Competition and SG&A Spending

by

Rengong Zhang

A thesis submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Accounting

Faculty of Business
University of Alberta

Abstract

The existing literature debates whether selling, general and administrative (SG&A) spending is on average beneficial to shareholders as an asset-like investment or detrimental to shareholders as the result of empire building. I address this debate by examining the behavior and consequence of SG&A spending in the context of product market competition. Using two natural experiment settings of industry deregulation and trade cost changes, I find that competition makes firms more committed to SG&A spending, as reflected in its degree of stickiness when sales decline. Subsample tests confirm the rationale that firms commit to intangible slack resources to avoid underinvestment and predation by competitors, and such slack resources have higher option value in more uncertain competitive environment. I also find that firms with high abnormal SG&A spending capture market share at the expense of their rivals, and such effect increases with competition. Overall, SG&A is on average an asset-like investment, and it plays a strategic role unexplored in the prior literature.

Acknowledgements

I want to express my deepest gratitude to my supervisor, Heather Wier, for her guidance and support. She is always nice, considerate and helpful. She was responsive in giving feedback and her comments were extremely helpful. I have benefited greatly from her wisdom, kindness and generous financial support. She remains my role model for being a good researcher and teacher.

I also appreciate the insightful comments from the rest of my committee members: David McLean, Shamin Mashruwala, Mengxin Zhao, Moin Yahya, and Mark Anderson (University of Calgary). I thank them for sharing their time and expertise to improve my paper.

I thank my excellent PhD colleagues and friends for their help and support during my program: Ding Tian, Youngbin Joo, Haibin Wu, Claire Liang, Zhenyang Tang, and Xiaowei Xu. Their friendship made my research journey much more enjoyable.

I thank the staff from the Department of Accounting and the PhD office for their timely assistance and help over the past five years: Sharon Luyendyk, Karmeni Govender, Deb Picken Jeanette Gosine, and Debbie Giesbrecht.

I received valuable comments on my dissertation from Mary Barth, Dan Simunic, Susan Krische, Jeffery Pittman, T.J. Wong, J.B. Kim, Liandong Zhang, Agnes Cheng, and workshop participants at 2014 AAA/Deloitte Foundation/J. Michael
Cook Doctoral Consortium, 2014 CAAA Annual Meeting Craft of Accounting Research for Doctoral Students, University of Alberta, University of Carlos III, Chinese University of Hong Kong, City University of Hong Kong, Hong Kong Polytechnic University and University of Saskatchewan.

I feel deeply indebted to my parents, Yadong Zhang and Guoling Hu for their enduring love and sacrifice for me.

Special thanks to my fiancée, Guilin Zhang, for her love and support. She humbled me when I was proud and boosted me up when I was downcast. Her witty comments brought me so many laughs. She challenged me intellectually and encouraged me in my faith. I learned the meaning of love through her sacrifice, forgiveness and patience.

Lastly, I thank God for giving me a new life and a research career.

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Chapter1: Introduction

The existing literature debates whether selling, general and administrative (SG&A) costs are beneficial or detrimental to shareholders. One stream of literature argues that SG&A spending is detrimental because it represents an agency cost (see e.g., Chen, Lu and Sougiannis 2012; Giroud and Mueller 2010). By contrast, a number of researchers document the asset-like properties of SG&A (see e.g., Banker, Huang and Natarajan 2011a; Eisfeldt and Papanilolaou 2013; Lev and Radhakrishnan 2005) thereby indicating that SG&A spending can be beneficial. It is difficult to disentangle the two arguments due to the fact the SG&A encompasses substantial managerial discretion and aggregates a number of different spending categories.

Examining the behavior and consequences of SG&A spending in the face of product market competition provides a natural laboratory in which to test whether SG&A spending is on average beneficial or harmful to shareholders. I ask two questions: (1). Does competition make firms more or less committed to SG&A spending? (2). Does higher abnormal SG&A spending lead to better or worse product market outcomes, as reflected in the gains or losses of market share?

In examining my first question, I measure commitment to SG&A spending by the stickiness of SG&A cost. Cost is sticky when it decreases less when sales decrease than it increases when sales increase (Anderson, Banker and Janakiraman 2003). The prior literature documents this sticky cost behavior and attributes it to firm commitment to slack resources (e.g., Anderson et al.; Chen et al. 2012). Obviously, some level of SG&A is essential to the firm, so the concept of slack SG&A is critical to the debate in the literature about the value of SG&A spending. Agency costs can flourish in the presence

of slack resources, and for this reason slack in SG&A spending lies at the heart of the controversy.

I evaluate SG&A spending in the presence of competition to assess the value of SG&A spending to the firm. Whether SG&A is on average asset-like or the result of empire building has polar implications for SG&A spending in the face of competition. Consistent with Anderson et al. 2003 and Chen et al. 2012, I interpret stickiness as firm commitment to slack resources. Competition can either increase or decrease the stickiness of SG&A spending. On the one hand, competition can decrease cost stickiness as it reduces agency cost by disciplining managerial slack and the empire building incentives (Hart 1983; Bertrand and Mullainathan 2003; Giroud and Mueller 2010). On the other hand, competition can increase the stickiness of SG&A cost via two channels. First, competition increases the risk of losing growth opportunities to competitors (Grenadier 2002; Fresard 2010), and therefore make firms hold slack resources to avoid underinvestment. Second, competition increases the uncertainties firm faces (Gaspar and Massa 2006; Comin and Phillipon 2005), which increases the option value of slack resources. Therefore, the net effect of competition depends on the relative strength of the competing forces described above.

If competition causes SG&A spending to be less sticky, we can conclude that on average, SG&A spending is partially the result of agency costs. Firms who continue to spend in value-reducing ways can expect to be driven out of the market by their more efficient competitors. Under this scenario, managers cannot afford to maintain sticky SG&A costs in competitive product markets. If, on the other hand, competition increases commitment to SG&A spending, we can conclude that SG&A is on average asset-like.

I find that competition increases the stickiness of SG&A spending, which suggests that the asset-like nature of SG&A spending dominates the agency cost argument. I measure competition by using two natural experiment settings. In the first setting, I use deregulations of airlines, electricity, natural gas, telecoms, and transportation industries around the 1980s as exogenous increases of firms' competitive pressure. In the second setting, I exploit exogenous variations in industry-level trade costs as exogenous shocks to firms' competitive environment. Trade cost is measured as the sum of tariffs and transportation costs. Reductions in trade costs significantly increase firms' competitive pressure from foreign rivals. Under both settings, competition increases the stickiness of SG&A cost. My results are robust to five other competition measures used in the prior literature.

Subsample test results confirm the proposed two rationales as to why competition increases the stickiness of SG&A cost. First, the results are stronger for firms with greater growth opportunities, consistent with the explanation that firms hold slack resources to avoid underinvestment risks. Second, the results are stronger when competition increases future sales growth volatility, consistent with the explanation that slack resources have higher option value in the face of greater uncertainties. In another supplementary test, I find that the results are stronger for firms with high organizational capital (a measure of firm intangibles based on the capitalized stock of SG&A spending), which suggests that SG&A spending is more important for high intangible firms.

My second research question asks how abnormal SG&A spending affects the firm's gain and loss of market share. I measure abnormal SG&A spending using the Rowchowdhury (2006) model to control for the normal operating needs of SG&A

spending. Further, because abnormal SG&A is estimated by running annual industry regressions, it also captures the relative standing of a firm's SG&A position within that industry in a given year. My results show that firms with high abnormal SG&A spending gain market share at the expense of competitors within the industry with low abnormal SG&A spending. This effect increases with the level of competition. This predatory role of SG&A spending is very similar to that of cash documented by Fresard (2010). It suggests that to capture growth opportunities, firms not only need cash, but also need intangible resources such as key employees and distributional networks maintained by SG&A spending. My results document a strategic role of SG&A spending that is unexplored in the prior literature.

My study makes several contributions to the literature. First, it addresses the debate on whether SG&A expenditures are on average beneficial to shareholders as an asset-like investment or detrimental to shareholders as the result of empire building. My results show that SG&A is on average an asset-like investment rather than the result of agency cost. Prior literature on the benefits of SG&A mainly relies on a positive association between SG&A spending and future profitability (e.g., Anderson, Banker, Huang and Janakiraman 2007; Banker et al. 2011a). Although these results are suggestive of an asset-like role for SG&A, such association does not completely rule out the agency explanation of SG&A spending, because anticipation of higher future profitability could result in higher perquisite consumption and hence higher current SG&A expense. By examining the behavior and consequences of SG&A spending in the context of product market competition, I not only show that SG&A spending is on average beneficial, but also show the mechanisms through which it benefits the firm. By using SG&A

expenditures to invest in and maintain intangible assets such as key employees, well-functioning IT system, and distributional networks, firms not only can avoid losing growth opportunities to competitors and keep operating flexibility in uncertain environments, but also can capture market share from underinvested competitors.

Second, my study connects the SG&A literature with the cash holding literature by demonstrating a striking parallel between commitment to SG&A spending and commitment to holding cash: 1. Both resource commitments can be driven by precautionary motives. 2. Both commitments can be abused for empire building.[1] 3. Competition encourages both commitments, suggesting that the precautionary motives dominate the agency costs in the U.S. 4. Both SG&A and cash can be used in product markets as a predatory tool to gain market share from competitors.

Third, to the extent that abnormal SG&A measures real earnings management, my study contributes to the real earnings management literature by documenting the consequence of real earnings management in product markets. Although real earnings management is considered to be myopic (Rowchowdhury 2006; Cohen, Dey and Lys 2008), there is little evidence of its detriment to the firm. My study shows that firms who manage real earnings with SG&A risk losing market share to competitors, and such risk is especially high with greater competition.

Fourth, my study contributes to the literature on cost stickiness by documenting the product market considerations to resource commitment. Prior research focused on transaction cost (Anderson et al. 2003), agency cost (Chen et al. 2012) and financial market considerations (Kama and Weiss 2013). Banker, Flasher and Zhang (2013b) also

[1] The agency cost of cash holdings is demonstrated by Dittmar and Smith (2007) and Dittmar, Smith and Servaes (2003).

shows that firm *choice* of strategy (differentiation strategy *versus* cost leadership strategy) affects cost stickiness. In contrast to the studies above, my study shows that firms do not make SG&A spending based on firm-level aspects alone; they also consider the competitive pressure in the product market. The latter is typically beyond a firm's choice in the short-run.

The paper is organized as follows. Section two reviews the literature and develops hypotheses. Section three explains the empirical methods and sample selection. Section four presents the results. Section five presents robustness checks. Section six concludes.

Chapter2: Literature Review and Hypothesis Development

2.1 The debate on SG&A spending

The SG&A classification contains a broad category of expenditures that help provide a match between the firm's physical capital and human capital. These expenditures include advertising, marketing (including investments in distribution channels and customer relations), research and development (R&D), information technology, and investments in human resources. Examples include Wal-Mart's supply chain management system, Deloitte's employee training centre (Deloitte University), and Verizon Wireless's customer service system. The breadth of these expenditures suggests that the SG&A category contains investments in intangible assets that are necessary to the firm's maintenance of its competitive position. Nevertheless, the usefulness of these expenditures does not guarantee that they are spent efficiently. In particular, SG&A encompasses substantial managerial discretion (Rowchowdhury 2006) and slack resources (Anderson et al. 2003), which leaves room for managers to pursue their private

benefits at the expense of shareholders. Therefore, SG&A spending attracts controversy, as summarized by the two conflicting streams of literature below.

One stream of literature argues that SG&A is value-enhancing based on a positive association between current SG&A expenditures and future performance. For example, Banker et al. (2011a) find that SG&A is positively associated with future operating earnings. Anderson et al. (2007) find that during periods of sales declines, a less than proportionate decrease in SG&A spending is positively associated with future earnings, because retention of slack resources conveys managers' optimistic expectations about the future. In addition, a stream of literature capitalizes the stock of SG&A spending to construct a measure of organizational capital, and shows that organizational capital is positively correlated with accounting and stock performance (e.g., Lev and Radhakrishnan 2005; Lev, Radhakrishnan and Zhang 2009; Eisfeldt and Papanikolaou 2013), lower employee turnover (Carlin, Chowdhry and Garmaise 2012) and better merger and acquisition outcomes (Li, Qiu and Shen 2013). The above evidence implies that SG&A is asset-like, value enhancing as well as a useful signal to predict performance in fundamental analysis.

In contrast, another stream of literature argues that SG&A spending reflects operational inefficiencies and agency costs. For example, Lev and Thiagarajan (1993) find a negative association between changes in the SG&A cost ratio, defined as the difference between the annual percentage change in SG&A and the percentage change in sales, and contemporaneous excess returns. Abarbanell and Bushee (1997) find a negative association between changes in the SG&A cost ratio and future earnings changes. Later literature recognizes agency costs as drivers of inefficient SG&A spending

(Giroud and Mueller 2010). In particular, the cost stickiness literature points out that SG&A cost encompasses substantial slack (Anderson et al. 2003), which allows managers to pursue empire building at the expense of shareholders (Chen et al. 2012). Chen et al. argue that managers are reluctant to downsize because the benefits mainly accrue to shareholders and they lose the private benefits of control. The authors find that cost stickiness increases with agency costs. Practitioners also express concern about SG&A spending as a potential form of empire building. For example, the CFO magazine's sixth annual survey of SG&A cost expresses concern over the "little progress in the battle to lower selling, general, and administrative costs" (Mintz 1999, p. 45). The survey uses lean SG&A spending as key criteria to select "big winners".

In sum, although SG&A spending encompasses asset-like qualities, it also encompasses substantial managerial discretion and slack, which makes it subject to criticisms about empire building. Understanding the properties of slacks (as captured by the stickiness of SG&A spending) and how competition affects the degree of stickiness is essential to address this debate. This leads to a discussion of competition and cost stickiness in the next session.

2.2 Competition and the stickiness of SG&A cost

Anderson et al. (2003) document that SG&A cost decreases less when sales decrease than it increases when sales increase. They call this asymmetric cost response "cost stickiness" and provide a good explanation: when sales decline, managers face adjustment costs such as the costs of firing employees and selling assets. As a result, managers are willing to hold slack resources if they expect a sales recovery later, causing cost to be sticky. The role of adjustment cost in explaining sticky cost behavior has been

further confirmed and extended by later research (e.g., Banker, Byzalov and Chen 2013a; Balakrishnan and Gruca (2008), see Banker et al. 2011b for a comprehensive review). Chen et al. 2012 further extend the literature to incorporate the agency costs of downsizing. As stated, they find a positive association between the stickiness of SG&A cost and agency cost. They also report that this effect is mitigated by strong corporate governance.[2]

When sales increase, adjusting resources upward is also costly because of the costs associated with hiring and training new employees (Banker et al. 2011b), and interruption of existing operations (Hamermesh and Pfann 1996; Banker et al. 2011b). During the adjustment, firms may lose growth opportunities to competitors who already have resources in place to make the first move. Therefore firms face a higher predation risk, defined as "the risk of underinvestment leading to a loss of investment opportunities and market share to product market rivals" (Haushalter, Klasa, and Maxwell 2007). This risk, though important, has received little attention in the cost stickiness literature.

Because of adjustment costs caused by market frictions, forward-looking managers are willing to retain unused resources when sales decrease. Such resource commitment reduces predation risks and has value as an option. This is similar to the transaction cost and precautionary motives for cash holdings, as it is also management's deliberate resource commitment decision in the face of adjustment costs. Absent market frictions such as information asymmetry and transaction costs, there is no need to hold cash as firms can always raise it immediately (Opler, Pinkowitz, Stulz and Williamson

[2] Although the cost stickiness literature starts with the stickiness of SG&A cost, later research shifts the attention to study the stickiness of operating cost (e.g., Banker et al. 2013a; Banker et al. 2013b; Kama and Weiss 2013). The only exception is Chen et al. (2012), primarily because SG&A cost better captures the empire building incentives due to its discretionary nature. My paper uses the stickiness of SG&A cost as a tool to examine the behavior of SG&A cost in the context of product market competition.

1999; Keynes 1936). The transaction cost and the precautionary motives of cash holdings are evidenced by the fact that firms with limited access to the capital market and greater growth opportunities hold more cash, and the marginal values of cash is higher (Opler et al.; Faulkender and Wang 2006). Similar to cash holdings, SG&A spending is influenced by market frictions. Managers who hold cash are influenced by capital market frictions, while managers who invest in SG&A are influenced by frictions in labor markets and real asset markets.

Because of predation risks, firms are willing to commit to more slack resources to avoid underinvestment. Haushalter, Klasa and Maxwell (2007) and Hoberg, Phillips and Prabhala (2014) find that firms increase their cash holdings when predatory risks and competitive pressure increase. Firms do not only need cash to seize growth opportunities; they also need additional tangible assets, as well as intangible slack resources. The complementary relationship between cash and SG&A is also supported by Falato, Kadyrzhanora and Kim (2013), who find that the trend of cash holdings is mainly to support the rising trend of intangible capital, of which the stock of SG&A is a key element.[3] Thus, I expect that they will increase their commitment to SG&A spending in the face of competition.

Competition can increase commitment to SG&A spending in two ways. First, competition increases the risks of underinvestment and predation by competitors (Grenadier 2002; Akdogu and MacKay 2008; Fresard 2010), and therefore induces managers to hold slack resources to avoid such risks. Second, competition increases the

[3] Passov (2003) also shows that firms hold more cash to fund R&D spending during downturns. This precautionary motive is not confined to R&D spending only. Falato et al. (2013) show that firms hold more cash to sponsor any kind of intangible capital, including the stock of SG&A expense. SG&A expense is also much larger in magnitude than R&D expenditures, as it is on average 6 times that of R&D expense.

uncertainties firms face (Comin and Phillipon 2005), which increases the option value (Black and Scholes 1973) of slack resources. I examine the relationship between the stickiness of SG&A costs and competition in my first hypothesis:

H1: Competition increases the stickiness of SG&A costs.

As noted above, the value of resource commitment comes from two sources: to avoid the risk of underinvestment and predation by competitors, and to have option value in volatile product market environments. Therefore one would expect that the value of slack resources increases with the strength of growth opportunities and the uncertainties firm face. This argument is supported by both the cash and the SG&A literature. On the cash side, Opler et al. (1999) find that firms with strong growth opportunities and riskier cash flows hold relatively higher ratios of cash relative to non-cash assets. Pinkowitz and Williamson (2007) find that the value of cash is positively related to the firm's growth opportunities, the uncertainty of its investment program, and the volatility of its operating cash flows. On the SG&A side, Banker et al. (2011b) and Chen et al. (2012) show that cost is stickier for growth firms, and Banker et al. (2011a) show that SG&A creates higher future values for firms with higher earnings volatility.

Competition further increases the value of resource commitment in the face of growth opportunities and future uncertainties. First, for firms with greater growth uncertainties, competition increases the risks of underinvestment and predation by competitors. Second, because competition increases the uncertainties firms face, competition may be associated with sales volatility. As explained more fully in Section 4, I use trade costs as a proxy for competition, and estimate the relation between future sales grown volatilities and lagged trade cost. I expect cost stickiness to be particularly evident

when lagged trade costs are positively related to future sales volatilities. I thus propose my second and third hypotheses as follows:

H2: Competition increases the stickiness of SG&A cost more for firms with greater growth opportunities.

H3: Competition increases the stickiness of SG&A cost when competition is positively associated with volatility in future sales growth.

A significant portion of SG&A is spent on maintaining organizational capital. Thus, the importance of organizational capital may moderate the relationship between competition and cost stickiness. According to Lev and Radhakrishnan (2005 p75), organizational capital is "an agglomeration of technologies—business practices, processes and designs, and incentive and compensation systems—that together enable some firms to consistently and efficiently extract from a given level of physical and human resources a higher value of product than other firms find possible to attain." Examples of organizational capital include product design, brand enhancement, distribution network, key employees and information technology system. Typically, these amounts are included in the SG&A category. In fact, both Lev and Radhakrishnan (2005) and Eisfeldt and Papanikolaou (2013) use SG&A to measure the flows to organizational capital. SG&A spent on the resources described above is asset-like in nature because the benefits may last a long period of time (Banker et al. 2011a). Compared to physical capital, organizational capital is hard to replicate because it is intangible and firm-specific. Therefore organizational capital is an important source of a firm's core competency (Lev and Radhakrishnan). For firms that heavily rely on organizational capital, competition

makes SG&A spending even more important to maintain its core competency. Therefore, I propose my fourth hypothesis:

H4: Competition increases the stickiness of SG&A cost more for firms with high organizational capital.

2.3 The strategic role of SG&A spending in product market competition

Baskin (1987) theoretically and empirically shows that liquid assets can be used to pre-empt new opportunities. Fresard (2010) finds that when competition intensifies, firms with greater cash holdings in place gain more market share at the expense of firms with fewer cash holdings. To explain the mechanism, Fresard (2010, p.1098) states that "A firm may also use its cash reserves to fund competitive choices, such as the location of stores or plants, the construction of efficient distribution networks, the use of advertising targeted against rivals, or even the employment of more productive workers."[4] A significant portion of these activities is captured by SG&A spending. Fresard's statement highlights that, to capture growth opportunities, firms not only need cash, but also need to spend on SG&A to maintain key employees, well-functioning IT systems and distributional networks. Therefore, SG&A spending may play a similar strategic role to cash holdings as in Fresard (2010).

To capture the strategic SG&A spending, I use abnormal SG&A spending (also called "discretionary SG&A"), defined as residual SG&A spending after controlling for normal operational needs. This measure was first created by Rowchowdhury (2006) and

[4] Cash-rich firms can also drive financially constrained firms out of the market by lowering price, as predicted by Bolton and Scharfstein (1990).

later widely used to capture the discretionary portion of SG&A spending (i.e., Cohen, Dey and Lys 2008; Zang 2012). I focus on abnormal SG&A spending rather than raw SG&A spending for two reasons: (1) abnormal SG&A spending better captures manager's *deliberate* choice; and (2) abnormal SG&A is estimated by running industry-year regressions. Thus, it captures the relative amount of firms' SG&A expenditures relative to their industry rivals. When firms compete for market share, their relative resource commitment is more relevant than the absolute amount.

Therefore, I propose my fifth hypothesis:

H5: Firms with higher abnormal SG&A spending gain market share at the expense of firms with lower abnormal SG&A spending, and this relationship is stronger when competition intensifies.

Chapter3: Empirical Methods and Sample Selection

3.1 Measuring the impact of competition on the stickiness of SG&A cost

My first hypothesis is that competition increases the stickiness of SG&A cost. To test this hypothesis, I follow Chen et al. (2012) and use the following generic model.

$$log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$$

$$= \beta_0 + \beta_1\, log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right] + \beta_2 Sticky_{i,t} + \beta_3 Compete_{i,t}$$

$$+ \beta_4 Asset\_intensity_{i,t} + \beta_5 Employee\_intensity_{i,t}$$

$$+ \beta_6 Successive\_decrease_{i,t} + \beta_7 Sticky_{i,t} * Compete_{i,t} + \beta_8 Sticky_{i,t}$$

$$* Asset\_intensity_{i,t} + \beta_9 Sticky_{i,t} * Employee\_intensity_{i,t} + \beta_{10} Sticky_{i,t}$$

$$* Successive\_decrease_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

Where $\text{Sticky}_{\text{i,t}} = \text{Decrease\_dummy}_{\text{i,t}} * \log\left[\frac{\text{Sales}_{\text{i,t}}}{\text{Sales}_{\text{i,t-1}}}\right]$, and $\text{Decrease\_dummy}_{\text{i,t}}$ is an indicator variable =1 if sales decreases in year t and 0 otherwise. This variable captures the differential response of SG&A to sales decreases and increases. A negative regression coefficient indicates that SG&A decreases by a lower proportion when sales decrease than it does when sales increase. The more negative the value of the coefficient, the more asymmetrically SG&A costs respond to sales increases and decreases, and the more sticky SG&A costs are.

$\text{Asset\_intensity}_{\text{i,t}} = \log\left[\frac{\text{Asset}_{\text{i,t}}}{\text{Sales}_{\text{i}}}\right]$; It is included because asset intensity increases adjustment costs (Anderson et al. 2003). As stated in Anderson et al., disposing of an asset is costly because of selling cost and asset-specificity. When faced with greater adjustment costs, managers are less likely to cut resources when sales decline, making cost stickier for asset-intensive firms.

$\text{Employee\_intensity}_{\text{i,t}} = \log[\frac{\text{Employee}_{\text{i,t}}}{\text{Sales}_{\text{i,t}}}]$; It is included because employee intensity increases adjustment cost (Anderson et al. 2003). According to Anderson et al.

(2003), laying off employees is costly because of severance payments, wasted firm-specific training, and lost morale. Therefore, cost is stickier for employee-intensive firms.

$\text{Successive\_decrease}_{i,t} = 1$ if sales decrease in t-1, and is 0 otherwise. This variable is shown to decrease cost-stickiness because managers retain fewer resources when they are pessimistic about the future (Anderson et al. 2003).

The four variables noted above have also been used in Anderson et al. (2003), Banker et al. (2013a), and Chen et al. (2012).

I add firm dummies in all main tests. Fixed-effect models test how changes in competition affect changes in cost stickiness within firms. When performing the robustness checks I also use industry dummies to observe within-industry variation in competition measures. To control for year fixed effects, I add year dummies in all my specifications.

I winsorize the top and bottom of all variables at the1% level to reduce the influence of outliers. Following the literature, I cluster standard errors by industry because competition is measured at the industry level.

3.2 Identification and measures of competition

The degree of stickiness in SG&A cost reflects the manager's endogenous choice of resource commitment. Therefore to avoid the identification challenge arising from correlating two endogenous variables, I use two natural experiment settings in which competition exogenously intensifies.

In the first setting, I follow Gaspar and Massa (2006) to use deregulations of airlines (1978), electricity (1978), natural gas (1978), telecoms (1980), and transportation

(1980) as shocks to firms' competitive environment. I investigate how the degree of cost stickiness changes in the 3 years before and after deregulation in each industry. Winston (1998) shows that deregulation of government control over entry, exit and price in these industries spurs intensive competition and improvement in efficiency.

In the second setting, I exploit exogenous variations in trade costs to further pin down the effect of competition on cost stickiness. Trade cost is calculated as tariff plus transportation cost at the industry level. The advantage of this measure is that it directly measures the industry entry barrier, which is a source of competition. Changes in entry barriers are exogenous to individual firms and there are multiple shocks to employ. Bernard, Jensen and Schott (2006) demonstrate the intensification of competition following reductions in trade costs, as evidenced by more deaths of plants in the U.S. manufacturing sector. For ease of interpretation, I multiply trade cost by (-1) so that a higher value of the transformed variable indicates lower trade cost and hence greater competition.

As a robustness check, I also use five other competition variables used by the prior literature. The first four are market-share based measures. The rationale is that when market share in an industry is less concentrated, each firm enjoys less market power and the competition is higher. First, I use Hoberg and Phillips (2010) measure of the Herfindahl index (HHI_HP). This measure is based on public and private firm data and employee data from Compustat, the U.S. Department of Commerce, and the Bureau of Labor Statistics. It has the advantage of incorporating private firm information and covering all industries. This measure has also been used by Valta (2012). Then, I use two conventional concentration measures. My second measure is the Herfindahl index based

on Compustat data (HHI_compu). I log-transform both HHI_HP and HHI_compu measures in my tests. My third measure of competition is four-firm concentration ratios (HHI_con4), calculated as the sum of sales for the top 4 firm in each industry divided by total industry sales for that year. The Herfindahl index based on Compustat data (HHI_compu) and the four-firm concentration ratios (HHI_con4) reflect the degree of competition between large players in the market. For ease of interpretation, I multiply raw measures of HHI_HP, HHI_compu, and HHI_con4 by (-1) so that higher values of these variables indicate greater competition. My fourth measure of competition is import penetration, calculated as imports/ (imports + domestic production – exports). It reflects the market share occupied by foreign competitors. I use it to capture foreign competitive pressure. This measure has also been used by Bloom, Sadun and Van Reenen (2010), Xu (2012), and Mello and Wang (2012).

My fifth competition measure takes advantage of the recent advancement in text-based finance research by using the product fluidity measure created by Hoberg, Phillips, and Prabhala (2014). They first use product descriptions in company 10-k filings to construct a product space of each firm in a given year. Then, they construct a measure called "product market fluidity" (hereafter, fluidity) to reflect the extent to which the product space of one firm is intruded upon by other firms in that year. Fluidity measures competition at the product level and allows for dynamic changes in the product market. Its weakness is that it only reflects competition between public firms in the U.S.

3.3 Data and Sample Selection

My two natural experiments settings consist of two samples: the industry deregulation sample and the trade costs sample. Table 1 lists the procedures of sample

selection. In constructing the industry deregulation sample, I start with the Compustat Annual file for the 5 deregulated industries (deregulation years) of Airlines (1978), Electricity (1978), Natural Gas (1978), Telecoms (1980) and Transportation (1980). I keep the observations 3 years before and after the deregulation year for each industry. Then I drop observations with missing or negative sales and SG&A expense. Then I drop observations with missing independent variables. The final sample has 476 observations.

[Insert Table 1 about here]

In constructing the trade costs sample, I start with the Compustat Annual file for all manufacturing firms (SIC 2000-3999) from the period 1974-1999, when trade costs data is available. I then drop observations with missing or negative sales and SG&A expense. SIC codes fail to accurately classify certain industries. Inspired by Clarke (1989) and Fresard (2010), I delete industries whose four-digit SIC codes ends in zero if the industry is labeled "miscellaneous". I also delete all industries whose four digit SIC code ends in nine.[5] Then I merge with trade costs data obtained from Peter Schott's website and drop observations with missing independent variables. The final sample has 36,402 observations.

Chapter4: Empirical Results

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics and the correlation matrix. In the industry deregulation sample, I use an event dummy After_dum to measure competition. After_dum equals 1 if a given year is within the 3 years after the deregulation year, and

[5] Fresard (2010) focuses on manufacturing and deletes all four digit-SIC industries ending with zero and nine. However, not all zero-ending industries are ill-classified but all nine-ending industries are. Therefore, I delete zero-ending industries only if labeled "miscellaneous" and delete all industries ending in nine.

equals 0 if a given year is 3 years before the event year (including the event year).[6] In the trade cost sample, the mean and median trade cost is approximately 7% of good values (I multiplied raw trade cost by -1), which is economically significant.

[Insert Table 2 about here]

Panel A also presents other competition measures. They are obtained from Hoberg-Philips Data Library (for HHI_HP), Peter Schott's website (for Import_pene), or constructed by using variables from the Compustat Annual File (for HHI_compu and HHI_con4). Detailed data source and variable definitions can be found in Appendix A. Remember that I already multiplied the 3 industry concentration measures (HHI_HP, HHI_compu and HHI_con4) by (-1) so that a higher value of the transformed variable indicate greater competition. Note that the mean (median) import penetration ratio is 18.9% (12.8%), which suggest that foreign rivals occupy economically significant market share.

Panel B of Table 2 presents the correlation matrix. All competition measures are positively correlated because by construction the measures increase with competition. Trade cost has a 0.2803 correlation with import penetration. The correlation between the Hoberg- Phillips version of the Herfindahl Index (HHI_HP) and the Herfindahl Index based on Compustat (HHI_compu) is 0.5516. This indicates that HHI_HP captures more than just the concentration ratio of public firms. The correlation between logged sales growth and logged SG&A growth is 0.5768, suggesting that sales is the key driver of SG&A costs.

[6] The results are robust if I reclassify the event year from the control group (After_dum=0) into the treatment group (After_dum=1).

4.2 Competition and the stickiness of SG&A spending: industry deregulation setting

The industry deregulations around the 1980s provide a natural experiment setting when competition exogenously intensifies within deregulated industries. I examine how competition affects firm commitment to SG&A spending by comparing the degree of stickiness before and after deregulations. The sample consists of the 5 deregulated industries (deregulation years) of Airlines (1978), Electricity (1978), Natural Gas (1978), Telecoms (1980), and Transportation (1980). Table 3 shows the results using the following regression model:

$$log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right] = \beta_0 + \beta_1\, log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right] + \beta_2 Sticky_{i,t} + \beta_3 After\_dum_{i,t} + \beta_4 Asset\_intensity_{i,t} + \beta_5 Employee\_intensity_{i,t} + \beta_6 Successive\_decrease_{i,t} + \beta_7 Sticky_{i,t} * After\_dum_{i,t} + \beta_8 Sticky_{i,t} * Asset\_intensity_{i,t} + \beta_9 Sticky_{i,t} * Employee\_intensity_{i,t} + \beta_{10} Sticky_{i,t} * Successive\_decrease_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

Note that this model is essentially the same as model (1), except that the competition measure here is an event dummy (after_dum) that equals 1 if the year is within the 3 years after industry deregulation, and 0 if the year is within the 3 years before industry deregulation (including the deregulation year).

[Insert Table 3 about here]

Table 3 shows the results. Column (1) examines the stickiness of SG&A spending. The coefficient for sticky*after_dum is -0.551 with a t-value of -5.389. This indicates that SG&A cost became more sticky after industry deregulations. Because there are many

missing SG&A observations during the sample period, I expand the sample by examining operating costs. Compared to SG&A costs, operating costs contain less of a discretionary component and add noise to the test, so the effect for operating costs may be weaker than SG&A costs. The results are as predicted. As column (2) shows, the results are weaker but still hold. This suggests that my results are not confined to a small sample of firms with available data on SG&A costs.

4.3 Competition and the stickiness of SG&A spending: trade costs setting

My second setting use changes in trade costs as shocks to firms' competitive environment. Because trade cost is typically beyond the control of an individual firm, its change is exogenous and represents a natural experiment setting. I continue to use regression model (1) to estimate the effects and use trade costs as a competition measure, as specified below.

$$log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right] = \beta_0 + \beta_1\, log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right] + \beta_2 Sticky_{i,t} + \beta_3 Trade\_cost_{i,t} + \beta_4 Asset\_intensity_{i,t} + \beta_5 Employee\_intensity_{i,t} + \beta_6 Successive\_decrease_{i,t} + \beta_7 Sticky_{i,t} * Trade\_cost_{i,t} + \beta_8 Sticky_{i,t} * Asset\_intensity_{i,t} + \beta_9 Sticky_{i,t} * Employee\_intensity_{i,t} + \beta_{10} Sticky_{i,t} * Successive\_decrease_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

I include firm dummies in the specification, and therefore the coefficient β_7 captures how changes in trade costs moderate the degree of stickiness in SG&A spending

within firms. As previously stated, I multiplied trade cost by (-1) so that a higher value of the transformed variable indicates greater competition.

[Insert Table 4 about here]

Table 4 shows the results. The coefficient of sticky*compete (β_7) is -1.115 with a t-value of -2.598. In other words, when trade costs decrease by 1%, cost stickiness increases by 1.115%. This effect is economically significant. The results suggest that when it is easier for foreign competitors to enter the U.S. market, U.S. firms respond with more commitment to SG&A spending. The evidence supports Hypothesis 1 that competition increases cost stickiness.

The coefficients of sticky*asset_intensity and sticky*employee_intensity are negative and statistically significant, confirming the predictions in section 3.1 that firms with higher asset_intensity and employee_intensity have higher adjustment costs and therefore more sticky SG&A costs. The coefficient of sticky*successive_decrease is positive and statistically-significant, confirming that firms with successive decreases in sales are more pessimistic about the future and reduce their commitment to SG&A spending. The results for the above three control variables are also consistent with Anderson et al. (2003), Chen, et al. (2012), and Kama and Weiss (2013).

4.4 Competition and the stickiness of SG&A spending: The role of growth opportunities

H2 proposes that competition increases cost stickiness more for firms with high growth opportunities. To test this hypothesis, I run regression model (3) by partitioning firms by their growth opportunities. A firm is defined as having greater growth opportunities if its size and book to market (BTM) are below the sample median, or if its

R&D intensity is above the sample median. Size and BTM are widely used in the literature as proxies for growth opportunities. R&D intensity generates product innovation and growth opportunities and increases the portion of firm value tied to growth options (Grullon, Lyandres and Zhdanov 2012). I define R&D intensity as R&D expense scaled by total assets. This procedure generates 6 subsamples: high/low R&D, high/low BTM, and larger/small firms.

Note that for subsample tests (this section and section 4.4 and 4.5), I use trade cost to measure competition because it is available for all manufacturing industries over a span of nearly 30 years. In contrast, the industry deregulation sample is small, so further partitioning the sample will significantly reduce the statistical power of tests.

[Insert Table 5 about here]

The results in Table 5 supports that the contention that the effect of competition on cost stickiness is stronger for firms with greater growth opportunities. The coefficient for sticky*compete is statistically significant for small firms (Size_small) and low BTM firm (BTM_low), but is insignificant for big firms (Size_big) and high BTM firm (BTM_high). Although the t-value for R&D_high group is only -1.488, it is still much higher than that of -0.507 for R&D_low. The results suggest that, in the face of greater competition, firms are more concerned about underinvestment, and therefore more committed to SG&A spending in response to greater competition.

4.5 Competition and the stickiness of SG&A spending: Volatility as a channel

H3 proposes that competition increases cost stickiness when it is positively associated with volatility in future sales growth. To test this hypothesis, I first regress

three-year sales growth volatility on lagged trade costs for each of the two-digit SIC codes. Then, I rank industries based on the association between volatility and trade costs. I run regression model (1) on each subsample respectively.

[Insert Table 6 about here]

Table 6 supports Hypothesis 3 by showing that competition increases cost stickiness only when it is positively associated with volatility in future sales growth. Column (1) shows the results when competition increases sales growth volatility (the "increasers"). The coefficient of sticky*compete is -1.384 and with a t-value of -2.421, indicating that competition increases the stickiness of SG&A cost for this group. Column (2) shows the results when competition fails to increase sales growth volatility ("non-increasers"). The coefficient of sticky*compete is -0.218 and statistically insignificant. Overall, the results confirm the proposed rationale that competition increases cost stickiness by increasing the uncertainties firm face, and under such circumstances resource commitment has greater option value. Note that column (1) has more observations than column (2). This is because column (1) industries have more firms than column (2) industries.

4.6 Competition and the stickiness of SG&A spending: the importance of organizational capital

The concept of organizational capital has received increasing prominence in recent finance literature (see e.g. Eisfeldt and Papanikolaou 2013, Carlin et al. 2012, Lustig, Syverson, and Van Niewerburgh 2011, and Li et al. 2013). The empirical literature uses a measure of capitalized SG&A to represent organizational capital. My

prior tests focus on the flow of SG&A spending; I now turn to organizational capital as a measure of the stock of SG&A spending. To test H4 (competition increases cost stickiness more for firms with high organizational capital), I estimate regression models for high and low organizational capital firms separately. Following Eisfeldt and Papanikolaou (2013), I calculate the value of organizational capital (O_{it}) by capitalizing SG&A spending and depreciating it like an asset using the following procedures:

$$O_{it} = (1 - \alpha_o)O_{it-1} + \frac{SGA_{i,t}}{cpi_t}$$

Where cpi is consumer price index. The initial value of organizational capital is calculated using the following formula:

$$O_0 = \frac{SGA_1}{g + a_0}$$

Following Eisfeldt and Papanikolaou (2013), I use a 10% growth rate (g) which is also the average growth rate of SG&A in my sample ($g = 10\%$) and a 15% depreciation rate ($\alpha_o = 0.15$). I then scale O_{it} by the book value of assets.

A firm is defined as having high organizational capital if its organizational capital is above the sample median, and as having low organizational capital otherwise.

[Insert Table 7 about here]

The results in table 7 support hypothesis 4 that competition increases cost stickiness mainly for firms with high organizational capital. The coefficient of sticky*compete is -1.174 with a t-value of -2.476 for high organizational capital firms, while the coefficient for low organizational capital firms is only -0.455 and is statistically insignificant. The results suggest that SG&A spending is more important for high intangible firms, specifically for firms whose intangible assets can be well-represented by organizational capital.

It is worth noting that the tests using organizational capital provide strong evidence that the asset-like nature of SG&A dominates the empire building explanation. Since, following Eisfeldt and Papanikolaou (2013), I define high organizational capital firms as firms with high capitalized SG&A levels relative to their industry peers; these are firms whose *stock* of SG&A spending is high. These firms have invested in SG&A not just in the current year, but also in the past. If this consistently high level of SG&A investment represented managerial empire building or perquisite consumption, managers would not be able to sustain this level of spending in the face of competition. The fact that competition increases cost stickiness mainly for high organizational capital firms provides confirmatory evidence that SG&A spending is indeed an asset.

4.7 Competition and the stickiness of SG&A spending: alternative competition measures

In prior tests, I show that competition increases the stickiness of SG&A spending using two natural experiment settings. Such settings allow me to capture the exogenous changes in firms' competitive environments and to obtain clean identification. However, they also confine me to a restricted sample of 5 deregulated industries and manufacturing industries respectively. To test if the results are robust to alternative competition measures and generalizable to a larger sample, I use five alternative competition measures as introduced before. The first four measures are based on concentration of market share. They are the Herfindahl-Hirschman Index based on the Hoberg-Phillips measure (HHI_HP), Herfindahl-Hirschman Index based on Compustat measure (HHI_compu), the four-firm concentration ratio (HHI_con4) and import penetration (Import_pene). As noted previously, I multiply HHI_HP, HHI_compu, and HHI_con4 by

(-1), so that a higher value indicates less concentration (and hence more competition). I continue to use regression model (1) and use the above 5 variables as alternative competition measures.

[Insert Table 8 about here]

The results are shown in table 8. Competition increases cost stickiness across all measures, and in both the manufacturing and the all-industry sample. The coefficients for sticky*compete are all negative and statistically significant.

Column (5) presents the result when competition is measured by product market fluidity. The coefficient for sticky*fluidity is negative with a t-value -3.392. Because fluidity measures the extent to which other firms' product market space intrudes into the firm's own product market space, adding firm dummies captures how cost stickiness changes in response to the *changes* in fluidity. A negative coefficient for sticky*fluidity with a t-value of -3.392 indicates that when other firms *accelerate* their intrusion into the firm's product space, firms respond by increasing their cost stickiness at a 1% significance level. The robustness of results using alternative competition measures confirms the generalizability of my results beyond the two natural experiment settings.

4.8 The strategic role of SG&A in product market competition

Prior results show that competition makes firms more committed to SG&A spending, as reflected in the increased level of stickiness. The increased commitment to SG&A spending leads to a question of what benefits SG&A brings in product market competition. To answer this question, I examine how abnormal SG&A spending affect firm's product market performance, as reflected in the gains and losses of market share.

Use of abnormal rather than total SG&A not only controls for firm's normal operating needs, but also captures the relative standing of a firm's SG&A cost within its industry in a given year. As previously stated, firms not only need cash to preempt rivals in gaining market share, but also need to spend on SG&A to maintain key employees, well-functioning IT systems and distributional networks. Thus, similar to the cash effect documented by Fresard (2010), we may find that firms with higher SG&A expenditures gain market share against their rivals, and such effect increases with competition (H5). This hypothesis can be tested with the following model:

$$\Delta MarketShares_{i,t} = \beta_0 + \beta_1 Ab\_SGA_{i,t-1} + \beta_2 Compete_{i,t} + \beta_3 Ab\_SGA_{i,t-1} * Compete_{i,t} + \beta_4 Cash_{i,t-1} + \beta_5 Cash_{i,t-2} + \beta_6 Size_{i,t-1} + \beta_7 Lev_{i,t-1} + \beta_8 Lev_{i,t-2} + \beta_9 Salesgrowth_{i,t-1} + \beta_{10} Salesgrowth_{i,t-2} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (4)$$

The dependent variable is change in market share. Following Fresard (2010), it is calculated as a firm's sales growth minus industry-year average sales growth.

To measure the degree of abnormal SG&A spending, I use the Roychowdhury (2006) procedure of estimating the following regression:

$$\frac{SG\&A_{i,t}}{Asset_{i,t-1}} = \propto_0 + \propto_1 \left(\frac{1}{Asset_{i,t-1}}\right) + \beta \left(\frac{Sales_{i,t-1}}{Asset_{i,t-1}}\right) + \epsilon_{i,t} \quad (5)$$

Where $SG\&A_{i,t}$ is selling, general, and administrative expense, $Asset_{i,t-1}$ is lagged total asset, and $Sales_{i,t-1}$ is lagged net sales. I estimate the model for each of the two-digit SIC years with no less than 10 observations. Abnormal SG&A is the residual from this regression.

I include the following control variables that have been shown to be determinants of market share in Fresard (2010):

Cash = (Cash and equivalent + short-term investment)/total asset. I control for the first and second lags of cash holding because Fresard (2010) shows that cash holding affects market share.

Size =Ln(total asset). I control for lagged size because larger firms have more resources to predate on smaller firms. Larger firms also grow slower than smaller firms.

Leverage = long-term debt/total asset. I control for the first and second lags of leverage because Zingales (1998) shows that highly leveraged firms have higher predation risks.

Sales growth = (Sales – Sales_lag)/ by lagged sales. I include one- and two-lagged sales growth to control for sales momentum.

[Insert Table 9 about here]

The results in table 9 support Hypothesis 5 by identifying the role of SG&A spending in product market competition. These results demonstrate that abnormal SG&A spending leads to increased market share in the following period. This relationship gets stronger as competition increases. Columns (1)-(6) consistently show that the coefficients of ab_SGA_lag*compete are positive and statistically significant, suggesting that when competition intensifies, firms that spend more on SG&A gain even more market share at the expense of firms that spend less. This predatory role of SG&A spending is very similar to that of cash documented in Fresard (2010). The results confirm the argument that to preempt rivals in obtaining market share, firms not only need cash, but also need intangible resources maintained by SG&A spending.

The results discussed above beg the question as to why firms underinvest in SG&A. There are two potential reasons. The first reason is that firms face pressure from

the capital market to meet or beat short-term earnings benchmarks, and thus they may myopically cut SG&A cost at the expense of long-term benefits (Rowchowdhury 2006; Kama and Weiss 2013). The second reason is that the capital market does not fully appreciate the value of SG&A spending. Anderson et al. (2007) shows that during periods of sales decline, a portfolio based on buying firms with high increases in the SG&A/sales ratio and shorting on firms with low increases in this ratio yields positive abnormal returns. This suggests that the capital market undervalues commitment to SG&A spending. This undervaluation, together with practitioners' concern over SG&A cost (Mintz 1999), could discourage some firms from fully investing in SG&A.

Chapter 5: Robustness check

5.1 Incorporating the implications of Banker, Byzalov, Ciftci and Mashruwala (2014)

My results are consistent with Banker, Byzalov, Ciftci and Mashruwala (2014) (hereafter BBCM) after incorporating the impacts of prior year sales increases and decreases. BBCM shows that cost stickiness is mainly driven by a subsample of firms with prior sales increases as managers are more optimistic about future sales, and therefore more willing (unwilling) to retain slack resources in the current period. In contrast, cost is anti-sticky with prior sales decreases as managers are pessimistic about future and reluctant to retain slack resources.[7] To incorporate this implication, I run my analysis separately for firms with a prior year sales increase (the "prior increasers") and firms with a prior year sales decrease (the "prior decreasers"). I predict that my results

[7] Cost is anti-sticky when cost decreases to a greater extent when sales decline than its increase when sales increase.

should be stronger (weaker) for the prior increasers (decreasers) as they have more optimistic (pessimistic) expectations and less (more) carried-over slack resources. The results (untabulated) confirm this. The results of competition are stronger for the prior increasers and for the prior decreasers they are mostly insignificant. Note that the results of prior increasers overlap with prior results of growth firms, as growth firms are more likely to have a prior sales increase.

5.2 Other robustness checks

Kama and Weiss (2013) document that target-beating incentives decrease cost stickiness. This finding is unlikely to confound my results because competition increases the pressure to meet or beat earnings benchmarks, causing cost to be less sticky and biasing against my results. To be cautious, I still control for the incentives to avoid a loss or earnings decrease, or to meet or beat consensus analyst forecasts. My results are robust against these additional controls.

Trade cost incorporates both tariffs and transportation costs. Tariffs cuts are often reciprocal between countries, and reductions in transportation costs facilitate both imports and exports. To eliminate the possibility that my results are purely driven by exports, I delete firm year observations that report export or foreign sales. My results continue to be robust.

SG&A expense also includes advertising expenditures. It has long been recognized that advertising matters for competition (see Bagwell 2007 for a comprehensive review). If advertising is the main driver of my results, then the study simply shows that competition encourages advertising. However, this is not the case.

First, advertising expense is on average only 3.5% of SG&A in my sample. Second, my results are qualitatively the same when I exclude advertising from SG&A.

There is no consensus in the literature on whether to include base controls (i.e., Compete, Asset_intensity, Employee_intensity, and Successive_decrease). Anderson et al. (2003), Banker et al. (2011), and Banker et al. (2013) do not include base controls, while Chen et al. (2012) do. My results are qualitatively similar in both specifications.

My results are also robust to the clustering of standard errors by firms, the replacement of firm dummies with industry dummies, and when I use industry level BTM and R&D to proxy for growth opportunities.

Chapter 6: Conclusion

Firms commit to slack resources to avoid underinvestment and predation by competitors. These slack resources have value as an option. Prior research has documented the precautionary and predation role of cash holdings, and that these effects are stronger when competition intensifies. I empirically document that there is also a precautionary and predatory role of SG&A spending. Specifically, I find that firms are more committed to SG&A spending when competition intensifies, making SG&A cost more sticky. This effect is stronger for firms with greater growth opportunities and high organizational capital, and when competition increases sales growth volatility. I further document the predatory role of SG&A by finding that firms with more abnormal SG&A spending gain market share at the expense of firms with low SG&A spending. Such predation behavior increases with competition. My study connects the SG&A and the cost stickiness literature with the cash holding literature. Beyond its main contributions to

the SG&A and cost stickiness literature, to my knowledge, it is also the first study to document the potential negative consequences of real earnings management in the product market: Firms who cut discretionary expenditures such as SG&A in order to meet earnings targets are likely to incur real costs through the loss of market share to competitors My study shows that SG&A cost is on average an asset-like investment, and it plays a strategic role in product market competition.

My study also offers a framework for assessment of company's slack resources. All slack resources can be abused due to agency cost but also have value as an option to avoid underinvestment. I offer an approach for evaluating whether such slack resources are beneficial or detrimental to the firm overall by investigating whether the competition encourages for disciplines expenditure on these resources.

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Appendix A Definition of variables

This table presents definitions of variables. HHI_HP data are from Hoberg-Phillips Data Library. Import-pene is calculated using tariff data from Peter Schott's website. Trade cost data is also from Peter Schott's website. Other data are from Compustat Annual file.

Sticky	$\text{Decrease\_dummy} * \log\left[\frac{\text{Sales}_{i,t}}{\text{Sales}_{i,t-1}}\right]$. Decrease_dummy is an indicator variable that equals 1 if sales decrease in year t.
Hoberg- Phillips version of Herfindahl Index (HHI_HP)	(-1)*Herfindahl-Hirschman Index at the three-digit SIC code level proposed by Hoberg and Phillips (2010). This index combines public company data with private company and employee data, and covers all industries.
Four Firm Concentration Ratio (HHI_con4)	(-1)*Four firm concentration ratio from Compustat. It is calculated using the sum of top 4 firm sales in an industry divided by total industry sales in the same year. It is calculated at three-digit SIC level.
Herfindahl Index using Compustat data (HHI_compu)	(-1)*Herfindahl-Hirschman Index using Compustat data at three-digit SIC level.
Import Penetration (Import_pene)	Import penetration calculated as *import/ (domestic production - exports + imports). It measures the market share seized by imports at four-digit SIC level.
Trade cost	(-1)*Tariff plus freight and insurance at four-digit SIC level.
Fluidity	Captures to what extent competitors' product market space intrudes into the firm's own product market space. This measure was constructed by Hoberg, Phillips, and Prabhala (2014).
Asset intensity	$\log\left[\frac{\text{Asset}_{i,t}}{\text{Sales}_{i}}\right]$
Employee intensity	$\log[\frac{\text{Employee}_{i,t}}{\text{Sales}_{i,t}}]$
Successive decrease	An indicator variable that equals 1 if sales decrease in year t-1.
Size	Total assets
ΔMarketShare	Changes in market share calculated as sales growth minus its industry-year average, following Fresard (2010).
Abnormal SG&A (Ab_SGA)	Abnormal SG&A spending calculated by running industry-year regressions, following Roychowdhury (2006).
Cash	(Cash and equivalent + short-term investment)/total asset
Leverage	long term debt/total asset
size	Ln(total asset)
Salesgrowth	(sales-sales_lag)/sales_lag

Table1. Sample Selection Procedures

	Industry Deregulation Sample	Trade_cost sample
Starting sample:	3,721 (all firms in deregulated industries with a period of 3 years before and after industry deregulation)	90,775 (all manufacturing firms in 1974-1999)
Drop observations with missing or negative sales and SG&A expense	578	78,454
Drop four-digit SIC ending with 9 and SIC classification beginning with "miscellaneous "	N/A	68,246
Drop observations with missing independent variables	476	36,402

Table2. Sample Description

Panel A: Descriptive Statistics

	Mean	*SD*	*Q1*	*Median*	*Q3*	*Count*
Industry Deregulation Sample						
log(SG&A/SG&A_lag)	0.146	0.251	0.037	0.130	0.220	476
log(Sales/Sales_lag)	0.134	0.254	0.031	0.121	0.207	476
Sticky	-0.032	0.107	0.000	0.000	0.000	476
After_dum	0.443	0.497	0.000	0.000	1.000	476
Asset_intensity	-0.036	0.669	-0.480	-0.141	0.360	476
Emplyee_intensity	-4.314	0.511	-4.591	-4.260	-4.022	476
successive_decrease	0.233	0.423	0.000	0.000	0.000	476
Trade Costs Sample						
log(SG&A/SG&A_lag)	0.118	0.246	0.004	0.102	0.217	36402
log(Sales/Sales_lag)	0.115	0.290	-0.017	0.099	0.228	36402
Sticky	-0.051	0.133	-0.017	0.000	0.000	36402
Trade_costs	-0.076	0.047	-0.100	-0.068	-0.043	36402
Asset_intensity	-0.146	0.542	-0.473	-0.208	0.094	36402
Emplyee_intensity	-4.618	0.760	-5.091	-4.600	-4.099	36402
Successive_decrease	0.316	0.465	0.000	0.000	1.000	36402
Other Competition Measures						
log(HHI_HP)	-6.329	0.305	-6.525	-6.292	-6.109	107,662
log(HHI_compu)	1.994	0.662	1.524	2.013	2.536	146,981
log(HHI_con4)	0.503	0.316	0.252	0.464	0.742	148,330
Import Penetration	0.189	0.201	0.053	0.128	0.261	49,335
Fluidity	6.570	3.087	4.242	6.149	8.448	35,115

Panel B: Correlation Matrix

This table presents Pearson Correlations between variables used in my analysis. P-values are in parenthesis.

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
(1)log(SG&A/SG&A_lag)	1											
(2) log(Sales/Sales_lag)	0.5768 (0.0000)	1										
(3) Sticky	0.3461 (0.0000)	0.6764 (0.0000)	1									
(4) log(HHI_HP)	0.0383 (0.0000)	0.0533 (0.0000)	-0.0630 (-0.0000)	1								
(5) log(HHI_compu)	0.0365 (0.0000)	0.0498 (0.0000)	-0.0213 (0.0000)	0.5516 (0.0000)	1							
(6) log(HHI_con4)	0.0435 (0.0000)	0.0542 (0.0000)	-0.0150 (0.0000)	0.5181 (0.0000)	0.9523 (0.0000)	1						
(7) Trade_cost	0.0516 (0.0000)	0.0491 (0.0000)	-0.0235 (0.0000)	0.0782 (0.0000)	0.2774 (0.0000)	0.2950 (0.0000)	1					
(8) Import_pene	-0.0146 (0.0007)	-0.0056 (0.1956)	-0.0740 (0.0000)	0.0814 (0.0000)	0.0971 (0.0000)	0.0825 (0.0000)	0.2803 (0.0000)	1				
(9) Asset_intensity	0.0760 (0.0000)	0.0450 (0.0000)	-0.1574 (0.0000)	0.2500 (0.0000)	0.1766 (0.0000)	0.1603 (0.0000)	0.1625 (0.0000)	0.1183 (0.0000)	1			
(10) Employee_intensity	0.0332 (0.0000)	-0.0070 (0.0065)	0.0015 (0.5508)	-0.1352 (0.0000)	-0.1228 (0.0000)	-0.0992 (0.0000)	-0.2157 (0.0000)	-0.2716 (0.0000)	-0.0243 (0.0000)	1		
(11) Successive_decrease	-0.1005 (0.0000)	-0.0610 (0.0000)	-0.1206 (0.0000)	0.0318 (0.0000)	-0.0102 (0.0000)	-0.0138 (0.0000)	0.0063 (0.1850)	0.0313 (0.0000)	0.0659 (0.0000)	0.0079 (0.0013)	1	
(12) Fluidity	0.1439 (0.0000)	0.1510 (0.0000)	-0.0566 (0.0000)	0.3491 (0.0000)	0.3615 (0.0000)	0.3720 (0.0000)	0.2790 (0.0000)	0.0382 (0.0001)	0.3825 (0.0000)	-0.0066 (0.2049)	-0.0325 (0.0000)	1

Table 3. The impacts of competition on cost stickiness: industry deregulation

This table presents the results of regression models investigating how industry deregulation affects cost stickiness. Deregulated industries (deregulation years) are Airlines (1978), Electricity (1978), Natural Gas (1978), Telecoms (1980), and Transportation (1980). The dependent variable is $\log\left[\frac{\mathrm{SG\&A_{i,t}}}{\mathrm{SG\&A_{i,t-1}}}\right]$ for (1) and $\log\left[\frac{\mathrm{OperateExpense_{i,t}}}{\mathrm{OperateExpense_{i,t-1}}}\right]$ for (2). Testing windows are three years before and after industry deregulation. After_dum is an indicator variable that equals 1 if the year is after the deregulation year, and 0 otherwise. Other independent variables are defined as in Appendix A. Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry and corrected for heteroskedasticity.

VARIABLES	*SG&A* *(1)*	*Operating Expense* *(2)*
log(sales/sales_lag)	0.663***	0.966***
	(9.165)	(40.665)
Sticky	-1.742*	-0.584***
	(-2.137)	(-5.960)
After_dum	0.088	0.022***
	(1.683)	(5.733)
*Sticky*After_dum*	-0.551***	-0.156**
	(-5.389)	(-2.689)
Asset_intensity	0.075	0.017
	(0.720)	(1.484)
Employee_intensity	-0.103	0.018
	(-1.233)	(0.777)
Successive_decrease	-0.017	-0.002
	(-0.697)	(-0.274)
*Sticky*Asset_intensity*	0.293	0.162**
	(1.629)	(3.274)
*Sticky*Employee_intensity*	-0.441*	-0.145***
	(-2.257)	(-5.222)
*Sticky*Sucessive_decrease*	-0.155	0.122
	(-0.695)	(1.570)
Firm Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	-0.362	0.086
	(-1.122)	(0.940)
Observations	476	2,841
R-squared	0.469	0.819

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. The impacts of competition on cost stickiness: trade cost changes as a natural experiment

This table presents the results of an empirical model investigating how competition affects cost stickiness. The dependent variable is $\log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$. Independent variables are defined as in Appendix A. The sample period is 1974-1999. Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry and corrected for heteroskedasticity.

VARIABLES	*log(SGA/SGA_lag)*
log(sales/sales_lag)	0.519***
	(26.305)
Sticky	-0.475***
	(-2.789)
Trade_cost	-0.119*
	(-1.936)
*Sticky*Trade_cost*	-1.115**
	(-2.598)
Asset_intensity	0.071***
	(10.526)
Employee_intensity	0.027***
	(4.138)
Successive_decrease	-0.049***
	(-14.752)
*Sticky*Asset_intensity*	-0.180***
	(-7.684)
*Sticky*Employee_intensity*	-0.065*
	(-1.979)
*Sticky*Sucessive_decrease*	0.122***
	(5.149)
Firm Dummies	Yes
Year Dummies	Yes
Constant	0.194***
	(8.091)
Observations	36,402
R-squared	0.376

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. The impacts of competition on cost stickiness: importance of opportunities

This table presents subsample test results based on the importance of growth options. Columns (1), (2), and (3) present firms which size or BTM intensity is below the sample median, or which R&D is above the sample median. Columns (4), (5), (6) present firms which size or BTM is above the sample median, or which R&D is below the sample median. The dependent variable is $\log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$ for (1). Compete is measured by trade cost. Other independent variables are defined as in Appendix A. Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry and corrected for heteroskedasticity.

VARIABLES	*Size_small* *(1)*	*BTM_low* *(2)*	*R&D_high* *(3)*	*Size_big* *(4)*	*BTM_high* *(5)*	*R&D_low* *(6)*
log(sales/sales_lag)	0.419***	0.484***	0.470***	0.711***	0.607***	0.599***
	(20.182)	(20.793)	(20.801)	(26.408)	(22.695)	(24.699)
Sticky	-0.333**	-0.537**	-0.568***	0.297	-0.292	-0.189
	(-2.277)	(-2.170)	(-2.758)	(0.803)	(-0.981)	(-0.753)
Trade_cost	-0.091	-0.212*	-0.232***	-0.087	-0.063	0.009
	(-1.089)	(-1.959)	(-2.943)	(-1.284)	(-0.802)	(0.119)
*Sticky*Trade_cost*	-1.383***	-1.933**	-1.003	0.052	-0.669	-0.297
	(-3.123)	(-2.550)	(-1.488)	(0.084)	(-1.203)	(-0.507)
Asset_intensity	0.085***	0.090***	0.087***	0.027***	0.053***	0.063***
	(10.330)	(9.244)	(8.948)	(3.501)	(5.358)	(7.697)
Employee_intensity	0.029***	0.027***	0.029***	0.038***	0.029***	0.020**
	(3.786)	(2.943)	(3.128)	(4.601)	(2.809)	(2.124)
Successive_decrease	-0.057***	-0.055***	-0.051***	-0.032***	-0.041***	-0.045***
	(-11.550)	(-11.897)	(-12.390)	(-8.207)	(-8.669)	(-10.420)
*Sticky*Asset_intensity*	-0.178***	-0.193***	-0.213***	-0.197***	-0.124***	-0.074**
	(-7.486)	(-5.428)	(-5.899)	(-3.025)	(-2.677)	(-2.461)
*Sticky*Employee_intensity*	-0.045	-0.069	-0.090**	0.085	-0.021	-0.015
	(-1.524)	(-1.520)	(-2.432)	(1.266)	(-0.365)	(-0.322)
*Sticky*Sucessive_decrease*	0.146***	0.138***	0.132***	0.043	0.137***	0.052
	(5.188)	(3.456)	(4.222)	(0.747)	(3.478)	(1.428)
Firm Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.256***	0.207***	0.228***	0.163***	0.177***	0.147***
	(8.082)	(4.765)	(5.601)	(6.092)	(4.695)	(4.590)
Observations	18,201	16,174	18,201	18,201	16,173	18,201
R-squared	0.312	0.359	0.354	0.539	0.418	0.422

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6. The impacts of competition on cost stickiness: volatility as a channel

This table presents the results of subsample analysis based on whether trade cost increases sales growth volatility. Columns (1) and (2) present subsample results when competition increases or fails to increase volatility. Volatility is measured by sales growth volatility over the next 3 years. The dependent variable is $\log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$. Competition is measured by trade cost. Other independent variables are defined as in Appendix A. Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry and corrected for heteroskedasticity.

VARIABLES	*Volatility Increase* *(1)*	*Volatility no Increase* *(2)*
log(sales/sales_lag)	0.500***	0.620***
	(24.569)	(14.275)
Sticky	-0.520***	-0.219
	(-3.219)	(-0.518)
Trade_cost	-0.176***	-0.059
	(-3.104)	(-0.761)
*Sticky*Trade_cost*	-1.384**	-0.218
	(-2.421)	(-0.289)
Asset_intensity	0.080***	0.035**
	(10.862)	(2.961)
Employee_intensity	0.023***	0.029*
	(3.584)	(1.930)
Successive_decrease	-0.051***	-0.041***
	(-12.964)	(-8.148)
*Sticky*Asset_intensity*	-0.188***	0.059
	(-7.245)	(-1.268)
*Sticky*Employee_intensity*	-0.079***	-0.003
	(-2.659)	(-0.038)
*Sticky*Sucessive_decrease*	0.129***	0.089
	(5.966)	(1.056)
Firm Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	0.195***	0.140***
	(7.173)	(2.724)
Observations	27,517	8,885
R-squared	0.373	0.409

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. The impacts of competition on cost stickiness: importance of organization capital

This table presents the results of an empirical model investigating how competition affects cost stickiness. The dependent variable is $\log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$. Organizational capital is calculated following Eisfeldt and Papanikolaou (2013). A firm is classified as having high organization capital if its organization capital is above the sample median, and low organization capital otherwise. Other independent variables are defined as in Appendix A. Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry and corrected for heteroskedasticity.

VARIABLES	*Organ_cap Low*	*Organ_cap High*
log(sales/sales_lag)	0.568***	0.396***
	(22.213)	(20.543)
Sticky	-0.287	-0.332**
	(-0.959)	(-2.082)
Trade_cost	-0.083	-0.128
	(-1.173)	(-1.575)
*Sticky*Trade_cost*	-0.455	-1.174**
	(-0.699)	(-2.476)
Asset_intensity	0.033***	0.031***
	(4.084)	(3.046)
Employee_intensity	0.039***	0.033***
	(3.935)	(3.615)
Successive_decrease	-0.030***	-0.055***
	(-6.817)	(-13.072)
*Sticky*Asset_intensity*	-0.201***	-0.214***
	(-4.298)	(-6.053)
*Sticky*Employee_intensity*	-0.028	-0.059*
	(-0.445)	(-1.966)
*Sticky*Sucessive_decrease*	0.058	0.113***
	(0.914)	(3.816)
Firm Dummies	Yes	Yes
Year Dummies	Yes	Yes
Constant	0.229***	0.203***
	(6.191)	(5.423)
Observations	18,201	18,201
R-squared	0.372	0.309

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8. The impacts of competition on cost stickiness: alternative competition measures

This table presents results of an empirical model investigating how competition affects cost stickiness. The dependent variable is $\log\left[\frac{SG\&A_{i,t}}{SG\&A_{i,t-1}}\right]$. Independent variables are defined as in Appendix A. The sample period is 1975-2005 for column (1), 1971-2011 for column (2) and (3), 1972-2005 for column (4) and 1997-2008 for column (5). Firm and year dummies are included. All variables are winsorized at top and bottom 1% level. Standard errors are clustered by industry for column (1)-(4), clustered by firm for column (5) and corrected for heteroskedasticity.

VARIABLES	*HHI_HP* *(1)*	*HHI_compu* *(2)*	*HHI_con4* *(3)*	*Import_pene* *(4)*	*Fluidity* *(5)*
log(sales/sales_lag)	0.549***	0.532***	0.533***	0.521***	0.552***
	(20.599)	(21.117)	(21.586)	(25.869)	(48.683)
Sticky	-0.956***	-0.091	-0.123	-0.342***	-0.219**
	(-3.104)	(-0.941)	(-1.545)	(-3.358)	(-2.061)
Compete	-0.026***	-0.009	-0.015	-0.046**	0.001
	(-2.852)	(-1.140)	(-0.671)	(-2.555)	(0.673)
*Sticky*Compete*	-0.114**	-0.049*	-0.137***	-0.240***	-0.016***
	(-2.289)	(-1.931)	(-3.074)	(-3.119)	(-3.392)
Asset_intensity	0.055***	0.047***	0.047***	0.070***	0.079***
	(7.317)	(7.483)	(7.355)	(12.786)	(11.232)
Employee_intensity	0.027***	0.023***	0.022***	0.019***	0.031***
	(4.497)	(6.256)	(6.403)	(3.207)	(4.788)
Successive_decrease	-0.052***	-0.048***	-0.048***	-0.052***	-0.064***
	(-14.936)	(-15.130)	(-15.382)	(-15.425)	(-19.559)
*Sticky*Asset_intensity*	-0.176***	-0.170***	-0.168***	-0.154***	-0.132***
	(-13.947)	(-13.188)	(-12.784)	(-9.376)	(-7.067)
*Sticky*Employee_intensity*	-0.023*	-0.017	-0.018	-0.061***	-0.037**
	(-1.767)	(-1.418)	(-1.539)	(-2.783)	(-2.013)
*Sticky*Sucessive_decrease*	0.129***	0.112***	0.109***	0.136***	0.131***
	(7.685)	(6.419)	(6.150)	(6.102)	(5.149)
Firm Dummies	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes
Constant	0.050	0.228***	0.218***	0.208***	0.247***
	(1.115)	(9.004)	(10.325)	(9.499)	(7.288)
Observations	107,662	146,981	148,330	49,335	35,115
R-squared	0.384	0.373	0.375	0.388	0.418

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9. The role of SG&A spending in product market competition

This table presents results of regression models examining the strategic role of SG&A spending on product market competition. The dependent variable is the change in market share defined as sales growth minus its industry-year average. Ab_SGA is lagged value of abnormal SG&A expenditure calculated following Rowchowdhuary (2006). All competition measures are defined as in Appendix A. Control variables are the same as in Fresard (2010). Firm and year dummies are included. Standard errors are corrected for heteroskedasticity, clustered at firm level for column (4) and at industry level for other columns. All variables are winsorized at top and bottom 1% level.

VARIABLES	*HHI_HP* *(1)*	*HHI_compu* *(2)*	*HHI_con4* *(3)*	*Fluidity* *(4)*	*Import_pene* *(5)*	*Trade_cost* *(6)*
Ab_SGA_lag	0.331***	0.227***	0.340***	0.108	0.194***	0.336***
	(3.998)	(7.072)	(4.958)	(1.158)	(3.852)	(5.385)
Compete	-0.000	-0.014	0.032	0.005*	0.009	-0.147*
	(-0.189)	(-0.231)	(0.954)	(1.746)	(0.322)	(-1.785)
*Ab_SGA_lag*Compete*	0.000**	0.357***	0.285***	0.027***	0.239*	1.008**
	(2.025)	(3.013)	(2.669)	(2.748)	(1.879)	(2.268)
Cash_lag	0.128***	0.082***	0.081***	0.242***	0.105	0.088
	(3.300)	(2.841)	(2.812)	(4.189)	(1.491)	(1.380)
Cash_lag2	0.491***	0.443***	0.444***	0.434***	0.465***	0.468***
	(9.301)	(10.829)	(10.852)	(7.778)	(6.061)	(5.913)
Size_lag	-0.080***	-0.068***	-0.068***	-0.114***	-0.077***	-0.091***
	(-11.349)	(-11.023)	(-11.176)	(-8.343)	(-9.757)	(-9.626)
Lev_lag	0.106***	0.104***	0.104***	0.070	0.088**	0.116**
	(3.315)	(3.887)	(3.904)	(1.376)	(2.249)	(2.526)
Lev_lag2	-0.102***	-0.098***	-0.099***	-0.088*	-0.045	-0.073**
	(-2.747)	(-3.559)	(-3.602)	(-1.713)	(-1.168)	(-2.025)
Salesgrowth_lag	-0.014	-0.005	-0.005	-0.025	-0.040**	-0.043**
	(-1.249)	(-0.460)	(-0.439)	(-1.557)	(-2.532)	(-2.535)
Salesgrowth_lag2	-0.030***	-0.020***	-0.020***	-0.022**	-0.027***	-0.035***
	(-4.373)	(-2.947)	(-2.955)	(-2.119)	(-2.849)	(-2.809)
Firm Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.291***	0.205***	0.228***	0.521***	0.224***	0.255***
	(11.186)	(7.986)	(7.271)	(7.648)	(7.156)	(6.781)
Observations	104,285	141,831	141,831	30,224	45,269	33,966
R-squared	0.035	0.030	0.030	0.058	0.038	0.041

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1