

Analysis of sticky costs: Croatian Evidence

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Abstract: Understanding cost behavior is one of the essential assumptions of successful managing of any company. However, traditional model of costs behavior doesn't take into account the way in which managerial intervention affects the resource-adjustment process. Therefore, in this study we test cost stickiness hypothesis according to which managers deliberately adjust the recourses in response to the changes in the volume. Direct implication of managerial deliberation is that costs increase more when volume rise than they decrease when volume is reduced by an equivalent amount i.e. costs are sticky. The investigation is conducted on the Croatian companies that operated in the food and beverage industry during the period from 1999 to 2009. The results of the analysis revealed that operating costs increase 0.61% for every 1% increase in revenue and decrease 0.52% per 1% decrease in revenue. However, the latter relationship was not statistically significant.

Key-Words: sticky costs, food and beverage industry, Croatia, operational costs

1 Introduction

Traditional managerial accounting literature assumes that cost can be distinguished between fixed and variable, where variable costs are proportional to the volume change [10, 20, 12]. This means that the relation between variable costs and volume is symmetric for both volume increase and decrease, i.e. costs increase/decrease for the same percentage regardless of whether the volume is increased/decreased. However, some authors like Cooper and Kaplan state that costs raise more along with the increase in activity volume, than they fall when volume is decreased [9]. Rayburn explains that accountants assume that variable costs are proportional, while economists assume nonlinear relationship between variable costs and volume [19]. As noted by Pindyck & Rubinfeld [17] and Besanko & Braeutigam [6] nonlinearity is often explained in terms of *economies of scale* (arising due to employees specialization, better rate of interest obtain from the bank, division of high fixed costs across large number of units...) and *diseconomies of scale* arising at the point where an enterprise's size causes communication, coordination and monitoring problems [7, 3].

Alternative explanation of cost asymmetry is offered by sticky cost theory. Although sticky cost seems to be a new concept, its roots can be found in the early 90's. Still, greater interest on this subject is created recently when Anderson et al. [1] published

their seminal article in which they emphasized that cost become sticky as a result of the deliberate decision made by managers as well as a result of cost adjustments being unable to maintain the speed of sales declines.

This study is mainly motivated by the paucity of research related to sticky costs theory, and as such represents one of the few studies that analyzed the issue of the cost stickiness. The aim of this research is to investigate whether sticky cost theory can be applied on the Croatian companies that operated in the food and beverage industry during the 1999-2009 period. By applying the Anderson et al.' methodology, it is found that operating costs increase 0.61% for every 1% increase in operating revenue and decrease 0.52% per 1% decrease in operating revenue (i.e. magnitude of the increase in costs associated with an increase in volume is larger than the magnitude of the fall in costs associated with an increase in volume). Despite the fact that the magnitude of the activity changes is in accordance with the sticky cost theory, the latter relationship was not statistically significant.

The study is organized as follows. The next section provides insight into the theoretical background of the sticky cost concept. Section 3 is devoted to the relevant prior literature while section 4 describes the sample and research design. The results of the conducted analysis are presented in the 5 section. The final section concludes the study.

2 Sticky cost - theoretical background

Traditional fixed/proportional variable cost approach is static by its nature since it implicates that costs in the current period are only affected by current period volume, i.e. current costs are not related (even to some degree) with costs and volume from the previous/future periods [5]. Contrary to that, some empirical studies inserted dynamics into the cost behavior (i.e. costs incurred in a current period depend on costs incurred in the previous period and on current beliefs about future demand). These studies reveal that costs are "sticky", which means that costs respond differently to upward and downward change of activity level. This can be called asymmetric reaction of costs to the change in the level of activity, because costs decrease slower when activity decreases, than they increase when activity increases.

Costs stickiness may be result of the *deliberate decision* made by managers. Anderson et al., argue that managers deliberately adjust the resources to the changes in the volume [1]. When the level of activity decreases managers must forecast whether decrease in demand is temporary or not. If the fall in demand is perceived as *temporary* then one can expect higher cost stickiness since cost of adjustment might be higher than costs of unused capacity. Specifically, elimination of the resources (due to decline in sales) and then again their reacquisition (when sales is recovered) may result in higher costs and a long term decline in profits in comparison to the situation where excessive resources are temporary retained (even though in this situation, the current period profits may be decreased). Therefore, managers need to make deliberate decision regarding retaining excessive resources temporarily (and bear the costs of operating with unutilized capacity) *or* eliminating excessive resources (and incur the adjustment costs) and then reacquiring resources again if sales recover. Cost stickiness occurs if managers decide to retain excessive resources rather than incur adjustment costs. Of course, if demand falls over several consecutive periods, managers' conviction that a demand decline is permanent is higher. Otherwise, if the macroeconomic environment is beneficial, the managers are more unwilling to reduce costs because a probability that demand decline is permanent is lower.

Costs stickiness may also occur as a result of the *cost adjustments delay* effect i.e. cost adjustments being unable to keep up with the speed of sales declines [1, 22]. In the real life managers can not add or subtract resources in small amounts in order to quickly respond to every change in demand. As

noted by Anderson et al. [1], the more intensive is the use of recourses, the more sticky become costs, since the adjustments (dismissal of employees, termination of long term contracts, sale of short-term and especially fixed assets) is more difficult. Also, managers who are faced with decreasing sales may wait with cutting resources until they are more certain about the permanence of decline in demand. In this case, managers' decision to maintained unutilized resources in the interim that goes from the reduction in volume up to the adjustment decision leads to sticky costs. Also, there may be a time span between the decision to reduce excessive recourses and the moment when these resources are actually reduced (e.g. this time lag may be due to contractual constraints).

3 Literature review

Many papers replicate Anderson et al. [1,2] methodology and find cost stickiness in different countries (UK, France, Germany, Japan, Brazil, Argentina, Canada...). Most of the papers focus on stickiness of SG&A costs, but some papers analyze costs of goods sold - COGS, operating costs or total costs. Majority of the research was done on the samples of listed non-financial companies, while only few papers use sample of banks or hospital departments.

One of the first authors that used the term costs stickiness was Malcolm [14], who pointed out that many of the overhead "costs tend to be nonvariable in character i.e. lumpy and not strictly proportional to changes in activity". As an example of sticky costs he stated material ordering and handling costs. When production increases additional employees are added to handle materials, but when production decreases these employees are not immediately laid off. Another early study indirectly dealing with the cost stickiness was done by Noreen & Sodestrom [16] who found that costs did not behave in same manner when activity was increasing or decreasing. Namely, in 13 of 16 costs elements (hospital departments) it was discovered that costs increase much more easily when activities increase, then they decrease when activities decrease. Limitation of this early finding on cost stickiness was the fact that estimated regression coefficients were statistically insignificant.

Anderson et al. recently re-introduced concept of sticky cost and created great interest on this subject. Authors focused on SG&A costs since these costs may be significantly related with sales volume [1]. Results of the analysis conducted on the sample of US listed companies in period 1979-1998 confirmed

sticky cost theory since authors revealed that SG&A costs increased 0.55% for 1% increase in sales, but decreased only 0.35% for 1% decrease in sales. Study also discovered that cost stickiness was: lower when company had successive revenue decrease (in time t and $t-1$); higher in years with growth of GDP; and higher in companies with higher assets and labor intensity. Seminal work of these authors was used as the main basis for all research that followed.

Subramaniam & Weidenmier [21] explore whether cost stickiness is related with different ranges of activity changes. The use of Anderson et al.'s model has resulted with finding that SG&A costs were stickier than COGS. Also, authors found that "sticky parameters" are not negative or significant for revenues change less than 10%, but beyond 10% change almost all parameters were negative and significant. Extension of cost stickiness analysis was done by Balakrishnan et al. [4] whose research focus was on capacity utilization. Empirical analysis was done on the sample of 49 physical therapy clinics during the period 1994-1997. The authors hypothesized (and later proved) that respond to decrease of activity should be higher than response to increase of activity if company is having excess capacity. Based on this finding, they concluded that Anderson et al.'s study on cost stickiness should be interpreted with caution since cost stickiness may be feature only for the firms with strained current capacities.

Analysis of costs stickiness for 198 Brazilian publicly listed companies in period 1986-2003 was done by Medeiros & Souza Costa [15]. By replicating Anderson et al. methodology authors found that SA&G costs for sampled Brazilian companies were sticky. Surprising finding was the fact that cost stickiness increased when data was aggregated for two, three and four years, which means that cost stickiness gets worse in longer periods. Hypothesis on lagged adjustment of SG&A costs was rejected, while partial reversion hypothesis of stickiness was accepted.

Calleja et al. [8] conducted the comparative research for US, UK, French and German companies during the 1988-2004 period. By applying Anderson et al. methodology, authors found that: (1) operating costs are sticky in all four countries; (2) in time of capital markets growth β_2 measure of stickiness is more negative than in periods of capital markets fall; (3) in longer horizon (two year period) stickiness declined for US, UK and French companies, while increased for German companies; (4) stickiness is less pronounced for high revenue changes than for low revenue changes.

Unlike other papers Balakrishnan and Gruca [5] did not use the sample of listed companies, but departments of Ontario hospitals (Canada). Their methodology was aimed to reveal differences in (operating) cost stickiness in one organization. Empirical findings revealed that cost stickiness was observable only for patient care department, while β_2 measure of stickiness was insignificant for ancillary and support services. Therefore, Balakrishnan and Gruca conclude that core competences influence costs stickiness.

Cost stickiness of SG&A costs for Japanese listed companies was explored by He et al. [11] for period 1975-2000. The paper confirmed that stickiness reverses in subsequent periods and stickiness decreases with length of the data aggregation period. Research model also included dummy variable for Japan post bubble economy (1992-2000), which revealed that SG&A costs have become much less sticky in the post bubble economy era.

In explaining costs stickiness phenomenon, Kama & Weiss [13] put focus on managers' intention to meet earnings target. Research was done on the sample of listed US companies for period 1979-2006 and the obtained results suggested that the incentives to meet earnings targets (to avoid losses and/or avoid earnings decreases) lead to deliberate resource adjustments that diminish cost stickiness.

Application of cost stickiness behavior in banking sector was analyzed by Porporato and Werbin [18]. Research was done on the sample of banks from Argentina, Brazil and Canada in period 2004-2009 and by replicating Anderson et al. model authors revealed cost stickiness in all three countries.

4 Methodology and sample

In order to test if the theory of sticky cost holds for companies operating in a developing country such as Croatia, we apply methodology of Anderson et al. [1]. These authors formulated model that enabled measurement of the selling, general and administrative (SG&A) costs response to contemporaneous changes in sales revenue and discriminated between periods when revenue increased and revenue decreased. In order to improve the comparability of the variables across firms operating in different industries and to alleviate potential heteroskedasticity, the authors introduced ratio forms and log specification, as presented by the model (1).

$$\log\left(\frac{SG \& A_{i,t}}{SG \& A_{i,t-1}}\right) = \beta_0 + \beta_1 \log\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \beta_2 \cdot Decrease_Dummy_{i,t} \cdot \log\left(\frac{Revenue_{i,t}}{Revenue_{i,t-1}}\right) + \varepsilon_{i,t} \quad (1)$$

where interaction variable, *Decrease_Dummy*, took the value of 1 when sales revenue decreased between periods $t-1$ and t , and 0 otherwise.

Due to a log specification of the model, economic interpretation of the estimated coefficient becomes more perspicuous. Furthermore, if the traditional fixed- and variable-cost model is valid, than the value of β_2 will be zero, because the upward and downward changes in costs will be equal. On the other hand, the existence of the sticky costs is tested by showing that $\beta_1 > 0$ and $\beta_2 < 0$, what is equivalent to the $\beta_1 + \beta_2 < \beta_1$ when sales from the previous period exceeds sales from the current period.

Since information about SG&A costs were not available for Croatian companies, in this study we used operating costs. Our sample consisted of all large and medium enterprises that were operating in the Croatian food and beverage industry at least four years during the period from 1999 to 2009. Small enterprises were not taken into consideration due to the different form of financial statements. Financial data were obtained from the Croatian Financial Agency. We excluded sample data in which operating costs or sales were zero, because dividing by zero is undefined. At the end, the sample consisted of a total of 998 observations.

5 Empirical findings

The descriptive statistics of the variables used in this study are presented in the table 1 from which can be seen that the average values of operating revenue and operating costs are 30.2 mil EUR and 25.9 mil EUR respectively.

Table 1 Descriptive statistics (in thousands of EUR)

Variable	Min	Max	Mean	Std. deviation
Operating revenue	101,2	392,263	30,211	50,610
Operating costs	129,1	388,132	25,981	42,573

Source: Authors' calculation

Due to a large difference between minimum and maximum value of the variables, it is evident that

the sample is consisted of enterprises with wide span of size distribution. Therefore, relative values and log specification seems to be rational and reasonable option that, among other things, justify the choice of the model (2).

In order to test costs stickiness, the methodology of Anderson et al. is adapted, resulting with the model 2.

$$\log\left(\frac{OC_{i,t}}{OC_{i,t-1}}\right) = \beta_0 + \beta_1 \log\left(\frac{OR_{i,t}}{OR_{i,t-1}}\right) + \beta_2 \cdot Decrease_Dummy_{i,t} \cdot \log\left(\frac{OR_{i,t}}{OR_{i,t-1}}\right) + \varepsilon_{i,t} \quad (2)$$

where $OC_{i,t}$ denotes the operating costs of company i in year t ; $OR_{i,t}$ denotes the operating revenue of company i in year t ; \log denotes natural logarithm; *Decrease_Dummy* is a dummy variable which takes the value 1 when operating revenue decreased between periods $t-1$ and t , and 0 otherwise; and $\varepsilon_{i,t}$ is the error term.

Table 2 depicts the result of the pooled regression analysis. The evaluated regression model is significant as a whole because the significance of the calculated F-ratio is 0.00001%. The degree of explanation of the model is moderate since the adjusted coefficient of determination comes to 33.7%. In order to test the potential problem of multicollinearity, the statistical package SPSS employs VIFs. In view of the fact that no VIF is greater than 5, it can be concluded that multicollinearity is not a problem. Autocorrelation of residuals is tested with the use of the Durbin-Watson test. Because of the calculated value of 1.929 and the table of critical values it appears that in the evaluated model there is no problem in autocorrelation of residuals. Residuals are also tested out for normality with the use of the Komolgorov-Smirnov test, which shows that residual follow the normal distribution. The diagram of dispersion of standardized expected residuals and the standardized residuals of the evaluated model do not suggest the existence of any problem of heteroscedasticity.

The signs of all variables are in line with expectations. However, although parameter β_1 has anticipated positive and statistically significant influence on dependent variable (log ratio of operating costs), the parameter β_2 is statistically insignificant (though its negative sign is in accordance with sticky cost theory). The estimated value of β_1 of 0.609 indicates that that operating

costs increased for 0.61% per 1% increase in operating revenues. The magnitude of the increase in operating costs for an increase in operating revenue is similar to those found in other studies (0.59% for Brazil, 0.55% for USA).

Table 2 Results of estimated regression model

Variables	Unstandardized Coefficients		Sig.	Collinearity Statistics	
	β	Std. Error		Tolerance	VIF
β_0	0.017	0.010	0.069	-	-
β_1	0.609	0.039	0.001	0.407	2.455
β_2	-0.091	0.060	0.127	0.407	2.455
Adjusted R ²	0.337				
DW	1.929				

Source: Authors' calculation

The combined value of $\beta_1 + \beta_2 = 0.518$ suggests that operating costs decrease only 0.52% per 1% decrease in operating revenue. Yet, this result must be treated with caution since the parameter β_2 , as noted earlier, is not statistically significant. A possible explanation for insignificant sticky parameter revealed in this study may be found in the fact that Croatian managers' beliefs about future demand movements are not so optimistic (what is not so surprising if one bears in mind that Croatia still feels the consequences of the recent fierce war, unsuccessful privatization and high indebtedness) and therefore managers are not so willing to maintain the excess capacity. Additionally, in this research we explore the premise of sticky cost behavior for operating costs instead of SG&A costs. This also may contribute to the insignificance of the parameter.

Insignificant parameter of β_2 is also found in study of Noreen and Sodestrom and Balakrishnan [16] and Gruca [5], while Subramaniam and Weidenmier [21] found that "sticky parameters" were not negative or significant for revenues change less than 10%.

6 Conclusion

Understanding the theory and practice of costs behavior is important for managers, economist and investors since they rely on both economic and accounting system when making decisions. In this research we test cost stickiness hypothesis according to which managers deliberately adjust the recourses in response to the changes in the volume. By applying the Anderson et al.' methodology, it is

found that operating costs increase 0.61% for every 1% increase in operating revenue and decrease 0.52% per 1% decrease in operating revenue. Despite the fact that the magnitude of the activity changes is in accordance with the sticky cost theory, the latter relationship was not statistically significant.

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