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Debt-Financing and Product Market Competition in an Emerging Economy: Evidence from India

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Debt-Financing and Product Market Competition in an Emerging Economy: Evidence from India

Indrani Chakraborty[1]

Abstract:

This study has empirically tested the relation between leverage and product market competition using a balanced panel data on 1469 Indian firms over 26 manufacturing industries during 2001-2016. The regression results indicate that competition, measured either by Tobin's q or HHI, has an overall negative effect on leverage. In other words, as competition increases, leverage decreases. Therefore, our findings support the deep purse model and the investment effect model for Indian firms. The magnitude of this effect depends on firm size and growth opportunities of the company, the negative impact of competition being higher for larger companies. Similar results hold good for growth opportunities too. Hence, the negative effect of competition on leverage is intensified with larger firm size and larger growth opportunities. Finally, we examine if the relationship between leverage and competition is non-monotonic by using the dynamic panel regression as well as the panel semi-parametric regression. Our results show no important departure from linearity while using HHI but support the cubic relationship while using Tobin's q.

Keywords: Leverage,product market competition, dynamic panel regression, semi-parametric regression, deep purse model, investment effect model, India

JEL Classification: C14; C20; C23; G32; L22; L60.

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1. Introduction

The literature on industrial organization focuses on market structure strategy and maximization of profits by firms and industry; it does not consider the effects of capital structure. The literature on corporate finance, on the other hand, focuses on maximization of shareholders' wealth and ignores product market decisions. Only in recent years, some scholars have surveyed recent theoretical studies which model interaction of the capital structure of the firms with the product market (Harris and Raviv, 1991; Ravid, 1988; Istatieh and Rodriguez, 2006). Among the researchers who have investigated this relationship are Brander and Lewis (1986), Maksimovic (1988), Showalter (1995, 1999), Poitvein (1989), Bolton and Scharftein (1990), Phillips (1995), and Wanzenried (2003) among others. These studies have developed theoretical models which show that output by a firm and its competitors can be affected by the use of increased debt financing. However, few studies have empirically investigated this relationship.

The present study examines empirically the relationship between debt financing and product market competition in the context of Indian industries in the post-reform period. We attempt to answer the following two questions: (i) How does product market competition impact leverage? and (ii) What is the nature of the relationship between leverage and product market competition?

In recent years, a large number of scholarly papers have shown that corporate finance practices may not be internationally uniform.They are country-specific, depending on the cultural, legal, and institutional contexts of the specific country (La Porta et. al., 1997; La Porta et. al., 2000a, La Porta et. al., 2000b). The institutional context of India has changed significantly since the economic reforms of 1991. Until the eighties, the corporate sector in India faced several constraints on the choice of capital structure. Access to the equity market was controlled by the Controller of Capital Issues,imposing severe restrictions on firms. Development finance institutions played a major role in the supply of debt to the corporate sectors. On the other hand, lack of well-defined bankruptcy procedures, poor disclosure norms, and the

absence of an effective market for corporate control also influenced the quality of financial services (Bhaduri, 2002).

This situation has changed since the economic reforms in July 1991 (Chakraborty, 2010). In May 1992, the Controller of Capital Issues was removed,and firms were allowed more freedom of access to the equity market. In 1994, the National Stock Exchange (NSE) was set up with nationwide stock trading, electronic display, and clearing and settlement facilities. Facing competition from the NSE, the Bombay stock Exchange (BSE), the oldest stock exchange in India, also introduced electronic trading in 1995. Certain reform measures were initiated in the banking sector at the same time, which enhanced the choice of financing by firms through debt too. First, the banking sector deregulated interest rates and took some liberalization measures on the cash reserve ratio (CRR) and statutory liquidity ratio (SLR). Before 1991, the CRR was as high as 25 per cent and SLR 40 per cent. The CRR came down to 5 per cent and SLR to 24 per cent by 2010. Second, since 1991, a number of foreign banks and private entrepreneurs were invited to commence banking operation in India. The number of foreign and private banks operating in India increased from 21 and 23 in 1991 to 33 and 30 in 2004, respectively. Finally, in March 1996, a uniform prudential norm was introduced in the lines of Basel Committee on Banking Supervision. Very few banks had a capital adequacy ratio of up to 8 per cent before 1991. By March 1998, only one of the 28 public sector banks fell short of this standard (Ahluwalia, 1999). Following the reform measures, there were efforts to reduce the nonperforming assets (NPA) too. They came down to 1.3 per cent by the end of 2007-2008 (Government of India, 2009). However, NPA in public sector banks increased by about Rs. 6.2 lakh crore between March 2015 and March 2018, accounting for 20.41% of the gross advances (The Economic Times, March 9, 2018).

As a result of the reform measures in the financial sector of India, the capital structures of Indian firms changed significantly, providing an opportunity to study the changing nature of financing decision of Indian firms. Indian firms are supposed to have experienced a more competitive environment since the economic reforms of 1991. After reforms, due to liberalization, entry barriers

were slackened, leading to an increase in competitive pressures (Chakraborty, 2013). Further, economic reforms led to the removal of trade restrictions, and the introduction of new products, which might have intensified the product market competition in India (Kato, 2009). By addressing the interaction between debt financing and product market competition in India, therefore, this study fills the gap in the existing literature that has been mostly focused on studies in developed economies (Rathinasamy et. al., 2000; Krishnaswamy et. al., 1992; Chevalier,1993; Phillips, 1995).

In this study, we apply the system GMM estimation technique for dynamic panel to test the relationship between debt financing and product market competition in Indian industries. This method corrects for simultaneity bias using instrumental variables and controls for unobserved firm-specific effects. To examine if the relationship is non-monotonic, we apply both the dynamic panel regression as well as the panel semi-parametric regression techniques. Our study is based on a balanced panel of 1469 firms over 26 manufacturing industries during the period 2001-2016.

The study finds that the relation between leverage and product market competition, whether measured by Tobin's q[1] or the Herfindahl-Hirschman index (HHI), is a negative one. Further, companies with larger size and higher growth opportunities experience the negative effect of competition on leverage more intensely Thus, the deep purse model andt he investment effect model hold in the Indian context. We find no evidence of non-linearity in the relationship between leverage and product market competition while using HHI but get support for a cubic relationship while using Tobin's q as the measure of competition.

The remainder of the paper is organized as follows: In section 2, we present a brief review of literature, section 3 discusses the methodology, section 4 discusses the data and descriptive statistics, section 5 reports the main empirical findings, section 6 provides the robustness tests, and we conclude in section 7.

2. Literature Review

The theoretical literature on the relationship between leverage and product market competition can be classified into three groups –

the output and limited liability model (Brander and Lewis, 1986; Maksimovic, 1988); Showalter, 1995), strategic bankruptcy and deep purse model (Telser, 1963; Brander and Lewis, 1988; Bolton and Scharfstein, 1990; Poitevin, 1989), and capital structure and investment effect model (Phillips, 1995; Myres, 1977; Kovenock and Phillips, 1995). In what follows, we discuss these theories in detail, followed by a review of empirical literature.

***The Output and Limited Liability Model*:**

Brander and Lewis (1986) are often credited with the pioneering work on the relationship between leverage and product market competition. They use a two-stage duopoly model with uncertain demand, where the firms choose their leverage in the first stage and compete in quantities on output markets in the second stage. Marginal profit is influenced by a random shock that increases profits with good realizations of the shock and decreases profits with bad realizations of the shock. They show that a limited liability firm that uses debt may choose to compete more aggressively by increasing its output. Such a strategy increases returns for shareholders when the firm is doing well. When the firm is doing badly, shareholders are indifferent because they have limited liability as debt holders have prior claim on the firm's assets in the situation of a bankruptcy. By increasing the variance of the firm's profits, shareholders increase the value of their claims on the profits of the firm. Therefore, with the increase in debt, firms increase their output at their rivals' expense. Hence, the oligopolistic firm, in contrast to a firm in competitive markets, would employ higher levels of debt to produce more as the opportunities to earn higher profits arise. Therefore, the limited liability model predicts a positive relationship between leverage and market structure.

Showalter (1995) modified the results of Brander and Lewis (1986) by considering a model of Bertrand (price) competition among firms. He shows that the use of debt is advantageous if there is uncertainty in demand because leverage leads to increased industry prices and higher expected profit. On the other hand, the use of debt is disadvantageous if the costs are uncertain because leverage results in the reduction in industry prices and expected

firm profit. Maksimovic (1988) also extends the model of Brander and Lewis (1986) by focussing on the effects of the limited liability of equity. He shows that there exists an upper bound on the firm's debt level in the absence of bankruptcy costs. The maximum debt capacity depends on the number of firms in the industry, the industry discount rate, and the industry's elasticity of demand.

Strategic Bankruptcy and Deep Purse Model:

In this model, (Brander and Lewis, 1986; Bolton and Scharfstein, 1990;Poitevin, 1989; Telser, 1963) a highly leveraged firm is prone to predation by a low-leveraged firm that expands output or lowers price to drive the rival firm out of business. The low-leveraged firm, in this model, has a deep purse. A deep purse represents greater access to funds and its ability to remain solvent in the situation of mounting losses. A deep purse has relevance when capital markets are closed to the rival firm, which is the target of predatory price behaviour. Otherwise, the rival firm can continue to borrow more to withstand bankruptcy. The implication of these models is that the low-leveraged firm with deep purse has the incentive to increase its output in order to push its rival firms into bankruptcy. Therefore, these models predict a negative relationship between leverage and market performance.

Capital Structure and Investment Effect Model:

In this model, (Myres, 1977; Phillips, 1995; Kovenock and Phillips, 1995) increased debt leads to a decrease in industry output. As higher debt leads to a commitment to payoff a higher percentage of free cash flow in each period, residual cash flows available to stockholders will be reduced, and hence future investment will be reduced. In this model, it is assumed that firms have agency problems or asymmetric information problems. Therefore, internal financing, consisting of free cash flows and retained earnings, is a cheaper source of investment than external debt or equity financing. Since a higher debt level leads to higher output cost and investment, a rival firm, like in the deep purse model, may increase output to decrease the highly–levered firm's profit in order to prevent the firm from investing and expanding further. The rival firm behaves less aggressively and does not make up all of the decreased output due to the levered firm's loss of output.

Therefore, the overall industry output will decrease with increase in debt levels. Hence, this model predicts a negative relationship between leverage and market performance.

There are very few empirical studies in the context of emerging market economies on the relationship between leverage and product market competition. Some studies exist in the context of the U.S. viz., Chevalier (1993), Phillips (1995), Krishnaswamy et. al.(1992),Khanna and Tice (2000), Mackay and Phillips (2005). Chevalier (1993) examines the relationship between firm's capital structure and product market competition using data from supermarket chains which undertook leveraged buyout transactions in the late 1980s. Her findings show that product market competition becomes softer with the increases in leverage. Thus, her finding supports capital structure and investment effect models.

Phillips (1995) examines the relationship between leverage and competition in four industries in which firms have increased leverage, and the study covers the period from 1980 to 1990. His findings show that in three industries, output decreases with the increase in debt whereas in one industry there is a positive association between output and leverage. Hence, his findings support both the capital structure and investment effect models and the output and limited liability effect models.

Krishnaswamy et. al. (1992) use data from 1969 to 1987 and find a positive relationship between debt and competition. Hence, their finding is consistent with the output and limited liability effect models.

Khanna and Tice (2000) examine the entry of Walmart in the discount department store industry and the responses of incumbent firms in this respect. Their findings show that larger and more profitable incumbents respond more aggressively to Walmart's entry whereas highly leveraged incumbents respond less aggressively. Hence, the results are consistent with predation and deep purse models and the output and investment effect models.

MacKay and Phillips (2005), using U.S. data, find that financial

leverage is higher and less dispersed in concentrated industries. Moreover, they find that in competitive industries, a firm's leverage depends on its proximity to the median industry capital-labour ratio, the actions of the other firms in the industry, and its status as entrant, incumbent, or exiting firm.

Rathinasamy et. al. (2000) examine the relationship between leverage and product market competition in the international context drawing data from 47 countries over the period 1987 to 1991. Their finding shows that firms with monopoly power use more long-term and total debt and is consistent with the output and limited liability effect models.

In the context of emerging market economies, one important study is that of Guney et. al. (2011) on the Chinese economy, covering the period 1994-2006. Their findings reveal that the relationship between leverage and product market competition is non-linear and depends on industry type, firm size, and growth opportunities of firms.

The non-linear relationship between leverage and product market competition was first emphasized by Pandey (2004). He argued that, due to the complex interplay among market structure, agency problems, and bankruptcy costs, the relationship might be non-linear, in particular, cubic. His study, using data from Malaysia over the period 1993-2000, shows that the relationship between capital structure and market power appears to be a cubic one.

A later study by Campello (2006) supports the existence of such a non-linear relationship between leverage and competitive performance by developing a theoretical model and testing it empirically. In the theoretical model, he introduces a third-party contracting in an environment with financing frictions and proves the existence of a non-monotonic association between firm debt and competitive performance. Empirically, he examines the relationship between leverage and sales performance,using U.S. data covering the period 1971-2000 and finds that moderate debt-taking is associated with market share gains that are obtained at the expense of industry rivals, and higher debt leads to product market underperformance.

3. Methodology

In this section, we describe model specification and the estimation methods used to analyse the relationship between leverage and product market competition. Selection of the variables that are expected to affect the firm's leverage is based on the existing capital structure theories. We have used the system GMM methods in dynamic panel using both linear and non-linear models (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). System GMM method gives the dynamic relationship between leverage and competition. System GMM has some advantages. In the case of panel data, the sample size becomes much larger than would be the case if just time-series or cross-sectional data were employed and so the degrees of freedom increase. Moreover, the estimates from panel data are more efficient than those from the pooled OLS, and hence the reliability of the regression coefficients increases (Baltagi, 2005). In particular, we apply the two-step procedure, which provides consistent and efficient estimates under the condition of large samples (in the cross-sectional dimension) and appropriate instruments. Our model to be estimated is as follows:

$$LEV_{it} = \beta_0 + \beta_1 PMC_{it} + f(CAPSTV_{it}) + \eta_i + \eta_t + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

where LEV_{it} is the leverage, PMC_{it} is the measure of market competition, $CAPSTV_{it}$ are the set of traditional explanatory variables for capital structure, η_i is the unobserved firm-specific effects, η_t is the time-specific effects capturing the effects of macroeconomic factors that are outside the firm's control, and ε_{it} is the error term. The variables and symbols used in the econometric analysis are described below:

Leverage (LEV): Earlier empirical studies used two measures of leverage as the dependent variable, viz. book leverage and market leverage. Book leverage is defined as the book value of total debt divided by the book value of total assets. Market leverage is defined as the book value of total debt divided by the book value of total liabilities plus the market value of total equity. We use the first of these two measures of leverage in this study viz., the ratio of total borrowing to asset (LEV). This measure was used in an earlier study on Indian firms by Bhaduri (2002) and Chakraborty (2010).

Tobin's q (TOBIN Q): Following Chung and Pruitt (1994) and Guney et. al. (2011), we use Tobin's q as our first measure of market competition. We define it as the ratio of sum total of market value of equity and book value of debt to total assets. The relationship between Tobin's q and product market competition may be positive, negative, or non-linear, depending on the validity of the limited liability and the deep purse effects.

Herfindahl-Hirschman index (HHI): It is our second measure of competition and is measured as $\sum_{i=1}^{N}$ Square of market share of firm i in industry j in year t. The value of *HHI* lies between 0 and 1. If the value is 0, it means perfect competition prevails, whereas if it is 1, it indicates monopoly.

Control Variables:We consider profitability, tangibility, size, growth opportunities, non-debt tax shields,uniqueness, and free cash flow.

Profitability (PROFIT): The theoretical prediction about the effect of profitability on leverage is ambiguous. According to the pecking order theory, firms with higher profitability will prefer internal financing to debt, and hence a negative relationship is expected between profitability and leverage. According to the static trade-off theory, more profitable firms are supposed to have more debt-serving capacity and more taxable income to shield. Hence, a positive relationship is expected between profitability and leverage. We consider the ratio of profit before interest, tax, and depreciation to total assets as the measure of profitability. This measure was used earlier by Titman and Wessels (1988), Chen (2004), and Michaelas et. al. (1999).

Tangibility (TANGY): According to the agency cost theory, there are incentives for shareholders to invest in a sub-optimal manner due to conflicts between lenders and shareholders. Because of this tendency, lenders will take actions to protect themselves by requiring tangible assets as collateral. Firms with high levels of tangible assets will be in a position to provide collateral for debts. If the firm defaults on debt, the tangible assets will be seized but the firm will avoid bankruptcy. A positive relationship is thus expected to exist between tangibility and leverage. Following Huang and Song (2006) and Bevan and Danbolt (2002), we measure tangibility as the ratio of fixed assets and total assets.

Firm Size (SIZE): The effect of firm size on leverage is ambiguous. Rajan and Zingales (1995) argue that larger firms generally disclose more information to outsiders than smaller ones. Larger firms with less asymmetric information problems tend to have more equity than debt, and hence, have lower leverage. Therefore, following the pecking order theory of capital structure, the size of the firm is expected to be negatively related to leverage. On the other hand, according to the trade-off theory, larger firms tend to be more diversified, and thus, less prone to bankruptcy. This argument suggests that firm size should be positively related to leverage. We measure firm size as the natural logarithm of sales.

Growth opportunities (GROWTH): Firms with higher growth opportunities require more funds, and the pecking order theory suggests that firms prefer external financing, especially for debt. Hence, we expect a positive relationship between growth and leverage. On the other hand, as discussed earlier, firms with growth opportunities may invest sub-optimally, making creditors more reluctant to lend for longer periods (Myers, 1977). In such a situation, the solution is short-term financing or convertible bonds (Titman and Wessels, 1988). Therefore, we expect short-term debt to be positively related to growth if growing firms go for short-term financing instead of long-term financing. Following Chen et. al. (1999), we take the percentage change in sales as our measure of growth opportunities.

Non-debt Tax Shields (NDTS): Firms are likely to favour debt because they can benefit from the tax shield due to interest deductibility. Thus, we expect a positive relationship between effective tax rate and leverage. However, DeAngelo and Masulis (1980) argue that non-debt tax shields (such as tax deductions for depreciation and investment tax credits) are substitutes for the tax benefits of debt financing, and a firm with larger non-debt tax shields is expected to use less debt. Therefore, an increase in non-debt tax shield can affect leverage negatively. Following Huang and Song (2006), we use the ratio of depreciation and amortization to total assets as the measure of non-debt tax shields.

Uniqueness (UNIQUE): Titman (1984) argues that a firm's capital structure should depend on the uniqueness of its product. If a firm

offers unique products, its customers, workers, and suppliers suffer relatively high costs in case of liquidation, and hence the costs of bankruptcy increase. Accordingly, the trade-off theory predicts a negative relationship between uniqueness and leverage. We use research and development expenditures over sales as the measure of uniqueness.

Free Cash Flow (FCF): The free cash flow hypothesis (Jensen, 1986) states that managers endowed with excessive free cash flows will invest sub-optimally rather than paying the free cash flow out to shareholders. Jensen (1986) predicts that firms with excessive free cash flow are likely to have higher leverage. Free cash flow is measured as operating income before tax, depreciation, and amortization, after deducting the total tax paid and dividends paid. It is also used as measure of free cash flow in an earlier study by Brailsford et al (2002). For testing the non-linear relationship between leverage and product market competition, we add square and cubic terms for PMC_{it} variable in equation (1).

4. Data and Descriptive Statistics

Our sample is drawn from PROWESS, a database provided by the Centre for Monitoring Indian Economy (CMIE). We have selected all the firms listed on the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) during 2001-2016, assuming the impact of reforms were felt after a few years since its initiation. Moreover, quite a few regulations related to share buy-back and creeping acquisitions were implemented during the period covered in this study which can potentially impact financing decision of firms. We consider a balanced panel of 1469 firms over 26 manufacturing industries for which a continuous data set exists over the sample period. Firms with any missing observations have been dropped.

The summary statistics of the major variables for selected years (2001 and 2016) as well as for the entire period 2001-2016 are presented in Table 1. The measure of leverage, LEV, has increased from 2001 to 2016. Both the measures of competition, TOBINQ and HHI, have increased over the years. The firms have clearly grown in size and profitability as well as in terms of

uniqueness and free cash flow. However, the share of tangible assets in their balance sheets has remained the same. The variable, NDTS, is also unchanged over the years.

Table 1: Summary statistics for leverage and its determinants

Vari-	2001		2016		2001-2016			
ables	Mean	Std.dev.	Mean	Std.dev	Mean	Std.dev.	Min.	Max.
LEV	0.145	0.079	0.182	0.107	0.490	0.765	0	4.486
TOBINQ	0.193	0.117	0.332	0.169	0.584	0.977	.019	8.486
HHI	0.296	0.340	0.313	0.343	0.301	0.336	0.016	1
PROF	0.038	0.047	0.048	0.034	0.051	0.066	-0.200	0.951
TANGY	0.108	0.039	0.100	0.033	0.145	0.049	0.019	0.302
GRTH	0.205	0.438	0.180	0.493	0.689	3.105	-0.306	42.139
NDTS	0.016	0.003	0.017	0.005	0.019	0.008	-0.062	0.104
UNIQUE	1.845	3.450	19.941	38.717	10.046	27.310	0	69.124
FCF	81.171	257.499	571.192	534.323	282.104	709.916	-296.726	8767.236
SIZE	1.654	1.085	2.432	1.263	2.537	1.223	0.010	7.323

Table 2 reports the correlation coefficients between the variables. Leverage is positively correlated with TOBINQ and negatively correlated with HHI (correlation coefficients are 0.041 and -0.109, respectively). Among the explanatory variables, non-debt tax shield is highly correlated with tangibility (correlation coefficient is 0.376) and profitability is highly correlated with size (correlation coefficient is 0.338). Moreover, uniqueness is highly correlated with firm size (correlation coefficient is 0.305). However, none of the correlations among the independent variables raises multicollinearity concern, as is evident from the test for variance inflation factor (VIF)[2].

Table 2: Correlation coefficients between variables and VIF coefficients

	LEV	TOBINQ	HHI	PROF	TANGY	GRTH	NDTS	UNIQUE	FCF	SIZE	VIF
LEV	1.00										1.89
TOBINQ	0.411	1.00									1.04
HHI	-0.109	0.044	1.00								1.34
PROF	-0.006	0.085	0.066	1.00							1.14
TANGY	0.013	0.076	-0.387	0.121	1.00						1.30
GRTH	0.055	0.012	-0.092	0.015	0.076	1.00					1.01
NDTS	0.219	0.055	-0.212	0.047	0.377	0.038	1.00				1.25
UNIQUE	-0.085	-0.055	-0.047	0.059	0.177	0.0009	0.184	1.00			1.24
FCF	-0.112	-0.051	0.004	-0.005	-0.038	0.018	-0.012	0.284	1.00		1.13
SIZE	-0.033	-0.063	0.091	0.338	0.259	0.013	0.063	0.305	0.175	1.00	1.56

We already stated that the average value of leverage (LEV) has increased over the period 2001-2016. Following Quah (1993), we attempt to construct a “mobility matrix” for leverage over the 16-year period from 2001 to 2016 to understand the changing pattern of leverage relative to the average of these 1469 firms from the 26 manufacturing industries. To construct the mobility matrix, first we take the ratio of leverage of each firm to the average leverage of all firms in 2001 and 2016. If for any particular firm, this ratio is less than or equal to 0.25, we put this firm in the category ¼. Similarly, firms with ratios greater than 0.25 and less than or equal to 0.5 are put in the next category ½, and so on. This classification of leverage into four categories is done for each firm for the two time points, viz., 2001 and 2016. Then we estimate the percentage of firms that move from one category to another over these 16-year periods and put these values in respective cells of Table 3 which represent the mobility matrix. The value 61.91 in the cell corresponding to the first column and first row tells us that 61.91 per cent of the firms’ leverage was less than or equal to ¼ of the leverage of average of 1469 firms, both in 2001 and 2016. Thus, there was no change in their relative position. All the diagonal values represent the percentage of firms which held the same relative position in 2001 and 2016. The off-diagonal values represent the percentage of firms that changed their relative position over the same period. Table 3 reveals that only 15.36 per

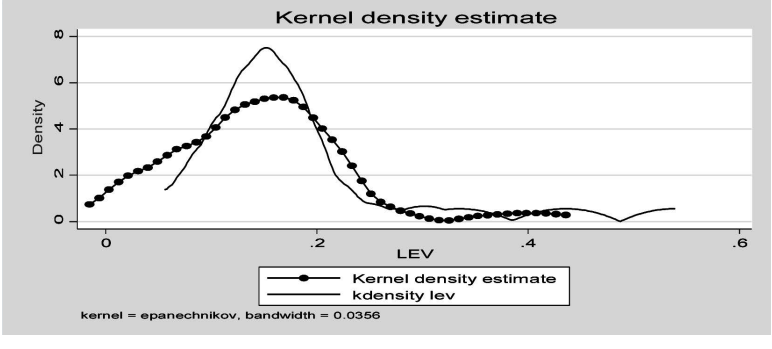
cent of firms have improved their relative position in terms of leverage over the 16-year periods i.e., moving from a lower category to a higher category. 69.63 per cent of firms, having leverage equal to the average leverage, remained in the same category over these 16-year periods.

Table 3: Mobility matrix for leverage at the firm level between 2001 and 2016

2016	2001			
	1/4	1/2	2/3	1
1/4	61.91	0.44	0.48	12.52
1/2	1.02	0.04	0.06	0.75
2/3	1.10	0.03	0.05	0.77
1	12.78	0.21	0.22	7.62

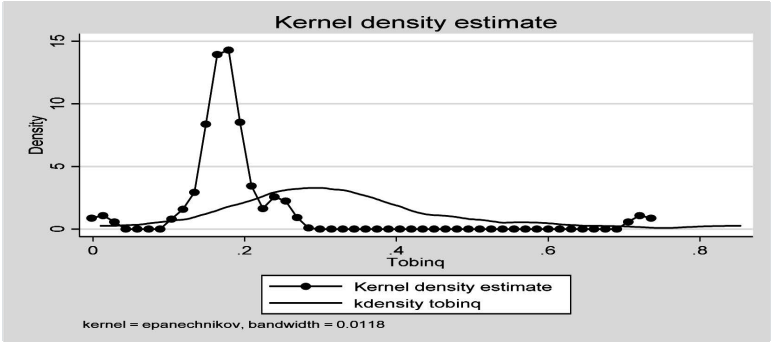
Before turning to the empirical analysis of our data, we highlight a further feature of the data. The changes in average leverage hide large differences across firms. This is illustrated in Fig 1. The connected dotted line is for 2016 and the other one is for 2001. Similar interpretation holds for Fig 2 and Fig3 too. The leverage of 2001 was relatively narrowly distributed across firms because most firms' leverages were closely clustered. The increase in

Fig. 1: The changing distribution of leverage across manufacturing industries: 2001-2016



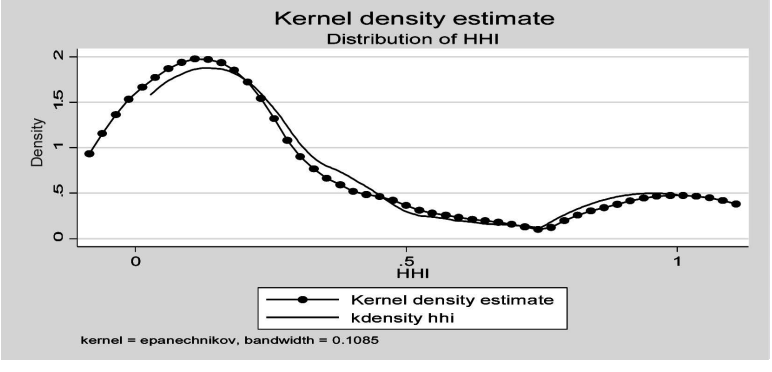
leverage between 2001 and 2016 was accompanied by an increased dispersion of leverage. As leverage increased between 2001 and 2016, the distribution of leverage also shifted to the right. Thus, the proportion of firms with higher leverage has increased between 2001 and 2016.

Fig.2: The distribution of Tobin's q in manufacturing industries: 2001-2016



Similarly, we have plotted the distribution of both the measures of competition viz. TOBINQ and HHI across firms between 2001 and 2016 and depicted these in Fig. 2 and Fig. 3, respectively.It is evident from Fig. 2 that there is a long right tail both in 2001 and 2016, which indicates that there are a few firms having very high Tobin's Q in both the years viz. 2001 and 2016. On the other hand,

Fig. 3: The distribution of HHI in the manufacturing industries: 2001-2016



very high values of Tobin's Q seem to be concentrated to a few firms in 2016. From the distribution of HHI in Fig. 3, we observe that the pattern has not changed largely over the years. Both in 2001 and 2016, there were long right tails which indicate that majority of the firms operate with less competition.

5. Empirical estimation

The purpose of our empirical investigation is to estimate the effects of competition on leverage and investigate the channel

Table 4: Estimation results for system GMM regressions using Tobin's Q and HHI

Variables	Tobin's Q			HHI		
	1.1	1.2	1.3	1.4	1.5	1.6
Constant	-0.144 (0.055)***	-0.092 (0.079)	-0.190 (0.096)***	-0.253 (0.096)**	0.055 (0.230)	-0.059 (0.142)
LEV_{t-1}	0.599 (0.007)*	0.603 (0.011)*	0.607 (0.013)*	0.645 (0.005)*	0.671 (0.013)*	0.644 (0.019)*
TOBINQ	0.175 (0.016)*	0.171 (0.019)*	0.166 (0.019*)			
HHI				0.521 (0.153)**	0.617** (0.253)	0.400** (0.233)
PROF	-0.237 (0.033)*	-0.244 (0.035)*	-0.210 (0.039)*	-0.047 (0.055)	-0.009 (0.002)*	-0.054 (0.006)*
TANGY	0.441 (0.190)**	0.185 (0.392)	1.071 (0.828)	0.654 (0.257)*	0.009 (0.002)*	0.699 (0.011)*
NDTS	11.007 (2.208)*	13.666 (2.861)*	15.658 (3.524)*	12.205 (0.570)*	8.054 (2.100)*	14.277 (2.862)*
UNIQUE	-0.0002 (0.002)	-0.001 (0.001)	-0.001 (0.002)	-0.003 (0.001)**	-0.001 (0.002)	-0.004 (0.002)
FCF	-0.0002 (0.00003)*	-0.0002 (0.00004)*	-0.0001 (0.00005)*	-0.0002 (0.00005)**	-0.0002 (0.00005)*	-0.0002 (0.00005)*
GRTH		0.006 (0.0009)*	0.006 (0.001)*		0.008 (0.001)*	0.008 (0.001)*
SIZE			0.062* (0.014)			0.045** (0.018)
Wald Chi-square	101864.49*	111989.39*	270077.72*	42588.60*	62278.33*	78012.74*

through which competition may have effect on leverage. In particular, we examine whether competition interacts with firm size or growth opportunities to affect leverage.

Our regression results indicate that competition, measured either by Tobin's q or HHI, has a negative overall effect on leverage. In other words, as competition increases, leverage decreases. However, the magnitude of this effect depends on the firm size and the growth opportunities of the company; companies with larger firm size face a direct negative effect of competition. Similar results hold good for growth opportunities too. Hence, the negative effect of competition on leverage is intensified with larger firm size and higher growth opportunities. Therefore, our findings support the deep purse model and the investment effect model in Indian firms.

Table 4 reveals several interesting results for the effects of competition on leverage. Three different models are estimated for each measure of competition viz. Tobin's q and HHI. Model 1.1 shows that Tobin's q has a positive significant effect on leverage, after controlling for the variables PROF, TANGY, NDTS, UNIQUE, and FCF. It indicates that, as competition increases, leverage decreases. Then we estimate Model 1.2 with the inclusion of another variable GRTH. From the estimated results, it appears that GRTH has a positive and significant effect on leverage. In this model, Tobin's q is positively significant. In Model 1.3, we include one more control variable, SIZE, and its effect appears to be positively significant at the 1% level. In this model, the effect of Tobin's q is positive and significant.

Similar estimations are conducted with the alternative measure of competition viz., HHI in Models 1.4 to 1.6 in Table 1. In all these models, HHI is positively significant at 1% level. It indicates that, as competition increases, leverage decreases since higher value of HHI indicates lower competition.

Some discussion on the findings of control variables is pertinent here. The variable PROF has a negative effect on leverage. However, it is significant in some of these models but not in all. Hence, it confirms the findings of some earlier studies (Ozkan, 2001; Miguel and Pindado, 2001; Frank and Goyal, 2003). This

finding provides support to the pecking order theory which says that firms prefer internal sources to external sources of finance when profit is high. On the other hand, low-profit firms use more debt because their internal funds are insufficient. TANGY is positive and significant in most of these models. This result supports the trade-off theory, which postulates a positive relationship between long-term debt ratio and tangibility. The result implies that the firms with more fixed assets thatcan be used as collateral have a higher leverage ratio. Thus, tangibility helps to reduce default risk in Indian firms. A similar finding was reported by some earlier studies (Rajan and Zingales, 1995; Frank and Goyal, 2003; Gaud et. al., 2005). NDTS has a positive significant effect on leverage in all these models. This finding is quite puzzling because it contradicts the findings from earlier studies by Ozkan (2001), Huang and Song (2006), and Wiwattannakantang (1999). Our finding implies that firms with a high level of non-debt tax shield prefer more debt possibly because they can benefit from the tax shield due to interest deductibility. Thus, our finding contradicts trade-off theory, which emphasizes the substitution between non-debt and debt tax shields. Although this finding is puzzling, it confirms the finding of Delcoure (2007) in the context of the emerging Central and Eastern European countries and Chakraborty (2010) in the context of India. The variable UNIQUE has a negative effect on leverage but not significant in all the models. Finally, FCF has a negative significant effect on all the models. Thus, it implies that the managers with more free cash flows will invest sub-optimally, and hence these firms will prefer debt in their capital structure.

Then we include the interaction terms between competition and growth opportunities (GRTH), and competition and SIZE, respectively, in dynamic panel regressions and report the results in Table 5. These specifications improve the overall performance of the regressions measured by Wald statistics as compared to those in Table 4[3]. In Model 1.1, we include the interaction term between Tobin's q and GRTH viz. TOBINQGRTH. The coefficient is positiveand statistically significantwhilethe coefficient on Tobin's q is also positive and significant. These indicate that as GRTH increases, leverage increases with higher values for Tobin's q.

Table 5: Estimation results for system GMM regressions using Tobin's Q and HHI with interaction terms

Variables	TOBINQ		HHI	
	1.1	1.2	1.3	1.4
Constant	-0.045 (0.098)	-0.381 (0.114)*	-0.212 (0.183)	-0.429 (0.198)
LEV_{it-1}	0.587 (0.011)*	0.545 (0.027)*	0.652 (0.008)*	0.626 (0.009)*
TOBINQ	0.166 (0.009)*	0.600 (0.120)*		
HHI			0.537 (0.045*)	1.165 (0.059)*
PROF	-0.215 (0.031)*	-0.249 (0.267)	0.033 (0.057)	0.070 (0.046)
TANGY	0.138 (0.241)	6.196 (2.600)**	1.038 (0.344)**	1.767 (0.551)**
NDTS	9.983 (3.937)**	-1.459 (10.666)	18.629 (3.678)*	5.703 (2.891)**
UNIQUE	-0.002 (0.002)	-0.001 (0.003)	0.001 -(0.002)	0.00007 (0.003)
FCF	-0.0002 (0.00005)*	-0.00009 (0.00006)	-0.00009 (0.00004)**	-0.0002 (0.00005)**
GRTH	0.012 (0.002)*	0.007 (0.001)*	0.015 (0.005)**	0.007 (0.001)*
SIZE		0.145 (0.020)*		0.075 (0.043)***
TOBINQGRTH	0.015 (0.002)*			
TOBINQSIZE		0.148 (0.036)*		
HHIGRTH			0.013 (0.007)**	
HHISIZE				0.247 (0.046)*
Wald statistic	507876.54*	889801.06*	70238.51*	126787.82*

Thus, the negative effect of competition on leverage is intensified with higher growth opportunities. Similarly, we have estimated Model 1.2 with the interaction term between Tobin's q and SIZE viz. TOBINQSIZE. The values of these coefficients indicate that all companies with larger size will experience more leverage as Tobin's q increases. Similarly, we have estimated Models 1.3 to 1.4 with the interaction between HHI and GRTH, and HHI and SIZE, respectively. The coefficients for HHISIZE indicate that all companies with larger size will experience stronger negative effect of competition on leverage. Therefore, companies with larger size and higher growth opportunities will experience the negative effect of competition on leverage more intensely. Thus, these findings support the deep purse model and the investment effect model for Indian corporate firms. Overall, the results show strong complementary effects between competition and firm size as well as between competition and growth opportunities on leverage. This result is consistent with the idea that increase in competition can decrease leverage of a company by interacting with that company's size and growth opportunities. These findings provide support to the earlier observations of Guney et. al. (2011) in the context of China.

We have observed that, while there is no agreement on the direction of the relationship between leverage and competition in the theoretical literature, there is also controversy in the empirical literature regarding its shape. For example, Pandey (2004), Guney et. al. (2011), and Campello (2006) find a cubic relationship between leverage and competition. We have also explored the possibility of a cubic relationship between leverage and competition in India using a dynamic panel framework. We get support for a cubic relationship while using Tobin's q but not with HHI. The estimation results are reported in Table 6. Thus, the assertion that the relationship between leverage and competition may be non-linear is partially supported for Indian firms.

To test the robustness of the above result, we apply panel semi-parametric regression technique here.

Table 6:Estimation results for system GMM regressions using Tobin's Q and HHI with cubic terms

Variables	TOBINQ	HHI
	1.1	1.2
Constant	-0.191 (0.116)***	0.208 (0.526)
LEV_{it-1}	0.569 (0.020)*	0.635 (0.035)*
TOBINQ	0.781 (0.128)*	
$TOBINQ^2$	-0.242 (0.044)*	
$TOBINQ^3$	0.021 (0.004)*	
HHI		-1.372 (6.527)
HHI^2		0.754 (21.153)
HHI^3		-0.861 (16.522)
PROF	-0.105 (0163)	0.053 (0.091)
TANGY	0.068 (0.815)	1.156 (2.065)
NDTS	10.672 (3.44)*	10.211 (4.911)**
UNIQUE	-0.0009 (0.002)	0.00003 (0.002)
FCF	-0.0001 (0.00005)**	-0.0002 (0.00007)*
GRTH	0.006 (0.001)*	0.008 (0.001)*
SIZE	0.020 (0.057)	-0.006 (0.048)
Wald statistic	161970.66*	47005.37*

1. Robustness:

To capture the non-linearity between leverage and competition, a cubic relationship was estimated in some earlier studies as stated before. But it is well known that misspecification of the functional form can lead to biased estimation and hypothesis testing. Hence, we are applying the panel semi-parametric method of estimation of eqn. (1), where the control variables are included linearly and the variable PMC_{it} appears non-parametrically. In this method, we do not impose the functional form a priori, and hence we can avoid the problem of mis-specification of the functional form. We use theBaltagi and Li (2002) panel semi-parametric estimation method with fixed effects. The advantage of the fixed effect method here is that fixed effects control for potentially endogenous time-invariant unobserved firm-level heterogeneity. Under the panel semi-parametric estimation method with fixed effects, eqn. (1) becomes:

$$LEV_{it} = m(PMC_{it}) + f(CAPSTV_{it}) + \eta_i + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

where m(.) denotes the unknown (nonparametric) functional form.

The results of the estimation for panel semi-parametric regression are presented in Table 7. In Model 1.1, we report the estimate of the semi-parametric panel fixed effect model in which leverage (LEV) is a nonparametric function of Tobin's q (TOBINQ) and is a linear parametric function of all other control variables. Model 1.2 reports similar estimation results for the other measure of competition viz., HHI. The graphical plot of the relationship between Tobin's q and leverage is depicted in Fig. 4, which reveals a cubic relationship between context of Indian firms.

From Table 7, we observe that only two variables viz., NDTS and FCF have significant effects on leverage. NDTS has a positive significant effect on leverage, whereas FCF has a negative significant effect on leverage. These results are similar for both the measures of competition viz., TOBINQ and HHI. All other control variables have no significant effect on leverage here.

As we observe similar results for both the measures of competition, viz., TOBINQ and HHI, for both panel semi-parametric and dynamic panel regression, it strongly supports that our findings are robust.

Table 7: Estimation results for semi-parametric panel regression for Tobin's Q and HHI

Variables	TOBINQ	HHI
	1.1	1.2
PROF	-0.129 (0.322)	-0.115 (0.322)
TANGY	-0.517 (1.341)	-0.495 (1.321)
NDTS	16.107 (2.847)*	16.406 (92.824)*
UNIQUE	0.003 (0.003)	0.003 (0.003)
FCF	-0.00008 (0.00004)***	-0.00008 (0.00004)**
GRTH	-0.003 (0.006)	-0.003 (0.006)
SIZE	0.116 (0.110)	0.116 (0.109)

Fig. 4: Semi-parametric regression results for Tobin's Q

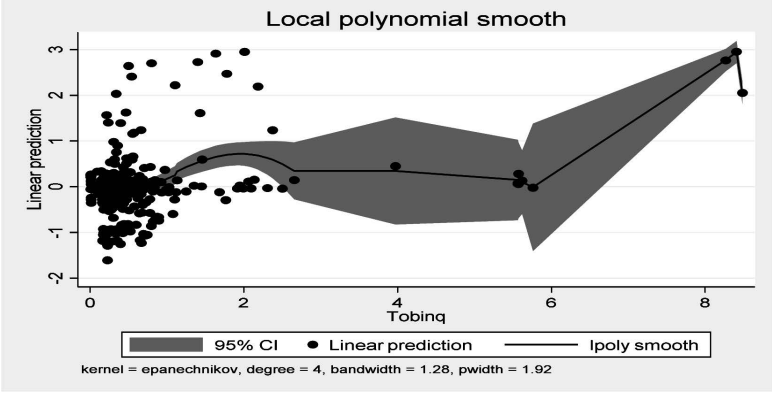
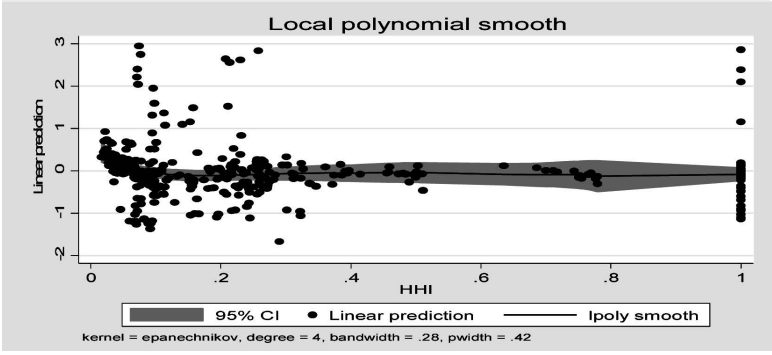


Fig. 5: **Semi-parametric regression results for HHI**



1. Conclusion

This study has empirically tested the relation between leverage and product market competition using a balanced panel data on 1469 firms over 26 manufacturing industries during 2001-2016 in the context of India. The dynamic panel regression technique, based on system GMM method has been used in this study, which accounts for unobservable firm-specific effects and the endogeneity problem. The results show that the relation between leverage and product market competition, whether measured by Tobin's q or the Herfindahl-Hirschman index (HHI), is a negative one. One possible interpretation of this result is that firms with low leverage are adopting more aggressive product-market strategies (for example, selling their product at lower prices) and driving their rival firms with higher leverage into bankruptcy. Thus, the deep purse model holds in the Indian context. Another interpretation is that, a rival firm with low leverage may increase output to decrease the highly-leveraged firm's profit in order to prevent the firm from investing and further expansion. Thus, the results support the investment effect model too, in the Indian context.

Then we estimate the system GMM model by including the interaction terms between competition and growth opportunities as well as between competition and firm size. The findings show that companies with larger size and higher growth opportunities will experience the negative effect of competition on leverage more intensely. This result is consistent with the idea that an increase in competition can decrease leverage of a company by interacting

with that company's size and growth opportunities.

Finally, we testify the relationship between leverage and competition is non-monotonic by using the dynamic panel regression. However, we find the evidence of non-linearity in the relationship between leverage and product market competition while using Tobin's q as the measure of competition but not with the alternative measure of competition viz., HHI. To test the robustness of this finding, we then apply panel semi-parametric regression technique, meaning that we do not impose any a priori functional form on the relation between leverage and competition, which is important in this context, given how controversial this issue is in the empirical literature. Our panel semi-parametric results support our results from dynamic panel regression estimation too.

The implication of the study is that the industry structure, which includes rival firms' leverage and the industry's ease of expansion, is important for understanding the sources of observed ex post changes in firms' leverage. Our review of theoretical literature and the following empirical analysis reveal that financial structure determines the ability to resist predation and not to default on debt obligations, at the same time. Financial structure also provides signals on the firm's profitability not only to the capital market but also to competing firms in the product market.

Our results indicate that firms' financial and real decisions move simultaneously and highlight that examining how firms decide on one specific policy in isolation could hide more complex economic mechanisms. Although the idea that firms jointly decide on several corporate dimensions appear natural and is central in many corporate finance models, it is generally overlooked in empirical literature.This study may be considered as an important contribution in this direction. It shows that the design of the firm's financial structure must consider the nature of the product market.

This study is important in the context of post-reform India, where competition is expected to be high. Our results show that competition has actually decreased between 2001 and 2016. As competition decreases, the concentration of firms increases as more funds are available to fewer firms. In India, these firms are typically large business group firms who borrow from banks but fail to repay the loans, as is evident from the recent occurrences of

scams. Here in lies the importance of this study for policy-makers. Though group-affiliation is considered to be beneficial for emerging economies like India by some earlier studies (Khanna and Palepu, 2000), it loses importance in post-reform India with the removal of the imperfections in the capital, labour, and product markets. Moreover, the 'deep pockets' for business group affiliates, as argued by Boutin et. al. (2013) in the context of France, are no longer valid after the development of the capital markets in post-reform India. Due to the reforms in the banking sector and stock markets in India, as discussed earlier, the stand-alone firms also have deep pockets. Therefore, the stand-alone firms do not exit from the industry due to the competition from group-affiliated firms in post-reform India. The development of capital markets in post-reform India has greatly reduced financing constraints for stand-alone firms, eliminating the difference in the performances of group-affiliated and stand-alone firms in India (Richter and Chakraborty, 2015). The above arguments lead us to conclude that business group firms no longer have an advantage over stand-alone firms in an emerging economy like India, and hence, public policy should be formulated accordingly.

Notes:

1. As competition increases, the firm's value-adding capabilities decreases, and hence, the value of Tobin's q deceases. Thus, Tobin's q is an outcome of the competitive process, and competition and Tobin's q are inversely related.
2. Multicollinearity is a serious problem if the value of the variance inflation factor (VIF) is greater than 10 (Nachane, 2006).
3. Wald statistics should be used to decide on the selection of the optimal model (Candelon et. al., 2012).

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SPECIAL LECTURES

1. *Education for Profit, Education for Freedom* by Martha C. Nussbaum, March 2008.
2. *Always Towards : Development and Nationalism in Rabindranath Tagore* by Himani Bannerji, May 2008.
3. *The Winding Road Toward Equality for Women in the United States* by Diane P. Wood, June 2008.
4. *Compassion : Human and Animal* by Martha C. Nussbaum, July 2008.
5. *Three 'Returns' to Marx : Derrida, Badiou, Zizek (*Fourth Michael Sprinker Lecture) by Aijaz Ahmad, March 2012.
6. *Inequality: Reflections on a Silent Pandemic* by Ashwani Saith, December 2009.
7. *A Study in Development by Dispossession* by Amit Bhaduri, March 2015.

WORKING PAPERS

1. *Primary Education among Low Income Muslims in Kolkata: Slum Dwellers of Park Circus* by Zakir Husain, July 2004.
2. *Impact of District Primary Education Programme (DPEP) on Primary Education: A study of South 24 Parganas* by Suman Ray, July 2004.
3. *Representation of Public Health in the Print Media : A Survey and Analysis* by Swati Bhattacharjee, January 2009.
4. *Maternal Anthropometry and Birth Outcome Among Bengalis in Kolkata* by Samiran Bisai, April 2009.
5. *Transfer of Technology and Production of Steel in India*, An interview of Anil Chandra Banerjee by Amiya Kumar Bagchi, December 2013.

BOOKS

1 *Economy and the Quality of Life - Essays in Memory of Ashok Rudra*, Amiya Kumar Bagchi, Manabendu Chattopadhyay and Ratan Khasnabis (editors),Kolkata, Dasgupta & Co.,2003.

2 *The Developmental State in History and in the Twentieth Century,* Amiya Kumar Bagchi, Regency Publications , New Delhi, 2004.

3 *Pliable Pupils and Sufficient Self –Directors: Narratives of Female Education by Five British Women Writers*, 1778-1814 Barnita Bagchi, Tulika, New Delhi, 2004.

4 *Webs of History: Information, Communication and Technology from Early to Post-colonial India,* Amiya Kumar Bagchi, Dipankar Sinha and Barnita Bagchi (editors), New Delhi, Manohar, 2004.

5 *Maladies, Preventives and Curatives: Debates in public health in India*, Amiya Kumar Bagchi and Krishna Soman (editors), Tulika, New Delhi, 2005.

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8 Translation with an introduction of Rokeya S. Hossain: *Sultana's Dream and Padmarag,* Barnita Bagchi**,** Penguin Modern Classics, 2005.

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11 *Labour, Globalization and the State: Workers, Women and Migrants Confront Neoliberalism*, Edited, Michael Goldfield and Debdas Banerjee (editors), Routledge, London and New

York, 2008.

12 *Eastern India in the Late Nineteenth Century, Part I: 1860s-1870s*, Amiya Kumar Bagchi and Arun Bandopadhyay (editors), Manohar and Indian Council of Historical Research, New Delhi, 2009.

13 *Indian Railway Acts and Rules 1849-1895: Railway Construction in India : Selected Documents (1832-1900),* Vol. IV, Bhubanes Misra (editor); Amiya Kumar Bagchi (General Editor), Indian Council of Historical Research, New Delhi, 2009.

14 *Colonialism and Indian Economy,* Amiya Kumar Bagchi**,** New Delhi, Oxford University Press, 2010.

15 *Market Media and Democracy*, compiled, Buroshiva Dasgupta**,** Institute of Development Studies Kolkata, 2011.

16 *Four Essays on Writing Economic History of Colonial India*, Institute of Development Studies Kolkata and Progressive Publishers, 2011.

17 *Rabindranath: Bakpati Biswamana***,** Volume 2, Sudhir Chakravarti (editor), Rabindranath Tagore Centre for Human Development Studies, 2011.

18 *Rabindranath: Bakpati Biswamana***,** Volume1**,** Sudhir Chakravarti**,** Rabindranath Tagore Centre for Human Development Studies, 2011.

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Indian Economy, Indrani Chakraborty and Ratan Khasnabis (editors), Springer, March 2014.

24 *Indian Skilled Migration and Development: To Europe and Back*, Uttam Bhattacharya and Gabriela Tejada, *et al.*, (editors), New Delhi: Springer, 2014.

25 *The Look East Policy and Northeast India*, Gorky Chakraborty and Asok Kumar Ray (editors), Aakar Books, 2014.

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