Sticky costs: evidence from Croatian food and beverage industry

M. Pervan and I. Pervan

Abstract— Understanding the theory and practice of costs behaviour is important for managers, economist and investors since they relay on cost information in decision making process. Traditional literature on costs behaviour assumes symmetric relation between cost and volume regardless of whether the volume increases or decreases. Alternative view, tested in this research and known as sticky costs theory, assume that costs increase more when activity rises than they decrease when activity falls by an equivalent amount. Such behaviour of costs occurs because managers deliberately adjust the resources in response to the changes in the volume. In order to test sticky costs theory, we conducted analysis on a sample of Croatian companies that operated in the food and beverage industry during the period from 2003 to 2010. The results of the analysis allowed us to accept the sticky costs hypothesis since the results revealed that material costs and costs of employees (M&E costs) increase 0.85% for every 1% increase in sales and decrease 0.68% per 1% decrease in sales.

Keywords—Croatia, food and beverage industry, sticky costs

I. INTRODUCTION

ONE of the ways in which firms can sustain and improve their competitive advantage is to manage cost effectively and thereby maximize firm's value [1]. The management of modern firms is based on flexibility and foresight that impose the use of operative and complex economic and accounting information in decisions making [2]. This information, especially the one on the costs, is needed by managers for choosing the optimal solution to problems the firm is facing [3]. However, in order to improve business performance, it is necessary for managers to have information not only about what costs where occurred, but also information about how costs vary with a changing volume and what is the relationship between costs and revenue [4].

In traditional managerial accounting literature costs are divided into fixed and variable cost, whereby costs response mechanically (without management intervention and on the basis of production schedule) to activity volume. A basic assumption in cost approach is that variable costs are proportional to the volume change [5], [6], [7]. 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, Cooper and Kaplan state that costs raise more along with the increase in activity volume, than they fall when volume is decreased [8]. Rayburn explains that accountants assume that variable costs are proportional, while economists assume nonlinear relationship between variable costs and volume [9]. In the recent managerial accounting textbooks [10] approach to the explanation of variable costs is more detailed and variable costs are classified into true variable costs (for example direct materials) and step variable costs (for resources acquired in large chunks), with emphasis that nonlinearity may be feature of variable costs behavior. Also, the fixed costs are classified into committed fixed costs and discretionary fixed costs.

As noted by Pindyck and Rubinfeld [11] and Besanko and Braeutigam [12] costs 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 [13], [14].

Alternative explanation of cost asymmetry is offered by sticky costs theory. Although sticky costs theory 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. [15] 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 costs theory can be applied on the Croatian companies that operated in the food and beverage industry during the 2003-2010 period. By applying the Anderson et al. [15] methodology, it is found that material costs and costs of employees (M&E costs) increase 0.85% for every 1% increase in sales and decrease 0.68% per 1% decrease in sales (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 decrease in volume). Therefore, we can accept sticky costs hypothesis for analyzed Croatian firms.

M. Pervan is with the Faculty of Economics, University of Split, Cvite Fiskovića 5, 21 000 Split, Croatia (phone: +385-21-430-680; fax: +385-21-430-701; e-mail: mpervan@efst.hr).

I. Pervan is with the Faculty of Economics, University of Split, Cvite Fiskovića 5, 21 000 Split, Croatia (phone: +385-21-430-604; fax: +385-21-430-701; e-mail: pervan@efst.hr).

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 main characteristics of Croatian food and beverage industry. In section 5 the data and research design are presented, while section 6 discusses the results of the conducted analysis. The final section concludes the study.

II. STICKY COST - THEORETICAL BACKGROUND

Traditional fixed/proportional variable costs 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. Contrary to that, some empirical studies inserted dynamics into the cost behaviour (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. [15] argue that managers deliberately adjust the resources to the changes in the volume. 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 [15], [16]. 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., 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).

III. PREVIOUS RESEARCH

One of the first authors that used the term costs stickiness was Malcolm [17], 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 and Sodestrom [18] who found that costs did not behave in same manner when activity was increasing or decreasing. When analyzing accuracy of proportional cost models for overhead allocation in hospitals authors discovered that only around 20% (for one year data model) of hospital overhead costs are variable and fixed cost modeling is more accurate than proportional cost modeling. Two period model resulted with ratio of variable cost averaged of 33%, while in three period model ratio of variable variable was 40%. Additional very interesting finding was that costs do not behave in same manner when activity was increasing or decreasing. Namely, in 13 of 16 costs elements (hospital departments) it was discovered that cost increased much more easily when activities increased, then decreased when activities decreased. Limitation of this early finding on cost stickiness was the fact that estimated regression coefficients were statistically insignificant.

Seminal work on cost stickiness was done by Anderson et al. [15] on the sample of USA listed companies in period 1979-1998. Authors focus on SG&A costs since these costs may be significantly related with sales. Usage of pooled sample regression analysis revealed that SG&A costs increased 0.55% for 1% increase in sales, but decreased only 0.35% for 1% decrease in sales (in time t). Due to the potential time lag between demand drop and adjustment decision cost stickiness may be reversed in the subsequent periods. In order to test that hypothesis in the regression model are included changes in revenue from the previous period (t-1), and the dummy for sales decrease in that period. Coefficient for decrease dummy (t-1) was positive and significant which means that cost stickiness is not existent if demand has also dropped in the previous year (t-1). Authors argue that for longer data aggregation period stickiness should be lower since in the longer period manager are more informed about nature of demand drop and adjustment cost are relatively smaller in comparison with costs of unused resources. In order

to test that hypothesis data was aggregated for two, three and four years period and β_2 measure of stickiness was less negative with longer period of data aggregation. Study also revealed that cost stickiness was:

- lower when company had successive revenue decrease (in time t and t-1)
- higher in years with growth of GDP
- higher in companies with higher assets and labor intensity.

Seminal work and methodology of the study was used as the main basis for many studies that followed.

Subramaniam and Weidenmier [19] put focus on magnitude of activity changes and explore weather cost stickiness is related with different ranges of activity changes. Research was done on the USA data in period 1979-2000. Analysis resulted with finding that SG&A costs are stickier than COGS, since SG&A decrease for 0.57%, while COGS decrease for 0.94% with 1% decrease in revenue. By employing 5% changes in revenues additional regression model included 6 dummy variables for the revenues changes in arrange from 0% to 30%. This part of research has revealed 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. Cross-industry analysis has shown that the stickiest industry is manufacturing due to the large levels of fixed assets and inventory, while the least sticky industry is merchandise industry.

Extension of cost stickiness analysis was done in [20] by including into analysis capacity utilization. Namely, in the paper is hypothesized that if company is having excess capacity respond to decrease of activity should be higher than response to increase of activity. Respond variable as managerial reaction to activity changes was therapist hours, while therapist salaries resulted with similar findings. Empirical analysis was done on the sample of 49 physical therapy clinics in period 1994-1997. Research revealed that if clinics had excess capacity therapist hours reductions (for activity decrease) were higher than therapist hours increase (for activity increase). Contrary to that, if current clinic capacities were strained therapist hours reductions (for activity decrease) were lower than therapist hours increase (for activity increase). Therefore, authors conclude that conclusion 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 and Souza Costa [21]. Authors used panel data regression while all data was deflated by General Price Index. By replicating Anderson et al. [15] methodology authors found that SA&G costs for sampled Brazilian companies are sticky. Namely, SG&A costs increase 0.59% for 1% increase in revenue, but decrease only for 0.32% for 1% decrease in revenue. Observed stickiness is more pronounced for Brazilian firms than for US firms from paper of Anderson et al., where SG&A cost decrease was 0.35% for 1% decrease in revenue. Surprising finding for Brazilian sample 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.

In [22] cost stickiness literature was extended by conducting the comparative research for USA, UK, French and German companies. Namely, authors start from the standpoint that corporate governance system has impact on cost management. USA and UK represent common law countries where corporate governance is focused on maximalization of profits and market for corporate control puts pressure on management and costs control. In contrast to such environment, in France and Germany corporate governance is more perceived as coalition of internal and external interested groups. Authors found that:

- operating costs are sticky in all four countries
- in time of capital markets growth β_2 measure of stickiness is more negative than in periods of capital markets fall
- in longer horizon (two year period) stickiness declined for USA, UK and French companies, while increased for German companies
- stickiness is less pronounced for high revenue changes than for low revenue changes.

Unlike other papers Balakrishnan and Gruca [23] 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. Paper hypothesized that cost stickiness among hospital departments should be observable since adjustment costs for core activities (patient care) should be higher than for support activities (other service departments). 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, authors conclude that core competences influence costs stickiness.

Cost stickiness of SG&A costs for Japanese listed companies was explored by for period 1975-2000 [24]. Empirical finding confirmed SG&A stickiness since β_2 measure of stickiness was negative and significant as expected. Also research revealed that costs decrease only for 0.45% for 1% revenue decrease. 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 and Weiss [25] put focus on managers' intention to meet earnings target. Authors build their hypothesis on literature which has shown that managers reduce costs to meet defined targets. Therefore, they have expectation that existence of incentives to meet earnings targets will accelerate cost savings when activity decreases and cost stickiness should be low. Also, investment in technologies in the previous periods represents constraint which restricts ability to respond to current decline in activity.

Here is very important flexibility of technology, since technologies with low flexibility (high adjustment costs) cause cost stickiness. Research was done on the sample of listed US companies for period 1979-2006. After identifying companies that managed earnings just above zero empirical usage of Anderson et al. [15] model has resulted with finding that β_2 - measure of stickiness was positive for companies that were involved in earning management, indicating no cost stickiness. As expected companies that used less flexible technologies had higher level of cost stickiness. Authors also combined two effects and discovered that incentive to meet earnings targets was stronger than technological constraint.

Application of cost stickiness behavior in banking sector was analyzed by Porporato and Werbin [26]. Paper is focused only to one industry (banking) and explores two potentially omitted variables from the previous studies, cost structure and country economic climate. Research was done on the sample of banks from Argentina, Brazil and Canada in period 2004-2009. Replicating Anderson et al. [15] model revealed cost stickiness in all three countries, because with 1% decrease in total income caused total costs decrease 0.38% in Argentina, 0.48% in Brazil and 0.55% in Canada. After controling for the cost structure and economic climate research findings indicated no costs stickiness since β_2 coefficients for all three countries were insignificant.

Paper of Yasukata and Kajiwara [16] explores "deliberate decision theory" on costs stickiness, which means that in cases when managers perception of revenue decline is considered to be temporary managers deliberately hold resources. Such management decision can be justified when in long run it is cheaper to hold unused resources, than to temporary eliminate and latter acquire the same resources. In this context managers put more importance on long run profitability than on short run profitability. This kind of deliberate management decisions should be observable when manager forecast increase in next year revenue and therefore researchers employ increase forecast dummy variable (β_3). Paper hypotheses are tested on the sample of all non-financial sector companies from Tokio Stock Exchange in period 1991-2005. Empirical findings reveal that SG&A costs decrease 0.42%, while COGS decrease 0.89% with 1% decline in revenue. As expected sign of parameter β_3 is negative and by adding $\beta_1 + \beta_2 + \beta_3$ authors conclude that in cases when manager forecasted revenue growth in next year SG&A costs decrease only by 0.34%, in comparison with decrease of 0.42% when they do not have such information.

Pervan and Pervan [27] conducted analysis on a sample of large and medium enterprises that were operating in the Croatian food and beverage industry at least four years during the period form 1999 to 2009. Since information about SG&A costs were not available for Croatian companies, the authors used operating costs in order to investigate costs stickiness. 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.

IV. CHARACTERISTICS OF CROATIAN FOOD AND BEVERAGE INDUSTRY

Over the last twenty years, the Croatian economy was marked by a process of deindustrialization which is mainly the result of war devastation, transition process and failures in politics and privatization. Despite of all this, manufacturing still remains the most important economic activity in which food and beverage industry plays a crucial role.

Technological advances, market liberalization, globalization, automation, mergers and acquisitions, as well as changes in consumer habits, significantly affect the performance of companies in this industry [28]. Increasing difference between small, medium and large enterprises is noticeable not only in Croatia, but also in other countries, whereas analysis at a global level shows that large companies are those that are the most successful, that have a dominant position in this industry, and that determine trends in the market [29]. As stated by Pfitzer and Krishnaswamy [30] advantages of large firms that operate in the food and beverage industry refer to:

- Knowledge of demand market (large firms understand both domestic and international markets as well as the nature of demand for foodstuffs)
- Span across the value chain (large firms operate or strongly influence entire value chains from growers to consumers and as such can either link producers to the rest of the world or strengthen local cycles of wealth creation by mobilizing growers, producers, distributors and consumers)
- Recourses and credibility (large firms have the weight to confront legacy approaches to production and reputation to be credible partners).

Having in mind the importance of large firms in the food and beverage industry, we have decided to get insights into the distribution of revenue and the number of firms according to their size.

For the period covered by this research, the number of large firms remained almost unchanged, but due to the increased number of small and medium firms operating in this industry, the proportion of large firms has slightly decreased. This trend is clearly presented in Fig. 1. However, more realistic picture of strength and importance of large firms is obtained when a category of total revenue is observed. Fig. 2 demonstrates unquestionable dominance of large firms in comparison to their smaller rivals. Still, one must not neglect the growing importance and relevance of SME on the market.
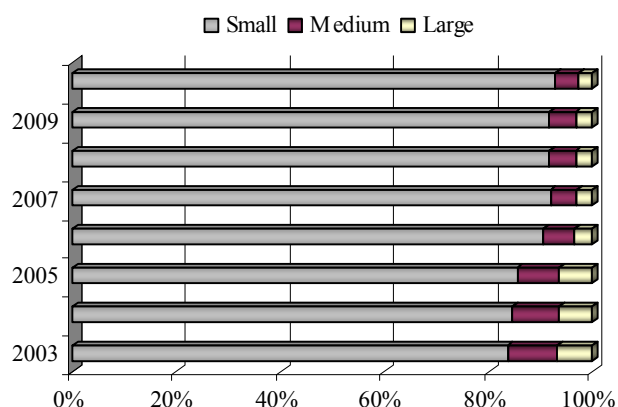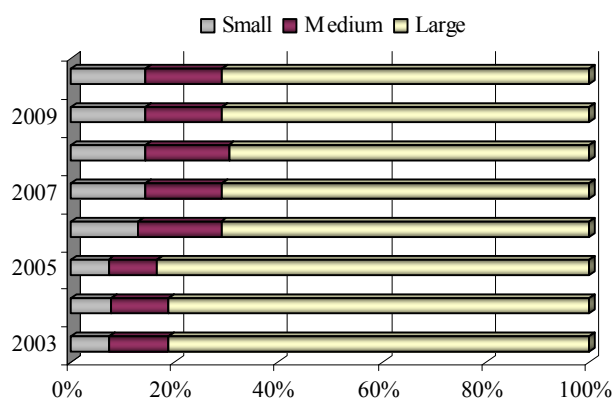
Fig. 1 changes in the number of firms

Fig. 2 changes in the total revenue

Fig. 3 sales value of industrial products

Fig. 4 number and compositions of persons in paid employment in legal entities

Food and beverage production is a very important activity for any country's economy, including Croatia. Each country tries to meet the nutritional needs of its population with its own production and to minimize food import dependency. It is very well known that Croatia has significant natural, material and human resources as well as great potential for food production. This potential goes even above the level that meets the needs of its own population [31]. The importance of food and beverage industry in Croatia is reflected in the size, growth and performance of this industry relative to the other sectors within Croatian economy.

Food and beverage industry involves companies that mainly belong to the most successful Croatian companies and in comparison to other manufacturing industries it is exactly this industry that achieves the highest sale values and employs the largest number of people. According to the statistical publications [32], [33] food and beverage industry in 2010 participated with 21.3 percent in sales value of Croatian manufacturing industry (see Fig. 3) and employed about 43,400 people (Fig. 4) which is approximately 20 percent of the total employment in manufacturing industry.
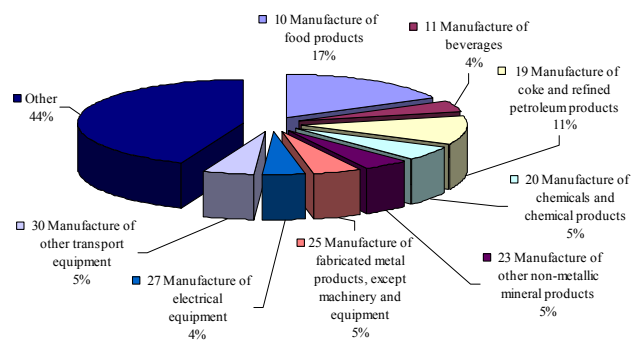
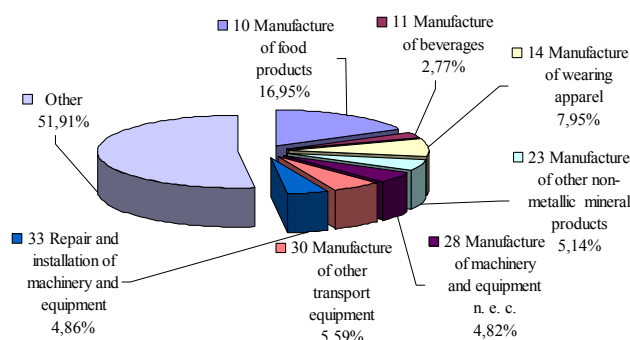Furthermore, the value of food and beverage industry in Croatia is reflected in the fact that its share in GDP is around 2.8%, while its export structure is dominated by products of food industry, rather than primary agricultural produce. An additional characteristic of this industry making it important for the Croatian economy is its ownership structure which is still predominantly Croatian. Unlike the other sectors of the Croatian economy that are stagnating or even declining over time, food and beverage industry has managed to maintain stability during the last decade. All this makes the food and beverage industry, together with agriculture and tourism, one of the strategic sectors for the further development of Croatian economy. Starting from the previously presented and taking into account enormous importance that food and beverage industry have in manufacturing industry, the authors have decided to test cost stickiness hypothesis on this industry.

V. METHODOLOGY AND DATA

Methodology of Anderson et al. [15] has been employed to test if the theory of sticky cost holds for companies operating in a developing country such as Croatia. This methodology enables the measurement of the selling, general and administrative (SG&A) costs response to contemporaneous changes in sales revenue. It also discriminates between periods when revenue increased and revenue decreased.

In formulating the model, Anderson et al. [15] used ratio forms and log specification, as presented by (1). A major reason for using variables in the form of ratios is to control for the systematic effect of size on the variables under examination [34] as well as to improve the comparability of the variables across firms operating in different industries. On the other hand, a log specification is used in order to alleviate potential heteroskedasticity. Beside that, another advantage of the log specification lies in the fact that economic interpretation of the estimated coefficient becomes more perspicuous.

Coefficients for the unknown variables in (1) can be estimated using linear regression approach.

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

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

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.

Unlike the study of Pervan and Pervan [27] that was based only on the large and medium enterprises operating in the Croatian food and beverage industry, in this research the sample of analyzed firms has been expanded by the inclusion of all small firms that had more than 15 employees. Based on this, more accurate results are expected to be obtained.

Furthermore, in order to have more representative sample and more reliable results, we introduced additional year, 2010, which have task to prolong period (captured by analysis) during which decline in firms' sales (due to economic crisis) is recorded. In this way, difference in magnitude between the periods of sales/costs increase/decrease is more pronounced. Namely, during the periods of economic growth (2003-2007) one expects to observe significant increase of the sales and M&E costs. Inversely, due to the economic crisis, from 2008 onwards, a decrease of the sales and M&E costs (with a lower magnitude of costs decrease, than it was the magnitude when costs were increasing) should be observable.

Given that information about SG&A costs were not available for Croatian companies for the 2003-2010 period, and in order to test whether our results will differ from those of Pervan and Pervan [27] (who used operating costs), in this study we used material costs and costs of employees (M&E costs). Distribution of M&E costs and sales according to the firm's size for our sample are presented in Fig. 5 and Fig. 6.
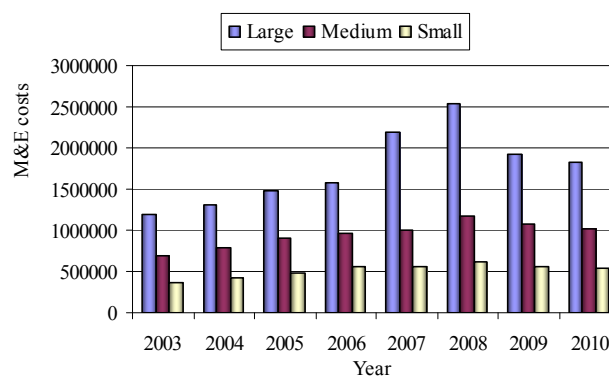

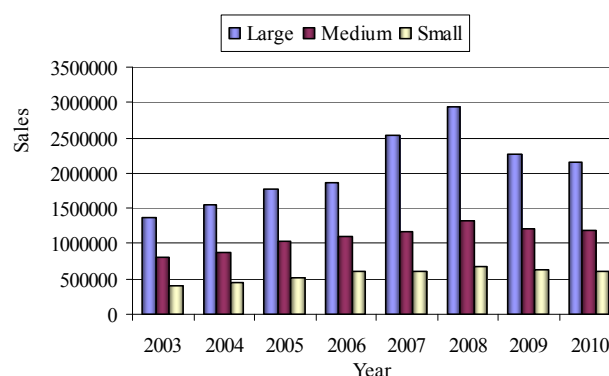Fig. 5 M&E costs according to the firm's size

Fig.6 sales according to the firm's size

All necessary data were obtained form the Croatian Financial Agency and Croatian Chamber of Economy. We excluded sample data in which value of variable sales *or* variable M&E were zero, because dividing by zero is undefined. At the end, on average, the sample comprised around 334 firms per year, yielding with a total of 2678 observations for the period under consideration.

VI. RESULTS AND DISCUSSION

In examining the nature of the relationship between M&E costs and sales, we first review the descriptive statistics which is presented in Table 1. Average values of sales and M&E costs are 11.1 mil EUR and 9.6 mil EUR respectively, while the standard deviation shows quite statistical dispersion in data used in the model.

Table 1 Descriptive statistics (in thousands of EUR)

Variable	Min	Max	Mean	Std. deviation
Sales	2	510,116	11,073	32,295
M&E costs	8	443,867	9,604	28,503

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 firms 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 (2).

Before conducting regression analysis we wanted to see changes in values of variables used in our research. As can be seen from Fig. 7, both variables were continuously increasing until 2008, when they reached a peak and started to decline. This downward trend is attributable to the financial and economic crises which left its mark in many sectors all over the word, including Croatian food and beverage industry.
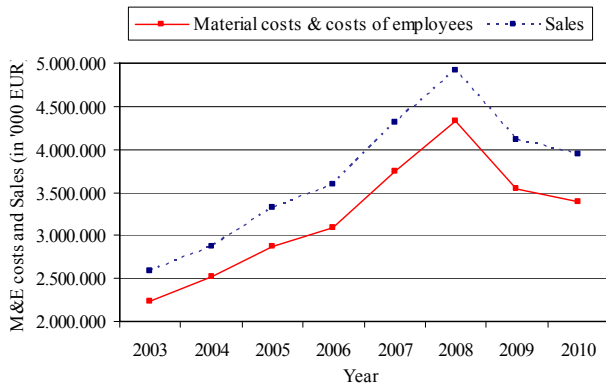

Fig. 7 values of M&E costs and sales during the 2003-2010 period

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

$$\log\left(\frac{M \& E \text{ costs}_{i,t}}{M \& E \text{ costs}_{i,t-1}}\right) = \beta_0 + \beta_1 \log\left(\frac{\text{Sales}_{i,t}}{\text{Sales}_{i,t-1}}\right) +$$

$$+ \beta_2 \cdot \text{Decrease\_Dummy}_{i,t} \cdot \log\left(\frac{\text{Sales}_{i,t}}{\text{Sales}_{i,t-1}}\right) + \varepsilon_{i,t} \quad (2)$$

where M&E costs$_{i,t}$ denotes the material costs and costs of employees of firm i in year t; Sales$_{i,t}$ denotes the revenue a firm i receives in year t from selling its products; log denotes natural logarithm; *Decrease_Dummy* is a dummy variable which takes the value 1 when Sales decreased between periods *t-1* and *t*, and 0 otherwise; and $\varepsilon_{i,t}$ is the error term.

Results of the pooled regression analysis are shown in Table 2. 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 quite high since the adjusted coefficient of determination comes to 77.6%. 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 1.932 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 parameters β_1 and β_2 are in line with sticky costs theory expectations. Parameter β_1 has anticipated positive and statistically significant influence on dependent variable (log ratio of M&E), while the sign of parameter β_2 is negative and also statistically significant. These findings are crucial for the acceptance of sticky costs theory.

Table 2 Results of estimated regression model

Variables	Unstandardized Coefficients		Sig.	Collinearity Statistics	
	β	Std. Error		Tolerance	VIF
β_0	-0.001	0.005	0.774	-	-
β_1	0.847	0.011	0.001	0.557	1.797
β_2	-0.164	0.019	0.001	0.557	1.797
Adjusted R^2	0.776				
DW	1.932				

Source: Authors' calculation

The estimated value of β_1 of 0.847 indicates that that M&E costs increased for 0.85% per 1% increase in sales. The estimated value of β_2 of -0,164 provides strong support for the sticky costs hypothesis. The combined value of $\beta_1 + \beta_2 = 0.683$ suggests that M&E costs decrease only 0.68% per 1% decrease in operating revenue.

The magnitude of the increase in M&E costs for an increase in sales is less than that obtained by Calleja et al. [22] (who found that operating costs increase by 0.97% per 1% increase in revenues, but decrease by only 0.91% per 1% decrease in revenues) or that obtained by Yasukata and Kajiwara [16] (cost of goods sold -COGS- increase 0.955% per 1% increase in sales, but decrease 0.896% per 1% decrease in sales). At the same time, the magnitude is more pronounced than those documented in previous studies for Brazil [21] (0.59% and 0,32% per 1% increase and decrease, respectively) or for USA (0.55% and 0,35% per 1% increase and decrease, respectively).

One of the main reasons that explain the stickiness of costs found in our research refers to Croatian managers' beliefs about future demand movements. Although Croatia still feels the consequences of the recent war, it is possible that Croatia's upcoming entry into the EU makes managers more reluctant to reduce costs and more optimistic about future trend in demand because managers are aware of the benefits that EU membership brings. Furthermore, it is possible that Croatian managers (especially those working in state owned firms) are less inclined (due to political reasons and pressures) to dismiss workers when sales drops because of the persistent social problems in Croatia that has been recording for years high levels of unemployment rates. Finally, despite the effort of the governments to create and present Croatia as a country of

knowledge, there is a paucity of skilled workers, and firms usually have to train their own personnel in order to have skilful employees.

VII. CONCLUSION

Understanding cost behaviour is one of the essential assumptions for successful managing of any company. Namely, for the purpose of financial planning and decision making managers should have reliable information on costs according to the forecasted demand and sales. However, traditional model of costs behaviour (proportional variable costs) doesn't take into account the way in which managerial intervention affects the resource-adjustment process and costs behaviour in real life. Therefore, in this study we test cost stickiness hypothesis according to which managers deliberately adjust the recourses in response to the expected changes in the demand and sales volume. Direct implication of managerial deliberation is that costs increase more when volume rises than they decrease when volume is reduced by an equivalent amount, i.e. costs are sticky. By applying the Anderson et al. [15] methodology on a sample of Croatian firms operating in food and beverage industry it is discovered that material costs and costs of employees (M&E costs) increase 0.85% for every 1% increase in sales and decrease 0.68% per 1% decrease in sales.

REFERENCES

[1] B. Hooshyar. (2011, April 14). Strategic Knowledge Management and its effects on Cost Management in projects, [Online]. Available: http://wseas.us/e-library/conferences/2010/Constantza/.../MEQAPS-31.pdf

[2] M. Radu, V. Radu, G. C. Giju and D. E. Nicolae. (2012, Janaury 11). Interest of cost management within the context of accounting system development in Romania, [Online]. Available: http://.wseas.us/e-library/conferences/2011/.../SOSOMACTS-16.pdf

[3] M. Radu, L. Tanase, L. Ionescu and M. C. Voinea. (2011, July 25). "Study regarding Fundaments of Managerial Decisions on Costs" [Online]. Available: http://wseas.us/e-library/conferences/2010/Cambridge/ICBA/ICBA-26.pdf

[4] B. Knapova. (2012, January 5). Operating Company´s Performance Through Managers´ Eyes in the Czech Republic, [Online]. Available: http://wseas.us/e-library/conferences/2011/Iasi/IAASAT/IAASAT-06.pdf

[5] R. Garrison, *Managerial accounting*. Boston: IRWIN, 1991.

[6] G. Shillinglaw and K. McGahran, *Accounting: A Management Approach*. Homewood: IRWIN, 1993.

[7] R. Hilton, M. Maher and F. Selto, *Cost management: Strategies for business decisions*. New York: McGraw Hill, 2003.

[8] R. Cooper and R. Kaplan, *The design of cost management Systems: Text, Cases and Readings*. Upper Saddle River: Prentice Hall, 1998.

[9] G. Rayburn, *Principles of cost accounting: Using cost management approach*. Burr Ridge: IRWIN, 1993.

[10] P. Brewer, R. Garrison and E. R. Noreen, *Introduction to managerial accounting*. New York: McGraw-Hill/Irwin, 2009.

[11] R. Pindyck and D. Rubinfeld, *Microeconomics,* Upper Saddle River: Prentice Hall, 2012.

[12] D. Besanko and R. Braeutigam, *Microeconomics*. Hoboken: John Wiley and Sons Inc, 2007.

[13] E. K. Browning and M. Zupan, *Microeconomics - theory and application*. Hoboken: John Wiley & Sons Inc, 2012.

[14] A. R. Arnold, *Microeconomics*, Manson: South-Western Cengage Learning, 2010.

[15] M. C. Anderson, R. D. Banker and S. Janakiraman, "Are selling, general and administrative costs sticky", *Journal of Accounting research,* Vol. 41, No. 1, pp. 47-63, 2003.

[16] K. Yasukata and T. Kajiwara. (2011, April 6). Are "sticky costs" the result of deliberate decision of managers?, [Online]. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1444746. 2011.

[17] R. E. Malcolm. "Overhead control implications of activity costing", *Accounting Horizons,* pp. 69-78, December, 1991.

[18] E. Noreen and N. Sodestrom, "The accuracy of proportional cost models: evidence from hospital service departments", *Review of Accounting Studies,* No. 2, pp. 89-114, 1997.

[19] C. Subramaniam and M. L. Weidenmier. (2011, May 15). Additional Evidence on the Sticky Behavior of Costs, [Online]. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=369941.

[20] R. Balakrishnan, M. J. Petersen and N. S. Sodestrom, "Does capacity utilization affect the "stickiness" of cost", *Journal of Accounting, Auditing & Finance,* Vol. 19, No. 3, pp. 283-299, 2004.

[21] O. R. Medeiros and P. Souza Costa. (2011, April 12). Cost stickiness in Brazilian firms, [Online]. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=632365

[22] K. Calleja, M. Stelarios and D. C. Thomas, "A note on cost stickiness. Some international comparisons", *Management Accounting Research,* No. 17, pp. 127-140. 2006.

[23] R. Balakrishnan and T. S. Gruca, "Cost stickiness and core competency: A note", *Contemporary Accounting Research,* Vol. 25, No. 4, pp. 993-1006, Winter, 2008.

[24] D. S. He, J. Teruya and T. Shimizu, "Sticky selling, general and administrative cost behavior and its changes in Japan", *Global Journal of Business Research,* Vol. 4, No. 4, pp. 1-9, 2010.

[25] I. Kama and D. Weiss. (2011, April 10). Do managers' deliberate decisions induce sticky costs?, [Online]. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1558953

[26] M. Porporato and E. Werbin. (2011, April 11). Active cost Management in banks: evidence of sticky costs in Argentina, Brazil and Canada, [Online]. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1659228.

[27] M. Pervan and I. Pervan, "Analysis of sticky costs: Croatian evidence", in *Proccedings Of 4th World Conference Applied Economics, Business And Development (AEBD'12)*, Porto, 2012, pp. 152-157.

[28] F. Bunte and H. Dagevos, *The Food Economy, Global issues and challenges*, Wageningen: Wageningen Academic Publishers, 2009.

[29] J. W. Plunkett, *Plunkett's Food industry Almanac*, Houston: Plunkett Research, Ltd., 2010.

[30] M. Pfitzer and R. Krishnaswamy, *The role of the food and Beverage sector in Expanding economic opportunity,* Cambridge, MA: John F. Kennedy School of Government, Harvard University, 2007.

[31] M. Leko-Simic, *Prehrambena industrija u istocnoj Hrvatskoj-karakteristike problemi i perspektive*, Osijek: Hrvatska gospodarska komora, 1999.

[32] *Statistical yearbook of the Republic of Croatia*, Zagreb: Croatian Bureau of Statistics, 2011.

[33] *Monthly Statistical Report*, No. 12-2011, Zagreb: Croatian Bureau of Statistics, 2012.

[34] B. Lev and S. Sunder, Methodological issues in the use of financial ratios, *Journal of accounting and economics*, No. 1, pp. 187-210, December, 1979.