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Effects of Capacity Utilization on SG&A Costs Stickiness

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이 논문을 경영학석사학위논문으로 제출함

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Abstract

Effects of Capacity Utilization on SG&A Costs Stickiness

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This study examines the effect of capacity utilization on SG&A costs stickiness and further explores how the stickiness varies with economic factors in association with capacity utilization. We collect the capacity utilization rates data of listed Korean manufacturing firms between 2002 and 2012. First, we find that SG&A costs are sticky (anti-sticky) when the capacity utilization measured at the beginning of the period is high (low). Second, our results suggest that when the adjustment cost in manufacturing operation is higher due to greater asset and production-employee intensity, managers cut SG&A costs more actively to prevent earnings from plunging in sales-decrease periods. Third, we provide an important insight on SG&A cost behavior in the light of supply-chain cost structure. We predict that outsourcing practice enables firms to attain better operating flexibility, thereby reducing the adjustment costs, and find that stickiness of SG&A costs is higher in upstream industries than downstream industries after controlling the effect of current capacity utilization. Finally, we find that the capacity utilization plays more significant role when sales are decreasing over two years but the pattern documented under the single-period sales-change model becomes weak. The significance shifted from a single sales decrease to continuous sales decreases makes sense because the capacity management, and hence capacity utilization, is a long-term aspect. Collectively, we contribute to the literature by examining the implication of capacity utilization on cost behavior with refined measures and provide general large-sample evidence on SG&A costs in contrast to prior studies examining specific cost items.

Keywords: cost stickiness, capacity utilization, upstream, downstream

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1. INTRODUCTION

Since Anderson, Banker, and Janakiraman [2003] documented that selling, general, and administrative (SG&A) costs behave asymmetrically according to the sales-change direction, cost stickiness has seized considerable attention from accounting researchers. In particular, Balakrishnan, Petersen, and Soderstrom [2004] document that cost behavior differs based on the degree of capacity utilization. Balakrishnan et al. [2004] use proprietary data for physical therapy clinics and capture the capacity utilization by means of available medical staff time per patient visit. They find that therapy hours and salary paid to therapists are sticky when capacity utilization is high but anti-sticky when capacity utilization is low. However, no following-up research has tried to examine the impact of capacity utilization on the behavior of “SG&A” costs because capacity utilization data are hard to obtain at the firm-level.

This study examines the effect of capacity utilization on SG&A costs stickiness and further explores how the stickiness varies with economic factors in association with capacity utilization. We collected the capacity utilization rates data of listed Korean manufacturing firms that are mandated to disclose both the maximum production capability and the actual production size in terms of manufacturing facility hours. Using the data from 2002 to 2012, we test for effects of capacity utilization on SG&A costs behavior. We take four steps to draw deeper understanding on implications of capacity utilization. First, we find that SG&A costs are sticky (anti-sticky) when the capacity utilization measured at the beginning of the period is high (low). That is, managers given strained capacity are unlikely to reduce the capacity when sales decline but they actively adjust the capacity level along with sales decrease if there is substantial excess capacity. This result is consistent to Balakrishnan et al's finding on hospital data.

Second, we partition the sample based on asset intensity, employee intensity, and GDP growth and investigate how SG&A costs behave under different levels of manufacturing capacity utilization. In comparison to Anderson et al. [2003] that provide general insights about those three variables in only SG&A contexts, our data allow us to relate the manufacturing cost rigidity and the manufacturing capacity utilization to the support-side cost management. Our results suggest that when the adjustment cost in manufacturing operation is higher, managers cut SG&A costs more actively to prevent earnings from plunging in sales-decrease periods. This tendency—the difference pattern in SG&A cost adjustment between high versus low asset (and employee) intensity—holds along capacity utilization levels. Interestingly, we show that SG&A cost stickiness increases with employee intensity only when we measure the employee intensity via manufacturing labor force.[1] However, such pattern vanishes when employee intensity is computed via entire labor force, which differs from Anderson et al's result [2003].

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[1] Our data contain the number of manufacturing employees and non-manufacturing employees separately.

Third and more importantly, we provide new insight on SG&A cost behavior in the light of supply-chain cost structure. We predict that outsourcing practice enables firms to attain better operating flexibility, thereby reducing the adjustment costs. To address it, we classify industries into downstream and upstream. Firms belonging to upstream industries have less opportunity to outsource their operation. For instance, component manufacturers have to commit themselves to manufacturing facilities whereas final-goods manufactures can outsource some of their manufacturing operations to outside venders in upstream. In addition, upstream firms are more remote from end-users and hence suffer from the delay in resource adjustment as well as the distorted demand information, so-called the bullwhip effect. Therefore, we hypothesize that upstream firms' costs are stickier than downstream firms' costs. Interestingly, our results show that upstream firms' costs are sticky even when capacity utilization is very low. We find that stickiness of SG&A costs is higher in upstream industries than downstream industries after controlling the effect of current capacity utilization.

Finally, we verify the effect of capacity utilization on cost stickiness in a complex two-year model proposed in Banker et al. [2012]. Since prior sales changes are a factor in deciding the direction of asymmetric cost behavior, it is meaningful to condition the analysis on the prior period sales change. When we incorporate two-consecutive-year sales change directions, we find that the capacity utilization plays more significant role when sales are decreasing over two years but the pattern documented under the single-period sales-change model becomes weak. The significance shifted from a single sales decrease to continuous sales decreases makes sense because the capacity management, and hence capacity utilization, is a long-term aspect. Collectively, we contribute to the literature by examining the implication of capacity utilization on cost behavior with refined measures and provide general large-sample evidence on SG&A costs instead of specific cost items.

The remainder of the paper is organized as follows. In section2, we review prior literature and develop our hypotheses. In section 3, we describe the sample and variable measurement used in the analyses. Section 4 presents empirical models and results, and section 5 concludes.

2. HYPOTHESES DEVELOPMENT

2.1. Stickiness of SG&A costs and capacity utilization in manufacturing facilities

Traditional view of cost behavior considered cost with respect to only the activity level in the concurrent period, implying proportional relationship between changes in costs and changes in sales (Noreen [1991]). However, since Anderson et al. [2003], a new framework has been justifying the asymmetric cost response to activity changes, the phenomenon named "cost stickiness." When managers match resource changes to demand changes, the changes involve substantial adjustment costs such as hiring and firing costs for labor, or installation and disposal costs for machinery. Specially, the optimal adjustments go towards stickiness on average because downward adjustment costs are often larger than upward adjustment costs (e.g. Cooper and Haltiwanger [2006]). The asymmetric adjustment costs imply that downward adjustment might be more painful than bearing unutilized capacity if volume would be restored shortly. In other words, the manager must consider the optimality of carrying idle capacity (Banker, Hwang, and Mishra [2002]; Banker, Byzalov, and Dujowich [2012]). Thus, efficient decisions need to draw on not only the current sales as in the traditional model, but also the level of capacity and the future sales forecasts.

Among the factors influencing the managers' cost adjustment decision, there is very little evidence about the role of capacity control in prior studies. Regarding the cost behavior under the capacity control context, Balakrishnan et al. [2004] use physical therapy clinics data and find that costs of staffing hours and salaries paid to therapists are sticky when capacity utilization is high, but they are anti-sticky when the utilization is low. Their capacity utilization is measured by available staff time per patient visit. We build on this study examining SG&A costs directly and extending to the firm and industry-level business circumstances. The mechanism of capacity constraints can be understood in the sense of fixity of SG&A costs (Ahmed [1994], Anderson et al. [2007]). Because certain costs cannot be adjusted to continuously address small changes in demand, slacks are created when sales decline or increasing activities are expected. The lumpy costs lead managers to tradeoff costs between deliberate adjustment and as-it-is strategies. The extent of bearing excess capacity costs from holding slack or costs associated with lacking resources depends on the capacity planning and demand uncertainty (Banker, Hwang, and Mishra [2002]; Banker, Byzalov, and Dujowich [2012]). For example, if a firm is operating with high amount of unused capacity, managers may need not to remove it as long as they can use the slack resource to absorb increased demand in the future. Furthermore, continuous decrease in demand may strongly signal the pessimistic future and be likely to push managers to cut capacity down. On the other hand, when a firm is experiencing capacity constraint, acquiring more resources is necessary to accommodate high demand (Balakrishnan et al. [2004]).

However, the sticky cost literature has not fully researched the behavior of SG&A costs to the change of sales volume in manufacturing firms. Banker, Byzalov, and Dujowich [2012] document that the cost stickiness exists in manufacturing costs as well as SG&A costs, by looking into number of production workers and number of production hours. However, they do not incorporate the capacity utilization issue. Balakrishnan et al. [2004] have brought up the capacity utilization context in cost stickiness but studied the service sector. Thus, the literature hasn't connected the support-side cost adjustment and the production-side capacity constraints. In contrast, this study explores implications of manufacturing capacity utilization on the SG&A cost management as discussed below.

Representing the supporting costs of headquarter services, marketing and distribution activities, etc., SG&A expenses reflect the choice of managers who have incentive to meet earnings target (Roychowdhury [2006], Kama and Weiss [2012]). Therefore, although capacity in supporting resources may not be perfectly aligned with capacity in manufacturing facilities, it is likely that managers determine the SG&A cost level according to the production-side capacity status. For instance, if sales drop and there is excess capacity of manufacturing which is hard to be removed quickly, it may induce managers to cut SG&A expenses, which are relatively more flexible and discretionary, in order to offset the costs from rigid manufacturing capacity (inefficiency costs) and hence meet the target in bottom line. By contrast, if capacity is highly constrained (being used with higher efficiency), the cost of carrying idle capacity in manufacturing divisions does not significantly hurt the firm's cost efficiency and therefore there is no material need to cut SG&A costs to meet the earnings target. Thus, we hypothesize:

H1: *When manufacturing capacity is excess (strained), SG&A costs are anti-sticky (sticky).*

2.2. Economic factors involving capacity utilization in manufacturing facilities

In this section, we examine circumstances where the stickiness pattern in the first hypothesis becomes more salient. Anderson et al. [2003] suggest that firms with a high ratio of assets to sales (fixed-asset intensity) suffer more from restructuring charges when scale down invested resources. As a result, they predict and empirically demonstrate that fixed-asset intensity amplifies the SG&A cost stickiness. However, Anderson et al. [2003] do not explicitly clarify whether it comes from the supporting-side assets intensity or manufacturing asset intensity. The former can be easily justified based on cost rigidity notion, whereas the latter case does not intuitively come along. However, we consider that our logic in the first hypothesis (managing earnings by adjusting more flexible SG&A costs given rigid manufacturing capacity costs, particularly when inefficiency costs due to idle manufacturing capacity is significant) can provide a solid connection between SG&A cost behavior and manufacturing asset intensity. That is, the level of fixed-asset intensity can be viewed as the degree of cost rigidity in manufacturing side, and consequently, our prediction in H1 becomes stronger with fixed-asset intensity.

H2A: *When manufacturing capacity is excess (strained), SG&A costs are anti-stickier (less sticky) with greater fixed-asset intensity.*

Labor adjustment costs will be higher for firms that use more [regular[2]] employees to create a certain amount of sales, since the high employee intensity brings more severance payments, training investments, and productivity losses (Anderson et al. [2003]). Similarly to fixed-asset intensity argument, we conjecture that employee intensity moderates the association between SG&A cost stickiness and manufacturing capacity

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[2] We interpret employee intensity in Anderson et al. [2003] in terms of regular employees because irregular and temporary workers are easily replaceable and thus they should not influence the cost stickiness.

utilization.[3]

H2B: *When manufacturing capacity is excess (strained), SG&A costs are anti-stickier (less sticky) with greater employee intensity.*

2.3. Upstream versus downstream industries

This section elaborates an important research agenda in our study—the shift of cost rigidity from downstream to upstream industries stemming from the manufacturer's outsourcing components from upstream suppliers. Along the supply-chain, various types of buyer-supplier relationships exist. Firms affiliated through the supply-chain relationship have incentive to exchange information such as final consumer demand, inventory, and production process, in order to maximize the supply chain performance. Because sharing such information helps the engaged firms respond more rapidly to market changes, this vertical inter-organizational relationship is beneficial in increasing operational efficiency (Cooper and Slagmulder [2004], Baiman and Rajan [2002]).

In addition to the information sharing, outsourcing has become a popular way of modular organizational form in manufacturing industries over past decades. Outsourcing can be a source of capacity flexibility as in Beach et al.'s [2000] summary of interviews with manufacturing directors: the

[3] Our database allows us to distinguish production-workers from non-production workers. To take advantage of this information, we test H2B for the entire employee intensity and for the production-worker intensity and contrast their different implication in Korean labor market environment.

authors find that almost 40 percent of respondents positively considered outsourcing some manufacturing operations to improve the cost structure efficiency. Through outsourcing, downstream manufacturers benefit from cost savings and greater cost flexibility because the firms can save on wages and other perk payments as well as transfer demand uncertainty to the outside (upstream) component-suppliers by dropping in-house production and necessary investment in long-term committed resources. In the management literature, Schilling and Steensma [2001] document the wide usage of modular organizational forms such as outsourcing, using data on 330 manufacturing industries at four-digit SIC level.

The bullwhip effect (Lee et al. [1997]) in supply chain also suggests that the distortion in demand information tends to increase as it moves from downstream to upstream. An anecdotal business case provides a good example: in the 1990s Hwelett-Packard could not temporarily meet the demand for its LaserJet printer and had to ration the product. When orders surged, the restriction made HP managers difficult to discern whether the orders were genuinely real market demands or were simply phantom orders from resellers trying to get better allocation of the product. When HP dropped its constraints on resupply of the LaserJets, many resellers canceled their orders. HP had to take on a burden of costs in excess inventory and in unnecessary capacity increases, amounting to the millions of dollars (Lee et al. [1997]).

A more recent case pertains to LG Display Co. and Apple Inc. In

October 2012, LG Display received additional orders that are close to their maximum capacity from Apple. However, it turned out that in January 2013 Apple canceled three quarters of its previous orders because the debut of new iPhone 5 was not as successful as projected. Some analysts suggested that the massive orders in October were bogus at the first place given that Apple went through supply shortfall of touch screen components produced by LG display in the previous month. Since an company placing an order, like Apple in this case, shares its demand forecasts with suppliers but does not take penalties when breaking the order in general, rationing and shortage gaming is likely to occur: Apple might place knowingly inflated orders to ensure sufficient level of display panels from LG display. Whatever the reason was, LG Display was challenged by the investments in facilities built to meet Apple's demand in the products that were not compatible with other customers' and by the inventory costs.

As described above, upstream side generally suffers demand information distortion more severely than downstream side. When sales activity declines, downstream side can easily adjust its cost structure by simply cutting orders to suppliers, but upstream side is not that flexible. In the similar context, Garavelli [2003] suggests that the bullwhip effect is engaged in the cost flexibility as it causes greater business uncertainty and operating risk in the upstream stages of the supply chain than in the downstream stages. Banker et al. [2012] indicates that when demand uncertainty increases firms will choose higher capacity of fixed inputs in order to reduce congestion costs; and as a result,, firms of upstream industries facing more volatile demands have to cope with higher cost rigidity or less cost flexibility than those of downstream industries.

Therefore, we expect that firms in upstream industries will have greater cost stickiness than firms in downstream industries due to less flexible cost structure and higher adjustment costs.[4] For instance, Lee et al. [1997] find that DRAM market faces a much higher volatility in demand than the computer market. Then we expect that the Chips industry (of Fama-French 48 industries and of upstream sides in our specification in Table 1), DRAM market, will show higher SG&A cost stickiness than the Computer industry (of Fama-French 48 industries and of downstream sides in our specification in Table 1). We hypothesize that

H3: *Stickiness of SG&A costs is higher in upstream industries than downstream industries after controlling for the effect of capacity utilization.*

2.4. Previous period's sales changes

We further examine the effect of capacity utilization on cost stickiness conditioning on prior sales changes. Banker et al. [2012], which is a refinement of Anderson et al. [2003], document the moderating effect of prior sales on asymmetric cost behavior. Their analyses show the cost stickiness following a prior sales-increase and the cost anti-stickiness following a prior sales-decrease: the cost adjustment decision is affected by how managers

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[4] We classify upstream and downstream industries by adapting Fama-French 48 industries as described in the next section.

interpret the prior sales change information. In their economic framework, the current capacity level is presumed to be subject to either the ‘resource expansion’ line or the ‘resource reduction’ line. The resource expansion line represents a condition that managers will stop resource expansion at a point where the benefit from adding another unit no longer exceeds the upward adjustment cost. Similarly, the resource reduction line represents a condition that managers will stop resource reduction at a point where the benefit from cutting another unit no longer exceeds the downward adjustment cost. This optimal resource allocation decisions drive the distinct patterns of stickiness and anti-stickiness conditioned on prior sales changes, the patterns which are further reinforced by the impact of prior sales changes on managers' expectations.

Nonetheless, even if the optimal resource level is determined by the resource expansion line and by the resource reduction line, managers often fail to meet the optimal level of capacity, thereby resulting in excess or strained capacity in reality. The variation from the optimal level capacity is another source of asymmetric cost behavior (Figure 1). If the current capacity level is above one of the resource lines, the excess capacity will decrease the stickiness of SG&A costs systematically. Similarly, if the current capacity level is below one of the resource lines, the strained capacity will increase the stickiness of SG&A costs. Therefore, we expect that the level of capacity utilization will have additional power to drive asymmetric SG&A costs behavior conditioned on prior sales changes.

H4: *Prior sales change directions amplify the stickiness of SG&A costs additionally increases (decreases) when capacity is currently strained (excess).*

3. SAMPLE SELECTION AND VARIABLE MEASUREMENT

3.1. Sample selection

Capacity utilization data are not available since they are considered confidential. We obtain data on capacity utilization rates, selling, general and administrative costs, sales revenue, and other financial variables from the TS-2000, which provides financial report data of Korean firms. Korean manufacturing firms listed in the stock market are required to report capacity utilization rates in their annual reports. The contents including capacity utilization rates are reported under the guideline of Financial Supervisory Service (FSS), the governing authority of Korea. As capacity utilization rates are available from 2001 at this database, our sample covers the period from the fiscal years 2002 through 2012, allowing one-year lag data of capacity utilization.

We analyze those listed manufacturing firms that have capacity utilization rate data.[5] We drop observations with missing values on SG&A

[5] Manufacturing firms are identified according to Standard Industrial Classification

costs and sales revenue for the current year or preceding year, and eliminate observations when sales revenue is smaller than SG&A costs. We also delete data observations with missing values on total assets and number of employees. After that, we eliminate top and bottom 1 percent of observations with extreme values in SG&A costs, sales revenue, and the capacity utilization rate. The final sample consists of 7,930 firm-year observations.

3.2. Capacity utilization rates

The sample firms have to provide the practical capacity (potential capacity under normal circumstances) in terms of facility-operating hours—mostly machine hours. If production capacity is difficult to compute based on facility-operating hours due to the nature of operation, firms are allowed to choose other measures reflecting those firms' business characteristics well and have to explain the reasons of choosing other measures. For example, Samsung Electronics maintains facility-operating hour standard for the components sector but uses quantity standard for end products sector.[6] The capacity utilization rate is determined by actual manufacturing performance over practical capacity where the actual manufacturing performance is either actual facility-operating hours or actual performance in the corresponding measure chosen by each sector. Then, firms

(SIC).

[6] The production capacity of end products sector is computed as 'the average number of line' × 'hourly standard output in quantity' × 'daily average operating hours' × 'annual number of days of operation.'

are required to report a consolidated capacity utilization rate at the whole firm-level. This is the number used in our model as current capacity utilization level.

3.3. Economic factors involving capacity utilization

To help better understand the implication of capacity utilization on cost stickiness, we consider three partitioning variables: asset intensity, employee intensity, and position in supply chain. Asset intensity is calculated as the ratio of total assets to sales revenue and employee intensity is calculated as the ratio of total assets to sales revenue.[7] We partition the sample data into two groups along each intensity variable and examine how cost behavior differs across those sub samples. We also divide sample into upstream versus downstream industry firms. Because it is almost implausible to analyze the tier of supply chain for every single firm, we turn to Fama-French 48 industry classifications and classify firms as follows. First we match the sample firms' Korea Standard Industry Code (KSIC) with US Standard Industrial Classification (abbreviated SIC). Next, the sample firms are assigned into Fama-French 48 industries. Then, we evaluate whether an industry is located close to (remote from) the end-users to identify downstream (upstream) industries. Upstream industries are generally considered suppliers of parts and components for final consumer goods. For instance, the Chips industry is upstream and the Computers industry is

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[7] We follow Anderson et al. [2003] in defining these two variables.

downstream. Companies in Computers industry assemble the components such as hard disks, flash memory chips, and LCDs produced by Chips industry firms like Hynix Inc. and LG Display Co. Another example is the Steel industry (upstream) and the Construction industry (downstream). Full descriptions are at Table 1.[8]

In fact, there are studies that take the similar approach to ours in proposing an industry classification according to the input-output relationship. Kenessey [1987] distinguishes 'primary' activities and 'secondary' activities on two-digit SIC with the scheme of the stage-of-processing classification. In Kenessey [1987], primary activities refer to agriculture, forestry, fishing and mining while secondary activities consist of construction and manufacturing. It states that major sectors significantly differ with respect to the usage of natural resources, the scale of operation of the productive units, the production process in which they engage, and the final products that they contribute. The concept of stage-of-processing classification is extended to subdivide manufacturing industry into further groups in other studies. Feenstra et al. [1999] have divided manufacturing industries into two broad groups of primary and secondary products with two-digit SIC. In their analyses, the primary products industries generally purchase more inputs from themselves than from any other manufacturing industry, but the secondary

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[8] Occasionally, some non-manufacturing sector companies (such as retailing, real estates, telecommunication, and personal/business services) report capacity utilization data when their business includes production of commodities. Although the number of these firms is small, in our analyses we make robustness check by excluding these firms and the results are absolutely unchanged.

industries have stronger upstream linkages, generally purchasing more from other supplying industries than from themselves. Therefore, the notion of the primary and the secondary industries of manufacturing sector is correspondent to our definition of upstream and downstream industries, respectively.

4. EMPIRICAL RESULTS

4.1. Descriptive statistics

Panel A of Table 2 provides descriptive statistics on annual revenues and SG&A costs for our testing sample. Note that the amount numbers presented in South Korea's currency, Korean Won (KRW).[9] The mean value of sales revenue is ₩316,276 million is comparable to $316.28 million and the mean value of SG&A costs as a percentage of sales revenue is 15.73%. The descriptive statistics numbers are smaller than those reported in Banker et al. [2011] (mean = 28.3%, median = 24.4%) that is analyzing manufacturing firms (NAICS 31-33) over the period 1979-2008. The last column shows the frequency of firm-year observations that revenue (SG&A costs) declined compared to the previous year. The percent of decline observations is 32.08% for revenue, and 30.84% for SG&A costs. These ratios show no significant difference with those of samples used in the prior studies.

[9] Over the sample period, the average KRW to USD currency exchange rate is roughly 1,000 KRW for a US dollar.

Panel B of Table 2 provides descriptive statistics for the three capacity utilization groups. We trisect the sample using the rank of capacity utilization rates of all observations: Low, Mid, and High utilization sub-samples. The Low group represents the firms having excess capacity, and the High group represents those with strained capacity. The sample median of capacity utilization rates is 84.10%. We find that the Mid group is densely populated around the median, showing a low standard deviation 3.44% compared to the other groups. Since the denominator of the definition of capacity utilization is normal capacity, abnormal operating situations exceeding the full capacity 100% exist in the High group.

Panel C of Table 2 provides information for persistency in capacity utilization status. The presented table follows the form of Balakrishnan et al. [2004]. Our data show that the historical chance of remaining in low (high) capacity utilization status for one year is 75.43% (75.30%). The persistency rate declines to 67.97% (68.45%) with a two-year horizon. However, in the long run, 74.03% of the firms having three years or more records in our test sample had shift in the capacity status at least once.

4.2. The effects of capacity utilization on cost stickiness

We estimate the following ordinary least squares (OLS) regression[10]

[10] To validate the use of OLS regression, we adopt the estimation method of two-way cluster-robust standard errors. The two-way clustering by firm and year allows for both time-series and cross-sectional dependence. Although our sample has only eleven years time periods, the concerns about the small number of clusters are relieved by Gow et al. [2010]'s finding that CL-2 produces unequivocally better

to provide the basis for tests of SG&A cost stickiness, modifying the log-change linear model used in Anderson et al. [2003] to facilitate different categories of capacity utilization:

$$\log\left(\frac{\mathrm{SG\&}A_{\mathrm{i,t}}}{\mathrm{SG\&}A_{\mathrm{i,t-1}}}\right) = \beta_{\mathrm{x0}} + \beta_{\mathrm{x1}}\log\left(\frac{\mathrm{Sales_{i,t}}}{\mathrm{Sales_{i,t-1}}}\right) + \beta_{\mathrm{x2}}\mathrm{Dec_{Dummy}}_{\mathrm{i,t}}\log\left(\frac{\mathrm{Sales_{i,t}}}{\mathrm{Sales_{i,t-1}}}\right) + \varepsilon_{\mathrm{i,t}}$$

where the indicator variable, $Dec\_Dummy_{i,t}$ takes the value of 1 when firm i's sales revenue in year t has decreased from the previous year and 0 otherwise. In this log specification, coefficient β_1 measures the percentage increase in SG&A costs with a 1% increase in sales revenue, and the sum of the coefficients ($\beta_1 + \beta_2$) measures the percentage decrease in SG&A costs with a 1% decrease in sales revenue.

To examine the effects of capacity utilization on SG&A cost stickiness, we divide our sample into three sub-groups (Low, Mid, High utilization) by rank of all capacity utilization rates observations. We estimate the above model for each subsample, where x = L for Low, M for Mid, and H for High capacity utilization. Then, we compare the coefficients on the decrease dummy interaction term β_2 among the three groups. Hypothesis 1 predicts that the degree of SG&A cost asymmetry increases with the level of

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inferences than other methods including White, Newey-West, and Z2 even with as few as 10 clusters.

capacity utilization. Thus, we expects that $\beta L_2 > \beta H_2$.

The empirical results are shown in Panel A of Table 3. The estimated values of β_1 are significantly positive for all three capacity utilization groups. The estimated value of β_1 is 0.358 (t = 17.00) for the low utilization sample and 0.633 (t = 28.78) for the high utilization sample. This indicates that SG&A costs increase by 0.63% for the high utilization sample per 1% increase in sales revenues. The estimated values of β_2 are reducing as resource utilization goes high, consistent with our expectations. The estimated value of βL_2 is significantly positive (0.246, t = 7.704), showing anti-stickiness in the Low utilization group. In the Mid utilization group, the coefficient on the interaction variable for revenue decreasing periods is not significantly different from zero. The estimated value of βH_2 is significantly negative (-0.258, t = -6.837), which supports cost stickiness in the High utilization group. The combined value of $\beta H_1 + \beta H_2 = 0.375$ indicates that SG&A costs decreased only 0.38% per 1% decrease in sales revenue when resources are strained, compared to 0.60% ($\beta L_1 + \beta L_2$) of excess capacity case. These results suggest that the degree of SG&A cost stickiness is positively associated with a firm's capacity utilization level.

To see whether our results are consistent across subsamples, we provide test for significant difference in SG&A stickiness between the High and the Low subsamples at Panel B of Table 3. The test result is consistent with our prediction, which is $\beta L_2 > \beta H_2$. The difference ($\beta H_2 - \beta L_2$) is -

0.5437 and significantly negative.

4.3. Capacity utilization and the economic factors on cost stickiness

Hypothesis 2A and 2B predict that the level of capacity utilization has different implication on the relation between asset and employee intensities and SG&A cost behavior, suggested in Anderson et al. [2003]. To test these hypotheses, we partition our sample of three utilization groups into Strong versus Weak subsamples in terms of asset intensity and employee intensity, based on the median value of each factor. Thus, we construct six subsamples (Strong-Weak intensity by Low-Med-High utilization) and estimate each subsample to compare the coefficients β_2 between Strong and Weak groups.

In columns 4-6 of Table 4, we find a significantly positive coefficient on β_2 (0.348, t = 9.28) for the Strong asset intensity and Low capacity utilization group and interestingly there is no sticky cost pattern with High and Med capacity utilization. These results are consistent with our prediction that manager's incentive to cut SG&A expenses more aggressively when sales declines (in order to offset the costs from rigid manufacturing capacity and hence meet the target in bottom line) is greater when there is a greater commitment to assets. In contrast, when asset intensity is low, there is less pressure on cost rigidity from manufacturing side and managers gain more freedom in reserving SG&A slacks in sales decrease periods. In columns 1-3, we find a significantly negative coefficient on β_2 (-0.441, t = -7.19) for the Weak asset intensity group in the High capacity utilization and the SG&A costs are not anti-sticky even with low capacity utilization level.

Furthermore, the coefficient estimates are reduced by the capacity utilization in both Strong and Weak asset intensity subsamples, indicating that capacity utilization is effective in reinforcing cost stickiness behavior even after asset intensity is controlled. Specifically, the estimated values of β_2 are bigger in Strong asset intensity group for all utilization levels. This result shows that SG&A cost stickiness decreases with asset intensity but increases with the degree of capacity utilization.

Panel B of Table 4 presents the results for the employee intensity partition. Differently from our prediction, however, the Strong and Weak subsamples do not provide any substantial difference in SG&A cost behavior across three capacity utilization levels. The coefficient estimates on β_2 are generally similar between columns 1-3 and columns 4-6. We conjecture that this result arises because of the special nature of Korean business environment.

Korean firms heavily rely on irregular workers to lower labor costs as well as avoid the long-term commitment to peripheral jobs. Jones and Tsutsumi [2009] document that about a third of workers in the Korean labor market are irregular employees who can be easily laid off by the employer. They also indicate that irregular labor is more popular in service sectors and administration-related jobs. Given the high percentage of irregular workers, a high employee intensity does not necessarily translates into rigid cost structure and hence managers do not face deep pressure to lower SG&A costs to offset the cost inefficiency in the manufacturing side (especially when the capacity utilization is low). To deal with this issue, we focus the sample observations where firms report the number of both production workers and non-production workers. Panel C in Table 4 reports the results from the analysis based on production-worker intensity instead of overall employee intensity. In this setting, the results provide the same intuition as those in Panel A, which confirms H2B.

4.4. Down/Upstream effect and cost stickiness

Hypothesis 3 predicts that association between capacity utilization and SG&A cost stickiness is more pronounced in firms of upstream industries. We first divide our sample into up- and downstream industries subsamples and then estimate the model for each subsample. The results are presented in Table 5 and consistent with our expectation. In the upstream industries subsample, the estimated values of β_2 are all significantly negative in the three utilization levels and decreasing as the level of capacity utilization goes up as expected in H1. The coefficient of β_2 in the extreme case, which is the High capacity utilization and Upstream industry subsample, is -0.456 (t = -8.57).

By contrast, in the downstream industries subsample, we find a significantly positive coefficient on β_2 in the low utilization group (0.287, t = 6.13) and that the estimated values of β_2 are decreasing as the level of capacity utilization goes up as well. However, there is no significant cost stickiness even under high capacity utilization. These results confirm our prediction that upstream firms are subject to strong cost rigidity due to either outsourcing or bullwhip effect. Component manufacturers have to build and commit to their own production facility, which makes it harder to adjust costs downward. Also, increased demand uncertainty through bullwhip effect forces upstream firms to maintain slack resources which might be unnecessary with precise demand signals. We interpret that the stronger cost stickiness attributes to these factors in upstream firms.

4.5. Prior sales changes

We estimate the following ordinary least squares (OLS) regression to test Hypothesis 4 with the modified log-change linear model used in Banker et al. [2012]:

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

$$= \beta_{x0} + \beta_{x1}\log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) I_{i,t-1} + \beta_{x2}\log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) I_{i,t-1} D_{i,t}$$

$$+\beta_{x3}\log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) D_{i,t-1} + \beta_{x4}\log\left(\frac{Sales_{i,t}}{Sales_{i,t-1}}\right) D_{i,t-1} D_{i,t} + \varepsilon_{i,t}$$

where the indicator variable It-1 (Dt-1) takes the value of 1 when sales revenue in year t-1 has increased (decreased) from the previous year, and 0 otherwise. To examine the effects of capacity utilization on SG&A cost stickiness, the above model is applied to each subsample, where x = L for

Low, M for Mid, and H for high capacity utilization. Banker et al. [2012]'s predictions and result show that $\beta_2 < 0$ and $\beta 4 > 0$, but our prediction following Hypothesis 4 is that βL_2 , $\beta L4 > 0$ and βH_2 , $\beta H4 < 0$.

The estimates are presented in Panel A of Table 6. As expected, the estimates for the high capacity group indicate significant stickiness of SG&A costs following both a prior sales increase (βH_2 = -0.122, t = -2.60) and a prior sales decrease ($\beta H4$ = -0.119, t = -2.09), but the estimates for the low capacity group indicate significant anti-stickiness of SG&A costs following both a prior sales increase (βL_2 = 0.146, t = 3.40) and a prior sales decrease ($\beta L4$ = 0.364, t = 8.52), supporting Hypothesis 4. The estimates for the mid capacity group are moderate compared to those of two polar groups, showing stickiness following a prior sales increase (βM_2 = -0.0874, t = -1.94) and anti-stickiness following a prior sales decrease ($\beta M4$= 0.154, t = 3.20). Thus, we find that current capacity utilization has an impact on asymmetric SG&A cost behavior even when we distinguish two distinct processes of cost stickiness and cost anti-stickiness conditioned on prior sales changes.

To supplement our previous findings on the one-year sales change context, additional test results are presented in Panel B through Panel E of Table 6. The estimation results from two-year setting are mostly consistent to those considering only one-year sales change direction. In other words, the degree of SG&A cost stickiness generally shows the same pattern between Anderson et al.'s [2003] basic model and Banker et al.'s [2012] refined model.

However, we note that the capacity utilization plays more significant role when sales are decreasing over two years but the pattern documented under the single-period sales-change model becomes weak. The significance shifted from a single sales decrease to continuous sales decreases makes sense because the capacity management, and hence capacity utilization, is a long-term aspect.

5. CONCLUSION

SG&A costs have been considered a representative example of sticky cost behavior. Nevertheless, in a deep understanding of efficient managerial decisions on capacity planning, we analyze how SG&A costs behave relying on the current capacity utilization level. We conjecture that SG&A costs will turn out anti-sticky when the current capacity is excess. Also, the conventional economic variables known to pronounce the stickiness of SG&A costs are tested in our extended model, which controls the effects of capacity utilization. The findings indicate that current capacity utility moderates SG&A costs response to change in activity and that the effects of asset intensity is reversed from Anderson et al. [2003] when the factor is combined with the capacity utilization variable.

The test based on the classification of downstream/upstream industry implies that outsourcing affect SG&A costs behavior, as we find that stickiness of SG&A costs is higher in upstream industries than downstream industries after controlling the effect of current capacity utilization. In the additional analyses, the effect of capacity utilization on cost stickiness is verified in a complex two-year model proposed in Banker et al. [2012], supporting that current capacity utilization increases the stickiness of SG&A costs conditioned on prior sales changes.

The anti-stickiness behavior of SG&A costs under low capacity utilization does not only surprise the conventional notions, but also substantiate the theory of managers' optimal resource planning in cost stickiness literature. Recent empirical research of Chen et al. [2012] poses concerns that prior literature does not control agency factors that may drive SG&A cost stickiness. Since empire building incentives do not explain the cause of anti-stickiness, our study supports explanation that managers' intervention to allocate resources optimally is powerful enough to drive the behavior of SG&A costs.

REFERENCES

Ahmed, A. 1994. Accounting earnings and future economic rents: an empirical analysis. *Journal of Accounting and Economics* 17, 377–400.

Anderson, M., R. Banker, and S. Janakiraman. 2003. Are selling, general, and administrative costs "sticky"? *Journal of Accounting Research* 41(1): 47-63.

Anderson, M., R. Banker, R., Huang, and S. Janakiraman. 2007. Cost behavior and fundamental analysis of SG&A costs. *Journal of Accounting Auditing and Finance* 22 (1):1-28.

Baiman, S. and M. Rajan. 2002. The role of information and opportunism in the choice of buyer–supplier relationships. *Journal of Accounting Research* 40, 247–278.

Balakrishnan, R., M. Peterson, and N. Soderstrom. 2004. Does capacity utilization affect the

"stickiness" of cost? *Journal of Accounting, Auditing and Finance* 19(3): 283-299.

Banker, R., D. Byzalov, M. Ciftci, and R. Mashruwala. 2012. The moderating effect of prior sales changes on asymmetric cost behavior. *Working paper*. http://ssrn. com/abstract= 902546.

Banker, R., D. Byzalov, and J. Plehn-Dujowich., 2012. Demand uncertainty and cost behavior. *Working paper.*

Banker, R., I. Hwang, and B. Mishra. 2002. Product costing and pricing under long-term capacity commitment. *Journal of Management Accounting Research* 14 (1): 79-97.

Beach, R., A. Muhlemann, D. Price, A, Paterson, and J. Sharp. 2000. Manufacturing operations and strategic flexibility: survey and cases. *International Journal of Operations & Production Management* 20(1): 7-30.

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: 252–282.

Cooper, R. and J. Haltiwanger. 2006. On the nature of capital adjustment costs. *Review of Economic Studies* 73: 611-633.

Cooper, R. and R. Slagmulder, 2004. Interorganizational cost management and relational context. *Accounting, Organizations and Society* 29: 1–26.

Fama, E. and R. Kenneth. 1997. Industry costs of equity. *Journal of Financial Economics* 43: 153–193.

Feenstra, R., D. Madani, T. Yang, and C. Liang. 1999. Testing endogenous growth in South Korea and Taiwan. *Journal of Development Economics* 60(2): 317-341.

Feenstra, R., T. Yang, and G. Hamilton. 1999. Business groups and product variety in trade: evidence from South Korea, Taiwan and Japan. *Journal of International Economics* 48(1): 71-100.

Garavelli, A. 2003. Flexibility configurations for the supply chain management. *International Journal of Production Economics* 85(2): 141–153.

Gow, I., G. Ormazabal, and D. Taylor. 2010. Correcting for cross-sectional and time-series dependence in accounting research. *The Accounting Review* 85(2): 483-512.

Jones, R. and M. Tsutsumi. 2009. Sustaining growth in Korea by reforming the labour market and improving the education system. *OECD Economics Department Working Paper,* No.672, OECD Publishing. http://dx.doi.org/10.1787/226580861153

Kama, I. and D. Weiss. 2013. Do earnings targets and managerial incentives affect sticky costs? *Journal of Accounting Research* 51: 201–224.

Kenessey, Z. 1987. The primary, secondary, tertiary and quaternary sectors of the economy. *Review of Income and Wealth* 33(4): 359-385.

Lee H., P. Padmanabhan, and S. Whang. 1997 Information distortion in a supply chain: the bullwhip effect. *Management Science* 43(4):546–558.

Lee, H., P. Padmanabhan, and S. Whang. 1997. The bullwhip effect in supply chains. *Sloan Management Review* 38: 93–102.

Neter, J., M. Kutner, C. Nachtsheim, and W. Wasserman. 1996. Applied linear statistical models. Chicago, IL: Irwin.

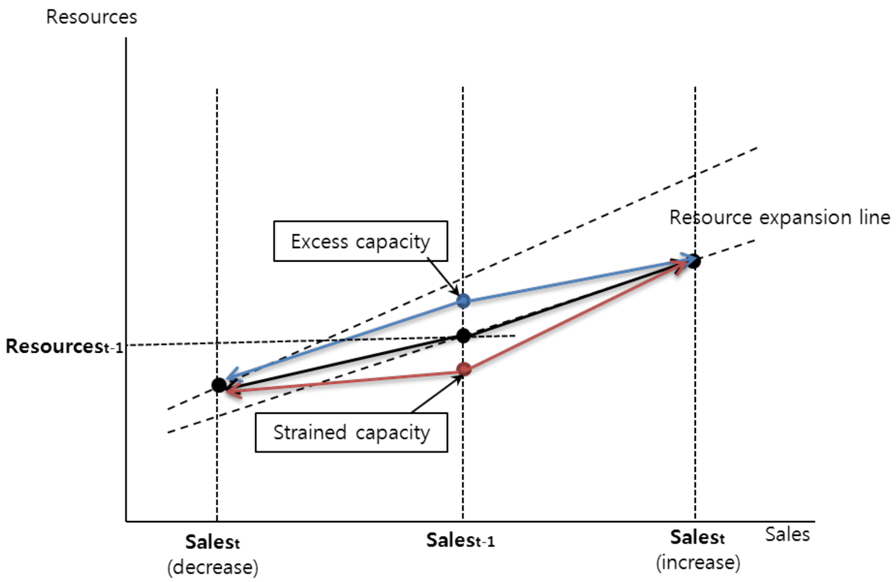
Noreen, E. 1991. Conditions under which activity-based costs provide relevant costs. *Journal of Management Accounting Research* 3: 159-168.

Roychowdhury, S. 2006. Earnings management through real activities manipulation. *Journal of Accounting and Economics* 42: 335–370.

Schilling, M. and H. Steensma. 2001. The use of modular organizational forms: an industry-level analysis. *The Academy of Management Journal* 44(6): 1149-1168.

Figure 1. Impact of current capacity utilization on stickiness or anti-stickiness, holding managers' expectations constant

Panel A. conditional on a prior sales increase



Panel B. conditional on a prior sales decrease

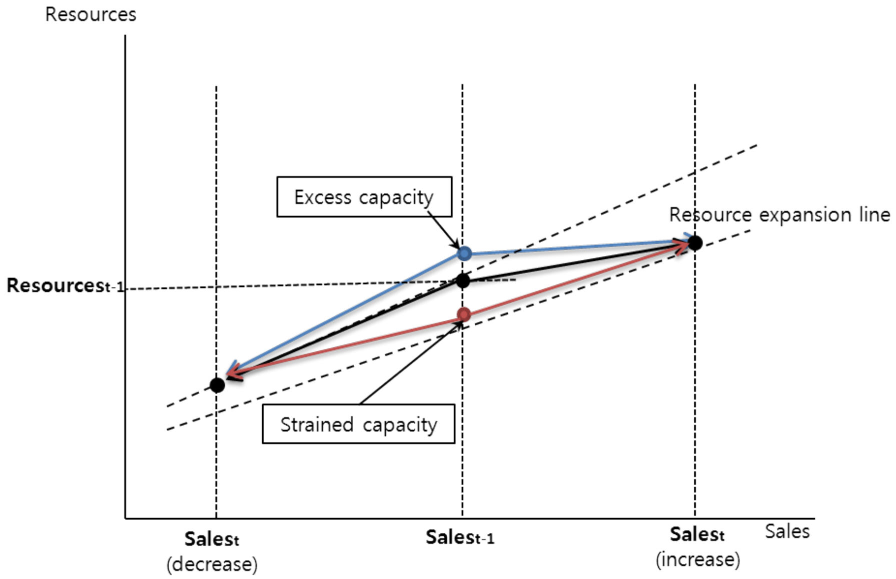


Table 1.

Upstream and downstream industry specifications and the sample description

Id	Desc	Up/Downstream	The number of Firm	The number of firm-year obs
1	Agric	Up	18	124
2	Food	Down	30	254
3	Soda	Down	2	20
4	Beer	Down	7	59
5	Smoke	Down	1	11
6	Toys	Down	14	87
7	Fun	Down	11	54
8	Books	Down	1	5
9	Hshld	Down	34	267
10	Clths	Down	15	126
11	Hlth	Down	-	-
12	MedEq	Down	11	63
13	Drugs	Down	81	649
14	Chems	Up	79	623
15	Rubbr	Up	28	171
16	Txtls	Up	16	148
17	BldMt	Up	54	398
18	Cnstr	Down	7	26
19	Steel	Up	73	645
20	FabPr	Up	13	85
21	Mach	Up	103	633
22	ElcEq	Down	26	184
23	Autos	Down	72	583
24	Aero	Down	2	4
25	Ships	Down	12	52
26	Guns	Down	1	8
27	Gold	Up	-	-
28	Mines	Up	-	-
29	Coal	Up	1	10
30	Oil	Up	4	34
31	Util	Down	2	6
32	Telcm	Down	5	20
33	PerSv	Down	3	21
34	BusSv	Down	58	319
35	Comps	Down	24	129
36	Chips	Up	188	1281
37	LabEq	Down	13	81
38	Paper	Up	18	155
39	Boxes	Up	25	252
40	Trans	Down	17	98
41	Whlsl	Down	43	185
42	Rtail	Down	2	16
43	Meals	Down	1	1
44	Banks	Down	-	-
45	Insur	Down	-	-
46	RlEst	Down	2	13
47	Fin	Down	-	-
48	Other	Down	4	30
	Total		1121	7930

Table 2

Descriptive statistics

Panel A: Distribution of Annual Revenue and SG&A Costs

	Mean	Standard Deviation	Median	Lower Quartile	Upper Quartile	Percentage of Firm-Years with Negative Percentage Change from Previous Period
Sales Revenue (₩mil)	316,276	862,488	95,338	42,642	220,385	32.08%
SG&A Costs (₩mil)	34,450	85,394	10,157	5,129	23,026	30.84%
SG&A Costs as % of Revenue	15.73	13.67	11.08	6.94	19.30	-

The table is for testing sample. Note that the reported numbers are in millions of Korean Won, the currency of South Korea.

Panel B: Distribution of Capacity Utilization Rate (%)

Capacity Utilization Level	N	Mean	Standard Deviation	Minimum	Median	Maximum
Low	2643	62.05	12.97	20.34	65.48	77.66
Mid	2611	84.02	3.44	77.67	84.10	89.99
High	2676	96.93	6.73	90.00	95.30	130.60

Panel C: Persistency in capacity utilization status

	Status Next Year				Status Two Years Later			
Current Year	Low	Mid	High	Total	Low	Mid	High	Total
Low	75.43 %	18.28 %	5.99 %	100.00 %	67.97 %	21.28 %	9.16 %	100.00 %
Mid	18.99 %	64.22 %	18.71 %	100.00 %	22.75 %	58.37 %	22.39 %	100.00 %
High	5.59 %	17.50 %	75.30 %	100.00 %	9.28 %	20.35 %	68.45 %	100.00 %

Table 3

Response in annual changes in SG&A costs to annual changes in sales revenue for the Low, Mid, and High capacity utilization subsamples

Panel A. Regression results

VARIABLES	(1)Low ch_sga	(2)Mid ch_sga	(3)High ch_sga
ch_sales	0.358***	0.515***	0.633***
	(0.0211)	(0.0224)	(0.0220)
	17.00	23.02	28.78
ch_sales_d	0.246***	-0.0314	-0.258***
	(0.0319)	(0.0351)	(0.0378)
	7.704	-0.896	-6.837
Constant	0.0557***	0.0364***	0.0168***
	(0.00593)	(0.00549)	(0.00521)
	9.384	6.633	3.224
Observations	2,643	2,611	2,676
Adjusted R-squared	0.353	0.325	0.326

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B: Test for significant difference in SG&A stickiness between the High and the Low subsamples

Test	Subsample	Prediction	Difference	t-value
Interaction with capacity utilization (Dec_Dummy*ch_sales)	High - Low	<0	-0.504	-9.95***

Table 4

SG&A costs behavior for economic factors under the control of capacity utilization with two-way clustering by firm and year

Panel A: Subsample analysis for asset intensity

	Weak Asset Intensity			Strong Asset Intensity		
VARIABLES	Low Util.	Med Util.	High Util.	Low Util.	Med Util.	High Util.
ch_sales	0.374***	0.476***	0.633***	0.416***	0.594***	0.645***
	(0.0351)	(0.0706)	(0.0631)	(0.0350)	(0.0671)	(0.0575)
	10.64	6.740	10.03	11.88	8.859	11.22
ch_sales_d	-0.0653	-0.324***	-0.441***	0.348***	0.0645	-0.158
	(0.0516)	(0.112)	(0.0850)	(0.0639)	(0.207)	(0.117)
	-1.267	-2.898	-5.184	5.441	0.312	-1.352
Constant	0.0319***	0.0248*	0.0158	0.0545***	0.0298**	0.0129
	(0.00957)	(0.0138)	(0.0116)	(0.00886)	(0.0128)	(0.0101)
	3.333	1.804	1.370	6.157	2.329	1.271
Observations	1,506	1,269	1,190	1,137	1,342	1,486
Adjusted R-squared	0.174	0.170	0.295	0.625	0.504	0.367

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Panel B: Subsample analysis for employee intensity

VARIABLES	Weak Employee Intensity			Strong Employee Intensity		
	Low Util.	Med Util.	High Util.	Low Util.	Med Util.	High Util.
ch_sales	0.323***	0.488***	0.605***	0.415***	0.563***	0.674***
	(0.0472)	(0.0552)	(0.0653)	(0.0521)	(0.0711)	(0.0563)
	6.834	8.847	9.274	7.966	7.920	11.96
ch_sales_d	0.284***	0.0247	-0.189*	0.205**	-0.173*	-0.428***
	(0.0763)	(0.189)	(0.106)	(0.0942)	(0.0920)	(0.128)
	3.720	0.131	-1.792	2.176	-1.876	-3.354
Constant	0.0633***	0.0393***	0.0270**	0.0460***	0.0298***	0.00399
	(0.0106)	(0.0148)	(0.0125)	(0.00904)	(0.00867)	(0.00921)
	5.991	2.650	2.149	5.084	3.436	0.433
Observations	1,534	1,253	1,171	1,109	1,358	1,505
Adjusted R-squared	0.341	0.344	0.324	0.394	0.286	0.332

Panel C: Subsample analysis for production worker intensity

VARIABLES	Weak Production-Worker Intensity			Strong Production-Worker Intensity		
	Low Util.	Med Util.	High Util.	Low Util.	Med Util.	High Util.
ch_sales	0.406***	0.639***	0.600***	0.320***	0.436***	0.742***
	(0.0332)	(0.0291)	(0.0359)	(0.0396)	(0.0436)	(0.0335)
ch_sales_d	-0.00202	-0.275***	-0.272***	0.140**	-0.177**	-0.570***
	(0.0716)	(0.0668)	(0.0784)	(0.0590)	(0.0693)	(0.0696)
Constant	0.0337***	0.0126	0.0193**	0.0536***	0.0368***	0.00656
	(0.00935)	(0.00833)	(0.00846)	(0.00982)	(0.00900)	(0.00881)
Observations	915	908	899	836	927	960
Adjusted R-squared	0.225	0.406	0.307	0.251	0.161	0.372

Table 5.

SG&A costs behavior for down/upstream industries factors under the control of capacity utilization with two-way clustering by firm and year

	Downstream			Upsteam		
VARIABLES	Low Util.	Med Util.	High Util.	Low Util.	Med Util.	High Util.
ch_sales	0.448***	0.580***	0.628***	0.357***	0.522***	0.654***
	(0.0680)	(0.109)	(0.0717)	(0.0206)	(0.0437)	(0.0453)
	6.594	5.343	8.756	17.28	11.94	14.44
ch_sales_d	0.287***	-0.00243	-0.162	-0.151**	-0.282***	-0.456***
	(0.0757)	(0.242)	(0.114)	(0.0722)	(0.0815)	(0.0770)
	3.795	-0.0100	-1.421	-2.086	-3.467	-5.921
Constant	0.0509***	0.0435**	0.0228***	0.0320***	0.0160**	0.00481
	(0.0123)	(0.0176)	(0.00812)	(0.00762)	(0.00746)	(0.00978)
	4.150	2.475	2.806	4.203	2.140	0.491
Observations	1,104	1,120	1,147	1,539	1,491	1,529
Adjusted R-squared	0.519	0.377	0.312	0.167	0.290	0.352

Table 6

Regression analysis for two-period model

Panel A: Response in annual changes in SG&A costs to annual changes in sales revenue for the Low, Mid, and High capacity utilization subsamples

VARIABLES	(1)Low ch_sga	(2)Mid ch_sga	(3)High ch_sga
ch_sales_It-1	0.477***	0.542***	0.536***
	(0.0315)	(0.0297)	(0.0292)
ch_sales_ It-1Dt	0.146***	-0.0874*	-0.122***
	(0.0430)	(0.0450)	(0.0469)
ch_sales_ Dt-1	0.241***	0.395***	0.505***
	(0.0261)	(0.0320)	(0.0365)
ch_sales_ Dt-1 Dt	0.364***	0.154***	-0.119**
	(0.0427)	(0.0481)	(0.0570)
Constant	0.0485***	0.0343***	0.0247***
	(0.00616)	(0.00569)	(0.00539)
Observations	2,468	2,473	2,558
Adjusted R-squared	0.366	0.315	0.262

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Subsample analysis for asset intensity

VARIABLES	Weak Asset Intensity Low Util.	 Med Util.	 High Util.	Strong Asset Intensity Low Util.	 Med Util.	 High Util.
ch_sales_I_{t-1}	0.525***	0.607***	0.513***	0.458***	0.461***	0.578***
	(0.0399)	(0.0322)	(0.0426)	(0.0498)	(0.0574)	(0.0407)
ch_sales_ $I_{t-1}D_t$	-0.201*	-0.380***	-0.213**	0.185***	0.0634	-0.133**
	(0.117)	(0.0683)	(0.0932)	(0.0602)	(0.0733)	(0.0574)
ch_sales_ D_{t-1}	0.269***	0.387***	0.603***	0.221***	0.419***	0.352***
	(0.0308)	(0.0343)	(0.0477)	(0.0437)	(0.0608)	(0.0575)
ch_sales_ D_{t-1} D_t	0.295**	0.276***	-0.278**	0.394***	0.131*	0.0512
	(0.115)	(0.0996)	(0.113)	(0.0594)	(0.0765)	(0.0756)
Constant	0.0294***	0.0174**	0.0189**	0.0574***	0.0483***	0.0293***
	(0.00889)	(0.00695)	(0.00830)	(0.00888)	(0.00925)	(0.00720)
Observations	1,123	1,299	1,324	1,345	1,174	1,234
Adjusted R-squared	0.217	0.309	0.207	0.423	0.321	0.319

Panel C: Subsample analysis for employee intensity

VARIABLES	Weak Employee Intensity Low Util.	 Med Util.	 High Util.	Strong Employee Intensity Low Util.	 Med Util.	 High Util.
ch_sales_I_{t-1}	0.425***	0.513***	0.499***	0.595***	0.648***	0.601***
	(0.0390)	(0.0352)	(0.0406)	(0.0499)	(0.0494)	(0.0415)
ch_sales_ $I_{t-1}D_t$	0.324***	0.185***	0.0313	-0.272***	-0.690***	-0.420***
	(0.0509)	(0.0526)	(0.0615)	(0.0740)	(0.0767)	(0.0733)
ch_sales_ D_{t-1}	0.220***	0.439***	0.469***	0.288***	0.359***	0.558***
	(0.0338)	(0.0391)	(0.0512)	(0.0385)	(0.0502)	(0.0513)
ch_sales_ D_{t-1} D_t	0.659***	0.245***	0.0162	0.121**	0.0850	-0.256***
	(0.0599)	(0.0655)	(0.0838)	(0.0594)	(0.0693)	(0.0767)
Constant	0.0526***	0.0315***	0.0231***	0.0289***	0.0230***	0.0214***
	(0.00849)	(0.00749)	(0.00762)	(0.00869)	(0.00820)	(0.00757)
Observations	1,171	1,257	1,383	1,297	1,216	1,175
Adjusted R-squared	0.519	0.457	0.286	0.236	0.231	0.255

Panel D: Subsample analysis for production worker intensity

VARIABLES	Weak Production-Worker Intensity Low Util.	Med Util.	High Util.	Strong Production-Worker Intensity Low Util.	Med Util.	High Util.
$ch\_sales\_I_{t-1}$	0.597***	0.613***	0.568***	0.565***	0.571***	0.519***
	(0.0475)	(0.0398)	(0.0432)	(0.0610)	(0.0547)	(0.0549)
$ch\_sales\_I_{t-1}D_t$	-0.330***	-0.369***	-0.242***	-0.286***	-0.545***	-0.333***
	(0.0990)	(0.0919)	(0.0916)	(0.0951)	(0.0859)	(0.0906)
$ch\_sales\_D_{t-1}$	0.165***	0.565***	0.577***	0.169***	0.216***	0.489***
	(0.0410)	(0.0426)	(0.0539)	(0.0475)	(0.0595)	(0.0611)
$ch\_sales\_D_{t-1} D_t$	0.430***	-0.0768	-0.117	0.362***	0.328***	-0.178
	(0.0925)	(0.0859)	(0.119)	(0.0670)	(0.0890)	(0.111)
Constant	0.0249***	0.0140	0.0215**	0.0342***	0.0271***	0.0235**
	(0.00949)	(0.00867)	(0.00863)	(0.0102)	(0.00906)	(0.00940)
Observations	869	876	866	753	859	894
Adjusted R-squared	0.252	0.360	0.296	0.290	0.215	0.177

Panel E: Subsample analysis for down/upstream industries factors

VARIABLES	Downstream Low Util.	Med Util.	High Util.	Upsteam Low Util.	Med Util.	High Util.
$ch\_sales\_I_{t-1}$	0.524***	0.577***	0.592***	0.521***	0.574***	0.514***
	(0.0508)	(0.0591)	(0.0469)	(0.0379)	(0.0322)	(0.0368)
$ch\_sales\_I_{t-1}D_t$	0.191***	0.000676	-0.0824	-0.329***	-0.451***	-0.296***
	(0.0615)	(0.0747)	(0.0678)	(0.0714)	(0.0648)	(0.0693)
$ch\_sales\_D_{t-1}$	0.294***	0.538***	0.508***	0.259***	0.365***	0.519***
	(0.0474)	(0.0658)	(0.0705)	(0.0290)	(0.0339)	(0.0406)
$ch\_sales\_D_{t-1} D_t$	0.521***	0.0537	-0.0868	-0.114*	0.0598	-0.212***
	(0.0649)	(0.0824)	(0.0936)	(0.0599)	(0.0665)	(0.0770)
Constant	0.0477***	0.0421***	0.0250***	0.0200**	0.0114	0.0170**
	(0.00974)	(0.00957)	(0.00875)	(0.00777)	(0.00699)	(0.00687)
Observations	1,038	1,068	1,101	1,430	1,405	1,457
Adjusted R-squared	0.533	0.373	0.299	0.176	0.277	0.231

국문초록

본 연구는 판매관리비의 하방경직성에 대한 가동률의 영향을 밝히고, 가돌률과 동시에 경제적 변수가 하방경직성의 정도를 어떻게 변화시키는지를 분석한다. 가동률 자료는 2002년부터 2012년까지의 한국 상장 제조기업을 대상으로 한다. 연구 결과는 다음과 같다. 첫째, 판매비 및 일반관리비는 기초에 가동률이 클 때 하방경직성을 보이고, 가동률이 낮을 때는 하방탄력성을 보였다. 둘째, 자산집중도 또는 생산직 집약도가 높아서 생산활동의 조정비용이 클 때 경영진은 매출 감소 시 이익이 급격히 하락하는 것을 막기 위해 판매관리비를 적극적으로 줄이는 것으로 나타났다. 셋째, 판매관리비의 행태는 공급 사슬 구조를 고려하여 조명되어야 한다. 본 연구에서는 기업들이 아웃소싱을 통해 유연 생산을 달성하기 때문에 낮은 조정비용을 부담할 것을 예측했다. 가동률을 통제하고 분석한 결과 원가의 하방경직성이 하부산업보다 상부산업에서 더 크게 나타났다. 마지막으로, 가동률이 원가행태에 미치는 영향은 한 기간 매출이 감소하는 경우보다 두 기 연속으로 매출이 감소할 때 더 뚜렷하게 나타났다. 이러한 현상은 설비용량조정활동이 장기로 이루어진다는 점에서 이해할 수 있다. 종합적으로, 본 연구는 기존보다 개선된 가동률 자료를 이용해 원가 행태에 미치는 영향을 분석하고 판매비 및 일반관리비에 대한 대표본 실증 연구결과를 제공한다.

주요어: 원가하방경직성, 가동률, 상부 산업, 하부 산업

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