Global Review of Accounting and Finance
Vol. 2. No. 1. March 2011 Pp. 1-17

Profitability Performance and the Role of Manufacturing Cost: Evidence from a Panel of US Manufacturing Firms

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For manufacturing firms, full productivity is considered to be one of the main factors for profitability maximization. In such a case, manufacturing costs seem to dominate over the other types of operating expenses. This empirical study aims at analyzing and quantifying the impact of such cost structure, i.e., the ratio of manufacturing costs to other operating expenses, on profitability of US manufacturing firms. By combining information from the financial statements and the panel time series methodology for 1,287 manufacturing firms, spanning the period 2000-2009, we are capable of estimating the impact of this particular cost structure on firms' profitability. The empirical findings display that there exists a positive association between the cost structure ratio and alternative measures of profitability, implying that the manufacturing cost structure seems to be a reliable informative indicator characterizing the productive potential of manufacturing firms.

JEL Codes: M41, C33

1. Introduction

In the framework of International Accounting Standards (IAS), the role of income statement format and the role of information contained in expenses and their predictability about future earnings or profits has been exemplified. In particular, according to IAS No. 1, the Statement of Comprehensive Income of a firm presents an analysis of expenses using a classification based on either their nature or their function within the firm, whichever provides information that is more reliable and more relevant.

Expenses are sub-classified to highlight components of financial performance that may differ in terms of frequency, potential for gain or loss and predictability. This analysis is provided in one of two forms. The first form of analysis is the 'nature of expenses' method and the second one is the 'function of expenses' or the 'cost of sales' method and classifies expenses according to their function as part of the cost of sales or the cost of distribution or administrative activities. At a minimum, a firm discloses its cost of sales under this method separately from other expenses. The method can provide more relevant information to users than the classification of expenses by

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nature, but allocating costs to functions may require arbitrary allocations and involve a considerable extent of judgment. It has also become common place for firms to develop and report their own measures of financial performance, which frequently omit certain pieces of accounting information related to their cost structure (Bradshaw and Sloan, 2002). However, accounting regulators have been very sceptical about this attitude by firms, claiming that this reported accounting information is used to manipulate investor's perception about the firm's future profitability prospects.

It is believed that the function of the 'expense method' is more useful for manufacturing firms, because it might predict the changes of earnings under suitable circumstances. In a normal situation and for manufacturing firms the primary part of their expenses must be the production cost, which is similar to the cost of goods sold and in cases without large changes in the inventories levels. Cost of goods sold is the direct cost of the products and services a firm sells. Biddle and Seow (1991) argue that this cost could also be regarded as a type of variable costs. While indirect or other costs or expenses, such as the cost of insurance, fuel, rents, heat, light, power, maintenance, administrative, research and development, interest, and taxes, are part of the goods produced and are incurred in the process of generating revenues, they cannot be identified as belonging to a specific job or good. Only the direct or manufacturing cost of the goods is included in the calculation of cost of goods sold, margin, and mark-up. Thus, in case of low levels of productivity, in which sales follow a downward trend, many managers attempt to maintain the cost of goods sold to other expenses ratio as stable as possible by transferring part of their indirect expenses embodied in the cost-of-goods sold to other expenses, so that they can maintain a stable profit margin as well as to disclose as little information as possible to the firm's external environment about their own managerial skills. In addition, this separation enables the cost impact of implementing various technologies to be evaluated and can be validated with financial accounting data. For instance, the number of successful production runs per year and the cost of facility down-time and batch failure are expected to have a much greater effect on manufacturing costs than changes in raw material prices or labour costs. Therefore, understanding the behaviour of such costs and those factors that influence their course over time, especially, during the development process of a good, is important to the future of the firm if it is to remain both profitable and successful.

The goal of this research work is to investigate, for the first time, whether the cost of goods sold to other operating (administrative) expenses ratio is capable of predicting any profit changes. In other words, the study will investigate whether any hidden information about the firm's true cost structure provides incremental information about the firm's profitability future. We are expecting a positive association between this ratio and firm's profitability; firms with relatively high (low) values of this ratio enjoying (suffering) more (from less) profits over time. This positive association occurs because a higher (lower) ratio implies that the firm's production levels are close (not close) to its maximum capacity. The remainder of this paper is organized as follows. Section 2 presents the literature review related to the issue under investigation, while Section 3 discusses the data and methodological issues.

Section 4 presents the empirical results and finally, Section 5 concludes the paper and provides some policy implications and suggestions for further research.

2. Literature Review

In this literature framework there have been certain research works about the information content of earnings and expenses as well as about the role of financial statement presentation format. The novelty of our study is two-fold. First, it introduces, for the first time, a new economic factor proxy that yields the impact of cost structure on firms' profitability and, second, it adds to evidence on potential limitations of accounting procedures and techniques highlighted by several researchers. The empirical findings of this study suggest that these limitations do compromise the ability of the cost structure to reflect information about firms' profitability. Lipe (1986) investigates the 'Information Content' of earnings in a study that makes use of certain determinants as: gross profits, general and administrative expenses, depreciation expenses, interest expenses and income taxes. He concludes that these determinants are capable of explaining more of the variation in stock returns vis-à-vis the explanatory power of a model that contains only earnings.

Swaminathan and Weintrop (1991) investigate the information content of quarterly earnings, revenues and expenses using Value Line forecasts as a proxy for the market's expectations about earnings and expenses. They find a statistically significant positive relationship between risk-adjusted returns and unexpected revenues as well as a statistically significant negative relationship between risk-adjusted returns and unexpected expenses. In addition, they find that the revenues and expenses components together have better information content than earnings alone. Kang (1991) argues that productivity measures are typically concerned with profitability, while Feltham and Xie (1994) show that accounting numbers are frequently used in evaluating management performance, which is an important ingredient in the managers' motivation process. Maines and McDaniel (2000) investigate how alternative accounting statements can affect investor's capacity in decoding the impact of volatility of unrealized gains on their judgments about managers' performance. Buchheit (2001) examines the hypothesis that information on non-used capacity costs can lead to biased performance evaluations. His results display that capacity reporting information affects performance evaluations, even in the case when evaluators have explicit incentives to ignore such types of information. Ahmed (2002) argues that in the case that non-expected earnings reflect information about future economic rents, then earnings are positively associated with the fixed to total costs ratio. Doyle and Soliman (2002) offer statistical evidence consistent with the hypothesis that many firms hide their actual cost structure to manage their reported profits. Ertimur *et al.* (2003) investigate investors' reaction to revenues and expenses surprises around preliminary earnings announcements. Their results display that the majority of investors value more highly a dollar of revenue surprise than a dollar of expenses surprise, while this differential market reaction depends on the proportion of operating to total expenses. Doyle *et al.* (2003) show that the current regulatory concern about the use of pro forma earnings may be warranted. The expenses that are excluded from the definition of pro forma earnings predict lower future cash flows and are negatively related to future stock returns. Finally, Buchheit (2004) shows that the manner accounting information about manufacturing costs is disclosed affects firm's pricing behaviour as well as its margin strategies.

3. Data and Methodological Issues

Annual data on operating income (OI), a proxy for firms' profitability, the returns to assets (ROA) ratio, an alternative proxy for the firms' profitability, the cost of goods sold to other expenses (COGS), a proxy for the ratio of manufacturing cost with respect to other expenses, total assets (A), the beta factor of the firm (BETA), market capitalization (MCAP), a proxy for the size of the firm, and real income (Y), proxied by GDP in constant 2000 prices, is obtained. Data come from 1,287 firms listed on the NYSE spanning the period 2000-2009 on a fiscal year basis. The selection procedure resulted in a sample of 12,871 observations. Data were obtained from the Bloomberg database. All firms are listed on the NY stock exchange (NYSE), they have at least five years of data, while only manufacturing firms with ordinary common equity are considered simply because non-manufacturing firms are subject to additional regulatory requirements that could affect the hypothesis under investigation (Teets, 1992). The focus of the empirical analysis is the impact of the cost of goods sold on manufacturing firm's profitability. Our benchmark models planned to be tested in this study are expressed as:

Model 1: $OI_t = a_0 + a_1\ COGS_t + a_2\ beta_t + a_3\ Y_t + u_{1t}$
Model 2: $ROA_t = b_0 + b_1\ COGS_t + b_2\ beta_t + b_3\ Y_t + u_{2t}$

where the variables are defined as above, while u's are random variables, i.e. white noises with $N(0, \sigma^2)$. All variables are calculated as per share amounts, which are then scaled by total assets per share. To limit the impact of outliers, all variables are winsorized at the 1% and 99% levels. Parameters a_1 and b_1 are the objective response coefficients. According to theoretical expectations, parameters a_1 and b_1 are expected to be positive and statistically significant. The beta factor and the income variable are control variables, with the latter capturing the business-cycle effect. Given the presence of heterogeneity in both dynamics and error variances in the panel, the heterogeneous panel cointegration test advanced by Pedroni (1999, 2004), which allows for cross-section interdependence with different individual effects, is employed as follows:

Model 1: $OI_{it} = a_0 + \alpha_{1it} + \delta_{1it} + a_1\ COGS_{it} + a_2\ beta_{it} + a_3\ Y_{it} + u_{1it}$
Model 2: $ROA_{it} = b_0 + \alpha_{2it} + \delta_{2it} + b_1\ COGS_{it} + b_2\ beta_{it} + b_3\ Y_{it} + u_{2it}$

where $i = 1,...,N$ for each firm in the panel and $t = 1,...,T$ refers to the time period. The parameters α_{1it} and α_{2it} and δ_{1it} and δ_{2it} allow for the possibility of firm-specific fixed effects and deterministic trends, respectively. To test the null hypothesis of no cointegration, $\rho_i = 1$, the following unit root test is conducted on the residuals as follows: $u_{it} = \rho_i u_{it-1} + w_{it}$. Pedroni (1999, 2004) proposes seven tests for cointegration. All tests are distributed asymptotically as standard normal and test the null hypothesis of no cointegration.

4. Empirical Analysis

4.1 Dynamic Heterogeneity

In the statistical framework of this study we first test for heterogeneity and then by controlling for it through appropriate techniques (Holtz *et al*., 1985; Holtz-Eakin, 1986). The dynamic heterogeneity, i.e., variation of the intercept over firms and time, across a cross-section of the relevant variables can be investigated as follows. In the first step, an ADF(n) equation for each relationship in the panel is estimated; then, the hypothesis of whether regression parameters are equal across these equations is tested. Next, a similar test of parameter equality is performed by estimating an n-order autoregressive model for each of the relationships under investigation. Standard Chow-type F tests under the null of parameter equality across all relationships are also performed. Heterogeneity in cross-sectional parameters is indicated if the results reject the null hypothesis. Finally, homogeneity error variance across groups is also examined as another measure of dynamic heterogeneity. White's tests for group-wise heteroscedasticity are employed to serve this objective. The results of this procedure are reported in Table 1. The empirical findings indicate that the relationship under investigation in both types of models is characterized by heterogeneity of dynamics and error variance across groups, supporting the employment of panel analysis.

Table 1: Tests of Dynamic Heterogeneity across Groups

Specification	ADF(3)	AR(3)	White's Test
Model 1	26.36*	36.23*	75.18*
Model 2	29.61*	39.22*	76.34*

ADF(3) reports the parameter equality test (F-test) across all relationships in the panel. AR(3) displays the F-test of parameter equality conducted in a third-order autoregressive model of the relationships. White's test reports the White's test of equality of variances across the investigated relationships in the panel.
* denotes statistical significance at 1%.

4.2 Panel Unit Root Tests

There is a variety of panel unit root tests which include Maddala and Wu (1999), Breitung (2000), Hadri (2000), Choi (2001), Levin *et al.* (2002), Im *et al.* (2003), and Carrion-i-Silvestre *et al.* (2005), among others. In light of parameter heterogeneity, the Im *et al.* (IPS, 2003) panel unit root test is utilized which allows for heterogeneous autoregressive coefficients. Such heterogeneity could occur due to the different economic conditions and stages of economic development in each country. Im *et al.* (2003) suggest averaging the augmented Dickey-Fuller (ADF) unit root tests while allowing for different orders of serial correlation. The null hypothesis is that each series in the panel contains a unit root. The alternative hypothesis is that at least one of the individual series in the panel is stationary. Their $t-bar$ statistic is normally distributed under the null hypothesis with the critical values for given values of N and T provided by Im *et al.* (2003). The LLC test allows heterogeneity of individual deterministic effects and heterogeneous serial correlation structure of the error terms assuming homogeneous first order autoregressive parameters. A procedure is developed that uses t-statistics of the estimator to evaluate the hypothesis that each individual time series contains a unit root against the alternative hypothesis that each time series is stationary. This test seems to have certain limitations, such as that it depends seriously upon the independence assumption across individual regressions and, hence, is not applicable if cross sectional correlation is present. In addition, a limitation is associated with the fact that the autoregressive parameters are considered as being identical across the panel regressions (see the above null hypothesis). However, this null hypothesis makes sense under some cases. As Maddala and Wu (1999) point out, the alternative hypothesis is too strong to be valid in any empirical case.

The Maddala and Wu and Choi tests offer a strategy that seems to overcome the limitations of both LLC and Im *et al.* tests. They suggest a non-parametric test, which is based on a combination of the p-values of the t-statistics for a unit root in each cross-sectional unit (the ADF test). More specifically, the testing approach has the advantage of allowing for as much heterogeneity across units as possible. Under the hypothesis that the test statistics are continuous, the significance of p-values are independent in a uniform manner. The advantage of this test is that it does not require an infinite number of groups to be valid, i.e., we do not have to assume that all groups must have the same type of non-stochastic components, its critical values are not sensitive to the choice of lag lengths in the ADF regressions and, finally, it does not have to assume that none of the groups have a unit root under the alternative hypothesis. The Hadri Lagrange Multiplier (LM) test is closely related to that of the Carrion-i-Silvestre *et al.* test. It has the advantage of combining both stationary and non-stationary variables and permits a formulation for a residual-based LM test of stationarity. The null hypothesis of trend stationarity corresponds to the hypothesis that the variance of the random walk is zero. The LM statistic is consistent and has an asymptotic normal distribution. The main advantage of this test is that the moments of the asymptotic distribution are exactly derived, while the disturbance terms can be heteroscedastic across i. A consistent estimator of the above variance is obtained using again the estimators provided by Newey and West (1994). The results in Table 2 point out that the hypothesis that all the variables contain a unit root is accepted at the 1% significant level in all tests, suggesting that the log variables in our study are I(1).

Table 2: Panel Unit Root Tests

IPS Panel Unit Root Tests

Variables	Without Trend	With Trend
oper	-1.19(3)	-1.21(3)
Δoper	-4.23(2)*	-5.16(1)*
roa	-1.59(3)	-1.71(3)
Δroa	-4.19(2)*	-4.66(2)*
cogs	-1.45(3)	-1.73(3)
Δcogs	-4.97(2)*	-5.62(1)*
beta	-1.61(3)	-1.87(2)
Δbeta	-4.37(1)*	-4.71(1)*
y	-1.28(3)	-1.51(3)
Δy	-4.33(1)*	-4.67(1)*

LLC Panel Unit Root Tests

Variables	
oper	-1.34
Δoper	-9.64*
roa	-1.56
Δroa	-8.91*
cogs	-1.51
Δcogs	-9.65*
beta	-1.44
Δbeta	-9.12*
y	-1.37
Δy	-9.61*

Handri (hom) Panel Unit Root Tests

Variables	
oper	13.13*
Δoper	1.23
roa	9.73*
Δroa	1.24
cogs	27.56*
Δcogs	1.60
beta	30.93*
Δbeta	1.26
y	27.66*

Δy	1.17

Handri (het) Panel Unit Root Tests

Variables	
oper	9.34*
Δoper	1.08
roa	8.57*
Δroa	1.64
cogs	25.41*
Δcogs	1.35
beta	31.07*
Δbeta	1.10
y	17.39*
Δy	1.23

Carrion-i-Silvestre *et al.* (no breaks, homogeneous)

Variables	
oper	16.53*
Δoper	1.94
roa	9.71*
Δroa	1.46
cogs	16.13*
Δcogs	1.58
beta	25.42*
Δbeta	1.17
y	16.93*
Δy	1.37

Carrion-i-Silvestre *et al.* (no breaks, heterogeneous)

Variables	
oper	15.43*
Δoper	2.10
roa	9.52*
Δroa	1.41
cogs	19.66*
Δcogs	1.36
beta	20.12*
Δbeta	1.52
y	18.09*

Δy	1.36
Fisher-ADF	
Variables	
oper	17.31
Δoper	90.08*
roa	21.33
Δroa	114.30*
cogs	14.38
Δcogs	121.05*
beta	12.26
Δbeta	109.18*
y	11.46
Δy	113.16*
Fisher-PP	
Variables	
oper	20.73
Δoper	120.19*
roa	31.11
Δroa	139.87*
cogs	34.34
Δcogs	142.26*
beta	28.19
Δbeta	135.82*
y	31.06
Δy	139.64*

Numbers in parentheses are the augmented lags include the unit root test.
* denotes statistical significance at 1%

4.3 Panel Co-integration Tests

Given the presence of heterogeneity in both dynamics and error variances in the panel, the heterogeneous panel co-integration test advanced by Pedroni (1999, 2004), which allows for cross-section interdependence with different individual effects, is employed as follows. Based on the four model specifications presented above, Table 3 reports panel co-integration test statistics. All seven test statistics and in both model cases reject the null hypothesis of no co-integration at the one percent significance level.

Table 3: Panel Cointegration Tests

Model 1	
Panel v-stat	44.85663*
Panel rho-stat	-48.55793*
Panel pp-stat	-47.74028*
Panel adf-stat	-6.52235*
Group rho-stat	-47.14415*
Group pp-stat	-48.17552*
Group adf-stat	-6.10534*
Model 2	
Panel v-stat	44.45632*
Panel rho-stat	-51.14285*
Panel pp-stat	-53.15347*
Panel adf-stat	-6.16542*
Group rho-stat	-50.33652*
Group pp-stat	-51.53784*
Group adf-stat	-6.34663*

* denotes statistical significance at 1%

Following Pedroni (2000), the fully modified OLS (FMOLS) methodological technique for heterogeneous co-integrated panels is followed. Table 4 displays the FMOLS results. In both model versions, the coefficients are shown to have the expected theoretical signs and they are statistically significant at the a 1 percent significance level. In particular, with respect to Model 1, the results display that a 1 dollar increase in the manufacturing cost to other expenses ratio leads to a 1.54 dollar statistically significant increase in firm's profitability, while with respect to Model 2, the results indicate that 1 dollar increase in the manufacturing cost to other expenses ratio statistically significantly increases profitability by a 1.59 dollars. The coefficients for the beta and income variables appear to have the expected theoretical sign. The reported t-statistics are based on standard errors adjusted for serial correlation in the estimates using the Newey-West (1994) correction. Finally, the adjusted R-square values show a significant explanatory value in both cases.

Table 4: FMOLS Estimates

Model 1

$$\text{oper} = \underset{(12.6)^*}{0.784} + \underset{(31.1)^*}{1.536}\,\text{cogs} - \underset{(-8.94)^*}{0.067}\,\text{beta} + \underset{(11.7)^*}{0.126}\,\text{y} \qquad \bar{R}^2 = 0.77$$

Model 2

$$\text{roa} = \underset{(41.6)^*}{0.241} + \underset{(10.4)^*}{1.591}\,\text{cogs} - \underset{(-9.71)^*}{0.072}\,\text{beta} + \underset{(10.9)^*}{0.138}\,\text{y} \qquad \bar{R}^2 = 0.84$$

t-statistics are reported in parentheses.
* denotes significance at 1%

4.4 Error Correction Causality Tests

Given that the variables under study are cointegrated, a panel vector error correction model is estimated to perform causality tests. Table 5 reports the results of these causality tests. They indicate that the manufacturing cost to other expenses ratio can determine both types of profitability in the short-run. In particular, Wald testing displays a p-value for the F-test of 0.00 in Model 1 and a p-value for the F-test of 0.01 in Model 2. In both models, the sum of the lagged coefficients for short-run changes turns out to be positive (1.197 in Model 1 and 1.223 in Model 2). In the long-run, both error correction terms are negative and statistically significant, implying the presence of long-run adjustment. Looking at the models' overall performance, as reported by a battery of diagnostics, the equations satisfy certain econometric criteria, namely, absence of serial correlation (LM test) and absence of functional misspecification (RESET test). ARCH tests were also applied to test the residual structure in the mean equations. The results accept the hypothesis that significant ARCH effects are not present. Overall, the empirical findings demonstrate that the component of the cost of goods sold to other operating expenses ratio provides a substantial piece of information content to the profitability potential of manufacturing firms. Therefore, this type of item is viewed as a recurrent and an important piece of accounting information for investors as well as for regulators.

Table 5: Panel Causality Tests (Income Equations)

Dependent Variable		Sources of Causation Short-run			Long-Run
Model 1					
	Δoper	**Δcogs**	**Δbeta**	**Δy**	**λ_1**
Δoper	**----**	F-test (1.197) [0.00] [0.01]	F-test(-0.124) [0.00] [0.00]	F-test(0.174) [0.00] [0.00]	-0.463 [0.00]
LM	2.18[0.21]				
RESET	1.35[0.19]				
ARCH(1)	0.51[0.24], ARCH(4)	0.43[0.29]			
ARCH(8)	0.31[0.32], ARCH(12)	0.24[0.27]			
Model 2					
	Δroa	**Δcogs**	**Δbeta**	**Δy**	**λ_2**
Δroa	**----**	F-test (1.223) [0.01] [0.00]	F-test(-0.145) [0.00] [0.00]	F-test(0.186) [0.00] [0.00]	-0.0927 [0.00]
LM	2.43[0.21]				
RESET	1.18[0.29]				
ARCH(1)	0.55[0.25], ARCH(4)	0.39[0.32]			
ARCH(8)	0.31[0.38], ARCH(12)	0.34[0.38]			

Wald F-tests reported with respect to short-run changes in the independent variables. The sum of the lagged coefficients for the respective short-run changes is denoted in parentheses. λs represent the coefficient of the error correction term, while values in brackets denote p-values. LM is a serial correlation test, RESET is a functional misspecification test and ARCH is an ARCH test at 1, 4, 8, and 12 lags.
* denotes statistical significance at 1%

4.5 Robustness Tests: The Size Factor

According to the analysis by Berk *et al.* (1999), Carlson *et al.* (2004) and Zhang (2005) about the importance of the firm's size in the role of the manufacturing cost to other expenses ratio in explaining its profitability as well as its value evolvement over time, the size tends to affect firms' systematic risk. In addition, from a process development perspective, a detailed understanding of the separation of manufacturing costs as opposed to other types of cost expenses and in association with potential process risk factors is a must-have map to help guide later stages of goods development. This is very important for small-size firms that are planning to or considering licensing out their products, since these firms are looking at the cost of manufacturing and supply-chain risk when licensing in as a part of the due diligence procedure. Moreover, there are certain additional problems in using the ROA measure of profits. Cross-sectional differences in ROAs could arise because of differences in age of assets, accounting techniques and managerial incentives to manage profits and/or to avoid political costs and maximize their compensation. Zmijewski and Hagerman (1981) argue that differences in accounting methods are systematically related to size.

To this end, we split our sample into small and large firms. We make use of the median of market capitalization. Those firms with a market capitalization above the median are characterized as large firms, while those with market capitalization below the median are characterized as small firms. The results are reported in Table 6. FMOLS results display that in both models the coefficient of the manufacturing cost to other expenses ratio turns out to be larger in the case of small firms vis-à-vis the large firms, i.e., 1.458 vs 1.411, for the operating income definition, respectively, and 1.471 vs 1.428, for the ROA definition, respectively. They are all statistically significant at the 1 percent significance level, implying that size could be a crucial factor in investigating the impact of the cost structure ratio on firm's profitability. Causality tests in both models display that the sum of the lagged coefficients for the manufacturing cost to other expenses ratio turns out to be positive and statistically significant, but the sums are higher for the case of small firms. Moreover, the sum of both the beta factor and the variable of income retain their expected theoretical signs. Finally, looking at the models' overall performance, all equations satisfy again the same econometric criteria as above.

Table 6: Robustness Tests - The Role of the Firm's Size

Small Firms

Panel I. Panel Cointegration Tests

Model 1

Panel v-stat	45.46842*
Panel rho-stat	-46.19225*
Panel pp-stat	-46.18654*
Panel adf-stat	-5.36547*
Group rho-stat	-45.37542*
Group pp-stat	-46.36854*
Group adf-stat	-5.10642*

Model 2

Panel v-stat	44.15583*
Panel rho-stat	-43.49006*
Panel pp-stat	-43.48382*
Panel adf-stat	-5.14552*
Group rho-stat	-45.10951*
Group pp-stat	-44.64754*
Group adf-stat	-5.06840*

Panel II. FMOLS Estimates

Model 1

oper = 0.471 + 1.458 cogs – 0.065 beta + 0.118 y

(10.2)* (22.3)* (-7.62)* (6.11)* $\bar{R}^2 = 0.68$

Model 2

roa = 0.327 + 1.471 cogs – 0.085 beta + 0.145 y

(12.8)* (15.3)* (-6.19)* (5.91)* $\bar{R}^2 = 0.74$

Panel III. Panel Causality Tests

Model 1

	Δoper	**Δcogs**	**Δbeta**	**Δy**	**λ_1**
Δoper	----	F-test (1.346) [0.00] [0.00]	F-test (-0.134) [0.00] [0.00]	F-test (0.187) [0.00] [0.00]	-0.154 [0.00]

LM	1.18[0.29]				
RESET	1.33[0.30]				
ARCH(1)	0.65[0.22]	ARCH(4)	0.39[0.20]	ARCH(8)	0.25[0.29]
ARCH(12)	0.27[0.34]				

Model 2

	Δroa	**Δcogs**	**Δbeta**	**Δy**	**λ_2**
Δroa	----	F-test (1.375) [0.00] [0.00]	F-test (-0.153) [0.00] [0.00]	F-test (0.194) [0.00] [0.00]	-0.181 [0.00]

LM	1.14[0.31]				
RESET	1.39[0.28]				
ARCH(1)	0.72[0.18]	ARCH(4)	0.48[0.25]	ARCH(8)	0.29[0.27]

ARCH(12)	0.39[0.33]

<u>Large Firms</u>
Panel I. Panel Cointegration Tests
Model 1

Panel v-stat	41.66332*
Panel rho-stat	-40.10247*
Panel pp-stat	-40.11673*
Panel adf-stat	-5.06557*
Group rho-stat	-40.39505*
Group pp-stat	-40.16664*
Group adf-stat	-5.14693*

Model 2

Panel v-stat	40.16577*
Panel rho-stat	-40.47301*
Panel pp-stat	-40.45583*
Panel adf-stat	-5.10582*
Group rho-stat	-40.17353*
Group pp-stat	-40.64658*
Group adf-stat	-5.19894*

Panel II. FMOLS Estimates

Model 1

oper = 0.418 + 1.411 cogs – 0.176 beta + 0.205 y
(14.1)* (17.9)* (-5.44)* (9.85)* $\bar{R}^2 = 0.54$

Model 2

roa = 0.306 + 1.428 cogs – 0.193 beta + 0.236 y
(9.24)* (13.4)* (-6.17)* (8.62)* $\bar{R}^2 = 0.59$

Panel III. Panel Causality Tests
Model 1

	Δoper	**Δcogs**	**Δbeta**	**Δy**	**λ_1**
Δoper	**----**	F-test (1.261)	F-test (-0.163)	F-test (0.218)	-0.108
		[0.00] [0.00]	[0.00] [0.00]	[0.00] [0.00]	[0.01]

LM	1.08[0.31]				
RESET	1.24[0.34]				
ARCH(1)	0.74[0.21]	ARCH(4)	0.44[0.24]	ARCH(8)	0.45[0.23]
ARCH(12)	0.33[0.28]				

Model 2

	Δroa	**Δcogs**	**Δbeta**	**Δy**	**λ_2**
Δroa	**----**	F-test (1.279)	F-test (-0.188)	F-test (0.247)	-0.138
		[0.00] [0.00]	[0.00] [0.00]	[0.00] [0.00]	[0.00]

LM	1.46[0.29]
RESET	1.54[0.24]

ARCH(1) 0.82[0.16] ARCH(4) 0.67[0.22] ARCH(8) 0.47[0.23]
ARCH(12) 0.58[0.28]

Similar to Tables 3, 4 and 5.

5. Concluding Remarks and Policy Implications

This paper offers a panel methodological proposal to investigate the role of manufacturing cost as opposed to the other cost components in determining the firms' profitability and for the case of US manufacturing firms. To this end, a panel sample of 1,287 US manufacturing firms was used over the time span 2000-2009. Through the methodology of panel cointegration and causality testing, the empirical findings show that the manufacturing cost has a significant informational content value for firms' profitability. Our results support the professions' contention that reported total expenses do not provide a complete summary of accounting information. In other words, the reported cost structure is not as informative about firm's profitability prospects as previously though. Some information is lost when the manufacturing cost component, analyzed in this research study, is aggregated into total costs. In other words, the evidence is consistent with the decomposition of total costs, providing a substantial and statistically significant amount of information that would be lost if only total cost measures are reported.

Moreover, this particular item is equally useful to those who make investment or any other decisions. Firms can agree on consistent methods for identifying the role of manufacturing costs as opposed to other types of expenses. These empirical results suggest that the usefulness of accounting information is affected by the role of the information in the market. In other words, our empirical findings are consistent with the market recognizing statistical differences in certain components of total costs (Lipe, 1986). The implications of the results could be very crucial to regulators, since managers may manipulate firms' costs through certain activities and thus investors could be misled by firm's reported accounting information. If firms can achieve such consistent methods of announcing manufacturing costs, then they will maximize their opportunities to drive out costs early in development with little effort, thus, leveraging their limited resources, especially in the case of small firms. An area for future research would be to identify other variables from total cost items, published in firms' financial statements, that would help analysts determine any possible impact of such items on firms' profitability. Furthermore, the analysis could be extended to identify whether the cost structure would affect the stock market response to such cost structure changes.

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