnings Forecasts. *Journal of Management Accounting Research* 28 (1): 57-80.

Cooper, R., and J. Haltiwanger. 2006. On the Nature of Capital Adjustment Costs. *The Review of Economic Studies* 73 (3): 611-633.

Dierynck, B., W. Landsman, and A. Renders. 2012. Do Managerial Incentives Drive Cost Behavior? Evidence About the Role of the Zero Earnings

Benchmark for Labor Cost Behavior in Private Belgian firms. *The Accounting Review* 87 (4): 1219-1246.

European Commission. 2014. The Joint Harmonised EU Programme of Business and Consumer Surveys.

Glaeser, E., and D. Mare. 2001. Cities and Skills. *Journal of Labor Economics* 19 (2): 316-342.

Hamermesh, D. 1989. Labor Demand and the Structure of Adjustment Costs. *The American Economic Review* 79 (4): 674-689.

Hamermesh, D., and G. Pfann. 1996. Adjustment Costs in Factor Demand. *Journal of Economic Literature* 34 (3): 1264-1292.

Hamermesh, D. 1993. *Labor Demand.* Princeton, N.J.: Princeton University Press.

Helsley, R., and W. Strange. 1990. Matching and Agglomeration Economies in a System of Cities. *Regional Science and Urban Economics* 20 (2): 189-212.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015a. The Impact of Changes in Regulation on Cost Behavior. *Contemporary Accounting Research* 32 (2): 534-566.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015b. Unraveling the Black Box of Cost Behavior: An Empirical Investigation of Risk Drivers, Managerial Resource Procurement, and Cost Elasticity. *The Accounting Review* 90 (6): 2305-2335.

Jaramillo, F., F. Schiantarelli, and A. Sembenelli. 1993. Are Adjustment Costs for Labor Asymmetric? An Econometric Test on Panel Data for Italy. *The Review of Economics and Statistics* 75 (4): 640-648.

Kama, I., and D. Weiss. 2013. Do Earnings Targets and Managerial Incentives Affect Sticky Costs?. *Journal of Accounting Research* 51 (1): 201-224.

Noreen, E. 1991. Conditions under which Activity-Based Cost Systems provide Relevant Costs. *Journal of Management Accounting Research* 3 (4): 159-168.

Oi, W. Y. 1962. Labor as a Quasi-Fixed Factor. *Journal of Political Economy* 70 (6): 538-555.

Pfann, G., and F. Palm. 1993. Asymmetric Adjustment Costs in Non-linear Labour Demand Models for the Netherlands and U.K. Manufacturing Sectors. *The Review of Economic Studies* 60 (2): 397-412.

Pfann, G., and B. Verspagen. 1989. The Structure of Adjustment Costs for Labour in the Dutch Manufacturing Sector. *Economics Letters* 29 (4): 365-371.

Popescu, C., K. Phaobunjong, and N. Ovararin. 2003. *Estimating building costs*. New York: Marcel Dekker.

Shust, E., and D. Weiss. 2014. Asymmetric Cost Behavior - Sticky Costs: Expenses versus Cash Flows. *Journal of Management Accounting Research* 26 (2): 81-90.

Venieris, G., V. Naoum, and O. Vlismas. 2015. Organisation Capital and Sticky Behaviour of Selling, General and Administrative Expenses. *Management Accounting Research* 26: 54-82.

Weidenmier, M., and C. Subramaniam. 2016. Additional Evidence on the Sticky Behavior of Costs. In *Advances in Management Accounting*, eds. M. Epstein, and M. Malina, 275-305. Bingley: Emerald Group Publishing Limited.

Weiss, D. 2010. Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review* 85 (4): 1441-1471.

8 Appendix

Table 9: Excerpt from the questionnaire for construction companies participating in the Joint Harmonized EU Program of Business and Consumer Surveys

Expression	Question	Answer possibilities
Expectations	How do you expect your building activity (sales) to change over the next three months?	• Increase • Remained Unchanged • Deteriorate
Limiting factors	What main factors are currently limiting your building activity?	• none • insufficient demand • weather conditions • shortage of labor force • shortage of material and/or equipment • financial constraints • other factors
Prices	How did the prices you charged change over the past three months?	• Increased • Remained Unchanged • Deteriorated
Order backlog in months	Assuming normal working hours, about how many months' work is accounted for by the work in hand and the work already contracted for?	Number of months

Table 10: Variable Definition

Variable Name	Description	Calculation
$ASSETINT_{i,t}$	Log-Ratio of total assets to operating sales	$log\left[\frac{Total\ Assets_{i,t}}{Sales_{i,t}}\right]$
$D_{i,t}$	Dummy variable for sales decreases between t-1 and t.	$\begin{cases}1\ if\ Sales_{i,t} < Sales_{i,t-1}\\ 0\ \ if\ Sales_{i,t} \geq Sales_{i,t-1}\end{cases}$
$D_{i,t-1}$	Dummy variable for sales decreases between t-2 and t-1.	$\begin{cases}1\ if\ Sales_{i,t-1} < Sales_{i,t-2}\\ 0\ \ if\ Sa\ \ \ es_{i,t-1} \geq Sales_{i,t-2}\end{cases}$
$EMPCO_{i,t}$	Log-ratio of personnel expenses to operating sales.	$log\left[\frac{Empco_{i,t}}{Operating\ sales_{i,t}}\right]$
$EMPINT_{i,t}$	Log-ratio of the total number of employees to operating sales	$log\left[\frac{Employees_{i,t}}{Sales_{i,t}}\right]$
$EMPLOY_t$	Mean level of employment in the construction industry divided by total employment in Denmark	$\frac{Mean[Employees]_{t,Industry}}{Total[Employees]_{t,DK}} \cdot 1000$
${EXPEC^{Neg}}_{i,t}$	Dummy variable for pessimistic (negative) future sales expectations according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases}1\ if\ Median[Expectations] = \text{"}Deteriorated\text{"}\\ 0\ if\ else\end{cases}$
${EXPEC^{Pos}}_{i,t}$	Dummy variable for optimistic (positive) future sales expectations according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases}1\ if\ Median[Expectations] = \text{"}Increased\text{"}\\ 0\ if\ else\end{cases}$

$I_{i,t-1}$	Dummy variable for sales increases between t-2 and t-1.	$\begin{cases} 1 \text{ if } Sales_{i,t-1} > Sales_{i,t-2} \\ 0 \text{ if } Sales_{i,t-1} \leq Sales_{i,t-2} \end{cases}$
$LIMITS_{i,t}$	Dummy variable for limits in the availability of labor according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases} 1 \text{ if labor in } t \text{ is limited} \\ 0 \text{ if else} \end{cases}$
$LIMITS_{i,t-1}$	Dummy variable for prior period limits in the availability of labor according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases} 1 \text{ if labor in } t-1 \text{ is limited} \\ 0 \text{ if else} \end{cases}$
$PRICE^{Dec}{}_{i,t}$	Dummy variable for price decreases according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases} 1 \text{ if } Median[Prices] = \text{"Deteriorated"} \\ 0 \text{ if else} \end{cases}$
$PRICE^{Inc}{}_{i,t}$	Dummy variable for price increases according to the assessment of construction companies, annualized based on the median of monthly answers.	$\begin{cases} 1 \text{ if } Median[Prices] = \text{"Increased"} \\ 0 \text{ if else} \end{cases}$
$PUBLIC_{i,t}$	Dummy variable if the company is public.	$\begin{cases} 1 \text{ if public} \\ 0 \text{ ifelse} \end{cases}$
$REGION_{i,t}$	Dummy variable for each of the five main geographical regions in Denmark.	
$\Delta lnSALES_{i,t}$	Log-change in sales between t and t-1.	$log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right]$
$\Delta lnSG\&A_{i,t}$	Log-change in SG&A costs between t and t-1.	$log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$

D PAPER III

Price Changes, Resource Adjustments and Rational Expectations

Abstract:

This study investigates the relationship between the accuracy of managerial demand expectations, resource adjustment decisions and selling price changes. In line with rational expectation theory, it is argued that managers adjust resources and selling prices differently in response to expected compared to unexpected demand shocks. The association is tested using the empirical concept of cost stickiness. Cost stickiness arises as a consequence of asymmetric resource or price adjustments. Resource and price adjustments are termed asymmetric if the magnitude of change is different for increases compared to decreases in activity.

Based on a longitudinal dataset of 1,677 private and public companies in Denmark, this paper shows that asymmetric resource adjustments are associated with unforeseen negative demand shocks. Cost stickiness due to asymmetric price adjustments however result from a decrease in prices through managers that anticipated the drop in demand and proactively lower selling prices and cut resources. Moreover, this study provides evidence for the moderating effect of managerial forecast accuracy on the relationship between demand uncertainty and cost elasticity. Findings show that cost elasticity is higher when a demand decrease is expected among companies with similar exposure to demand uncertainty. Overall, this implies that managerial competences in predicting future demand significantly determines firms' profitability; especially when demand uncertainty is high or macroeconomic growth is declining.

Keywords: Cost Stickiness, Resource Adjustment Costs, Rational Expectations, Managerial Decision-Making, Slippery Prices, Demand Uncertainty.

JEL Classifications: D24; M41; P22.

1 Introduction

The heated debate around the cost stickiness phenomenon highlights the need for more empirical research on cost behavior (Balakrishnan, Labro, and Soderstrom 2014; Banker and Byzalov 2014). Whereas traditional cost models assume that cost behavior can be approximated by a linear function between total cost and the level of activity (Horngren 2015; Noreen 1991), recent studies show that costs move differently in response to positive compared to negative changes in their driver. Specifically, costs are found to be sticky if the change in costs is greater for activity increases than for equivalent activity decreases (Anderson, Banker, and Janakiraman 2003; Anderson et al. 2007; Balakrishnan, Petersen, and Soderstrom 2004; Balakrishnan and Gruca 2008; Chen, Lu, and Sougiannis 2012; Dierynck, Landsman, and Renders 2012; Weiss 2010). In light of the cost stickiness literature, this study investigates the association between the accuracy of managers' demand expectations, resource adjustment decisions and selling price changes. Expectation accuracy captures the degree to which managers' beliefs about future demand coincides with the actual path of demand.

To understand how managers adjust resources and prices, the effect of managerial expectation accuracy on the degree of cost stickiness is examined. By doing so, it is possible to disentangle observed cost stickiness from merely price effects. Sticky costs can be ascribed to asymmetric resource or price adjustments or cases in which the marginal costs for adding capacity when demand grows are greater than marginal costs for adding capacity when demand falls (Cannon 2014). Thus, the application of the cost stickiness concept allows examining the simultaneous adjustment of resources and selling prices by assuming that these decisions do not only depend on managers' expectations about future demand but also on the ex-post accuracy of their expectations.

Using data from a Danish business survey and financial statement line items, this paper predicts and finds that cost stickiness decreases with increasing managerial expectation accuracy. The unique dataset provides several advantages. Most importantly, the survey contains information on managers' expectations about future demand, actual demand development and price changes. This allows for the construction of an empirical measure of expectation accuracy that does not require the aggregation of observations across years. Instead, management expectations and actual demand are compared on a monthly basis for each company. In addition, the incorporation of selling price changes as an endogenous variable circumvents some empirical design weaknesses in prior studies and provides evidence that cost stickiness can arise through asymmetric price adjustments when a decrease in demand is expected (Anderson and Lanen 2009; Cannon 2014). Another advantage of the dataset is that potential biases of empirical estimates due to information asymmetry or goal incongruence are mitigated because almost all the companies in the sample are privately owned (Chen, Lu, and Sougiannis 2012).

The analyses within the frame of this study build on the theoretical notion that firms react differently to expected compared to unexpected changes in demand (Hamermesh 1993). The difference is less pronounced for positive demand shocks because the exploitation of slack capacity and overtime work provides firms with a flexible option to react to increasing demand. The reverse however, reacting to an economic downturn by cutting resources, is generally more difficult e.g., due to employee protection laws or company reputation (Banker, Byzalov, and Threinen 2013; Bentolila and Bertola 1990). Hence, managers who anticipate a fall in demand try to avoid losses and react early by cutting costs and reducing capacity before the shock occurs. But if the change in demand is unexpected, the firm cannot pre-adjust to the actual drop in demand. Rather than proactively preparing the company for a decrease in demand, these firms adapt capacity and selling prices only after the shock occurred initially. Thus, the value of deriving implications for resource adjustments is gained from interpreting cost behavior as a consequence of deliberate decision-making in conjunction with the extent to which managers' sales expectations coincide with the actual path of demand. To do so, the following analysis comprises three steps.

The first part investigates how cost stickiness varies due to resource adjustments that differ depending on the degree to which managers correctly anticipate future demand. Building on the empirical model suggested by Anderson et al. (2003), the magnitude of cost stickiness is measured as the percentage change in selling, general and administrative costs (SG&A) per one percent change in sales. In this model, sales are used as the empirical proxy for demand changes. Because cost stickiness reflects a lower cost response to sales decreases than to sales increases, costs are predicted to be less sticky when resources are cut in anticipation of a fall in demand. Indeed, results show that managers who correctly anticipate a negative demand shock cut SG&A costs more than managers who did not correctly anticipate demand to fall. Robustness checks demonstrate that this association also holds for other cost categories such as total operating costs and personnel expenses.[48]

Based on the previous results, the second part of this study tests whether the accuracy of managerial expectations also moderates the adjustment of selling prices. To do so, the sample is split between firm-years during which prices stayed unchanged and all remaining observations for which prices either decreased or increased. Results suggest that mangers who correctly anticipate a negative demand shock lower cost stickiness by cutting resources and decreasing prices whereas managers who did not expect a fall in demand

[48] The accuracy of managerial expectations is not expected to moderate the change in cost of goods sold because fluctuations in demand are compensated with inventory adjustments.

retain SG&A resources and do not change prices. This implies that *asymmetric resource adjustments* predominantly arise due to unforeseen demand decreases. Conversely, *asymmetric price adjustments* can be ascribed to deliberate price decreases by executives who anticipate a fall in demand.

In addition to the previous two parts of this study, a supplementary analysis is conducted focusing on the association between demand uncertainty and cost behavior.
The degree to which managers are able to form accurate forecasts is closely related to demand uncertainty. Demand uncertainty is often measured as the *long-term* variance of sales for each company (Banker, Byzalov, and Plehn-Dujowich 2014). However, the notion of demand uncertainty is mostly unexplored in the cost stickiness literature because sticky costs are generally ascribed to *short-term* fluctuations in demand. To fill this gap, this study combines the concept of demand uncertainty and cost stickiness by embracing a short-term view of managerial demand expectations and their ex-post accuracy. Building on the cost elasticity literature,[49] this paper tests whether the empirical measure of managerial expectation accuracy moderates the documented relationship between demand uncertainty and cost behavior (Banker, Byzalov, and Plehn-Dujowich 2014; Goex 2002; Holzhacker, Krishnan, and Mahlendorf 2015). This is performed by replicating the empirical model of Banker et al. (2014), first, without and then, with including managerial expectation accuracy as additional explanatory variable. Results show that an increase in demand uncertainty induces a decrease in cost elasticity irrespective of managerial expectation accuracy. For demand decreases however, the association is different for firms that anticipated a negative demand shock than for firms that did not foresee the decrease in demand. This implies that managerial expectation accuracy is an important

[49] Cost elasticity is measured as the percentage change in costs per one percent change in their driver. This relationship can be affected by cost stickiness that arises when costs respond less to decreases than to increases in demand.

explanatory variable that should be acknowledged when analyzing cost behavior.

Overall, this study contributes to research in two ways. First, findings explain how managers adjust resources and prices in line with their expectations about future demand and how the accuracy of their expectations determines the degree of cost stickiness of the firm. Other cost stickiness studies recognize that managers adjust resources in accordance with their demand expectations but do not investigate the trade-off between selling price changes and capacity adjustments conditional on these expectations (Anderson, Banker, and Janakiraman 2003; Banker et al. 2014; Chen, Gores, and Nasev 2013; Chen, Kama, and Lehavy 2015; Venieris, Naoum, and Vlismas 2015). Second, this paper links demand uncertainty and cost stickiness research through the concept of managerial expectation accuracy. By demonstrating that the association between demand uncertainty and cost behavior depends on the accuracy of managerial expectations, the empirical results in this study moreover help to reconcile inconsistent conclusions in the literature. Contrary to the conventional thought, Banker et al. (2014) for instance argue that high demand uncertainty is positively associated with a more rigid cost structure (i.e., reduced cost response to changes in activity) than low demand uncertainty. However, this study shows that during a fall in demand, cost rigidity only increases with increasing uncertainty if the change in demand is unforeseen.

The remaining part of this paper is structured as follows. The next section provides an overview of the theoretical background from which the main hypothesis is derived. Section three explains the research design by describing the empirical model and the data used to test predicted effects. The main findings are discussed in section four with a description of additional tests and robustness checks in section five. The last section concludes.

2 Theory and Hypothesis Development

2.1 Accuracy of Managerial Expectations and Resource Adjustments

Managers' expectations about future demand drive asymmetric cost behavior. Research documents that if the adjustment of resources is costly, an executive who is optimistic with respect to future demand is more willing to build up or retain resources than a manager who expects a prospective decrease in demand. Thus, a higher degree of cost stickiness is associated with positive expectations. To test this relationship, several measures are used as estimates for management expectations. These include variables such as GDP growth (Anderson, Banker, and Janakiraman 2003; Banker et al. 2014), order backlog (Balakrishnan, Petersen, and Soderstrom 2004; Banker et al. 2014), the tone of forward-looking statements in 10-K reports (Chen, Kama, and Lehavy 2015), analyst forecasts (Banker et al. 2014), intangible investments (Venieris, Naoum, and Vlismas 2015),[50] and managerial overconfidence (Chen, Gores, and Nasev 2013).[51]

Recent work moreover analyzes the interplay between demand uncertainty and managers' resource adjustment decisions.

Banker et al. (2014) argue that firms will try to avoid congestion and therefore choose a more rigid cost structure when demand uncertainty is high. Using a combined analytical and empirical approach, the authors show that marginal costs increase with increasing congestion due to the convexity of the cost function. To prevent expensive bottlenecks, managers therefore invest in

[50] Venieris et al. (2015) argue that high levels of intangible assets reflect investments in organizational capital that is required to support the company's long-term growth strategy. Hence, high intangible assets are associated with optimistic sales expectations.

[51] According to Chen, Gores and Nasev (2013), overconfident managers are more likely to a) overestimate their impact of restoring demand when sales decline and b) overestimate the accuracy of their assessment of prospective demand. Therefore, overconfident managers are more optimistic with respect to future sales.

fixed capacity when demand is uncertain and the likelihood of extreme realizations of demand is higher.[52]

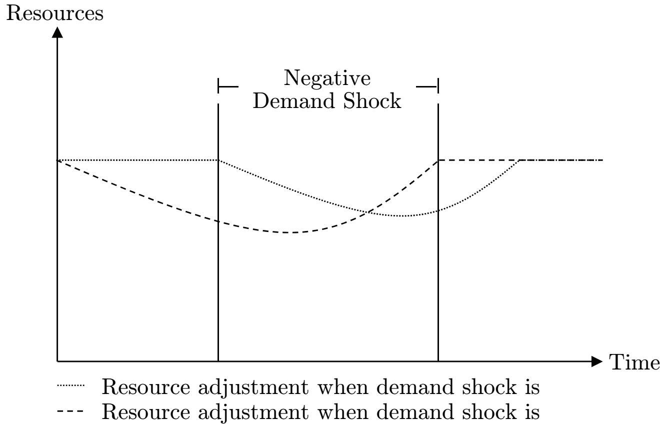
An exploration of actions through which managers alter the company's cost structure in response to demand uncertainty and financial risk is provided in Holzhacker et al. (2015b). Results show that decision-makers deliberately adapt cost elasticity through three main mechanisms: leasing instead of purchasing of equipment, engaging in flexible work contracts and outsourcing. Although the effect of demand uncertainty on cost behavior is acknowledged, none of these studies distinguish between expected and unexpected changes in demand by investigating if the anticipated path of future sales is realized. However, doing so can alter previous inferences. For instance, higher cost rigidity (i.e., lower cost elasticity) can result from a delayed adjustment of capacity when a negative demand shock is unexpected irrespective of the aggregate level of demand uncertainty. Examples of such include customer credit failure, launch of competitive products and currency fluctuations.

As illustrated in Figure 1, the adjustment of resources to expected shocks in demand is different from resource adjustment to unexpected shocks in demand. If the firm correctly anticipates an economic downturn, it will begin to adapt its current level of capacity before the shock occurs to prevent losses. On the contrary, if the shock is completely unexpected or expected to be positive, the firm cannot pre-adjust to the actual path of demand. The decision-maker becomes convinced of the shock only after it occurred initially

[52] This argument contrasts the conventional thinking claiming that the value of flexibility increases with uncertainty. According to Banker et al. (2014), increased demand uncertainty is associated with a higher variance of demand. Thus, managers increase the level of fixed capacity to prevent congestion when demand is uncertain, but would favor a greater variabilization of the company's cost structure only if also average demand is lower, which is reflected in a greater downside risk of demand (i.e., higher likelihood of unfavorable realizations without a commensurate increase of favorable realizations of demand).

(Hamermesh 1993). This leads to a lag in the adjustment of resources relative to the actual level of demand.[53]

Figure 1: Resource Adjustment under Uncertainty



Adapted from Hamermesh (1993).
The figure shows how managers adjust resources differently in response to expected compared to unexpected changes in demand. Specifically, when a drop in demand is expected managers can proactively decide to cut resources in order to prevent losses. When a drop in demand is unexpected, the adjustment is made with a time-lag after the demand shock occurred initially.

In case of a positive demand shock, all companies produce and sell as much as their current resources allow. This generally induces an increase in capacity utilization. However, sales are higher for firms that anticipated a growth in demand. Managers take advantage of their knowledge and smoothly build up capacity prior to the shock to exploit demand when it rises. Conversely, firms that did not expect a rise in demand are more likely to respond by using

[53] The effect is stronger for companies that face a convex adjustment cost function that make large and abrupt changes in resources more costly compared to small and gradual changes (Hamermesh and Pfann 1996).

overtime work or short-term labor. As this requires the payment of a premium, marginal costs are greater for firms that respond to unforeseen demand increases compared to firms that anticipated the change.

2.2 Accuracy of Managerial Expectations and Price Adjustments

Firms do not react to expected changes in demand by solely cutting or adding resources. They can also adjust selling prices. Under uncertainty, the optimal capacity and pricing decision then depends on what is known about demand at the time of the decision and the incorporation of new information over the planning cycle (Goex 2002).

Following Anderson et al. (2003), the majority of studies estimate the elasticity of cost response to variations in demand by regressing the change in costs on the change in sales. The statistical specification is as follows:

$$\Delta \ln COST_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \ln SALES_{i,t} + \varepsilon_{i,t}, \text{ where } \beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} \quad (1)$$

$\Delta \ln COST_{i,t}$ and $\Delta \ln SALES_{i,t}$ capture the log-change between the current and the previous period in costs and sales, respectively, and $D_{i,t}$ is a dummy variable set to one when sales decrease and zero otherwise. In the standard model according to Anderson et al. (2003), the implied association is estimated using SG&A costs. SG&A costs are sticky on average if $\beta_1 > 0$ and $\beta_2 < 0$. The general intuition is that managers retain idle capacity during periods of declining demand to avoid adjustment costs inherited in the act of changing resources (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014).

However, using sales as a proxy for activity can give rise to cost stickiness irrespective of changes in labor or capital resources. Specifically, costs are observed to be sticky if managers adjust selling prices asymmetrical, i.e., they lower prices to exploit existing capacity when demand decreases but build up capacity (instead of raising prices) when demand increases (Cannon 2014). Thus, the investigation of cost behavior based on a model that uses sales instead of actual activity can only be informative by including selling price changes as an endogenous variable.

2.3 Accuracy of Managerial Expectations and the Trade-Off between Price and Resource Adjustments

The previous two sections describe how cost stickiness arises as a consequence of asymmetric resource and asymmetric price adjustments. Asymmetric resource adjustments imply that managers retain resources as demand falls but add resources as demand grows (Anderson, Banker, and Janakiraman 2003; Balakrishnan, Petersen, and Soderstrom 2004; Banker and Byzalov 2014). Asymmetric price adjustments imply that managers decrease selling prices to utilize capacity as demand falls but keep selling prices unchanged as demand grows (Cannon 2014). Accordingly, a lower level of cost stickiness can be obtained by decreasing the asymmetry of resource *or* price adjustments.

As explained above, managers make resource and price adjustments in accordance with their expectations about future demand. This can be described using three simplified scenarios. First, demand changes but managers did not expect it and correspondingly maintained prices and resources. Second, a demand shock occurs but managers expected it. They responded by either cutting resources and/or decreasing prices or by adding resources and/or increasing prices. Third, demand falls but managers expected a positive development or demand rises but managers expected a negative development. Resources and/or prices were adapted in the opposite direction than the actual path of demand. Hence, the timeliness of correct price and resource adjustments is higher for firms that expect a change in demand. In the second case, this leads to lower price asymmetry if firms increase prices (instead of adding capacity) when they expect an increase in demand and lower resource asymmetry if they downsize capacity (instead of reducing prices) when they expect a decrease in demand. Accordingly, the main hypothesis is formulated as follows:

H1: The degree of cost stickiness decreases with increasing accuracy of managers' demand anticipations.

The question remains however as to which mix of resource and price adjustments firms choose in order to respond to a shock in demand. Prior literature suggests that adjustments are costly for both capacity (Hamermesh and Pfann 1996; Hayashi 1982) as well as prices (Mankiw 1985; Rotemberg 1982). To keep adjustment costs low, decision makers will therefore chose the least expensive mechanism in response to demand changes. Whether the choice of price and/or resources adjustments depends on the accuracy of managers' expectations prior to a shock in demand is investigated as part of the following analysis.

3 Research Design and Sample Selection

3.1 Empirical Model

The association between the accuracy of managerial expectations on firm-specific cost behavior is estimated based on the regression models below. Model (2) refers to the main model without additional control variables and model (2') refers to the specification that contains all control variables. To ensure that results are not driven by omitted-variable-bias, all explanatory variables are included as main effects as well as interaction terms.

Without controls:

$$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} + \beta_5 \cdot D_{i,t} + \beta_6 \cdot ACCURACY_{i,t} + \varepsilon_{i,t} \qquad (2)$$

where $\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} + \beta_3 \cdot ACCURACY_{i,t} + \beta_4 \cdot D_{i,t} \cdot ACCURACY_{i,t}$

With controls:

$$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \text{lnSALES}_{\text{i,t}} + \beta_5 \cdot D_{i,t} + \beta_6 \cdot ACCURACY_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t} \qquad (2')$$

where $\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} + \beta_3 \cdot ACCURACY_{i,t} + \beta_4 \cdot D_{i,t} \cdot ACCURACY_{i,t} + \lambda_1 \cdot Controls_{i,t}$

The change-specification captures the short-term elasticity of SG&A costs in response to a variation in sales and follows previous studies based on the standard model introduced by Anderson et al. (2003). β_2 is interpreted as the percentage change in SG&A costs per one percent change in sales and the dummy variable $D_{i,t}$ distinguishes the cost response between increases and decreases in demand. Hence, cost stickiness implies a lower cost elasticity for decreases in demand, which is reflected in a flatter slope of the cost function. β_2 is therefore negative if SG&A costs are sticky.[54]

The objective of the following analysis is to estimate the association between the accuracy of managerial expectations and cost behavior (β_3 and β_4). $ACCURACY_{i,t}$ is a logarithmic transformation of the percentage of months

[54] The log-model has several advantages over the linear model. First, the log-transformation alleviates heteroscedasticity and increases the comparability of variables across firms. Second, the logarithmic specification produces a more symmetric distribution than the linear model. Third, the logarithm facilitates an interpretation of the regression coefficients as elasticities (Anderson, Banker, and Janakiraman 2003).

during which future sales were correctly anticipated within one year. Because the survey elicited managers' expectations about demand over the next three months and actual demand development over the past three months, expectations are considered to be correct if the anticipated demand in t is equivalent to the actual demand in t+3.[55] The calculation is:

$$ACCURACY_{i,t} = log[\%Correct\_Dummy + 1]$$

$$\text{with } \%Correct\_Dummy = \frac{\#of\ months\ with\ correct\ expectations}{12}$$

Because the values of $\%Correct\_Dummy$ are confined to the interval between 0 and 1 and the log-transformed values range from $-\infty$ to $+\infty$, the application of the logistic measure induces a more normalized distribution through a reduction of positive skewness. An overview of possible combinations of managerial expectations and actual demand realizations is provided in Figure 2.

[55] See Table 8 for a description of survey questions.

Figure 2: Case Example For Estimating The Variable $\boldsymbol{CORRECT\_DUMMY_{i,t}}$

$\boldsymbol{CORRECT\_DUMMY_{i,t} = 1}$

	Expected demand in (t)	→	Actual demand in (t+3)
Case a)	Demand Increase		Demand Increase
Case b)	Demand Decrease		Demand Decrease
Case c)	No Change in Demand		No Change in Demand

$\boldsymbol{CORRECT\_DUMMY_{i,t} = 0}$

	Expected demand in (t)	→	Actual demand in (t+3)
Case a)	Demand Increase		Demand Decrease
Case b)	Demand Decrease		Demand Increase
Case c)	No Change in Demand		Demand Decrease
Case d)	No Change in Demand		Demand Increase
Case e)	Demand Increase		No Change in Demand
Case f)	Demand Decrease		No Change in Demand

The information on expected demand and actual demand are obtained from the Danish tendency survey which is conducted as part of the Joint Harmonized EU Program of Business and Consumer Survey.
(http://ec.europa.eu/economy˙finance/db˙indicators/surveys/index˙en.htm).
The survey question refers to managers expectations about demand over the next three months and the actual demand development during the past three months. Therefore expected demand and t and actual demand in t+3 are compared.

Control variables are additionally incorporated in the slope and intercept of model (2').

Differences in adjustment costs and size among firms are controlled for by including the empirical proxy of employee and asset intensity (Anderson, Banker, and Janakiraman 2003; Banker and Byzalov 2014) in the regression model.[56] Employee intensity is measured as the amount of personnel expenses divided by sales $(EMPINT_{i,t})$ and asset intensity is measured as the amount of total assets divided by sales $(ASSETINT_{i,t})$.[57] Because the degree to which managers are able to predict future sales can be influenced by the overall level of demand uncertainty, the variable $UNCERT_{i,t}$ is moreover included in model (2'). Following Banker et al. (2014), demand uncertainty is estimated as the standard deviation of log-changes in sales for each company. Acknowledging the objections of Balakrishnan, Labro and Soderstrom (2014) and the findings of Balakrishnan et al. (2004), the model moreover controls for industry differences (IND_i) as well as capacity utilization $(CAPA_{i,t})$.[58] The latter is defined as in Banker et al. (2014), who capture high capacity utilization with an indicator variable that is set to one if sales in the previous year increased and zero otherwise. Because prior period sales increases are not available for all firm-years, parameter estimates are tabulated separately, first, without controlling for capacity utilization and then, with controlling for capacity utilization.

Finally, this study investigates if selling price changes play a role in interpreting the association between resource adjustment decisions and managerial expectations. To do so model (2') is estimated for firm-year

[56] Although the majority of studies do not separately control for size when including employee intensity and asset intensity, a robustness check is conducted by testing if parameter estimates differ after including also the log-amount of total assets in model (2'). Results show that the magnitude of cost stickiness (β_2) varies with size for certain industries. However, the effect of managerial expectations on the change in SG&A costs remains strongly significant with the same sign of parameter estimates. To avoid multicollinearity, the log-amount of total assets is therefore not included as a separate control variable. Instead, the model controls for size by scaling all variables with total sales (including total assets) and using a logarithmic transformation.

[57] Because the total number of employees is not available for all firms, this study uses the ratio of personnel expenses to sales to estimate employee intensity (see also Holzhacker, Krishnan, and Mahlendorf 2015b).

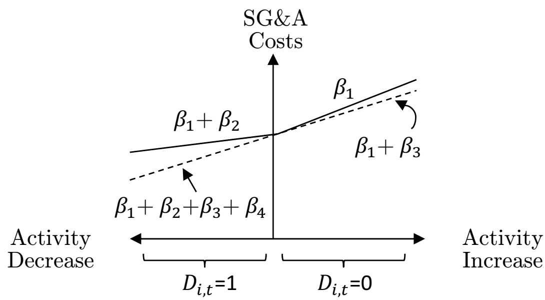
[58] Industry dummies are coded based on the Danish 19-group standard industrial classification (http://www.dst.dk/en/Statistik/dokumentation/Nomenklaturer/DB). Except for some subdivisions, the Danish industry classification is similar to NACE, rev. 2.

observations where managers indicated that selling prices either increased or decreased for at least one month during the year and separately for firm-year observations where managers stated stable selling prices.

3.2 Predicted Effects

In the case of a negative demand shock, the degree of cost stickiness is predicted to be lower for firms that correctly anticipated it. They will cut costs earlier to avoid a decrease in profitability. Accordingly, H1 is supported if $\beta_4 > 0$ with $\beta_1 + \beta_2 < \beta_1 + \beta_2 + \beta_3 + \beta_4$. Similarly, the magnitude of SG&A cost increases is predicted to be lower if a positive demand shock is expected. Companies will build up capacity prior to the shock whereas other firms that are surprised by high demand are more likely to use overtime work, which requires the payment of a premium. This implies that $\beta_3 < 0$ with $\beta_1 > \beta_1 + \beta_3$. Predicted effects are illustrated in Figure 3.

Figure 3: Illustration of Predicted Effects



The above figure illustrates predicted effects according to H1. β_1 captures the percentage increase in SG&A costs per one percent increase in activity. If the increase of SG&A costs is less for companies with high accuracy of managerial expectations then $\beta_1+\beta_3 < \beta_1$. The slope of the cost function for activity decreases is estimated trough the sum of β_1 and β_2. If costs are sticky on average, then $\beta_1 > \beta_1 + \beta_2$. According to H1, the degree of cost stickiness decreases with increasing accuracy of managerial expectations. For negative demand changes, this implies that $\beta_1 + \beta_2 < \beta_1 + \beta_2 + \beta_3 + \beta_4$ with $ACCURACY_{i,t} > 0$.

3.3 Data and Sample Selection

The analysis is conducted based on data from 1,677 Danish companies from 1999 to 2013. Because financial statements do not include information on actual managerial expectations and price changes on a monthly basis, this study uses micro-data from a business and consumer survey conducted by Denmark Statistics in addition to financial statement information.[59] The survey was launched as part of a harmonized EU-wide study with the objective of gaining insights into economic trends, short-term developments and potential turning points in the economic cycle (European Commission 2014). Authorized Danish research institutions are eligible to submit a project proposal that allows approved scholars to purchase access rights to firm-specific data. The interplay between the accuracy of managerial expectations, resource adjustment decisions and price changes can thus be studied on a firm basis instead of using aggregate information. Following the grouping of the original survey, the allocation of observations in the manufacturing, service, construction and trade sectors is 48 percent, 41 percent, nine percent and two percent, respectively. Because the manufacturing sector is the largest and is also the greatest contributor to the GDP in Denmark, it serves as the reference group for the following regressions.

Each analysis is performed on the secure server operated by Denmark Statistics. Raw data obtained from Denmark statistics are provided in separate files for each month and sector. Because the variable names and coding in the different sector files did not coincide, the monthly datasets were first cleansed and aggregated by year, followed by an aggregation by sector. Finally, financial statement information is anonymized and then merged with the survey data using the (modified) company ID as an individual identifier. Firm-month observations for which the same company ID occurs in different sectors are allocated to the sector in which the firm was listed with the

[59] http://www.dst.dk/en/Statistik/emner/konjunkturbarometre

majority of observations. Due to privacy protection it is not possible or allowed to identify individual companies.

Hypothesis 1 is tested based on two samples. The first sample contains all firm-year observations from 1999 to 2013. To ensure that results are not driven by very pessimistic managerial expectations during the financial crisis (Banker, Fang, and Metha 2013), the second sample (referred to as the 'Reduced Sample') excludes observations from 2007 and 2008. Private and public financial statement information on sales, operating income, depreciation, total assets and personnel expenses were obtained from the Orbis database maintained by Bureau Van Dijk. Because SG&A costs are not stated as separate line items, the amount is indirectly calculated by subtracting operating income, depreciation and costs of goods sold (for non-service firms) from operating sales per company. All financial variables are deflated to 2000 DKK values.

The final testing sample is obtained after cleansing the dataset in line with the procedure proposed by Anderson et al. (2003). Missing variables for SG&A costs, sales and observations with greater SG&A costs than sales are deleted and the sample is trimmed at two percent and 98 percent of the distribution.[60] Moreover, monthly data on managers' assessment of future sales over the next three months and information on actual sales development of the last three months are required. On this basis, expectations and actual demand are compared for periods during which a demand change occurred. This implies that demand either increased or decreased. For instance, a valid period would be if demand has been unchanged, then increases for three months followed by unchanged demand. This procedure assures that results are not driven by differences in demand variance as firms with lower demand variance are more likely to have correct expectations in demand. Additionally,

[60] One deviation from Anderson et al. (2003) is the deletion of extreme observations. Due to the potential influence of outliers in this smaller dataset, two percent of the tails of the distribution are trimmed whereas Anderson et al. (2003) chose a 0.5 percent limit.

this approach safeguards that the following empirical estimations are not influenced by the length of the demand shock, which is suggested by Anderson et al. (2003). To further alleviate this concern, a supplementary robustness check is conducted in which the degree of cost stickiness for firms with a very low accuracy of managerial expectations and for firms with a moderate accuracy of managerial expectations is compared among companies with the same time frame of the demand shock. Results indicate that potential biases due to differences in the length of the demand shock are not a concern in the following analyses.

3.4 Descriptive Statistics

Univariate descriptive statistics are presented in Table 1.

The average company in the sample generates 377 million DKK in sales (48 million USD) with 84 million DKK in SG&A costs (11 million USD) and 85 million in DKK in personnel expenses. The mean ratio of SG&A costs and personnel expenses to sales is 34 percent. The average number of employees is 465 with total assets of up to 82 percent of operating sales. Pearson correlations are shown in Panel B of Table 1.

The main explanatory variable in this study refers to the congruence of managerial expectations prior to a change in demand and the development of actual sales. Descriptive statistics are provided in Panel C of Table 1. Shown on the top, 41 percent of sales developments are correctly anticipated. $CORRECT\_DUMMY_{i,t} = 1$ implies that managers' assessment of the development of demand over the next three months is equivalent to the actual realization of demand.[61] There does not appear to be a clear tendency of whether firm executives are more or less optimistic when they make accurate predictions on future demand on a monthly (Panel C.2.) or annual (Panel C.4.) basis. Approximately half of all companies expect either a

[61] See Figure 2 for a detailed overview of possible cases.

negative demand change or a positive demand change.[62] Conversely, prices are only increased in nine percent and decreased in 16 percent of all firm-month observations (Panel C.3.). The latter provides initial support for Cannon's (2014) "Slippery Price" hypothesis which predicts that cost stickiness is partially a consequence of asymmetric price adjustments.[63]

Panel D of Table 1 presents the average level of capacity utilization differentiated by sales decreases (D.1.) and sales increases (D.2.) as well as correctness of expectations. The tabulated figures represent a much smaller proportion of the underlying dataset because the variable is only surveyed for manufacturing companies. Nevertheless, it provides an initial indication of the hypothesized effects. The level of capacity utilization is significantly higher when managers correctly anticipated future demand decreases whereas the difference is insignificant for demand increases.

Table 1: Descriptive Statistics

Panel A: Descriptive Statistics in Million DKK (Million 2000 USD)

		Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
Operating Sales	[1]	376.89 (47.53)	1,498.40 (189.85)	29.19 (3.68)	100.06 (12.62)	289.09 (36.45)
SG&A costs	[2]	84.12 (10.61)	298.12 (37.59)	8.23 (1.04)	22.60 (2.85)	61.17 (7.71)
Personnel expenses	[3]	85.11 (10.73)	280.83 (3.54)	10.45 (1.31)	28.02 (3.53)	67.60 (8.52)
SG&A costs/ Operating Sales	[4]	0.34	0.25	0.15	0.28	0.47
Personnel expenses/ Operating Sales	[5]	0.34	0.23	0.21	0.31	0.45
Total Assets/ Operating Sales	[6]	0.82	1.17	0.41	0.61	0.87

[62] Note that reported percentages are not weighted by the frequency of actual demand increases and demand decreases in each group.

[63] Specifically, companies' price elasticity for demand decreases is greater than for demand increases because managers decrease prices to utilize existing capacity when demand falls, but increase capacity (instead of prices) when demand rises.

Table 1 continued:

Number of Employees	[7]	465	1556	60	171	387

Panel B: Pearson Correlation

		[1]	[2]	[3]	[4]	[5]	[6]
[1]	Operating Sales						
[2]	SG&A costs	0.67***					
[3]	Personnel expenses	0.86***	0.84***				
[4]	SG&A costs/ Operating Sales	-0.12***	0.10***	-0.03**			
[5]	Personnel expenses/ Operating Sales	-0.13***	-0.04***	-0.02**	0.54***		
[6]	Total Assets/ Operating Sales	-0.00	0.01	0.00	0.03**	0.05***	
[7]	Number of Employees	0.83***	0.71***	0.90***	-0.06***	-0.06***	0.01

Panel C: Descriptive Statistics Differentiated by Accuracy of Expectations

Panel C.1.: Correctness of Expectations

(Percent)	$CORRECT\_DUMMY_{i,t}$ = 0	$CORRECT\_DUMMY_{i,t}$ = 1	*All firms*	*Rao-Scott Second-Order Chi-Square*
	58.75	41.25	100	***

Panel C.2.: Sales Expectations and Correctness

(Percent)	$CORRECT\_DUMMY_{i,t}$ = 0	$CORRECT\_DUMMY_{i,t}$ = 1	*All firms*	*Rao-Scott Second-Order Chi-Square*
Expected negative demand change	26.96	25.22	26.24	
No expected demand change	45.06	47.23	45.95	***
Expected positive demand change	27.99	27.55	27.81	

Table 1 continued:

Panel C.3.: Price Developments and Expectation Accuracy

(Percent)	$CORRECT\_DUMMY_{i,t} = 0$	$CORRECT\_DUMMY_{i,t} = 1$	*All firms*	*Rao-Scott Second-Order Chi-Square*
Price Decrease	16.48	16.18	16.35	
Price Unchanged	75.06	75.22	75.12	
Price Increase	8.46	8.60	8.52	

Panel C.4.: One-way Analysis of Variance (ANOVA)

	$Mean(ACCURACY_{i.t})$	F Value	$pr > F$
Demand Decrease	0.077	0.43	0.51
Demand Increase	0.079		

Panel D: Average Level of Capacity Utilization for Manufacturing Companies (monthly)

Panel D.1.: Demand Decrease

(Percent)	$CORRECT\_DUMMY_{i,t} = 0$	$CORRECT\_DUMMY_{i,t} = 1$	*F-test for Difference*
Capacity utilization	70.11	72.87	**

Panel D.2.: Demand Increase

(Percent)	$CORRECT\_DUMMY_{i,t} = 0$	$CORRECT\_DUMMY_{i,t} = 1$	*F-test for Difference*
Capacity utilization	77.93	78.48	

$* Pr > \chi^2$ of 0.10, $** Pr > \chi^2$ of 0.05, $*** Pr > \chi^2$ of 0.01.
*,**,*** Indicate significance at the 10, 5, and 1 percent levels, respectively.

$CORRECT\_DUMMY_{i,t}$ captures the congruence between managerial expectations about future demand and actual demand on a monthly basis. $ACORRECT\_DUMMY_{i,t} = 1$ if the manager's expectation in t is equivalent to the actual change in demand in t+3. The difference is three months because the survey asks for the expected change in demand for the next three months and the actual development of demand over the past three months. See Figure 2 for an overview of all possible cases.

$Mean(ACCURACY_{i,t})$ is the mean annual level of $\log(\%Correct + 1)$ with $\%Correct = \#of\ months\ with\ correct\ expectations/12$.

Number of observations = 1,078.

The level of capacity utilization is retrieved from the survey questionnaire for manufacturing companies. See Table 7 in the appendix for the description of the variable.

4 Empirical Results

4.1 Resource Adjustments

The main regression model is derived from the standard cost stickiness specification introduced by Anderson et al. (2003). The first column of Table 2 shows the respective parameter estimates using model (1). For comparison, results of estimating model (2) based on the whole sample and the reduced sample are shown in columns two and three.[64] Model (2) does not include additional control variables. As can be seen, costs are sticky on average. β_1 is significantly positive whereas β_2 is significantly negative. Moreover, the F-test results shown at the bottom of Table 2 confirm the significant difference in the effect of $ACCURACY_{i,t}$ for decreases in demand but not for increases in demand. The latter is unsurprising as all companies benefit from high demand irrespective of their previous expectations.

[64] The whole sample includes all firm-year observations from 1999 to 2013. The reduced sample excludes observations during the financial crisis in 2007 and 2008.

Table 2: Comparison of Estimates between the Anderson et al. (2003) model (1) and the Accuracy of Expectations Model (2)

Model (1): $\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \ln SALES_{i,t} + \varepsilon_{i,t}$, where $\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t}$

Model (2): $\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \ln SALES_{i,t} + \beta_5 \cdot D_{i,t} + \beta_6 \cdot ACCURACY_{i,t} + \varepsilon_{i,t}$,

Where $\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} + \beta_3 \cdot ACCURACY_{i,t} + \beta_4 \cdot D_{i,t} \cdot ACCURACY$

			Model (1)	Model (2)	
				Whole Sample[a]	*Reduced Sample*[b]
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_0	Intercept	±	-0.04*** (-4.26)	-0.05*** (-4.72)	-0.06*** (-5.00)
$\boldsymbol{\beta_1}$	**ΔlnSALES$_{i,t}$**	+	**0.97*** (52.88)**	**1.00*** (42.64)**	**1.01*** (41.15)**
$\boldsymbol{\beta_2}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t}$**	-	**-0.10*** (-3.68)**	**-0.17*** (-4.00)**	**-0.23*** (-4.52)**
$\boldsymbol{\beta_3}$	**ΔlnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	−		**-0.34* (-1.63)**	**-0.39** (-1.83)**
$\boldsymbol{\beta_4}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	+		**0.81** (2.14)**	**0.99** (2.15)**
β_5	$D_{i,t}$	±	-0.01 (-0.61)	-0.01 (-0.65)	-0.01 (-0.7)
β_6	$ACCURACY_{i,t}$	±		0.19** (2.15)	0.23** (2.32)
λ	$Controls_{i,t}$		No	No	No
n			5,501	5,501	4,649
Adj. R^2			0.69	0.69	0.66

Table 2 continued:

		Model (2) Whole Sample[a]	Model (2) Reduced Sample[b]
$(DD = 0)$:	H_0: $\beta_1 + \beta_3 = 0$ vs. H_a: $\beta_1 + \beta_3 \neq 0$	$F(2,2942) = 0.20$ $Pr > F = 0.40$	$F(2,2559) = 0.27$ $Pr > F = 0.38$
$(DD = 1)$:	H_0: $\beta_1 + \beta_2 + \beta_3 + \beta_4 = 0$ vs. H_a: $\beta_1 + \beta_2 + \beta_3 + \beta_4 \neq 0$	$F(2,2551) = 3.59$ $Pr > F = 0.01$	$F(2,2092) = 3.97$ $Pr > F = 0.01$

[a] Whole sample including all firm-year observations between 1999 to 2013.
[b] Reduced sample includes all firm-year observations between 1999 to 2013, excluding firm-year observations from 2007 and 2008.

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels respectively. The numbers in parentheses are the t-statistics, based on standard errors clustered by firm and year.

$ACCURACY_{i.t} = \log(\%Correct + 1)$ with
$\%Correct = \#of\ months\ with\ correct\ expectations/12$.

See Table 7 in the appendix for a description of all variables.

Table 3 presents parameter estimates based on the full model (2') that additionally controls for differences in adjustment costs, demand uncertainty, industry and capacity utilization. As described, SG&A costs decrease less for demand decreases than they increase for demand increases $(\beta_1 > \beta_1 + \beta_2)$. However, the magnitude of cost stickiness decreases with an increase in the number of months during which a change in demand was correctly anticipated. β_4 is significantly positive, and β_3 is significantly negative. The results are similar using the restricted sample that excludes 2007 and 2008 observations.

For ease of interpretation, the average change in SG&A costs during unexpected shocks in demand $(ACCURACY_{i,t} = 0)$ and expected shocks in demand at the mean level of $ACCURACY_{i,t}$ is depicted on the bottom of Table 3. These results support H1 and show that managers will adapt resources differently in response to foreseen demand shocks compared to unforeseen demand shocks. Specifically, at the average level of accuracy of managerial expectations the change in SG&A costs is 0.69 percent for one percent of anticipated sales decrease whereas it is only 0.63 percent if the shock is unexpected (column one). In accordance with results reported by Balakrishnan et al. (2004), parameter estimates furthermore show that cost stickiness is more pronounced for companies with high capacity utilization. The difference in the change of SG&A costs is 0.33 percent and 0.42 percent, respectively (column two).

Overall, these results may help to reconcile non-conforming findings in the literature regarding the association between demand uncertainty and cost elasticity. For instance, Banker et al. (2014) show that costs are stickier when demand uncertainty is high whereas Holzhacker et al. (2015) conclude that firms will alter their procurement choices to decrease cost stickiness in response to high uncertainty. Because the latter study is based on a sample of German hospitals, Holzhacker et al. (2015) argue that the difference in results might stem from diverging management incentives and ownership structure compared with public firms, as in Banker et al.'s setting. Nevertheless, this study shows that cost behavior is particularly determined by the accuracy of managers' expectations about future demand. These results hold with and without controlling for the level of aggregate demand uncertainty. Thus, the difference in previous findings can likewise be explained by managers' capacity adjustment decisions depending on whether they were surprised by a change in demand or correctly anticipated it.

Table 3: Estimation of the Accuracy of Expectations Model (2') for SG&A Costs

Model (2'): $\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\text{lnSALES}_{i,t} + \beta_5 \cdot D_{i,t} + \beta_6 \cdot ACCURACY_{i,t}$

$+ \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t}$

where:

$\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} + \beta_3 \cdot ACCURACY_{i,t} + \beta_4 \cdot D_{i,t} \cdot ACCURACY + \lambda_1 \cdot Controls_{i,t}$

			Model (2')			
			Whole Sample[a]		*Reduced Sample*[b]	
			Not controlling for capacity utilization	Controlling for capacity utilization	Not controlling for capacity utilization	Controlling for capacity utilization
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_0	Intercept	±	-0.06** (-2.1)	-0.08*** (-2.61)	-0.08*** (-2.57)	-0.11*** (-3.14)
$\boldsymbol{\beta_1}$	**ΔlnSALES$_{i,t}$**	+	**1.21*** (16.49)**	**1.28*** (15.41)**	**1.23*** (16.14)**	**1.30*** (15.06)**
$\boldsymbol{\beta_2}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t}$**	-	**-0.38*** (3.12)**	**-0.58*** (-3.91)**	**-0.40*** (-2.84)**	**-0.78*** (-4.33)**
$\boldsymbol{\beta_3}$	**ΔlnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	−	**-0.49** (-2.23)**	**-0.54** (-2.29)**	**-0.56*** (-2.44)**	**-0.63*** (-2.56)**
$\boldsymbol{\beta_4}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	+	**1.07*** (2.69)**	**1.20*** (2.86)**	**1.34*** (2.81)**	**1.54*** (3.04)**
β_5	$D_{i,t}$	±	0.00 (-0.21)	-0.01 (-0.37)	0.00 (0.09)	-0.01 (-0.57)
β_6	$ACCURACY_{i,t}$	±	0.25*** (2.65)	0.27*** (2.59)	0.29*** (2.77)	0.33*** (2.76)
λ_1	ΔlnSALES$_{i,t} \cdot EMPINT_{i,t}$		0.07** (1.81)	0.09** (2.06)	0.08** (1.82)	0.09** (2.09)
λ_2	$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot EMPINT_{i,t}$		-0.10* (-1.57)	-0.12** (-1.76)	-0.12* (-1.64)	-0.14** (-1.87)
λ_3	$EMPINT_{i,t}$		0.01 (0.57)	0.00 (-0.27)	0.00 (0.3)	-0.01 (-0.56)
λ_4	ΔlnSALES$_{i,t} \cdot ASSETINT_{i,t}$		0.00 (0.35)	0.01 (0.52)	0.00 (0.32)	0.01 (0.55)
λ_5	$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot ASSETINT_{i,t}$		-0.01 (-0.42)	0.00 (-0.07)	-0.03 (-1.19)	-0.02 (-0.97)
λ_6	$ASSETINT_{i,t}$		0.00 (0.4)	0.00 (-0.2)	0.00 (0.1)	-0.01 (-0.5)
λ_7	ΔlnSALES$_{i,t} \cdot UNCERT_{i,t}$		-0.20*** (-2.62)	-0.19** (-2.11)	-0.21*** (-2.73)	-0.19** (-2.11)

Table 3 continued:

Controls		Model (2')			
		Whole Sample[a]		*Reduced Sample*[b]	
		Not controlling for capacity utilization	Controlling for capacity utilization	Not controlling for capacity utilization	Controlling for capacity utilization
λ_8	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot UNCERT_{i,t}$	0.20* (1.63)	0.18 (1.17)	0.21* (1.42)	0.17 (0.92)
λ_9	$UNCERT_{i,t}$	0.03 (1.2)	0.03 (0.64)	0.05* (1.42)	0.04 (0.82)
λ_{10}	$\Delta\text{lnSALES}_{i,t} \cdot CAPA_{i,t}$		-0.06* (-1.5)		-0.07** (-1.73)
λ_{11}	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot CAPA_{i,t}$		0.21*** (2.36)		0.42*** (3.53)
λ_{12}	$CAPA_{i,t}$		0.01 (0.66)		0.02 (1.03)
λ_{1x}	Industry slope and main effect	yes	yes	yes	yes
n		5,158	4,414	4,339	3,655
Adj. R^2		0.69	0.71	0.67	0.68
Average $\Delta ln\, SG\&A_{i,t}$ at $ACCURACY_{i,t} = 0$ & mean level of control variables					
demand increase		0.93*** (24.57)	0.92*** (19.35)	0.94*** (24.41)	0.92*** (19.27)
demand decrease		0.63*** (7.36)	0.49*** (6.37)	0.61*** (6.57)	0.48*** (5.41)
	difference:	**0.30*** (2.98)**	**0.42*** (4.44)**	**0.33*** (3.02)**	**0.45*** (4.28)**
Average $\Delta ln\, SG\&A_{i,t}$ at $mean(ACCURACY_{i,t})$ & mean level of control variables					
demand increase		0.91*** (25.79)	0.90*** (19.97)	0.92*** (25.67)	0.90*** (19.88)
demand decrease		0.69*** (8.74)	0.57*** (8.01)	0.69*** (8.13)	0.57*** (7.18)
	difference:	**0.22** (2.34)**	**0.33*** (3.83)**	**0.22** (2.26)**	**0.33*** (3.51)**

[a] Whole sample including all firm-year observations between 1999 to 2013.
[b] Reduced sample includes all firm-year observations between 1999 to 2013, excluding firm-year observations from 2007 and 2008.

*,**,*** Indicate one-sided significance at the 10, 5, and 1 percent levels respectively. The numbers in parentheses are the t-statistics, based on standard errors clustered by firm and year.

The following control variables $\left(Controls_{i,t}\right)$ are included as both fixed effects as well as interaction effects: employee intensity $\left(EMPINT_{i,t}\right)$, asset intensity $\left(ASSETINT_{i,t}\right)$, empirical proxy for demand uncertainty $\left(UNCERT_{i,t}\right)$, industry classification (IND_i) and the empirical proxy for capacity utilization $\left(CAPA_{i,t}\right)$.

$ACCURACY_{i.t} = \log(\%Correct + 1)$
with $\%Correct = \#of\ months\ with\ correct\ expectations/12$.

See Table 7 in the appendix for a description of all variables.

4.2 Price Adjustments

Results reported in Table 4 are distinguished between firm-year observations with no price changes (Panel A) and firm-year observations with at least one month during which prices were adapted (Panel B).

The differences between parameter estimates generated based on the standard cost stickiness model (1) and the extended model (2') are striking. Whereas the insignificant estimate for β_2 in Panel A suggests that cost stickiness is merely a consequence of asymmetric price adjustments (column one), inferences are reversed when acknowledging the accuracy of managerial expectations (column two and three). The following interpretation therefore focuses on the regression results of model (2').

The significant negative parameter estimate β_2 in column two and three of Panel A indicates that unforeseen negative changes in demand lead to an increase in idle capacity as SG&A resources are decreased less than the actual drop in demand. Conversely, results in Panel B show that β_2 is insignificant when prices are decreased. Hence, managers who did not expect a fall in demand respond with a delayed or no adjustment of resources and do not adapt prices. However, the reverse does not hold for expected shocks in demand. If a drop in demand is foreseen, managers react by cutting resources as well as prices. β_4 is significantly positive in Panel B and marginally significant in Panel A. Overall, this implies that cost stickiness through *asymmetric resource adjustments* arises because a negative demand shock is unexpected whereas cost stickiness through *asymmetric price adjustments* is driven by early price decreases when a negative demand shock is anticipated. In addition to merely price decreases, forward-looking executives also cut resources when demand is expected to fall. This leads to a decrease in SG&A cost stickiness, whereas the effect is even stronger for firms with high capacity utilization.

Table 4: The Interplay between Selling Price Changes, Resource Adjustments and the Accuracy of Expectations

Model (1): $\Delta\ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\ln\text{SALES}_{i,t} + \varepsilon_{i,t}$, where $\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t}$

Model (2'): $\Delta\ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\ln\text{SALES}_{i,t} + \beta_5 \cdot D_{i,t} + \beta_6 \cdot ACCURACY_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t}$

where:
$\beta_{i,t} = \beta_1 + \beta_2 \cdot D_{i,t} + \beta_3 \cdot ACCURACY_{i,t} + \beta_4 \cdot D_{i,t} \cdot ACCURACY + \lambda_1 \cdot Controls_{i,t}$

Panel A: No Price Changes

			Model (1)	*Model (2')*	
				Not controlling for capacity utilization	Controlling for capacity utilization
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_0	Intercept	±	-0.05** (-2.42)	-0.19*** (-2.91)	-0.20*** (-2.78)
$\boldsymbol{\beta_1}$	Δ**lnSALES**$_{i,t}$	+	**0.89*** (15.52)**	**1.70*** (8.77)**	**1.84*** (9.40)**
$\boldsymbol{\beta_2}$	$\boldsymbol{D_{i,t}} \cdot \Delta$**lnSALES**$_{i,t}$	-	-0.05 (-0.65)	**-1.09*** (-3.25)**	**-1.42*** (-4.17)**
$\boldsymbol{\beta_3}$	Δ**lnSALES**$_{i,t} \cdot \boldsymbol{ACCURACY_{i,t}}$	–		-0.93 (-1.14)	**-1.39* (-1.71)**
$\boldsymbol{\beta_4}$	$\boldsymbol{D_{i,t}} \cdot \Delta$**lnSALES**$_{i,t} \cdot \boldsymbol{ACCURACY_{i,t}}$	+		1.48 (1.15)	**2.31* (1.77)**

Table 4 continued:

Controls			Model (1)	*Model (2')* Not controlling for capacity utilization	*Model (2')* Controlling for capacity utilization
β_5	$D_{i,t}$	±	0.02 (0.56)	0.03 (0.81)	0.01 (0.28)
β_6	$ACCURACY_{i,t}$	±		0.30 (1.26)	0.47* (1.88)
λ_1	$\Delta\text{lnSALES}_{i,t} \cdot EMPINT_{i,t}$			0.40*** (2.82)	0.44*** (2.99)
λ_2	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot EMPINT_{i,t}$			-0.60*** (-2.65)	-0.63*** (-2.71)
λ_3	$EMPINT_{i,t}$			-0.06 (-1.57)	-0.06 (-1.41)
λ_4	$\Delta\text{lnSALES}_{i,t} \cdot ASSETINT_{i,t}$			0.00 (-0.24)	0.00 (0.01)
λ_5	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot ASSETINT_{i,t}$			0.05 (1.51)	0.03 (1.00)
λ_6	$ASSETINT_{i,t}$			0.04* (1.73)	0.03 (1.17)
λ_7	$\Delta\text{lnSALES}_{i,t} \cdot UNCERT_{i,t}$			-0.22 (-0.94)	-0.23 (-0.96)
λ_8	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot UNCERT_{i,t}$			0.14 (0.39)	0.25 (0.76)
λ_9	$UNCERT_{i,t}$			0.07 (1.2)	0.06 (0.98)
λ_{10}	$\Delta\text{lnSALES}_{i,t} \cdot CAPA_{i,t}$				-0.10 (-0.94)
λ_{11}	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot CAPA_{i,t}$				0.24 (1.25)
λ_{12}	$CAPA_{i,t}$				-0.01 (-0.15)
λ_{1x}	Industry slope and main effect		Yes	Yes	Yes
n			1,172	1,059	935
Adj. R^2			0.57	0.61	0,62

Table 4 continued:

Panel B: Price Changes

Coeff.	Variable	Pred. Sign	*Model (1)* Estimate (t-statistic)	*Model (2')* Not controlling for capacity utilization Estimate (t-statistic)	*Model (2')* Controlling for capacity utilization Estimate (t-statistic)
β_0	Intercept	±	-0.02* (-1.68)	-0.02 (-0.51)	-0.02 (-0.44)
$\boldsymbol{\beta_1}$	**ΔlnSALES$_{i,t}$**	+	**0.98*** (35.72)**	**1.13*** (10.20)**	**1.02*** (8.79)**
$\boldsymbol{\beta_2}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t}$**	-	**-0.11** (-2.52)**	**-0.32 (-1.52)**	**-0.23 (-1.00)**
$\boldsymbol{\beta_3}$	**ΔlnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	−		**-0.66** (-2.22)**	**-0.75** (-2.37)**
$\boldsymbol{\beta_4}$	**$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot ACCURACY_{i,t}$**	+		**1.47*** (2.58)**	**1.71*** (2.86)**
β_5	$D_{i,t}$	±	-0.01 (-0.64)	-0.01 (-0.29)	-0.02 (-0.69)
β_6	$ACCURACY_{i,t}$	±		0.28** (1.98)	0.29* (1.94)
Controls					
λ_1	ΔlnSALES$_{i,t} \cdot EMPINT_{i,t}$			0.02 (0.24)	-0.01 (-0.12)
λ_2	$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot EMPIN_{i,t}$			-0.04 (-0.35)	0.02 (0.16)
λ_3	$EMPINT_{i,t}$			0.03 (1.43)	0.03 (1.34)
λ_4	ΔlnSALES$_{i,t} \cdot ASSETINT_{i,t}$			0.02 (0.95)	0.04 (1.37)
λ_5	$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot ASSETINT_{i,t}$			-0.06 (-1.17)	-0.05 (-0.96)
λ_6	$ASSETINT_{i,t}$			-0.01 (-0.76)	-0.02 (-1)
λ_7	ΔlnSALES$_{i,t} \cdot UNCERT_{i,t}$			-0.19 (-1.61)	-0.07 (-0.51)
λ_8	$D_{i,t} \cdot \Delta$lnSALES$_{i,t} \cdot UNCERT_{i,t}$			0.28 (1.19)	0.02 (0.09)
λ_9	$UNCERT_{i,t}$			0.03 (0.55)	0.01 (0.14)
λ_{10}	ΔlnSALES$_{i,t} \cdot CAPA_{i,t}$				0.04 (0.72)

Table 4 continued:

λ_{11}	$D_{i,t} \cdot \Delta\text{lnSALES}_{i,t} \cdot CAPA_{i,t}$			0.06 (0.51)
λ_{12}	$CAPA_{i,t}$			0.01 (0.37)
λ_{1x}	Industry slope and main effect	Yes	Yes	Yes
n		2,505	2,339	2,049
Adj. R^2		0.66	0.67	0,68

*,**,*** Indicate two-sided significance at the 10, 5, and 1 percent levels respectively. The numbers in parentheses are the t-statistics, based on standard errors clustered by firm and year.

The following control variables $(Controls_{i,t})$ are included as both fixed effects as well as interaction effects: employee intensity $(EMPINT_{i,t})$, asset intensity $(ASSETINT_{i,t})$, empirical proxy for demand uncertainty $(UNCERT_{i,t})$, industry classification (IND_i) and the empirical proxy for capacity utilization $(CAPA_{i,t})$.

$ACCURACY_{i.t} = \log(\%Correct + 1)$
with $\%Correct = \#of\ months\ with\ correct\ expectations/12$.

See Table 7 in the appendix for a description of all variables.

5 Additional Analysis and Robustness Checks

5.1 The Interplay between Cost Elasticity, Demand Uncertainty and Accuracy of Expectations

According to findings documented by Banker et al. (2014), cost elasticity is lower for companies with high demand uncertainty. Demand uncertainty is measured as the standard deviation of the log-change in sales across all years for each firm. The authors argue that a decrease in cost elasticity reflects investments in fixed capacity to avoid congestion when demand is high. The association between demand uncertainty and cost behavior is modeled as follows (Banker, Byzalov, and Plehn-Dujowich 2014):

$$\Delta\ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\ln SALES_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t} \tag{3}$$

where $\beta_{i,t} = \beta_1 + \beta_2 \cdot UNCERT_{i,t} + \lambda_1 \cdot Controls_{i,t}$

Previous analyses have shown that the degree of managers' forecast accuracy significantly moderates the magnitude of cost stickiness. Because higher cost stickiness reflects lower cost elasticity for negative demand changes, cost elasticity should also be higher for expected demand decreases and lower for unexpected demand decreases. This implies that the effect of demand uncertainty on cost elasticity is additionally moderated by the degree to which managers correctly anticipate a fall in demand.[65] To test this prediction, model (3) is modified in the following way:

$$\begin{aligned}\Delta\ln SG\&A_{i,t} = {} & \beta_0 + \beta_{i,t} \cdot \Delta\ln SALES_{i,t} \\ & + \beta_4 \cdot ACCURACY_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{4}$$

where $\beta_{i,t} = \beta_1 + \beta_2 \cdot UNCERT_{i,t} + \beta_3 \cdot UNCERT_{i,t} \cdot ACCURACY_{i,t} + \lambda_1 \cdot Controls_{i,t}$

Table 5 presents the estimation results using model (3) differentiated by the direction of change in demand. Consistent with Banker et al. (2014), higher demand uncertainty leads to a more rigid cost structure. β_2 is negative and significant for all observations and for demand increases. However, there is no significant relationship for demand decreases.

[65] In line with Banker et al. (2014), manufacturing companies are the reference group for all empirical tests.

Table 5: The Effect of Demand Uncertainty on Cost Elasticity; modeled According to Banker et al. (2014)

Model (3): $\Delta\ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta\ln\text{SALES}_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t}$,

where $\beta_{i,t} = \beta_1 + \beta_2 \cdot UNCERT_{i,t} + \lambda_1 \cdot Controls_{i,t}$

			Model (3)		
			All Observations	Demand Increase	Demand Decrease
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_0	Intercept	±	0.00*** (-3.69)	0.00 (-0.08)	0.00*** (-3.46)
$\boldsymbol{\beta_1}$	$\boldsymbol{\Delta\ln\text{SALES}_{i,t}}$	+	**0.89*** (36.46)**	**0.69*** (19.09)**	**0.65*** (16.86)**
$\boldsymbol{\beta_2}$	$\boldsymbol{\Delta\ln\text{SALES}_{i,t} \cdot UNCERT_{i,t}}$	-	**-0.07*** (-3.17)**	**-0.08*** (-2.97)**	**-0.03 (-1.17)**
Controls					
λ_1	$\Delta\ln\text{SALES}_{i,t} \cdot GDP_{i,t}$		-0.07*** (8.24)	-0.07*** (-2.38)	0.02 (0.72)
λ_3	$GDP_{i,t}$		-0.02*** (-2.47)	-0.10*** (-3.55)	0.09*** (2.68)
λ_{1x}	Industry slope and main effect		Yes	Yes	Yes
n			5,214	2,723	2,491
Adj. R^2			0.70	0.49	0,41

*,**,*** Indicate two-sided significance at the 10, 5, and 1 percent levels respectively. The numbers in parentheses are the t-statistics, based on standard errors clustered by firm.
The following control variables $(Controls_{i,t})$ are included as both fixed effects as well as interaction effects: GDP growth$(GDP_{i,t})$ and industry classification (IND_i).

$UNCERT_{i,t} = \text{STD}(\Delta\ln\text{SALES}_{i,t})$

See Table 7 in the appendix for a description of all variables.

Table 6 presents the estimation results using model (4) differentiated by the direction of change in demand. As can be seen, the degree to which managers correctly anticipate a negative demand shock moderates the relationship between demand uncertainty and cost behavior. The association is negative if managers do not expect a fall in demand and positive if a fall in demand is foreseen. Moreover, the F-test results in Table 6 support the hypothesis that $\beta_3 + \beta_4 \neq 0$.

Overall, this implies that the causal relationship between demand uncertainty and cost behavior depends on the accuracy of managers' expectations during a fall in demand. Thus, if a sample is dominated by demand decreases, then the association can be positive if managers have a high predictability of demand changes. However, if a sample is dominated by demand increases, the effect of managerial forecast accuracy diminishes.

Table 6: The Effect of Demand Uncertainty on Cost Elasticity Moderated by Accuracy of Expectations

Model (4): $$\Delta \ln SG\&A_{i,t} = \beta_0 + \beta_{i,t} \cdot \Delta \ln SALES_{i,t} + \beta_4 \cdot ACCURACY_{i,t} + \lambda_0 \cdot Controls_{i,t} + \varepsilon_{i,t}$$

where:

$$\beta_{i,t} = \beta_1 + \beta_2 \cdot UNCERT_{i,t} + \beta_3 \cdot UNCERT_{i,t} \cdot ACCURACY_{i,t} + \lambda_1 \cdot Controls_{i,t}$$

			Model (4)		
			All Observations	Demand Increase	Demand Decrease
Coeff.	Variable	Pred. Sign	Estimate (t-statistic)	Estimate (t-statistic)	Estimate (t-statistic)
β_0	Intercept	±	0.00*** (-3.9)	0.00 (-0.48)	0.00*** (-3.91)
$\boldsymbol{\beta_1}$	$\boldsymbol{\Delta \ln SALES_{i,t}}$	+	**0.89*** (36.45)**	**0.69*** (19.23)**	**0.65*** (17.00)**
$\boldsymbol{\beta_2}$	$\boldsymbol{\Delta \ln SALES_{i,t} \cdot UNCERT_{i,t}}$	-	**-0.07*** (-3.11)**	**-0.07*** (-2.53)**	**-0.06** (-2.09)**
$\boldsymbol{\beta_3}$	$\boldsymbol{\Delta \ln SALES_{i,t} \cdot UNCERT_{i,t} \cdot ACCURACY_{i,t}}$	+	**0.00 (0.26)**	**-0.02 (-0.85)**	**0.06** (2.23)**
β_4	$ACCURACY_{i,t}$	+	0.01 (1.21)	0.02 (0.86)	0.05** (2.13)

Table 6 continued:

		Model (4)		
		All Observations	Demand Increase	Demand Decrease
λ_1	$\Delta \ln SALES_{i,t} \cdot GDP_{i,t}$	-0.07*** (-8.26)	-0.07*** (-2.38)	0.02 (0.72)
λ_3	$GDP_{i,t}$	-0.02*** (-2.47)	-0.10*** (-3.56)	0.09*** (2.65)
λ_{1x}	Industry slope and main effect	Yes	Yes	Yes
n		5,214	2,723	2,491
Adj. R^2		0.70	0.49	0,41
H_0: $\beta_3 + \beta_4 = 0$ vs. H_a: $\beta_3 + \beta_4 \neq 0$		$F(2,5173) = 0.74$	$F(2,2682) = 0.37$	$F(2,2450) = 2.56$
		$Pr > F = 0.24$	$Pr > F = 0.35$	$Pr > F = 0.04$

*,**,*** Indicate two-sided significance at the 10, 5, and 1 percent levels respectively. The numbers in parentheses are the t-statistics, based on standard errors clustered by firm.

The following control variables $(Controls_{i,t})$ are included as both fixed effects as well as interaction effects: GDP growth ($GDP_{i,t}$) and industry classification (IND_i).

$UNCERT_{i,t} = \text{STD}(\Delta \ln SALES_{i,t})$
$ACCURACY_{i,t} = \log(\%Correct + 1)$ with
$\%Correct = \#of\ months\ with\ correct\ expectations/12$.

See Table 7 in the appendix for a description of all variables.

5.2 Robustness Checks

5.2.1 Managerial Incentives to Meet or Beat the Zero-Earnings Benchmark

Companies have an incentive to report healthy earnings to avoid negative consequences. These could be related to a greater intervention by banks due to the violation of debt contracts, prevention of dividend payments and cash bonuses, or the issuance of going-concern opinions. Thus, executives are inclined to manage costs to meet or beat the zero-earnings benchmark. To realize necessary cost reductions, firms reporting small profits are more likely to dismiss blue-collar workers when demand decreases and increase hours (instead of employees) when demand increases (Dierynck, Landsman, and Renders 2012). On average, this leads to a reduction in the level of cost stickiness.[66]

To verify that previous estimates are not driven by managerial incentives to meet or beat the zero-earnings benchmark, results are subjected to two robustness tests. First, regression estimates are obtained based on a reduced sample by excluding firm-year observations with small profits. Second, model (2') is estimated with an additional control variable capturing the effect of small profit firms. This approach follows Dierynck, Landsman and Renders (2012), who select small profit firms using a dummy variable that is set to one if the net income scaled by total assets is greater than or equal to zero but less than one percent. Overall, untabulated results of both tests show that previous findings remain unchanged.

5.2.2 Ownership Structure

Apart from high accuracy of managerial expectations, a lower level of cost stickiness can also result from differences in the ownership structure across companies in the sample. Capital market pressure and managerial compensation tied to stock performance have been identified as sources of short-termism that induces managers of public companies to avoid reporting losses or meet or beat analysts' forecasts (Bhojraj and Libby 2005; Degeorge, Patel, and Zeckhauser 1999; Roychowdhury 2006). In contrast, the large proportion of family ownership in private firms can lead to an alignment effect that incentivizes long-term strategies over short-term benefits to preserve family reputation (Bennedsen et al. 2007; Chen, Chen, and Cheng

[66] Other studies test the impact of managerial incentives on cost behavior by investigating the effect of meeting earnings targets or managerial empire building (Chen, Lu, and Sougiannis 2012; Kama and Weiss 2013).

2008). In another robustness check, model (2') is therefore extended by the moderation of a dummy variable that is equal to one if the company is public and zero otherwise. Untabulated results show that the association between correct anticipations of demand changes and a lower level of firm-specific cost stickiness is stronger for public firms but also significant and positive for private firms.

5.2.3 Regression Specifications and Additional Cost Categories

To test the robustness of standard errors against structural changes over time, model (2') is estimated using Fama-MacBeth regressions (Fama and MacBeth 1973). Corresponding parameter estimates represent the average of each slope coefficient based on separate cross-sectional regressions for each year. Overall, Fama-MacBeth regressions yield similar results as previous analyses. The parameter estimates capturing the effect of accuracy of managerial expectations on SG&A cost behavior continue to stay significantly negative for increases in sales and significantly positive for decreases in sales.

In addition to SG&A costs, model (2') is performed using the change in total operating costs and the change in total personnel expenses as dependent variables. The behavior of cost of goods sold is not examined because changes in inventories prevent stickiness of cost of goods sold. Thus, it is not expected that accuracy of managerial expectations have a significant effect on this cost category. Overall, untabulated results support the hypothesis that the accuracy of managerial expectations determines not only SG&A cost behavior, but also the change in total operating costs as well as the change in personnel expenses.

6 Conclusion

This study uses a merged dataset from a Danish business survey and financial statement information to investigate the interplay between the accuracy of managers' demand expectations and SG&A cost behavior. Other researchers have shown that cost behavior is driven by deliberate resource adjustment decisions to avoid adjustment costs associated with adapting resource levels. The level of capacity utilization is considered to be the outcome of these decisions (Anderson, Banker, and Janakiraman 2003; Anderson et al. 2007; Balakrishnan, Petersen, and Soderstrom 2004; Kama and Weiss 2013).

Consistent with this line of reasoning, it is hypothesized that the accuracy of managerial expectations is an important predictor of cost behavior. Because fluctuations in demand do not only occur on an annual basis, accuracy is measured as the log-transformation of the number of months during which managers correctly anticipate future demand. Results show that if demand is expected to fall, managers cut capacity to avoid losses when the shock occurs. This leads to a significant decrease in SG&A cost stickiness compared to firms that did not correctly anticipate a change in demand.

Thereupon, the study tests the interplay between managerial expectations, resource adjustments and selling price changes. Findings suggest that cost stickiness caused by asymmetric resource adjustments arises because managers did not expect a fall in demand. Firms retain idle capacity and do not decrease selling prices. Conversely, cost stickiness caused by asymmetric price adjustments arises because managers lower selling prices if they anticipate a negative demand shock. The magnitude of cost stickiness is less if forward-looking managers also cut resources in addition to decreasing selling prices.

Finally, additional analyses are conducted to test if the accuracy of managerial expectations moderates the association between demand uncertainty and cost behavior. Building on the empirical model introduced by

Banker et al. (2014), the sign of the parameter estimates reveals that the relationship is negative for unexpected demand decreases but positive for expected demand decreases. However, the effect is insignificant for demand increases. These results may help to explain contrary findings in the literature claiming that cost variability is either positively or negatively related to demand uncertainty.
All analyses in this study were conducted using data from Danish companies. Consequently, empirical estimates are not influenced by national differences in labor laws and market conditions but also limit the generalizability of findings. Additionally, it should be noted that even though the treatment of selling prices as an endogenous variable is a clear contribution of this study, the categorical nature of the survey results does not allow for measurement of the magnitude of price changes in response to expected or unexpected demand changes. Furthermore, the argument underlying the main hypothesis implies that adjustment costs occur within the time frame of the empirical tests. However, it is possible that some adjustment costs (e.g., negative effects on company reputation or working atmosphere) arise with a time lag and are consequently not captured by the empirical tests. To overcome these limitations suggest itself as a valuable approach for future research. Moreover, this study shows how managerial expectations impact cost as well as price adjustment decisions but does not provide insights into how managers derive expectations about future demand. The investigation of these factors, such as personal characteristics, analyses and decision-making processes, is left to future research.

7 References

Anderson, M., R. Banker, R. Huang, and S. Janakiraman. 2007. Cost Behavior and Fundamental Analysis of SG&A Costs. *Journal of Accounting, Auditing & Finance* 22 (1): 1-28.

Anderson, M., R. Banker, and S. Janakiraman. 2003. Are Selling, General, and Administrative Costs "Sticky"?. *Journal of Accounting Research* 41 (1): 47-63.

Anderson, S. and Lanen, W. 2009. *Understanding Cost Management: What Can We Learn from the Empirical Evidence on Sticky Costs?* Working paper, University of Michigan, Stephen M. Ross School of Business, Ann Arbor.

Balakrishnan, R., and T. Gruca S. 2008. Cost Stickiness and Core Competency: A Note. *Contemporary Accounting Research* 25 (4): 993-1006.

Balakrishnan, R., M. Petersen, and N. Soderstrom. 2004. Does capacity utilization affect the stickiness of cost?. *Journal of Accounting, Auditing & Finance* 19 (3): 283-300.

Balakrishnan, R., E. Labro, and N. Soderstrom. 2014. Cost Structure and Sticky Costs. *Journal of Management Accounting Research* 26 (2): 91-116.

Banker, R., Byzalov, D. and Threinen, L. 2013. *Determinants of International Differences in Asymmetric Cost Behavior*. Working paper, Temple University - Fox School of Business, Philadelphia.

Banker, R., and D. Byzalov. 2014. Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 43-79.

Banker, R., D. Byzalov, M. Ciftci, and R. Mashruwala. 2014. The Moderating Effect of Prior Sales Changes on Asymmetric Cost Behavior*. Journal of Management Accounting Research* 26 (2): 221-242.

Banker, R., D. Byzalov, and J. Plehn-Dujowich. 2014. Demand Uncertainty and Cost Behavior*. The Accounting Review* 89 (3): 839-865.

Banker, R., Fang, S. and Metha, M. 2013. *Anomalous Financial Performance Ratios during Economic Downturns*. Working paper, Temple University - Fox School of Business, Philadelphia.

Bennedsen, M., K. Nielsen, F. Perez-Gonzalez, and D. Wolfenzon. 2007. Inside the Family Firm: the Role of Families in Succession Decisions and Performance*. Quarterly Journal of Economics* 122 (2): 647-691.

Bentolila, S., and G. Bertola. 1990. Firing Costs and Labour Demand: How Bad is Eurosclerosis?*. The Review of Economic Studies* 57 (3): 381-402.

Bhojraj, S., and R. Libby. 2005. Capital Market Pressure, Disclosure Frequency-Induced Earnings/Cash Flow Conflict, and Managerial Myopia. *The Accounting Review* 80 (1): 1-20.

Cannon, J. 2014. Determinants of ''Sticky Costs'': An Analysis of Cost Behavior using United States Air Transportation Industry Data. *The Accounting Review* 89 (5): 1645-1672.

Chen, C., Gores, T. and Nasev, J. 2013. *Managerial Overconfidence and Cost Stickiness*. Working paper, University of Cologne, Cologne.

Chen, C., H. Lu, and T. Sougiannis. 2012. The Agency Problem, Corporate Governance, and the Asymmetrical Behavior of Selling, General, and Administrative Costs. *Contemporary Accounting Research* 29 (1): 252-282.

Chen, J., Kama, I. and Lehavy, R. 2015. *Management Expectations and Asymmetric Cost Behavior*. Working paper, University of Michigan - Stephen M. Ross School of Business, Ann Arbor.

Chen, S., X. Chen, and Q. Cheng. 2008. Do Family Firms Provide More or Less Voluntary Disclosure?. *Journal of Accounting Research* 46 (3): 499-536.

Degeorge, F., J. Patel, and R. Zeckhauser. 1999. Earnings Management to Exceed Thresholds. *The Journal of Business* 72 (1): 1-33.

Dierynck, B., W. Landsman, and A. Renders. 2012. Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. *The Accounting Review* 87 (4): 1219-1246.

European Commission. 2014. The Joint Harmonised EU Programme of Business and Consumer Surveys.

Fama, E., and J. MacBeth. 1973. Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3): 607.

Goex, R. F. 2002. Capacity Planning and Pricing under Uncertainty. *Journal of Management Accounting Research* 14: 59.

Hamermesh, D., and G. Pfann. 1996. Adjustment Costs in Factor Demand. *Journal of Economic Literature* 34 (3): 1264-1292.

Hamermesh, D. 1993. *Labor demand*. Princeton, N.J.: Princeton University Press.

Hayashi, F. 1982. Tobin's Marginal q and Average q: A Neoclassical Interpretation. *Econometrica* 50 (1): 213-224.

Holzhacker, M., R. Krishnan, and M. Mahlendorf. 2015. Unraveling the Black Box of Cost Behavior: An Empirical Investigation of Risk Drivers, Managerial

Resource Procurement, and Cost Elasticity. *The Accounting Review* 90 (6): 2305-2335.

Horngren, C. 2015. *Cost Accounting: A Managerial Emphasis*. Harlow, Essex, England.

Kama, I., and D. Weiss. 2013. Do Earnings Targets and Managerial Incentives Affect Sticky Costs?. *Journal of Accounting Research* 51 (1): 201-224.

Mankiw, G. 1985. Small Menu Costs and Large Business Cycles: A Macroeconomic Model of Monopoly. *The Quarterly Journal of Economics* 100 (2): 529-537.

Noreen, E. 1991. Conditions under which Activity-Based Cost Systems provide Relevant Costs. *Journal of Management Accounting Research* 3 (4): 159-168.

Rotemberg, J. 1982. Sticky Prices in the United States. *Journal of Political Economy* 90 (6): 1187-1211.

Roychowdhury, S. 2006. Earnings Management Through Real Activities Manipulation. *Journal of Accounting and Economics* 42 (3): 335-370.

Venieris, G., V. Naoum, and O. Vlismas. 2015. Organisation Capital and Sticky Behaviour of Selling, General and Administrative Expenses. *Management Accounting Research* 26: 54-82.

Weiss, D. 2010. Cost Behavior and Analysts' Earnings Forecasts. *The Accounting Review* 85 (4): 1441-1471.

8 Appendix

Table 7: Variable Description

Variable Name	Description	Calculation
$\%Correct$	Percentage of months during which future demand is correctly anticipated in one year.	$\frac{\#of\ months\ with\ correct\ expectations}{12}$
$CORRECT\_DUMMY_{i,t}$	Congruence of managerial expectations and actual demand development.	$\begin{cases} 1\ if\ expectations\ in\ t = actual\ demand\ in\ t+3 \\ 0\ if\ expectations\ in\ t \neq actual\ demand\ in\ t+3 \end{cases}$
$ACCURACY_{i.t}$	Logarithmic transformation of $\%Correct$. Captures the accuracy of managers' expectations per year.	$\log(\%Correct + 1)$
$ASSETINT_{i,t}$	Log-Ratio of total assets to operating sales	$log\left[\frac{Total\ Assets_{i,t}}{Sales_{i,t}}\right]$
$CAPA_{i,t}$	Empirical proxy for capacity utilization. Capacity utilization is high if prior period sales increased.	$\begin{cases} 1\ if\ Sales_{i,t-1} > Sales_{i,t-2} \\ 0\ if\ Sales_{i,t-1} \leq Sales_{i,t-2} \end{cases}$
$D_{i,t}$	Dummy variable for sales decreases between t-1 and t.	$\begin{cases} 1\ i\quad Sales_{i,t} < Sales_{i,t-1} \\ 0\ if\ Sales_{i,t} \geq Sales_{i,t-1} \end{cases}$
$EMPINT_{i,t}$	Log-ratio of personnel expenses to operating sales.	$log\left[\frac{Empco_{i,t}}{Operating\ sales_{i,t}}\right]$
$GDP_{i,t}$	Real GDP growth in Denmark	
$UNCERT_{i,t}$	Standard deviation of the log-change in sales between t and t-1	$STD\ \left(log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right]\right)$
$\Delta \mathrm{lnSALES}_{\mathrm{i,t}}$	Log-change in sales between t and t-1.	$log\left[\frac{Sales_{i,t}}{Sal\quad s_{i,t-1}}\right]$
$\Delta \mathrm{lnSG\&A}_{\mathrm{i,t}}$	Log-change in SG&A costs between t and t-1.	$log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$

Table 8: Excerpt from the Questionnaire of the Joint Harmonized EU Program of Business and Consumer Surveys

Expression	Question	Answer possibilities
Expectations	How do you expect demand (sales) to change over the next three months?	• Increase • Remained Unchanged • Deteriorate
Actual Demand	How did demand (sales) change over the past three months?	• Increased • Remained Unchanged • Deteriorated
Prices	How did the prices you charged change over the past three months?	• Increased • Remained Unchanged • Deteriorated
Capacity Utilization[67]	At what capacity is your company currently operating (as a percentage of full capacity)?	Percent

[67] Question is included in the survey for manufacturing companies only.

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