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Cost Behavior of Selling, General, and Administrative Costs and Cost of Goods Sold During Economic Recession

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1. Introduction

Cost management creates value for firms. Effective cost management leads to a firm's success. At difficult times, good cost management means survival. This paper gauges firms' cost management practices by empirically examining cost behavior of selling, general and administrative costs and cost of goods sold during the 2008 – 2009 recession.

Theoretically, costs display two different behaviors. Variable costs change proportionally in response to the activity change while fixed costs remain constant. In essence, there is a linear relationship between costs and activity (such as production units, number of customers) that cause the costs to occur. Prior research (Banker and Johnston 1993; Noreen and Soderstrom 1994, 1997) found that, however, costs rarely follow this theoretical pattern strictly. They either show stickiness or anti-stickiness. Stickiness means that for equal increase or decrease in activity, costs increase is greater than costs decrease. Thus, the costs change is not proportional to the activity change. Anderson et al. (2003) attribute such findings to managers deliberately adjust firm resources in different circumstances.

We follow prior study (Anderson et al. 2003) to test costs variability with respect to sales revenue variability during the recession period from 2008 – 2009 and compare to that of the pre - recession period from 2005 – 2006. The different cost behavior in the two periods can provide us some insight into the managerial practice shift which is reflected in the cost management. We study selling and general administrative costs and cost of goods sold.

2. Prior Research and Research Questions

Costs are generally assumed to be proportional to activity levels (Garrison et al. 2011).

However, empirical research (Banker and Johnston 1993; Noreen and Soderstrom 1994, 1997) do not indicate such proportional relationship. A few recent research such as Anderson et al. (2003) further show that some costs are sticky - costs increase more when activities rise than they decreases when activities fall. Some studies (Balakrishnan et al. 2003) show that some costs are anti-sticky – costs decrease more when activities decrease than they increase when activities rise.

Costs do not follow the theoretical model strictly because managerial action in response to changed circumstances cause cost behavior deviate from the proportional and mechanical relationship (Anderson et al. 2003). Anderson et al. (2003) offers resource adjustment costs as an explanation to the stickiness: it is more costly to reduce resources when sales decreases than increase resources when sales increases. Banker et al. (2014) add evidence to support the deliberate managerial decisions and cost behavior. They show that cost stickiness is conditional on a prior sales increase and cost anti-stikiness is conditional on a prior sales decrease. Kama and Weiss (2013) shows that when managers are incentivised to avoid losses or earnings decreases, they expedite downward adjustment of slack resources for sales decreases, which is anti-stickiness. Kallapur and Eldenburg (2005) show that, in the face of uncertainty, firms will prefer low fixed and high variable costs.

Based on the prior research, we study costs variability in the 2008 – 2009 recession period, and compare it to the 2005 – 2006 period to show how managers make moves to cope with the macro-economic and financial difficulties. Our research questions are as follows:

1. Does costs to sales revenue ratio differ between the two periods?

2. Does costs change in reaction to sales revenue change differ between the two periods?

3. Does costs stickiness differ between the two periods?

3. Sample

We obtain all U.S. firms from Compustat for two periods: pre-recession period 2005 – 2006 and

recession period 2008 – 2009. We do not include year 2007 because some U.S. firm started to face some economic difficulties since 2007 and including them may cause our results hard to interpret. We also delete financial institutions (one-digit SIC = 6) and utility firms (two-digit SIC = 49) because they are in highly regulated industries and may have different cost management practice. In addition to cost variables, selling, general, and administrative costs (mnemonics XSGA) and Cost of goods sold (mnemonics XLR), we also obtained sales revenue (mnemonics SALE). We further delete any observations with negative sales revenue. Finally we delete observations with sales revenue greater than selling, general, and administrative costs and sales greater than cost of goods sold.

4. Results

Table 1 reports costs as a percentage of sales in the two periods. After meeting data requirements, final sample consists of 4,319 observations in the 2005 – 2006 period and 6,727 observations in the 2008 – 2009 period. Costs to sales ratio appear to be fairly similar in the two periods. Selling, general, and administrative costs ratio (SGA) has a mean of 0.3015 and 0.2984 in the two periods. Cost of goods sold ratio (COGS) has a mean of 0.5924 and 0.5960 in the two periods. Overall, the two costs combined are about 89.40% of sales in the 2005 – 2006 period and 89.44% of sales in the 2008 – 2009 period. Further, we perform a t-test (untabulated) which do not show any statistical difference of these ratios across the two periods.

(Table 1 about here)

To address the second research question, we regress change in costs on change in sales revenue. The change variables are computed as the logarithm of the ratio of current value to the previous period value. The model used as follows is modified from Anderson et al. (2003):

$$\log(cost_t / cost_{(t-1)}) = \beta_0 + \beta_1 \log(Revenue_t / Revenue_{(t-1)}) + \epsilon$$

We report OLS regression results in Table 2. β_0 is the estimated coefficient on the intercept and β_1 is the estimated coefficient on change in sales revenue that measures the change in costs in reaction

to the changes in sales revenue. The results are consistent with SGA's mixed cost behavior and COGS's variable cost behavior with sales revenue as the activity measure. For example, in Table 2 Panel A, β_0 (the fixed component) is only significant in the SGA regression, but insignificant in the COGS regression; the estimated β_1 =0.5128 means that SGA changes about 0.51% when sales revenue changes 1%, and the estimated β_1 =1.0126 means that COGS changes about 1% when sales revenue change 1%. Then we compare β_1 across the two periods as reported in Panel A and Panel B. In the SGA regression, β_1 is 0.5128 in the 2005 – 2006 period and 0.4657 in the 2008 – 2009 period, and a t- test show this difference is significant (t=3.86). The results suggest that SGA increase less with respect to sales revenue increase in the latter period, which indicates greater cost control. In the COGS regression, β_1 is 1.0126 in the 2005 – 2006 period and 0.9047 in the 2008 – 2009 period, and a t- test show this difference is also significant (t=10.86). There could be a few explanations for why COGS change less proportionally with sales revenue in the latter period. First, our activity measured by sales revenue in dollars instead of sales units contribute to such results. Second, related to using sales revenue as activity measure, managers may change products mix in the latter period, and this could be a result of managers focusing resources on high profit margin products in the difficult economies.

(Table 2 about here)

To address the third research question, following Anderson et al. (2003), we regress change in costs on change in sales revenue and a dummy variable for sales revenue change. The change variables are computed as the logarithm of the ratio of current value to the previous period value. The dummy variable is 1 if sales revenue decreases. Results of estimating this model are reported in Table 3. The model used is as follows:

$$\log(cost_t/cost_{(t-1)}) = \beta_0 + \beta_1 \log(Revenue_t/Revenue_{(t-1)}) + \beta_2 Dummy \log(Revenue_t/Revenue_{(t-1)}) + \epsilon$$

Including a indicator variable, this model is slightly different than the model for Table 2, and

has been used extensively in studying stickiness of cost behavior. If β_2 is significantly negative, then costs decreases less than increases for the same magnitude of sales decrease and increase, a sticky cost behavior. OLS regression results are reported in Table 3. In SGA regression, β_2 is 0.1273 (t=4.73) in the 2005 – 2006 period and insignificant in the 2008 – 2009 period, and this difference is significant (t=4.54). These suggest that SGA decrease more than increase to respond to sales change, but such different reactions no longer exist in the 2008 – 2009 period. In COGS regression, β_2 is insignificant in the 2005 – 2006 period and 0.1251 and significant (t=6.89) in the 2008 – 2009 period, and this difference is significant (t=3.23). It is clear that stickiness of SGA and COGS is different in the two periods.

(Table 3 about here)

5. Conclusions

This paper empirically investigates how selling, general and administrative costs and cost of goods sold behave in the recession period with the pre-recession period as a benchmark. We find that, although the total costs (as a percentage of sales revenue) on average do no differ, both SGA and COGS changes became less sensitive to sales revenue changes in the recession period, and the stickiness of the two costs also changed but in different directions in the recession period. Since costs and activity relationship is greatly influenced by management decisions, we interpret our findings as results of managers coping crises with different cost management practices.

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Table 1 Descriptive Statistics of Costs as a Percentage of Sales Revenue

Panel A 2005 – 2006

	Mean	Std.	Median	Lower Quartile	Upper Quartile	N
SG&A costs as a percentage of revenue	0.3015	0.2102	0.2564	0.1389	0.4098	4,319
COGS as a percentage of revenue	0.5924	0.2077	0.6220	0.4497	0.7541	4,319
Total costs as a percentage of revenue	0.8940	0.1730	0.9002	0.8215	0.9629	4,319

Panel B 2008 – 2009

	Mean	Std.	Median	Lower Quartile	Upper Quartile	N
SG&A costs as a percentage of revenue	0.2984	0.2122	0.2493	0.1305	0.4148	6,727
COGS as a percentage of revenue	0.5960	0.2110	0.6296	0.4487	0.7587	6,727
Total costs as a percentage of revenue	0.8944	0.1728	0.9013	0.8141	0.9708	6,727

Table 2 Results of Regressing Changes in SG&A on Changes in Sales Revenue for 2005-2006 and 2008-2009 Periods (t statistics in pare

$$\log(cost_t/cost_{(t-1)}) = \beta_0 + \beta_1 \log(Revenue_t/Revenue_{(t-1)}) + \epsilon$$

Panel A 2005 – 2006 Period Parameter Estimates (t-statistics in parentheses)

	SGA	COGS
β_0	0.0578***	-0.0005
	(16.47)	(0.17)
β_1	0.5128***	1.0126***
	(58.87)	(144.05)
Adjusted R^2	0.4452	0.8278
N	4,319	4,319

Panel B 2008 – 2009 Period Parameter Estimates (t-statistics in parentheses)

	SGA	COGS
β_0	0.0153***	-0.0024
	(5.46)	(1.01)
β_1	0.4657***	0.9047***
	(55.71)	(132.35)
Adjusted R^2	0.3157	0.7225
N	6,727	6,727

***, **, * statistically significant at the 1%, 5%, 10% levels for a two-tailed test.

When β_1 is compared across the two periods, it is significantly lower in the SGA regression (t=3.86) and significantly lower in the COGS regression (t=10.86) in the 2008 – 2009 period.

Table 3 Results of Regressing Changes in SG&A on Changes in Sales Revenue and Sales Decrease Indicator for 2005-2006 and 2008-2009 Periods

$$\log(cost_t/cost_{(t-1)}) = \beta_0 + \beta_1 \log(Revenue_t/Revenue_{(t-1)}) + \beta_2 Dummy \log(Revenue_t/Revenue_{(t-1)}) + \epsilon$$

Panel A 2005 – 2006 Period Parameter Estimates (t-statistics in parentheses)

	SG&A	COGS
β_0	0.0657***	0.0014
	(16.97)	(0.46)
β_1	0.4899***	1.007***
	(48.22)	(125.07)
β_2	0.1273**	0.0318
	(4.73)	(1.46)
Adjusted R^2	0.4479	0.8278
N	4,319	4,319

Panel B 2008 – 2009 Period Parameter Estimates (t-statistics in parentheses)

	SG&A	COGS
β_0	0.0118**	0.0106***
	(3.24)	(3.60)
β_1	0.4792***	0.8550***
	(39.36)	(86.17)
β_2	-0.0339	0.1251***
	(1.52)	(6.89)
Adjusted R^2	0.4439	0.7244
N	6,727	6,727

***, **, * statistically significant at the 1%, 5%, 10% levels for a two-tailed test.

When β_2 is compared across the two periods, it is significantly lower in the SGA regression (t=4.54) and

significantly higher in the COGS regression (t=3.23) in the 2008 – 2009 period.