Sticky cost behavior among Egyptian firms: empirical evidence

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Abstract

This paper seeks to extend the literature on cost behavior by providing additional evidence on sticky cost behavior in emerging countries like Egypt. Moreover, this study aims to examine cost response to demand changes in the light of special political conditions, i.e., pre, during, and post the two successive Egyptian revolutions. The results of the study indicate that the total cost for the whole study period show cost anti-stickiness behavior as they increase by 0.56% and decline by 0.88% for the 1% increase and decrease in sales confirming the existence of asymmetric response of cost behavior in the Egyptian environment. Total costs, pre the two successive Egyptian revolutions, display cost stickiness behavior as they rise by1.08% but they diminish by 0.68% when sales increase and decrease by 1%. During the two successive Egyptian revolutions, total costs exhibit insignificant results. Post the two successive Egyptian revolutions, total costs grow by 0.36% when sales rise by 1% but they decline by 0.98% when sales decrease by 1% reflecting cost anti-stickiness behavior.

Key words: traditional cost behavior, cost stickiness, cost anti-stickiness, asymmetric response of cost behavior

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1. Introduction

The fundamental assumption of cost behavior in textbooks supposes that cost behavior displays a mechanistic relation between changes in costs and changes in demand, i.e., cost behavior in textbooks demonstrates that variable costs change symmetrically or proportionally with changes in demand. Nevertheless, Anderson et al. (2003) presented the seminal empirical study which proved that costs can respond asymmetrically with the changes in activity level. They found that costs rise by 0.55% and decline by 0.35% when sales increase and decrease per 1% which contradicts the symmetric cost behavior in textbooks. Sticky cost behavior refers to two types of cost behavior. Cost stickiness means that the cost response to the increase in demand is more than its response to the decrease in demand (Anderson et al., 2003). Whereas, cost anti-stickiness indicates that the cost response to the increase in demand is less than its response to the decrease in demand (Weiss, 2010).

Following the seminal study of Anderson et al. (2003), a growing stream in managerial accounting has criticized the fundamental assumption of cost behavior in textbooks (e.g., Calleja et al., 2006; Balakrishnan and Gruca, 2008; He et al. (2010); Dalla Via and Perego, 2014; Ezat, 2014; Ibrahim, 2015; Subramaniam and Watson, 2016; Ibrahim and Ezat, 2017; Hassanein and Younis, 2020). These studies concluded that some kinds of costs display asymmetric response towards changes in demand asserting the prevalence of sticky cost behavior. For example, Calleja et al. (2006) proved that total operating costs across four countries, US, France, UK, and Germany, show cost stickiness as they increase by 0.97% when sales increase by 1% and decline by 0.91% when sales decline by 1%. Also, Balakrishnan and Gruca (2008) concluded that operating costs increase by 0.21% but decline only by 0.03% per

1% increase and decrease in activity level which reflects the existence of cost stickiness. In the same vein, Ezat (2014) revealed that the cost of goods sold among 89 Egyptian listed firms exhibits stickiness in its behavior since it increases by 1.1% but diminishes by 0.95% when sales increase and decrease by 1%.

Asymmetric response of cost behavior occurs when managers respond to demand changes abnormally. For instance, if there is a decline in demand, managers should decide to modify resources by reducing unutilized resources. In the same context, if demand increases, managers should decide to modify resources by adding the needed resources to meet the increase in demand. This normal behavior leads to symmetric response of cost behavior and supports the proportionality of traditional cost model. However, the response of managers to changes in demand may be abnormal. In other words, mangers may deliberately accelerate adding additional resources when demand increases, but they delay cutting slack resources when demand declines if they have an optimistic view for the demand in the future. This behavior causes stickiness in costs as mentioned in Anderson et al. (2003). On the contrary, managers may purposely accelerate reducing resources when demand diminishes, but they postpone adding further resources when demand grows if they have a pessimistic view about future demand. This behavior leads to anti-stickiness in costs as proved in Weiss (2010).

Several studies have examined the determinants of sticky cost behavior. Some of these studies proved that internal determinants such as asset intensity, employ intensity, industry, organization capital, firm's characteristics, and cost structure affect the natural and extent of cost behavior (e.g., Anderson et al., 2003; Calleja et al., 2006; Balakrishnan et al., 2014; Venieris et al., 2015;

Magheed, 2016; Subramaniam and Watson, 2016). Another group of studies revealed that external determinants such as employment protection legislation, corporate governance systems, rollover risk, tax reduction, changes in regulations, and national culture have a significant impact on the natural and extent of sticky cost behavior (e.g., Chen et al., 2012; Banker et al., 2013; Holzhacker et al., 2015; Kitching et al., 2016; Haga et., 2019; Li and Zheng, 2020).

Nonetheless, no study attempts to investigate the effect of political events, especially in Egypt, on the response of cost behavior. Therefore, the current study expands the extant literature by examining the influence of occurrence two successive revolutions in Egypt on cost behavior during the period from 2007 to 2017. Moreover, this study investigates cost behavior before, during, and after the two successive Egyptian revolutions.

Egypt witnessed two successive revolutions. The first was the 25 January revolution in 2011. This revolution has driven Egypt to face major economic disturbances. To exemplify, the Gross domestic product (GDP) growth rate[3] collapsed to approximately 1.76% in 2011and 2.22% in 2012. Also, there was a speed increase in the unemployment rate as a result of closing many factories and companies. Furthermore, Egypt faced great stagnation in foreign direct investment. The second was the 30 June revolution in 2013. This revolution also generated great challenges for the Egyptian economy specially after requesting one of the Arabian countries to recover its deposit of 2.5 billion dollar. In addition, Egypt required a loan of 12 billion dollar from the International Monetary Fund (IMF) to support the economic and social reforms.

[3] https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EG

Accordingly, the present study seeks to achieve two main objectives. Firstly, this study aims to present additional evidence on the prevalence of sticky cost behavior in developing countries, particularly in Egypt. Secondly, the study intends to explore the cost response to changes in demand under some special political events, i.e., pre, during and post the two successive Egyptian revolutions. The findings of this study demonstrate that, first, total costs respond asymmetrically towards changes in demand as they increase by nearly 0.56% when sales increase by 1% but they decline approximately by 0.88% when sales decrease by 1% reflecting anti-sticky behavior. Second, pre the two successive Egyptian revolutions, total costs also show asymmetric response of cost behavior since they increase by 1.08% and decrease only by 0.68% for the 1% increase and decrease in sales showing cost stickiness. Third, during the two Egyptian revolutions, total costs are statistically insignificant. Forth, post the two successive Egyptian revolutions total costs display asymmetric response to changes in demand as they rise by 0.36% and decline by 0.98% for the 1% increase and decrease in sales showing cost anti-stickiness.

The remainder of this paper is organized as follows. Section 2 presents the literature review and hypotheses development. Section 3 deals with the methodology. Section 4 provides results and discussion. Section 5 provides the conclusion and points to future research.

2. Literature review and hypotheses development

2.1 Evidence on sticky cost behavior

A number of studies examined the validation of traditional cost behavior in textbooks (e.g., Cooper and Kaplan, 1988; Malcom, 1991; Mak and Roush, 1994; Noreen and Soderstrom, 1994; Noreen and Soderstrom, 1997). However,

the study of Anderson et al. (2003) is considered the pioneer study in this research area. Anderson et al. (2003) provided a clear model to define the disproportional response of costs to demand changes by analyzing data for 7629 American firms during the period from 1979 to 1998. The study found that costs rise by 0.55% and decline by 0.35% when sales increase and decrease per 1% which differs from the traditional cost behavior in textbooks. Also, this study denoted that costs show more stickiness during the period of economic growth as a result of managerial optimism.

After the study of Anderson et al. (2003), a new avenue has been opened to explore this type of cost behavior and its determinants. To exemplify, Calleja et al. (2006) examined how total operating costs respond to demand changes by depending on samples of the UK, US, German, and French firms during the period from 1988 to 2004. This study proved that total operating costs for the four countries exhibit cost stickiness as they grow by 0.97% when sales increase by 1% and fall by 0.91% when sales decline by 1%. Moreover, the study found that the degree of cost stickiness in French and German firms is high compared to the US and UK firms. The study attributed this difference to corporate governance systems and managers' oversight.

Also, Balakrishnan and Gruca (2008) investigated the asymmetric response of operating costs to demand changes by using data from 189 general Canadian hospitals during the 1986-1989 period. They inferred that operating costs rise by 0.21% but decrease only by 0.03% per 1% increase and decrease in demand which asserts the existence of cost stickiness. Further, He et al. (2010) examined the cost behavior of selling, general, and administrative costs by analyzing data for 1,802 Japanese firms during the period from 1975 to 2000. They concluded

that selling, general, and administrative costs increase by 0.59% when sales rise by 1% and decrease by 0.45 when sales diminish by 1%.

In 2014, Banker and Byzalov demonstrated that asymmetric response of cost behavior is an international phenomenon as they relied on 315,967 firm-years in 20 countries during the period from1988 to 2008. They concluded that operating costs show cost stickiness for 16 countries of 20 countries. In Egypt, Ezat (2014) investigated how the cost of goods sold respond to demand changes by using 89 Egyptian listed firms from 2009 to 2013. The findings revealed that the cost of goods sold increases by 1.1% if sales increase by 1% but declines by 0.95% if sales decrease by 1% which reflects the existence of cost stickiness. In addition, this study found that higher levels of managerial, governmental, and institutional ownership lead to higher levels of stickiness.

Uy (2016) examined the cost behavior of the cost of goods sold, operating costs, and investment costs among Philippine firms by employing data of 76 firms with 912 firm-year observations during 2000-2012. The results of the study revealed that the cost of goods sold displays cost stickiness as it increases by 0.41% for a 1% increase and declines by 0.01 for a 1% decrease in sales. Also, operating costs show cost stickiness as they increase almost by 0.27% but decline nearly by 0.11% when sales increase and decrease by 1%. Investment costs do not respond asymmetrically with demand changes.

In Greece, Cohen et al. (2017) checked the existence of asymmetric response of cost behavior in local government during the period from 2002 to 2008. This study confirmed that asymmetric response of cost behavior can be noticed in local government since administrative and public relation expenses exhibit anti-sticky behavior. Furthermore, the result of this study proves that political

incentives can play a primary role in the occurrence of asymmetric response of cost behavior.

Cheung et al. (2019) examined the cost behavior of research and development costs in Korea by using 1,106 firm-year observations covering the period 2012-2016. They concluded that research and development costs do not show asymmetric response of cost behavior. But, when controlling for a successive decrease in sales, performance, and economic growth, asymmetric response of cost behavior arose in research and development costs.

Hassanein and Younis (2020) examined asymmetric response of cost behavior before, during, and after the financial crisis in the U.K chemical industry for the period from 2001 to 2015 by using the cost behavior of six kinds of costs. These costs are selling, general, and administrative costs, cost of goods sold, operating costs, total costs, salaries and benefits, and financing costs. The most important result of this study is that the behavior of the same type of cost is not permanent because it can change from one period to another according to economic conditions. To exemplify, selling, general, and administrative costs generally display cost stickiness.

However, when dividing the sample period, Hassanein and Younis (2020) found that selling, general, and administrative costs show cost stickiness pre and post the financial crisis, but they do not show any asymmetric response during the financial crisis. Also, the cost of goods sold exhibits cost stickiness in general. Nonetheless, it changes to cost anti-stickiness after the financial crisis when splitting the sample period. Further, operating costs show cost stickiness but they turn to cost anti-stickiness during and post the financial crisis. Moreover, total costs present cost stickiness but they change to cost anti-

stickiness during and after the financial crisis. Regarding salaries and benefits, they do not show any asymmetric response in the whole sample and post the financial crisis. Nevertheless, salaries and benefits reflect cost stickiness before the financial crisis and change to cost anti-stickiness during the financial crisis. Finally, financing costs exhibit the behavior of cost anti-stickiness during the whole sample period and post the financial crisis, but they show cost stickiness before the financial crisis and present insignificant results during the financial crisis.

To sum up, the literature provides strong evidence on sticky cost behavior of various kinds of costs in different countries. Furthermore, prior studies ascribe the asymmetric response of costs to managers' decisions concerning adjustment costs. Also, the literature clarifies that the level of asymmetric response of costs is influenced by some factors such as the successive decrease in sales, type of ownership, and economic growth. Consequently, the current study expects that total costs in the Egyptian environment respond asymmetrically to changes in demand. Therefore, the first hypothesis can be formulated as follow:

H1: The response of total costs to the equivalent sales change is not asymmetric.

2.2 Egyptian revolutions and sticky cost behavior

Before the two successive Egyptian revolutions, the Egyptian government carried out some economic reforms to promote private business activity. These reforms helped the Egyptian economy to demonstrate a good growth rate and to be more stable. For instance, the Gross domestic product (GDP) growth rate[4] was approximately 7.08% in 2007 and 7.15% in 2008. Therefore, it was expected that the Egyptian economy witnessed good indicators of growth, i.e., a

[4] https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EG

period of economic prosperity. The literature argued that cost stickiness may appear during the period of economic prosperity. For instance, Anderson et al. (2003) explained that the economic prosperity period encourages managers to accelerate the decision of adding further resources if demand increases, but it induces managers to postpone the decision of cutting resources if demand decreases causing cost stickiness. In the same context, Ibrahim (2015) presented evidence that selling, general, and administrative costs and the cost of goods sold display cost stickiness during the economic prosperity period. The potential reason for that is the economic prosperity period creates managerial optimism about the future; consequently, managers are willing to add resources when demand increases more than cut resources when demand declines. As a result, the present study expects that total costs in the Egyptian environment before the two successive Egyptian revolutions exhibit asymmetric response of cost behavior, particularly cost stickiness. Therefore, the second hypothesis of the study is as follow:

H2: Pre the two successive Egyptian revolutions, total costs do not display sticky response to the equivalent sales change.

During the two Egyptian revolutions, the economic growth rate witnessed great stumbling as the GDP growth rate collapsed to 1.76% in 2011, 2.23% in 2012, and 2.19% in 2013. Moreover, the Egyptian economy faced major challenges that threatened its stability such as the considerable decline in foreign tourist arrivals, the closure of the Egyptian Stock Exchange for about two months, the stagnation in foreign direct investment, and the increase in the unemployment rate. Prior studies debated that the economic recession is likely to cause anti-sticky behavior. For example, Dierynck et al. (2012) addressed that managers delay the decision of inserting additional resources if demand

increases but they minimize slack resources immediately if demand diminishes during the period of economic recession. Likewise, Ibrahim (2015) proved that selling, general, and administrative costs show cost anti-stickiness during the period of economic recession. The cost anti-stickiness may be appear because the economic recession generates managerial pessimism about the future, therefore, managers are willing to cut resources when demand decreases more than add new resources when demand increases. As a consequence, the existing study foresees that total costs during the two Egyptian revolutions show asymmetric response of cost behavior, particularly anti-sticky behavior. Therefore, the third hypothesis of the study can be formulated as follow:

H3: During the two Egyptian revolutions, total costs do not show anti-sticky response to the equivalent sales changes.

After the two Egyptian revolutions, the Egyptian economy has been showing some indications which reflect the improvement in economic conditions. For instance, the GDP growth rate showed some improvement as it grew from 2.9% in 2014 to nearly 4.2% in 2017. Also, some economic sectors have been beginning to recover again specifically the tourism sector. Nonetheless, managers still have great fear about this growth because it depends mainly on loans[5] and grants from abroad so it could be temporary growth, not permanent growth. Therefore, managers, after the two successive revolutions, will be rather pessimistic about the future, in other words, managers will just add the important resources that are needed to produce the existing sales if sales grow but they will show more willingness to get rid of unused resources when sales decrease causing anti-sticky behavior. This expectation is in line with Hassanein

[5] For example, the International Monetary Fund (IMF) gave Egypt a loan of 12 billion dollar in order to achieve the economic and social reforms.

and Younis (2020) who concluded that total costs display anti-sticky behavior post the financial crisis. As a consequence, the fourth hypothesis of the study is as follow:

H4: Post the two Egyptian revolutions, total costs do not exhibit anti-sticky response to the equivalent sales change.

3. Methodology

3.1 Sample selection and data

The study population includes all Egyptian firms listed on the Egyptian Stock Exchange during the period from 2007-2017 except banks and financial services firms due to their particular accounting rules and unique reports as well. This exclusion is consistent with the sticky cost behavior literature as the majority studies relied on non-financial firms (e.g., Banker et al., 2016; Ibrahim and Ezat, 2017;; Prabowo et al., 2018; Chung et al., 2019; Hartlieb et al., 2019; Li and Zheng, 2020).

The study sample is selected according to the following criteria; first, all firms must have been listed on the Egyptian Stock Exchange during the period from 2007 to 2017. Second, all financial statements must have been prepared in the Egyptian pound. Third, firms that prepare their financial statements on 30 June have been excluded from the sample to achieve the consistency of the financial year. Forth, firms must have changes in the direction of sales during the period from 2007 to 2017. Fifth, firms must display sales revenue, and earnings in their income statements. Therefore, the final sample comprises 38 listed firms. All required data was extracted directly from income statements which issued on firms' websites, the Mubasher website, and Egypt for Information Dissemination Company.

The total study period from 2007 to 2017 is used to examine the existence of sticky cost behavior in the Egyptian environment. To test the cost behavior pre, during, and post the two Egyptian revolutions, the study period is divided into three sub-study periods. The period from 2007 to 2010 presents the period before the Egyptian revolutions, while the period from 2011 to 2013 reflects the period of Egyptian revolutions. Finally, the period from 2014 to 2017 shows the period post the Egyptian revolutions.

3.2 Model specification

To examine the study hypotheses, the present study replicates the pioneering model of Anderson et al. (2003) in this research area as follow:

$$Log\left[\frac{Cost_{i,t}}{Cost_{i,t-1}}\right] = \beta_0 + \beta_1 Log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right] + \beta_2 * Decrease_{Dummy_{i,t}} * Log\left[\frac{Sales_{i,t}}{Sales_{i,t-1}}\right] + \varepsilon_{i,t}$$

Where:

$Cost_{i,t}$ = total costs of firm (i) in the year (t)

$Cost_{i,t-1}$ = total costs of firm (i) in the year (t-1)

$Sales_{i,t}$ = sales revenue of firm (i) in the year (t)

$Sales_{i,t-1}$ = sales revenue of firm (i) in the year (t-1)

$Decrease_{Dummyi,t}$ = dummy variable that equals (1) if sales in the year (t) less than sales in the year (t-1), and equals (0) otherwise

$\varepsilon_{i,t}$ = the standard error

Total costs in the aforesaid model are calculated as the difference between sales revenue and earnings before extraordinary items[6]. The existing study uses total costs rather than the other kinds of cost components in order to exclude managerial discretion in cost classifications (Weiss, 2010). Moreover, investors, as Weiss (2010) demonstrated in his results, are somewhat able to realize the asymmetry in the behavior of total costs, not in cost components.

All variables in the previous model are modified by using the consumer price index (CPI)[7] to control for inflation. In other words, all variables in the prior model are adjusted by the consumer price index (CPI) to remove the impact of changes in the selling price which affects directly the prevalence of asymmetric cost behavior[8]. It worth mentioning that this model includes a dummy variable (Decrease Dummy) to distinguish between the years of sales decrease and the years of sales increase. Furthermore, this model uses ratio form and natural log in order to reduce the probable appearance of the heteroscedasticity problem (Anderson et al., 2003; Banker and Byzalov, 2014).

According to the concept of sticky cost behavior, total costs demonstrate stickiness in their behavior when the coefficient (β_1) is positive and the

[6] Some previous studies depended on this method such as Weiss (2010), Ciftci et al. (2016), Yao (2018), and Chung et al. (2019).

[7] Consumer price index (CPI) were obtained from The World Bank website: https://data.worldbank.org/indicator/FP.CPI.TOTL?end=2017&locations=EG&start=2017&view=map

[8] Deflating the model of asymmetric cost behavior was used in many studies such as Banker and Byzalov (2014); Balakrishnan et al. (2014), and Bu et al. (2015).

coefficient (β_2) is negative, therefore, the combined value of the coefficients (β_1) and (β_2) will be less than the coefficient (β_1). Whereas total costs displays anti-stickiness in their behavior when the coefficients (β_1) and (β_2) both are positive, as a result, the combined value of the coefficients (β_1) and (β_2) will be more than coefficient (β_1).

4. Results and discussion

4.1 Descriptive statistics

Table (1) reports some descriptive statistics for the annual sales, total costs, and the ratio of total costs to sales revenue. Panel (A) indicates the descriptive statistics of the whole sample period from 2007 to 2017. The sample includes 418 firm-year observations that match the screening criteria. Further, the mean of annual sales revenue is nearly LE 827 million, while the mean of total costs is about LE 714 million. The mean of total costs percentage to sales revenue is 98%. Panel (B) shows the descriptive data for the sample over the period of pre-Egyptian revolutions (2007-2010). The sample comprises 152 firm-year observations. Also, the sample firms, on average, show annual sales revenue of about LE 987 million, whereas the average of total costs is merely LE 774 million. In addition, the average percentage of total costs for annual sales revenue is roughly 81%.

Panel (C) provides the descriptive statistics for the sample during the period of the Egyptian revolutions (2011-2013). The sample consists of 114 firm-year observations. Moreover, the sample firms have a mean of about LE 805 million, whilst these firms report, on average, LE 721 million. Further, the average percentage of total costs for annual sales revenue is nearly 93%. Finally, panel (D) includes the descriptive data over the period of post-Egyptian revolutions

(2014-2017). The sample contains 152 firm-year observations. Furthermore, the mean of annual sales revenue is around LE 684 million, while the mean of total costs is approximately LE 648 million.

In sum, the ratio of total costs to annual sales revenue varies throughout all sample periods. Therefore, it is expected that the behavior of total costs will be different from one period to another.

Table (1) Descriptive statistics

Panel A: All sample period (2007-2017)					
	N	Mean	S.D	Minimum	Maximum
Sales	418	827828883.37	1974040160.42	1323594.85	14473553312.48
Total costs	418	714089714.73	1731811315.77	117033.66	12152358980.56
Total costs ratio	418	0.9866878	1.87686047	0,00560	38.36643
Panel B: Pre the two Egyptian revolutions (2007-2010)					
Sales	152	987555367.29	2284324509.72	14920303.00	14473553312.48
Total costs	152	774127320.80	1821852823.32	4944861.74	10785496755.39
Total costs ratio	152	0.81325	0.26591	0.11399	2.03196
Panel C: During the two Egyptian revolutions (2011-2013)					
Sales	114	805483056.54	1913601074.35	9046440.12	10918892837.24
Total costs	114	721709711.58	1764230974.03	955615.90	10121606910.78
Total costs ratio	114	0.93126	0.38939	0.04618	3.96481
Panel D: Post the two Egyptian revolutions (2014-2017)					
Sales	152	684861769.57	1660224682.78	1323594.85	13111083494.08
Total costs	152	648337111.01	1620516981.67	117033.66	12152358980.56
Total costs ratio	152	1.20169	3.07647	0.00559	38.36643

Source: statistical analysis results

4.2 The behavior of total costs in Egypt from 2007 to 2017

Table (2) summarizes the results of ordinary least squares regression analysis (OLS) concerning the response of total costs towards sales change over the whole sample period from 2007 to 2017.

Table (2) The regression results of total costs behavior over the whole sample period (2007-2017)

Panel A: Summary statistics of the model

Sig.	**0.000**	D-W	2.425
R^2	0.354	**Adj.R^2**	**0.351**

Panel B: Results of the main coefficients of the model

Variable	Estimator	Coefficient	Std. Error	Sig.	VIF	Tolerance
Constant	β_0	0.029	0.026	0.267		
X_1 [Log(sales)]	β_1	0.556	0.100	**0.000**	3.771	0.265
X_2 [Dec.dummy *Log(sales)]	β_2	**0.323**	0.131	**0.014**	3.771	0.265

Source: statistical analysis results

The aforementioned results of regression analysis indicate that the model is statistically significant, where the p-value is (0.000). Further, the adjusted value of the determination coefficient (Adjusted R^2) is (0.351). This implies that a change in sales explains 35% of the variations in total costs. Moreover, the variance inflation factor (VIF)[9] and the tolerance[10] are (3.771) and (0.265) respectively; therefore, multicollinearity is not a problem for this model. Also, the Durbin-Watson (DW)[11] statistic is (2.425), which means that autocorrelation in residuals from (OLS) regression analysis does not exist.

Regarding the main coefficients of the model, coefficient β_1 is positive and statistically significant at (0.556), which denotes that total costs increase nearly

[9] If (VIF) is less than 10, multicollinearity is not a matter of concern (Kutner et al., 2005).
[10] Tolerance is the reciprocal of (VIF). If the tolerance value is above 0.1, the model has not the multicollinearity problem (Field, 2009).
[11] If the value of Durbin-Watson statistic is more than 3 and less than 1, autocorrelation is a problem (Field, 2009).

by 0.56% when sales increase by 1%. The coefficient β_2 is positive and statistically significant at (0.323). The sum of coefficient β_1 and coefficient β_2 is (0.879), which means that total costs diminish approximately by 0.88% when sales fall by 1%. Consequently, these results reflects the prevalence of anti-sticky cost behavior for all sample period as coefficient β_1 is positive, coefficient β_2 is also positive, and coefficient β_1 is less than the combined value of β_1 and β_2. In other words, total costs increase by 0.56% and decline by 0.88% for the 1% increase and decrease in sales, thus, total costs change asymmetrically with changes in sales reflecting the prevalence of cost anti-stickiness.

The potential reason for this behavior is related to managers' reactions towards economic fluctuations that have been occurred as a result of the two successive Egyptian revolutions. Namely, total costs demonstrate anti-sticky behavior for the whole sample period because managers cannot forecast the direction of future sales as a result of political upheavals which affect economic and investment growth negatively. Therefore, managers tend to reduce resources if demand decrease more than to retain them if demand increase which leads to cost anti-stickiness. Consequently, the first hypothesis which indicates that **"The response of total costs to the equivalent sales change is not asymmetric"** can be rejected.

4.3 The behavior of total costs pre the two successive Egyptian revolutions from 2007 to 2010

Table (3) displays the outputs of ordinary least squares regression analysis (OLS) concerning the response of total costs towards sales change pre the two Egyptian revolutions during the period from 2007 to 2010.

Table (3) The regression results of total costs behavior pre the two successive Egyptian revolution (2007-2010)

Panel A: Summary statistics of the model

Sig.	**0.000**	D-W	2.555
R^2	0.511	**Adj.R^2**	**0.504**

Panel B: Results of the main coefficients of the model

Variable	Estimator	Coefficient	Std. Error	Sig.	VIF	Tolerance
Constant	β_0	-0.031	0.029	0.294		
X_1 [Log(sales)]	β_1	1.080	0.162	**0.000**	6.574	0.152
X_2 [Dec.dummy *Log(sales)]	β_2	**-0.396**	0.198	**0.047**	6.574	0.152

Source: statistical analysis results

The above-mentioned outputs of regression analysis report that the model is statistically significant, where the p-value is (0.000). Besides, the adjusted value of the determination coefficient (Adjusted R^2) is (0.504). This implies that a change in sales explains 50% of the variations in total costs. Furthermore, the variance inflation factor (VIF) and the tolerance are (6.574) and (0.152) respectively; as a result, multicollinearity does not exist in this model. The Durbin-Watson (DW) statistic is (2.555), which means that autocorrelation in residuals from (OLS) regression analysis is not a problem.

Relating to the main coefficients of the model, coefficient β_1 is positive and statistically significant at (1.080), which suggests that total costs increase nearly by 1.08% when sales increase by 1%. The coefficient β_2 is negative and statistically significant at (-0.396). The combined value of coefficient β_1 and coefficient β_2 is (0.684), which implies that total costs decline almost by 0.68%

when sales fall by 1%. Therefore, these results asserts the prevalence of cost stickiness in the period of pre the two Egyptian revolutions because coefficient β_1 is positive, coefficient β_2 is negative, and coefficient β_1 is more than the total value of β_1 and β_2. In other terms, total costs increase by 1.08% and decrease only by 0.68% for the 1% increase and decrease in sales, as a consequence, total costs pre the two Egyptian revolutions change asymmetrically with changes in sales showing the prevalence of cost stickiness.

The possible cause for this behavior is that the period from 2007 to 2010[12] can be described as a prosperity period, thus, managers foresee any decline in sales as a temporary decline. Therefore, managers accelerate to add resources when demand grows more than to cut resources when demand diminishes which drives to cost stickiness. As a consequence, the second hypothesis which denotes that **"Pre the two successive Egyptian revolutions, total costs do not display sticky response to the equivalent sales change"** can be rejected.

4.4 The behavior of total costs during the two Egyptian revolutions from 2011 to 2013

Table (4) demonstrates the findings of ordinary least squares regression analysis (OLS) regarding the response of total costs towards sales change during Egyptian revolutions during the period from 2011 till 2013.

[12] Egyptian GDP in this period ranged from 5.14% to 7.15%.

Table (4) The regression results of total costs behavior during the two Egyptian revolution (2011-2013)

Panel A: Summary statistics of the model

Sig.	**0.000**	D-W	2.227
R^2	0.428	**Adj.R^2**	**0.418**

Panel B: Results of the main coefficients of the model

Variable	Estimator	Coefficient	Std. Error	Sig.	VIF	Tolerance
Constant	β_0	0.004	0.037	0.905		
X_1 [Log(sales)]	β_1	0.850	0.154	**0.000**	3.097	0.323
X_2 [Dec.dummy *Log(sales)]	β_2	**-0.098**	0.223	**0.660**	3.097	0.323

Source: statistical analysis results

The previous results of regression analysis show that the model is statistically significant, where the p-value is (0.000). The adjusted value of the determination coefficient (Adjusted R^2) is (0.418). This reveals that a change in sales explains 42% of the variations in total costs. Also, the variance inflation factor (VIF) and the tolerance are (3.097) and (0.323) respectively; thus, the model does not suffer from multicollinearity. Further, Durbin-Watson (DW) statistic is (2.227), which indicates that autocorrelation in residuals from (OLS) regression analysis is not a matter of concern.

With respect to the main coefficients of the model, coefficient β_1 is positive and statistically significant at (0.850), which infers that total costs increase nearly by 0.85% when sales increase by 1%. The coefficient β_2 is negative but statistically insignificant at (-0.098). Therefore, these results exhibit that total costs do not behave asymmetrically during the two Egyptian revolutions. That is

to say, coefficient β_1 is significantly positive, and the whole model also is significant, nevertheless, asymmetrical behavior does not appear during the period of the two Egyptians revolutions since the main coefficient, β_2, which reflects the asymmetry in cost behavior is not significant.

The political instability during the period from 2011 to 2013, during the two Egyptian revolutions[13], can be a strong cause of this behavior since these political upheavals have generated strong economic recession. Consequently, managers cannot anticipate that demand will be rebound in the short term especially in the light of these political events even if there is a slight increase in demand. Therefore, it is hard for managers to take decisions like retain slack resources, cut unutilized resources, or add new resources. Therefore, the third hypothesis which implies that **"During the two Egyptian revolutions, total costs do not show anti-sticky response to the equivalent sales changes"** can be accepted.

4.5 The behavior of total costs post the two Egyptian revolutions from 2014 to 2017

Table (5) outlines the results of ordinary least squares regression analysis (OLS) about the response of total costs towards sales change post the two successive Egyptian revolutions during the period from 2014 up to 2017.

[13] Egyptian GDP in this period ranged from 2.18% to 4.37%.

Table (5) The regression results of total costs behavior post the two successive Egyptian revolution (2014-2017)

Panel A: Summary statistics of the model

Sig.	**0.000**	D-W	2.206
R^2	0.318	**Adj.R^2**	**0.309**

Panel B: Results of the main coefficients of the model

Variable	Estimator	Coefficient	Std. Error	Sig.	VIF	Tolerance
Constant	β_0	0.047	0.059	0.427		
X_1 [Log(sales)]	β_1	0.355	0.175	**0.044**	3.351	0.298
X_2 [Dec.dummy *Log(sales)]	β_2	**0.626**	0.230	**0.007**	3.351	0.298

Source: statistical analysis results

The aforesaid results of regression analysis declare that the model is statistically significant, where the p-value is (0.000). Also, the adjusted value of the determination coefficient (Adjusted R^2) is (0.309). This means that a change in sales explains 31% of the variations in total costs. Moreover, the variance inflation factor (VIF) and the tolerance are (3.351) and (0.298) respectively; therefore, multicollinearity is not a problem for this model. The Durbin-Watson (DW) statistic is (0.309), which means that the model does not face autocorrelation problem in residuals from (OLS) regression analysis.

About the main coefficients of the model, coefficient β_1 is positive and statistically significant at (0.355), which reflects that total costs increase roughly by 0.36% when sales increase by 1%. The coefficient β_2 is also positive and statistically significant at (0.626). The sum of coefficient β_1 and coefficient β_2 is

(0.981), which shows that total costs diminish nearly by 0.98% when sales fall by 1%. As a consequence, these results implies the prevalence cost anti-stickiness because coefficient β_1 is positive, coefficient β_2 is also positive, and coefficient β_1 is less than the combined value of β_1 and β_2. In other words, total costs rise by 0.36% and decline by 0.98% for the 1% increase and decrease in sales, therefore, total costs post the two Egyptian revolutions change asymmetrically with changes in sales reflecting the prevalence of cost anti-stickiness.

The possible reason for this result is that the Egyptian economy still suffers from economic contraction even after passing four years of the two Egyptian revolutions. The low economic growth generates managerial pessimism about future demand, consequently, managers predict a permanent decline in demand more than a permanent increase in demand. Therefore, managers will be conservative to insert additional resources if demand increase and they will be more willing to minimize the slack resources if demand decline which create anti-sticky behavior. Consequently, the forth hypothesis which suggests that **"Post the two Egyptian revolutions, total costs do not exhibit anti-sticky response to the equivalent sales change"** can be rejected.

To conclude, the two Egyptian revolutions have a significant impact on the behavior of total costs. Total costs displayed stickiness in their behavior before the occurrence of the two Egyptian revolutions (2007-2010) as the coefficient β_2 is negative. Conversely, total costs converted to anti-sticky behavior after the occurrence of the two Egyptian revolutions (2014-2017) since the coefficient β_2 is positive. During the two Egyptian revolutions (2011-2013), total costs did not exhibit any asymmetry in their behavior whether sticky or anti-sticky because the coefficient β_2 was insignificant. Besides, when aggregating all

periods before, during, and after the two Egyptian revolutions (2007-2017), the results indicate that total costs showed anti-sticky behavior as the coefficient β_2 was positive.

These results are in compliance with the result of Ibrahim (2015) and Hassanein and Younis (2020) as the two studies proved that the same kind of cost can have different behavior from one period to another as a result of economic fluctuations. For instance, Ibrahim (2015) revealed that selling, general, and administrative costs display stickiness in their behavior in the property period, but they show anti-stickiness in their behavior in the recession period. In the same vein, Hassanein and Younis (2020) also proved that the cost of goods sold demonstrates cost stickiness before the financial crisis, but it turns to cost anti-stickiness after the financial crisis.

5. Conclusion

The existing study expands cost behavior literature, especially sticky cost behavior, by providing further evidence from developing economies like Egypt; furthermore, it examines the cost response to changes in demand under some unusual political events, i.e., two successive revolutions. The findings of the study report that the total costs for the whole study period display anti-sticky behavior as they rise by 0.56% and decrease by 0.88% for the 1% increase and decrease in sales. While pre the two successive Egyptian revolutions, total costs demonstrate sticky behavior as they grow by1.08% but they decline by 0.68% when sales increase and decrease by 1%. During the two successive Egyptian revolutions, total costs show insignificant results. Results indicate that total costs increase by 0.36% when sales rise by 1% but they diminish by 0.98% when

sales decline by 1% reflecting anti-sticky behavior post the two successive Egyptian revolutions.

The study results point out important implications. From the theoretical perspective, this study sheds light on the effect of political events on economic conditions that affect the cost response to demand changes. From the practical viewpoint, first, managers should take into account sticky cost behavior when analyzing cost behavior to make accurate decisions and put good plans. Additionally, managers should choose a flexible cost structure that enables them to modify the committed resources without affording high adjustment costs, particularly under the uncommon political conditions. Also, managers should take into consideration that cost behavior may be changed as a result of fluctuations in economic conditions that arise from instability in political events. For instance, total costs demonstrate cost stickiness before the two revolutions but they show cost anti-stickiness after the two revolutions.

Second, when using techniques such as cost budgeting and cost volume profit analysis, cost accountants and managerial accountants should be cautious because the asymmetric response of costs indicates that costs change upward and downward along two curves, not one curve as the traditional cost behavior claims. Third, investors and analysts should be careful when making investment decisions during and after the unfamiliar political events because these periods cause instability in the economy and hence generate fluctuated earnings or losses. Also, investors and analysts should be aware when predicting earnings that costs respond asymmetrically to demand changes.

The present study suffers from some limitations. Firstly, the study focus only on one determinant that may affect the nature and extent of sticky cost behavior

although there are many determinates that influence this behavior such as cultural factors and investors protection legislation. Secondly, the study sample is considered small compared to those used in developed countries.

Finally, future research can replicate this study by using non-profit Egyptian firms. Further, future research can consider the opportunistic behavior of managers when analyzing cost response toward demand changes. Moreover, future researchers can test cost behavior under the COVID-19 crisis.

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