Variable Costs In Textile Industry: Financial Accounting Versus Managerial Accounting Data

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ABSTRACT

We interchange dependent variables to test Zimmerman's (2001) assumption that paucity of data precludes large sample based research in managerial accounting. We use publicly available data on Indian textile firms to examine whether financial accounting data can proxy for managerial accounting data. The good news for managerial accounting is that financial accounting data provides statistically significant results in the same direction as managerial accounting data. The bad news for Zimmerman's assumption is that sales and production are reliable and approximate proxies for physical quantity of units sold. In sum, for appropriate research issues, large sample based studies in managerial accounting can be conducted using financial accounting data.

JEL classification codes: M41, F30, G32, L23

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I. Introduction

Reporting requirements for Indian textile firms make it possible to estimate variable costs as well as document and aggregate physical quantity of goods sold. We term sales (in Indian Rupees), production (in Indian Rupees) and variable costs (in Indian Rupees) as financial accounting data since accounting standards worldwide require reporting such information to outside investors and creditors. We term physical quantity of goods sold as managerial accounting data. We examine a panel data of 1610 firm years in India over the time period 2000 to 2004 to document summary statistics and results that can be generalized by future studies in other countries.

Two types of previous studies relate to our study. Anderson, Banker, Chen and Janakiraman (2001); Anderson, Banker, and Janakiraman (2003); Anderson, Banker, Huang and Janakiraman (2004) and related studies find evidence of stickiness for selling, general & administrative expenses and cost of goods sold in large samples of U.S. firms. This strand of literature is built upon a weak foundation since these studies assume that financial accounting data (sales or cost of goods sold) are adequate proxies for managerial accounting data (sales volume). Our study makes no such assumption; instead we test whether making such an assumption is valid.

Other studies including ours focus on single industry samples. Noreen and Soderstrom (1997) report no evidence of sticky cost behavior for hospitals while Balakrishnan, Peterson, and Soderstrom (2004) find costs exhibit stickiness but only when resources are strained at therapy clinics. Banker and Johnston (1993) examine cost drivers in airline industry. First, these empirical studies (and related literature) assume ad-hoc metrics in service industries including patient days, Medicare billings and so on are

adequate proxies for sales volume. In sharp contrast, our study directly examines a pure measure of sales volume, physical quantity of goods sold. Second, prior studies based on capital intensive and fixed cost driven service firms cannot generate generalizable findings for variable costs. To the best of our knowledge, our paper is the first large sample study to examine manufacturing firms to generate results that can be generalized to other industries and countries. Third, fundamentals of managerial accounting concepts are based on manufacturing firms therefore we examine manufacturing firms while prior studies examine service firms.

The results from our study are simple and straightforward to summarize. This study uses publicly available data on Indian textile firms to examine whether financial accounting data (sales or production in millions of Indian rupees) can be used to proxy for managerial accounting data (physical quantity of goods sold in metric tons). Following conventional wisdom in managerial accounting, sales of Indian textile firms are moderately correlated with physical quantity of goods sold. We examine this issue further by using a simple and intuitive empirical experiment. If sales are an adequate proxy for physical quantity of goods sold then variable costs should have a statistically similar relationship with both proxies. We construct a new empirical test based on ordinary least squares (OLS) and fixed effects regressions for this purpose. We use financial variables (sales or production) as dependent variable and later substitute financial accounting variable(s) with managerial accounting variable (physical quantity of goods sold) to test their relationship with variable costs. Variable costs have an equally significant statistical relationship with sales, production and physical quantity of goods sold. Therefore in our view, large sample studies should use financial accounting data to

document stylized facts that act as hypotheses for in-depth small sample studies based on managerial accounting data.

The rest of the paper proceeds as follows. Section 2 briefly discusses the legal rules for corporate governance and accounting regulations prevailing in India during the time-period of this study. Section 3 provides a brief overview of the Indian textile industry. Section 4 details the sample construction, data availability due to accounting disclosure standards and regression specifications. Section 5 presents empirical results and interprets them. Section 6 concludes.

II. Corporate Governance and Accounting Regulations for Indian Firms

Indian companies are required to prepare audited annual reports signed by independent certified accountants. In addition, each company has an audit committee with elected board of directors' members. Accounting regulations for companies registered in India are unique in requiring detailed quantitative information on sales under 3 (I) and 4 (D) sections of Part II Section VI of the Companies Act, 1956. More pertinent for this study, Indian firms disclose quantitative information on major products manufactured by them. We focus primarily on cotton/man made fiber and filament yarn mills in the textile industry since their physical quantity of output can be aggregated; in other industries it is not possible to aggregate their range of products.

The rest of this section is based on Topalova (2004). Currently, four main laws regulate corporate governance of Indian firms. First, Companies Act of 1956 and amendments aim to ensure adequate protection of interests of creditors and shareholders while regulating the issue, transfer, and allotment of securities. Second, Securities Contracts (Regulation) Act of 1956 covers all aspects of securities trading and regulates

the operations of the stock market. Third, Securities and Exchange Board of India (SEBI) Act of 1992 protects interests of shareholders while promoting and regulating the securities markets. Fourth, Sick Industrial Companies (Special Provision) Act (SICA) deals with financial reorganization including bankruptcy procedures of distressed companies. Disclosure of price sensitive information to relevant stock exchanges and SEBI is mandatory. Remuneration of company officers must be disclosed in aggregated form as part of the audited annual report. Companies must be rated by approved credit agencies before they can issue any securities.

World Bank's Report on Observance of Standards and Codes (ROSC) in 2000 finds that India's corporate governance practices generally fall short of OECD standards. Further amendments to the Companies Act, 1956 were made in late 2000 to fill some of the gap by imposing more stringent corporate disclosures norms such as quarterly filings of shareholding data, segmented reporting of business activities, disclosure and treatment of related party transactions in directors' reports and mandatory appointment of an officer for monitoring share transfers.

III. Indian Textile Industry

Textile industry plays a crucial role in the Indian economy. Currently textiles contribute about 14 percent to India's industrial production, 4 percent to its GDP and 16 percent to India's export earnings. In comparison, WTO estimates world exports of textile and clothing as €566 billion in 2004, which accounts for 6% of total world exports. India's textile sector with 35 million workers is the second largest provider of employment, only agriculture employs more Indians.

Our sample's starting year coincides with India's New Textile Policy announced in November 2000 with the aim of helping India's textile industry attain a pre-eminent global standing in the manufacture and export of textiles. The policy has a target of textile and apparel exports of US$50 billion by 2010 including ready made garments exports worth US$25 billion.

The major sub-industry categories within India's textile industry include cotton/man made fiber textile mills, man made fiber/filament yarn firms, powerloom sector, woolen textiles, silk, handlooms and jute mills. Our sample firms are primarily cotton/man made fiber and filament yarn mills since their physical quantity of output can be aggregated. In other manufacturing industries in India, this aggregation is practically infeasible since firms produce a wide array of products.

This study's sample construction and methodology can easily be extended to textile industries in other countries. Since 1995, world trade in textile and clothing has been progressively liberalized. All textile and clothing quotas lapsed on 31 December 2004 under the WTO Agreement on Textiles and Clothing (ATC) with exception of China which aims at achieving full liberalization by 31 December, 2007. Textiles have always been a significant sector in the world trade for developed and developing countries. Post-2004 due to ATC, manufacturers in developed countries are likely to relocate operations to production centers in low wage countries especially China and India.

IV. Data Description and Regression Specifications

This section presents the basic sample construction and research method adopted in this study.

4.1 Database and Sample Construction

The primary empirical focus of this study is on panel data analysis of firm-level financial and managerial accounting data over the time-period 2000 to 2004. The data for the analysis comes from PROWESS database. PROWESS is a publicly available database maintained by the Center for Monitoring the Indian Economy (CMIE). The database is analogous to an abridged version of COMPUSTAT and CRSP. Extending Khanna and Palepu's (2000) reasoning we note that PROWESS database provides relatively high quality data used by academics and industry practitioners to analyze Indian companies. PROWESS covers firms operating on various stock exchanges in India. PROWESS has accounting information drawn from annual reports and other company filings required by Indian regulatory authorities. In addition, PROWESS has data on daily stock prices and information on corporate news items from press releases.

The starting point for our sample construction is the set of publicly listed textile firms on the two largest Indian stock exchanges BSE (Bombay Stock Exchange in Mumbai, India) and NSE (National Stock Exchange in Mumbai, India) over the time period 2000 to 2004. The key advantage of examining Indian textile firms is that reporting requirements make it possible to estimate variable costs and aggregate physical quantity of goods sold for publicly listed firms. Firms that have total borrowings higher or equal to total assets were eliminated since these are very likely financially distressed firms. Firms with sales less than 1 million rupees were eliminated for similar reasoning. Firms with obvious data errors were removed. Time intensive collection of aggregate physical quantity of goods sold and practical limitations of aggregating physical quantity of sales for firms with a diverse array of textile products translates into a final sample of

primarily cotton/man made fiber and filament yarn mills. We end up with 1610 firm years in India over the time period 2000 to 2004.

4.2 Accounting Disclosure Requirements and Information on Variable Costs

Reporting requirements for Indian firms make it possible to estimate annual variable costs for publicly listed firms. Following PROWESS, annual variable costs are estimated as total raw material expenses plus power and energy expenses plus indirect taxes plus variable component of wages and labor expenses plus cost of repairs to plant and machinery plus other operating expenses plus advertising plus marketing plus distribution costs minus change in inventory stocks from previous year. Sales are defined as sales minus indirect taxes; production is defined as sales plus change in inventory stocks from previous year. Indian firms disclose quantitative information on major products manufactured by them. We aggregate sales quantity of each product of textile firms into an aggregate physical quantity of sales for each firm. To help other researchers, the rationale for why we chose textiles industry for aggregating this key variable is given below.

There is no consistency in the presentation of product level information across companies. A number of times, there is no single unambiguously defined name of the product that is used by all firms. For example, two companies producing methyl alcohol term the same product as methyl alcohol and methanol respectively. Therefore, we hand check data to make sure we select an industry where products are similar such that physical quantity of sales can be aggregated. Textile firms' data meets our study's data requirements. Given that this is the first study to aggregate physical quantity of sales

across products manufactured within each firm, we conservatively, further screen for consistency of data and end up with cotton/man made fiber and filament yarn mills.

4.3 Regression Specifications

A key issue in structuring empirical regression specifications is to test if financial variables (sales or production in currency terms) can proxy for managerial accounting variable (physical quantity of goods sold). It is not enough to control for omitted variables using fixed effects since two proxies for the same variable (sales) cannot be used together in any regression test. Therefore, we have to construct a new ordinary least squares (OLS) and fixed effects regressions based empirical test. We use financial variables (sales or production) as dependent variable to test their relationship with variable costs. We later substitute financial accounting variables with managerial accounting variable (physical quantity of goods sold) to test their relationship with variable costs. Now, we can test if variable costs have a statistically significant relationship with financial and managerial accounting data at an equal level of significance. This method of interchanging dependent variables has natural advantage of directly addressing Zimmerman's critique (2001) that paucity of data precludes large sample based research in managerial accounting.

OLS tests have some drawbacks in this context. If two firms have different variable cost levels relative to their sales (measured in currency versus measured by quantity) then how do researchers conclude differences are due to different ways of measuring sales or due to differences between firms? Using control variables for expected differences in variable costs across firms is a cross-sectional data driven method. HHP (1999) note unobserved firm characteristics are correlated with observed

variables, therefore in this context panel data fixed effect coefficients are more reliable than cross-sectional data OLS coefficients. Recall for OLS and fixed effects tests alike, our main aim is that variation in variable costs behavior relative to sales (measured in currency) and variation in variable costs behavior relative to sales (measured by quantity) can be compared directly.

V. Empirical Results

In table 1 we document that textile firms in our sample have average sales of 1233.50 million rupees (Rs.), average production of Rs.1209.00 million and average sales in physical quantity of 16769.16 metric tons. The median textile firm in our sample has sales of Rs.409.70 million, average production of Rs.402.80 million and average sales in physical quantity of 2701 metric tons. This set of summary statistics illustrate that our sample firms are all publicly listed firms hence their size ranges from medium to large firms.

Khanna (2007) documents that fixed costs are a smaller component of total costs compared to variable costs for a ten year long panel data of all manufacturing industries in India. Similarly in textile firms, average variable costs at Rs.1092.70 million, average net loss of Rs.-25.70 million and corresponding average sales of Rs.1233.50 million underline the fact that variable costs are a major component of total costs. OLS regression constants in tables 2 and 3 are negative which means that without any variable costs (without any on-going manufacturing operations), firms would have negative sales. On average, production is less than firm sales during our sample time period from 2000 to 2004, which implies firms reduce their inventory levels (negative sales). Therefore, summary statistics of sales and production are supported by our OLS regression results.

We introduce production as an alternative to sales and define production as sales minus starting inventory plus ending inventory. Production is conceptually a better economic measure then sales for what drives variable costs. However practically speaking, in our sample production is nearly perfectly correlated +0.998 with sales (Table 1b).

Conventional wisdom in managerial accounting is that sales volume is often imperfectly correlated with sales. In table 1b, we confirm that conventional wisdom holds in our sample since physical quantity of sales is correlated +0.758 with sales. Summary statistics including correlations are not enough to make an informed judgment, much less test a hypothesis. Therefore, we turn to OLS and fixed effects regressions for documenting the relationship between variable costs and sales. Recall that our main aim is to test if financial variables (sales or production) can proxy for managerial accounting variable (physical quantity of goods sold); we test this by focusing on the biggest component of total costs i.e. variable costs.

We examine this issue by using a simple and intuitive empirical test. If sales or production are an adequate proxy for physical quantity of goods sold; then variable costs should have a statistically significant relationship with all three proxies. In table 2, we document that variable costs coefficient of 1.06 has a statistically significant relationship with sales at the 1% level of confidence. Variable costs coefficient of 1.02 has a statistically significant relationship with production at the 1% level of confidence. Both the variable costs coefficients in the two regressions are statistically similar at the 1% level of confidence; hence using either of the two financial accounting data, sales or production (both in currency terms) leads to similar findings.

In table 3 we document variable costs coefficient of 133.61 has a statistically significant relationship with sales in physical quantity units at the 1% level of confidence. The coefficient of variable costs in table 3 is statistically different from coefficient of variable costs in table 2 at the 5% level of confidence. The difference and similarity in financial accounting and managerial accounting data regressions in table 2 and 3 is interpreted as follows. First, physical quantity of sales as the dependent variable results in more precisely estimated coefficient for variable costs. Second, physical quantity of sales is theoretically sound measure of volume therefore it is not surprising that variable costs coefficient is estimated more precisely in managerial accounting data relative to financial accounting data. Third, the direction of variable costs and their significance at 1% level of confidence is the same for all three regressions in tables 2 and 3. Hence for empirical research purposes, tables 2 and 3 results imply that for certain research questions financial accounting data can be used where managerial accounting data is unavailable.

In tables 4 and 5 we use fixed effects regressions since we are interested in the question if different ways of measuring sales using financial accounting or managerial accounting data matters. By using fixed effects regressions, we eliminate unobservable differences between firms as the first explanation for why firms have different variable cost levels relative to their sales (measured in currency versus measured by quantity); leaving us to test the second explanation of different ways of measuring sales.

In table 4, we document that variable costs coefficient of 1.08 has a statistically significant relationship with sales at the 1% level of confidence. Variable costs coefficient of 0.98 has a statistically significant relationship with production at the 1% level of confidence. Both the variable costs coefficients in the two regressions are

statistically similar at the 1% level of confidence and these fixed effects coefficients are statistically indistinguishable from their OLS counterparts in table 2. Unobservable differences between firms are not a factor; therefore our empirical test is cleaner ex-post then we anticipated ex-ante.

In table 5 we document variable costs coefficient of 77.29 has a statistically significant relationship with sales in physical quantity units at the 1% level of confidence. Table 5's coefficient of variable costs is statistically different from coefficient of variable costs in table 4 at the 5% level of confidence. The bottom line is that our intuitive question and empirical test whether variable costs have a statistically significant relationship with financial and managerial accounting data alike is supported by the data. Hence the method of interchanging dependent variables (financial and managerial accounting data) and the fact that variable costs have a statistically significant relationship at 1% level of confidence across all ten regression specifications in tables 2, 3, 4 and 5 refutes Zimmerman's critique (2001) that paucity of data precludes large sample based research in managerial accounting.

VI. Conclusion

Contrary to Zimmerman's assumption paucity of data does not preclude large sample based research in managerial accounting. We find the top line number in financial accounting (sales) acts as an adequate proxy for the key number in managerial accounting (physical quantity of goods sold) since variable costs have a statistically significant relationship with both variables. Managerial accounting concepts are based on manufacturing firms while previous studies that use publicly available data are based on

service firms [Banker and Johnston (1993); Noreen and Soderstrom (1997); Andersen et. al. (2001, 2003 and 2004); Balakrishnan, Peterson, and Soderstrom (2004)].

Two questions are left unanswered by our study. First, are the results from our sample of Indian textile firms supported or refuted when textile firms in other countries are examined?

Second, limitations of annual financial data and limited time-period of our sample imply that changes in variable cost behavior due to seasonal or business cycle factors cannot be examined. Is the business cycle effect important for fundamental decisions on fixed costs, variable costs and total costs? Do spikes in sales due to high season and dampened sales due to low season change our basic findings? Case studies of individual firms and small sample studies that utilize monthly or quarterly sales volume data for a long time period are needed to re-examine our findings.

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Table 1a. Descriptive Statistics

Summary statistics on the panel of Indian Prowess database textile firms from 2000 to 2004. All means (medians) are in millions of Indian Rupees (Rs.) except physical quantity which is in metric tons.

Variables	Indian Firms
Sales (Rs.)	1233.50 (409.70)
Production (Rs.)	1209.00 (402.80)
Sales (Physical Quantity)	16769.16 (2701)
Variable Costs (Rs.)	1092.70 (364.30)
Net Profit (Rs.)	-25.70 (3.30)

Table 1b. Summary Correlations

Sales (Rs.)	Production (Rs.)	Sales (Physical Quantity)
1.000		
0.998	1.000	
0.758	0.753	1.000

Table 2. Financial Accounting Data Based Regressions

Panel database of Indian textile firms from 2000 to 2004. *** corresponds to statistically significant coefficient at the 1% level of confidence.

Explanatory Variables	**Dependent Variable (Sales)**	**Dependent Variable (Production)**
Constant	-1866.38 (2108.01)	-2020.60 (2197.87)
Variable Costs	1.06*** (0.06)	1.02*** (0.01)
Year	0.94 (1.05)	1.01 (1.10)
Number of Observations (R^2)	1610 (0.99)	1610 (0.98)

Table 3. Managerial Accounting Data Based Regressions

Panel database of Indian textile firms from 2000 to 2004. *** corresponds to statistically significant coefficient at the 1% level of confidence.

Explanatory Variables	**Dependent Variable (Sales In Physical Quantity)**
Constant	-968945.6 (197146)
Variable Costs	133.61*** (6.34)
Year	485.06 (984.71)
Number of Observations (R^2)	1610 (0.58)

Table 4. Financial Accounting Data Based Fixed Effects Regressions

Panel database of Indian textile firms from 2000 to 2004. *** corresponds to statistically significant coefficient at the 1% level of confidence and ** at the 5% level of confidence.

Explanatory Variables	**Dependent Variable (Sales)**	**Dependent Variable (Production)**
Constant	5.09** (2.30)	14.25*** 3.10
Variable Costs	1.08*** (0.02)	0.98*** (0.03)
Number of Observations (R^2 for within firm differences)	1610 (0.93)	1610 (0.86)

Table 5. Managerial Accounting Data Based Fixed Effects Regressions
Panel database of Indian textile firms from 2000 to 2004. *** corresponds to statistically significant coefficient at the 1% level of confidence.

Explanatory Variables	**Dependent Variable (Sales In Physical Quantity)**
Constant	8323.33*** (987.05)
Variable Costs	77.29*** (8.49)
Number of Observations (R^2 for within firm differences)	1610 (0.27)