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**Uncovering Heterogeneity in the Relationship
between Competition, Corporate Governance and
Firm Performance using Quantile Regression on
Indian Data**

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Uncovering Heterogeneity in the Relationship between Competition, Corporate Governance and Firm Performance using Quantile Regression on Indian Data

Indrani Chakraborty*

Abstract:

This paper investigates the relation between product market competition, corporate governance and firm performance in Indian manufacturing industries covering the period 2005-2015. Evidence suggests that firm performance improves as competition increases. Besides, the enactment of Clause 49 in December 2005, which aimed at improving corporate governance in India, improved firm performance in less competitive industries. The findings therefore imply that competition acts as an external mechanism to discipline management and increases firm performance as a consequence. Hence, competition seems to act as a substitute for good corporate governance. The results have important policy implications. Since improvement in corporate governance has relatively more pronounced effect in non-competitive industries, policy efforts should be made in that specific direction.

Keywords: Corporate governance, panel quantile regression, Tobin's q, return on assets, India.

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1. Introduction

Since the seminal work of Berle and Means (1932), many theoretical and empirical studies have shown that better corporate governance reduces conflicts of interests between managers and shareholders and thereby improves firm performance (Allen and Gale, 2000; Gompers et. al, 2003; Cremers and Nair, 2005; Chhaochharia and Grinstein, 2007; Bebchuck et. al., 2009). However, some theoretical studies have also argued that corporate governance is less crucial for firms that operate in competitive environment (Allen and Gale, 2000; Hart, 1983; Scharfstein, 1988; Schmidt, 1997; Stigler, 1958). Competition in the product market acts as a substitute for corporate governance as it provides strong incentives to reduce managerial slack and maximize firm value. It has been argued that as competition increases, the probability of liquidation increases and it acts as an incentive to managers to work harder in order to retain their jobs (Hart, 1983; Schimdt, 1997). All these arguments suggest that corporate governance matters more in less competitive industries than in more competitive industries.

The existing studies on this issue have largely been focused on developed economies. We want to extend this idea in the context of Indian firms which have experienced more competitive environment since the initiation of economic reforms in 1991. After reforms, due to liberalization, entry barriers have been slackened, which has led to an increase in competitive pressures (Chakraborty, 2013). Further, economic reforms led to removal of trade restrictions, introduction of new products and so forth, which might have intensified the product market competition in India (Kato, 2009). On the other hand, in the aftermath of such corporate scams as Enron, Tyco and others, Clause 49 of the Listing Agreements to the Indian Stock Exchange came into effect on December 31, 2005. It was enacted primarily to improve reporting standards and corporate governance practices in India. As increased competition provides stronger incentives for managers of these firms to put in more effort, it is expected that they should be less affected by the requirements of Clause 49 than managers in firms in non-competitive industries. Against this backdrop, our study pursues two questions: First, what is the

effect of competition on firm performance as a result of economic reforms? Second, does the effect of enactment of Clause 49 on firm performance differ between competitive and non-competitive industries? The study covers the period 2005-2015.

For our analyses, we employ Herfindahl-Hirschman index (HHI) as the measure of product market competition. HHI indicates the degree of concentration of firms in an industry. Smaller the value of HHI index higher is the degree of competition in an industry.

Our finding shows that firm performance – measured either by Tobin's q or return on assets (ROA) – is higher in competitive industries than in firms that belong to less competitive industries. Therefore, initiation of economic reforms, which is supposed to have increased product market competition is also supposed to reduce managerial slacks and improve firm performance. Moreover, our study finds evidence that after the approval of Clause 49 in December 31, 2005, firms that belong to more competitive industries experienced a significantly larger decline in firm performance than firms that belong to less competitive industries in the bottom of the quantile distribution of firm performance. Our application of quantile treatment effect regression reveals significant heterogeneity in the effects of corporate governance reforms on firm performance of the competitive vs. non-competitive industries. This finding is consistent with the hypothesis that corporate governance matters more in less competitive industries. In other words, competition acts as a substitute for good corporate governance.

Our study contributes to the existing literature in several ways. First, we investigate how product market competition affects firm performance by disciplining the management. Second, we provide empirical evidence from an emerging market economy to show that the hypothesis can be extended to cover these economies as well. Third, we contribute to the policy debate about the effective-ness of corporate governance mechanism for improving firm performance. It is generally argued by policy makers that a well-designed legal structure can improve corporate governance. However, we show that competition can act as an external disciplining mechanism to monitor managers

and it provides incentives to the managers to work harder and consequently to improve firm performance. Finally, our study addresses some methodological issues. Most of the existing studies are based on panel data and they use either a static model or a dynamic model that simultaneously takes care of the heterogeneity of firms and control for time effects. However, these studies estimate the average effect which might mask the heterogeneous effects along the distribution of firm performance. We have made an attempt to uncover this heterogeneous effect by applying some recently developed econometric techniques viz., the panel quantile regression and the panel quantile treatment effect regression models in this study.

The remainder of this paper is organized as follows: Section 2 discusses the related literature. Section 3 describes data and sample selection. Section 4 discusses the methodology. Section 5 examines the effect of competition on firm performance while Section 6 examines how the effect of Clause 49 differs between competitive and non-competitive industries. Section 7 concludes.

2. Literature Review

It has been a general belief among economists that product market competition limits managerial shirking and therefore is an important determinant of firm performance (Alchain, 1950; Stigler, 1958). The argument is that if managers expropriate large amount of resources in a competitive market, the firm will not be able to compete and will experience liquidation. This idea has been formalized later in the form of several models (Schmidt, 1997; Aghion, Dewatripont and Rey, 1999; Hart, 1983).

Some of these theoretical studies show that managerial incentives are greater in a competitive market because competition acts as a disciplinary mechanism to reduce managerial slack. However, the conclusions of these studies differ substantially from one another. Hart (1983), for example, shows that greater competition reduces managerial slack if firms' costs are correlated, but it does not if firm costs are independent. His model is based on two types of firms, viz. entrepreneurial firms and managerial firms. In the first type of firms, profit maximization is the only objective whereas in the second type, managers are assumed to pursue their own objectives other than maximization of firm's profit.

Under competition, as costs fall in one firm, all firms experience reduction in costs. If the total and marginal costs are correlated, then because of reduction in costs product price will fall resulting in expansion in firms' aggregate sales and supply. This will lead to reduced managerial slack and the managers will work hard to reach their targeted profit. The main argument is that if only their own costs fall, managers can take the entire fall in prices in the form of slack, while if there is a reduction in prices across firms, managers can take only part of the fall in prices in the form of slack. Therefore, under increased competition managerial slack will be reduced compared to a non-competitive situation where firms' costs are independent. However, Scharfstein (1988) shows that Hart's model depends on the assumption that the manager is risk averse and that income above a subsistence level has no value for the manager whereas income below this level is completely undesirable. Scharfstein (1988) develops a model based on a different assumption which states that the manager's marginal utility from income is strictly positive, and shows that Hart's results become reversed. His model shows that managerial slack increases under increased product market competition. His argument is that, in managerial firms, managers work hard when productivity is low but managerial slack increases as productivity increases. Similar ambiguous result between competition and managerial slack was reported by Hermalin (1992) too.

Another important study which shows the ambiguous effect of competition on managerial incentives is Schimdt (1997). In this study, Schimdt (1997) derives the optimal incentive scheme for a manager as a function of competitiveness of a firm. He argues that under increased competition if a firm has high cost then it will be unprofitable and the probability of liquidation will go up. Hence under increased competition the manager would work harder for a cost reduction so that the possibility of liquidation would be avoided and his job will be retained. In this model the manager is characterized as risk-neutral and wealth-constrained. Due to the wealth constraint the optimal incentive scheme has to pay a rent to the manager for effectively reducing costs so that the manager gets sufficient incentive to put in the desired level of effort. According to Schimdt (1997) the cost to implement a higher level of effort decreases as competition increases because of manager's wealth constraint and his disutility from liquidation. In

this model, there is another effect of competition on managerial slack which arises if the manager is paid a rent in excess of his reservation utility. If the value of a cost reduction decreases with increasing competition, then the owner of the firm will be less willing to pay a higher rent to the manager for a higher effort level. Hence under this circumstance, the managerial effort will be less with increased intensity of competition. Therefore, in this model, the effect of competition on manager's effort level is ambiguous.

In a recent study Raith(2003) analyses how the degree of competition among firms in an industry affects the incentives for their managers. He develops a model of oligopolistic industry in which firms provide incentives to managers to reduce marginal costs. One important assumption in this model is that the market structure is endogenously determined by free entry and exit in the industry. This model captures the dynamics of competition from three dimensions: increasing product substitutability, increasing market size and falling cost of entry. The paper argues that when the market structure is exogenous, two counter-veiling effects operate viz., a business-stealing effect and scale effect. The business-stealing effect states that, with elastic demand function at the firm level, a firm with lower costs can snatch away business from its rivals. Hence, having the prices set by its rivals, with increased competition the marginal benefit to the firm of reduction in its costs increases. Therefore, firms provide their manager with greater incentives. On the other hand, the scale effect states that, when a firm's rivals charge lower prices due to increased competition, the firm loses its market share and the increased competition reduces profits and the firm does not gain from reducing its costs. Hence, competition provides weaker incentives to the managers. Thus, these two effects work in opposite directions and cancel each other. However, when market structure is endogenous, as assumed in this model, the impact of competition on managerial incentives depends on the three dimensions of competition as stated earlier. In all these three situations, prices of the product fall and the market becomes more competitive. In this model, with greater product substitutability, the effect of competition is no longer ambiguous. An increase in competition leads to lower profits for any given number of firms, and hence some firms would exit. Each

surviving firm produces more output, and has more incentives to reduce its costs. Thus with more product substitutability, firms provide more incentives to their managers to put in more effort. Similarly, increase in market size leads to entry of new firms which in turn leads to increased output for each firm and as a result an increase in competition leads to increase in managerial incentives. However, the result is the opposite if competition increases due to a reduction in entry costs. With a reduction in entry costs there will be new entrants in the market and each firm will produce less output, which in turn will lead firms to give weaker incentives to managers. Thus, with increased competition, due to increased product substitutability or a larger market, firms provide stronger incentives to their managers to reduce costs.

Another influential study is by Karuna (2007) who examines the effect of industry product market competition on managerial incentives, extending the notion of competition beyond the level of concentration, as addressed previously by Raith (2003). He argues that competition has several dimensions, including product substitutability, market size and entry costs, given the level of concentration. Using this multi-dimensional nature of competition, he shows that managerial incentives are positively related to product substitutability and market size and negatively related to entry costs. Thus, his findings support the hypothesis that firms provide stronger managerial incentives when industry competition is greater. However, the relation between concentration and incentives turns out to be ambiguous in this study.

Some recent studies provide empirical support to the above theoretical predictions relating the interaction between competition, corporate governance and firm performance. Giroud and Mueller (2011) show that weakly governed firms experience lower equity returns, worse operating performance and lower firm value in non-competitive industries. They show that in the most competitive industries the relation between corporate governance and certain measures of firm performance is not significant. Similar observation has been made by Giroud and Mueller (2010) who show that after the enactment of business combination laws in US, there was a significant fall in operating

performance in the firms in non-competitive industries whereas no effect was observed in firms in competitive industries. It has been argued that since the threat of hostile takeovers was removed by business combination laws, it would weaken corporate governance and consequently managerial slack might increase. Chhaochharia et. al. (2009) examined the effect of Sarbanes Oxley law, which aimed at reducing agency conflicts, on the level of efficiency in competitive and non-competitive industries. They found that increase in efficiency was higher in firms belonging to less competitive industries than in firms in competitive industries. Therefore, they conclude that product market competition is a substitute for other governance mechanisms. Cremers et. al. (2008) show that takeover defences are much higher in firms in more competitive industries than in those in less competitive ones. They argue that competition is a substitute for corporate governance because there is a substantial flow of information in competitive markets which makes monitoring less costly. Ammann et. al. (2011) studied whether the valuation effect of corporate governance differed between competitive and non-competitive industries in a sample of 14 countries from European Union industries. They observe that corporate governance increases firm value only in non-competitive environment. Beiner et. al. (2011) develop a theoretical model to study the effects of competition on managerial incentives. The empirical results show that more competition leads to lower firm value and there is convex relation between competition and managerial incentives. Byun et. al. (2011) study the interaction between product market competition and corporate governance on managerial incentives to increase firm value and then empirically test the model based on a sample of Swiss firms. The model predicts a nonlinear relationship between competition, corporate governance and firm value. The study concludes that the substitution effect between product market competition and corporate governance on firm value noted in the existing literature occurs mainly through the channel of dividend pay-out and investment expenditure. It observes that the negative effect of corporate governance on payout disappears with increased competition. Similar observation holds for investment expenditure as well. Chou et. al. (2011) study the substitution effects of competition on corporate governance and conclude that competition imposes discipline on managers and it results from the fear of liquidation.

This brief overview of the literature shows that the direction of the effect of product market competition on firm value is ambiguous. There are plausible arguments for why managerial slack may be either less or more in competitive industries. Therefore, it is an empirical question to sort out these competing hypotheses.

3. Data

The data for the present analysis are obtained from PROWESS, a database provided by the Centre for Monitoring Indian Economy (CMIE) for the period 2005-2015. We begin with 2005, the year when Clause 49 was implemented in the Indian economy and to analyse its impact we have considered the period till 2015. For measuring competition we estimate Herfindahl-Hirschman Index (HHI), and Tobin's q (Tobin q) and return on assets (ROA) are used as the two alternative measures of firm performance. As control variables we use firm size (SIZE), firm age (AGE), growth opportunities (GROWOP) and leverage (LEV). Table 1 summarizes the description of all the variables used in this analysis.

Table 1: Summary table on description of the variables

Variable definition	Symbol used	Measurement of the variable
Tobin's q	Tobin q	Ratio of sum total of market value of equity and book value of debt to total assets
Return on assets	ROA	Ratio of net profit to total assets
Leverage	LEV1	Ratio of total borrowing to assets
Size of firm	SIZE	Natural log of sales
Age of firm	AGE	Log of number of years since the incorporation of the firm
Growth opportunities	GROWOP	Percentage change in sales
Herfindahl-Hirschman index	HHI	$\sum_{i=1}^N$ Square of Market Share of firm i in industry j in year t
Market Share of firm i	Share industry	Firm's net sales/ total sales in the industry

Table 2 reports the descriptive statistics for the variables in this study in two years viz., 2005 and 2015 for 24 industries. It appears that the mean value of Tobin's q as well as ROA have increased from 2005 to 2015. Average firm size remained almost the same. Mean leverage has decreased slightly and growth opportunities have decreased significantly. The mean value of HHI has increased over this ten year period.

Table 2: Descriptive statistics for the variables

Variables	2005				2015			
	Mean	Std. dev.	Min.	Max.	Mean	Std. dev.	Min.	Max.
Tobin's q	504566.3	366119.9	88366.41		1966583		4 4 1 8 8 4 8	
	1.54e+07	0	7.64e+07					
ROA	0.009	0.063	-0.189	0.141	0.149	1.063	-0.926	5.052
SIZE	5.180	0.823	3.423	6.642	5.563	1.670	0	7.749
AGE	2.838	0.306	2.158	3.490	3.335	0.252	2.501	3.836
LEV	0.569	0.710	0.004	3.704	0.412	0.455	0	2.397
GROWOP	31.986	60.102	2.652	308.341	5.301	11.040	-11.340	38.622
HHI	0.446	0.578	0	2.102	0.562	0.688	7.47e-08	2.295

Table 3 presents the correlations between the variables. The HHI is negatively correlated with both Tobin's q and ROA. It is positively correlated with size and age and negatively correlated with leverage and growth opportunities. However, none of the correlations among the independent variables raises multicollinearity concerns as the variance inflation factors (VIF) are all less than 10 (Nachane, 2006).

Table 3: Correlation matrix

	Tobin q	ROA	SIZE	AGE	LEV	GROWOP	HHI	VIF
Tobin q	1.00							1.73
ROA	0.267	1.00						1.52
SIZE	-0.128	-0.077	1.00					2.89
AGE	0.009	-0.067	0.559	1.00				2.13
LEV	0.099	0.046	0.002	0.031	1.00			1.16
GROWOP	-0.010	0.001	0.060	0.007	0.004	1.00		1.01
HHI	-0.045	-0.028	0.231	0.105	-0.008	-0.036	1.00	1.75

4. Methodology

To address the first objective, our empirical analysis employs a new panel quantile estimator as introduced by Powell (2016a) and referred to as QRPD. The motive behind the use of quantile regressions is to disentangle the differences of the impact of competition on firm performance along the distribution of firm performance across firms. The methodology differs from the standard econometric techniques that focus on the conditional mean of the dependent variable. We can model the impact of an explanatory variable across the entire distribution of the dependent variable and thus capture the heterogeneity of effects. The analysis allows us to draw conclusions about whether the difference in firm performance between the competitive and non-competitive industries is higher at the lower or upper end of the distribution of performance across firms. A simple OLS-estimator would deliver the average effect over the whole distribution, a relation that might not be representative for the outcome distribution. Moreover, a quantile estimator is also more robust to outliers and to non-normal errors than OLS.

The panel quantile regression model that we are using is as follows:

$$Y_{it} = C_{it} \beta(u_{it}^*) \dots \dots \dots (1)$$

Where Y_{it} is the firm performance and C_{it} represents the competition. This translates into the following quantile function:

$$Q_{y_{it}}(q|C) = \delta_t(q) + C\beta(q) \dots \dots \dots (2)$$

Where q stands for the quantile, $q \in (0,1)$ in the distribution of the dependent variable Y_{it} , δ_t is the time dummy and $u_{it}^* = f(\alpha_i, u_{it})$ for an unknown function f . This is the advantage of the Powell estimator, since other quantile estimators that use additive fixed effects will restrict the parameter of interest to vary only on the separated disturbance term u_{it} . Instead, the Powell estimator allows the parameters to vary based on the non-separable disturbance term u_{it}^* . In this setting the estimates can be interpreted like traditional cross-sectional quantile estimates. This estimator is consistent and asymptotically normal under certain conditions (details can be found in Powell, 2016a).

To address objective (ii), we use quantile treatment effect which

is a development over the methodology used in the existing difference-in-differences approach, following which our empirical model becomes:

$$Y_{it} = \alpha_i + \alpha_t + \beta_i (\text{Concentrated industry dummy} * \text{year} > 2005 \text{ dummy}) + \text{controls}_{it} + \varepsilon_{it} \dots (3)$$

where Y_{it} represents firm performance in firm i in period t . We estimate the above equation in panel quantile framework as developed by Powell (2016b). The quantile treatment effect for quantile q may be estimated very simply as the difference across treatment status in the two outcome quantiles. For instance, if we take the sample median for the treatment group and subtract from it the sample median for the control group, we have the quantile treatment effect at the 0.5 quantile. Other quantile treatment effects are estimated similarly. In general quantile treatment effect can be represented as follows:

$$q(d_1, \tau) - q(d_0, \tau) \dots (4)$$

where the difference is the τ -th quantile of the potential outcome for different values of the policy variable, $q(d, \tau)$. For further details on quantile treatment effect see Powell (2016b).

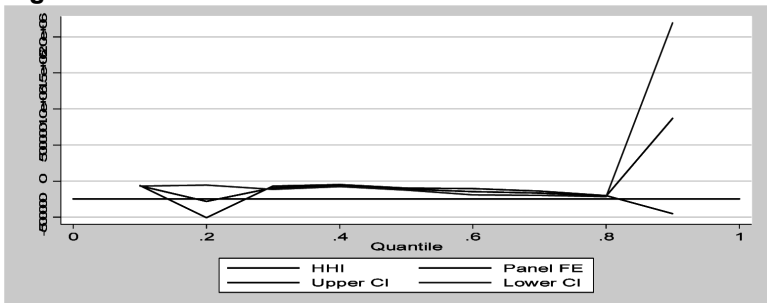
5. Effects of competition on firm performance: Empirical results

The results are presented in Table 4 and Fig.1 for Tobin's q where we include both panel data fixed effect and panel data quantile regression estimates. Panel data fixed effect estimates provide a baseline of mean effects and we compare these to estimates for separate quantiles in the conditional distribution of firm performance. To interpret the signs of the coefficient on HHI, one should note that smaller values represent more competition.

Table 4: Quantile regression results for Tobin's q

Variables	Panel FE	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Constant	741690 0 (3581680)*									
SIZE	-118974 6 (492975.4)*	60372. 43 (2526.755)*	3347.1 62 (75083.59)	30321. 87 (32408.2)	159768 .1 (28085.11)*	96454.5 3 (14786.95)*	33251.2 (70389.28)	112406 .3 (24868.91)*	- 370942 (12004.39)*	- 112706 0 (206099.9)*
AGE	507337 1 (1417080)*	191757 (13037.05)*	287774 (67281.45)*	- 43277. 95 (71481.13)	94369. 09 (14367.1.8)	406133. 3 (188991.4)**	114016 4 (580511.8)**	377611 .2 (12188.7.3)*	146401 9 (39381.38)*	642722 .5 (34552.40)
LEV	340428 .4 (200239)***	17802. 48 (1183.214)*	10903. 02 (4492.12)*	38101. 23 (14628.07)*	61959 (24902.11)*	35317.1 3 (22632.36)	68134.9 3 (26233.33)*	94917. 18 (17188.57)*	43864. 72 (13765.59)*	536136 4 (64149.06)
GROWOP	0.943 (100.742)	-6.993 (4.530)	-61.427 (71.952)	-10.068 (4.531)**	9.007 (5.719)	0.636 (2.213)	10.582 (10.830)	119.74 6 (125.091)	4.340 (5.584)	265.39 1 (342.239)
HIND EX	-247706 .9 (957903.1)	- 65887. 47 (3477.795)*	- 282421 .5 (226644.2)	- 93010. 17 (23164.57)*	- 63758. 88 (13273.44)*	- 111761. 4 (13769.96)*	- 147105. 6 (43786.47)*	- 169024 .6 (30623.88)*	- 208026 .7 (6674.138)*	869722 .8 (13224.94)
R ²	0.024									
N	360	360	360	360	360	360	360	360	360	360

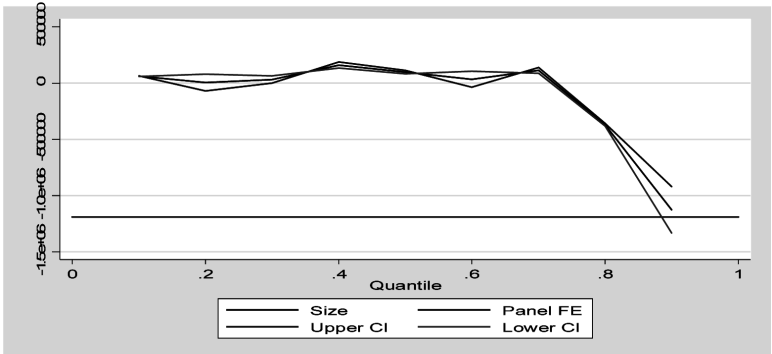
Fig. 1: Graphs from panel fixed effect and panel quantile regression for HHI



For HHI panel data fixed effect estimates imply no effect on Tobin's q. However, panel data quantile regression provides a much richer analysis of the data. We observe that except the quantiles at 20% and 90%, at all other quantiles, coefficient of HHI is negative and significant at 1% level. These results imply that as competition increases Tobin's q increases and this result holds for all the quantiles except at 20% and 90%. Therefore, along the conditional distribution of Tobin's q we observe that as competition increases firm performance improves.

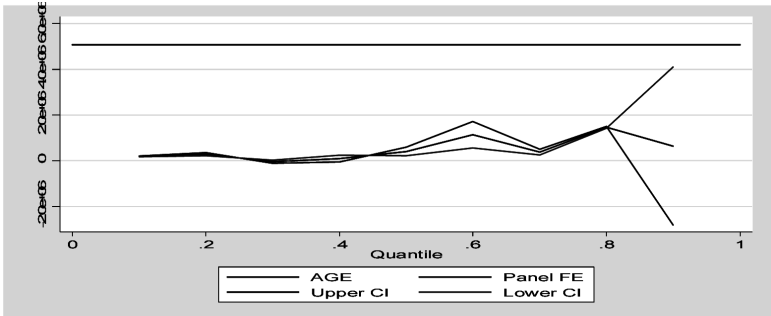
The fixed effect estimate from panel data tells us that firm size is negatively correlated with Tobin's q. But again quantile regressions tell us a different story. Regressing against the quantiles between the 10% and 70% produce a positive significant parameter estimate and we find a linear relationship between Tobin's q and firm size (Fig. 2). Starting from the 80% quantile the linear relationship turns into an inverted U-shaped relationship. This finding indicates that there are diminishing returns to firm size for higher level of firm performance.

Fig. 2: Graphs from panel fixed effect and panel quantile regression for Size



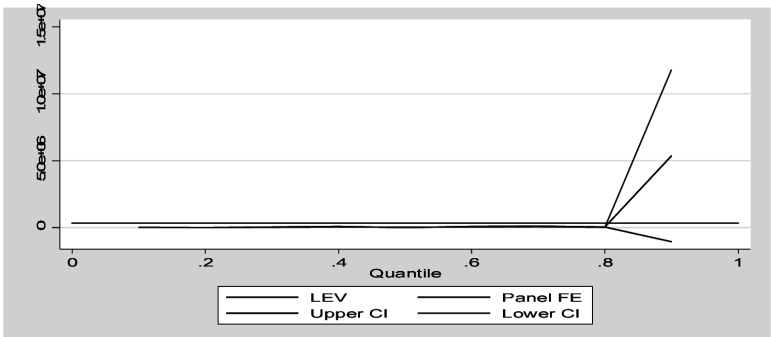
With reference to the variable firm age, the fixed effect estimate turns out to be positive and significant, which has been supported by the quantile regression results. Quantile regression results show that the effect of age is consistent across quantiles (Fig. 3). The findings imply that matured firms show higher level of performance.

Fig. 3: Graphs from panel fixed effect and panel quantile regression for AGE



The effect of leverage is always positive which implies that higher the debt-equity ratio higher is firm performance. However, the effect of leverage is not consistently significant. The fixed effect estimate suggests that leverage matters quite a bit in improving firm performance, but quantile regression results do not uniformly confirm that. The estimates are not significant at quantiles at 50% and 90% levels (Fig. 4).

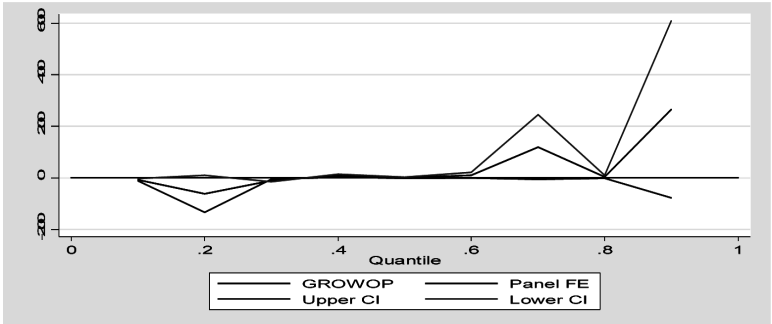
Fig. 4: Graphs from panel fixed effect and panel quantile regression for LEV



The effect of growth opportunity appears not to be significant in the fixed effect panel data estimate. However, it appears from the quantile regression that higher the growth opportunity is lower is firm performance, but the effect is not consistently significant throughout the conditional distribution of Tobin's q (Fig. 5). The effect is negative and significant only at 30%

quantile. As the effect of growth opportunity is insignificant in the uppermost quantile, it suggests that among the best performing firms, increasing the growth opportunity does not reduce firm performance.

Fig. 5: Graphs from panel fixed effect and panel quantile regression for GROWOP



We now discuss the results from the other measure of firm performance, viz. ROA. The results are reported in Table 5 and Fig. 6. The effect of HHI on ROA is not significant in fixed effect estimate from panel data and also throughout the quantiles except at 60% level. At the quantile at 60% level the effect is positive and significant. Therefore, competition increases firm performance measured by ROA only at the middle of the conditional distribution of ROA. But competition does not matter at the tails of the distribution.

For the sake of brevity, we have not reported the figures from quantile regression with respect to the control variables. Firm size has no significant effect on ROA in fixed effect estimate and throughout the quantiles except quantiles at 30% and 50% levels. Thus firm size improves firm performance with the strongest effects at the median of the conditional distribution of ROA. The effect is not significant at uppermost quantiles suggesting that within the best performing firms size of the firm does not matter as far as firm performance is concerned.

Table 5: Quantile regression results for ROA

Variables	Panel FE	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Constant	0.669 (0.622)									
SIZE	-0.133 (0.085)	0.028 (0.004) *	0.018 (0.002))*	0.007 (0.003)	0.002 (0.001)	0.003 (0.000) 7)*	0.008 (0.0006))*	0.005 (0.000) 6)*	0.008 (0.000) 1)*	-0.002 (0.021)
AGE	0.068 (0.246)	-0.073 (0.017) *	-0.014 (0.005))*	-0.045 (0.026)* ***	0.019 (0.004) 4)*	0.010 (0.004))**	0.010 (0.002) *	0.023 (0.010))**	- (0.0006) 5)	-0.519 (0.399)
LEV	0.050 (0.034)	0.005 (0.001) *	0.003 (0.000) 6)*	0.001 (0.0005)	0.002 (0.001)	0.0004 (0.000) 6)	0.002 (0.0007))**	0.003 (0.000) 7)*	0.009 (0.000) 1)*	0.020 (0.026)
GROWOP	-4.66e-06 (0.000001)	3.07e-06 (4.86e-07)*	2.38e-06 (8.23e-07)*	-4.89e-07 (2.70e-06)	3.21e-06 (3.75e-07)*	3.97e-06 (2.79e-07)*	3.37e-06 (1.40e-07)*	3.22e-06 (7.48e-08)*	2.99e-06 (1.79e-08)	0.00002 (0.00001) ***
HINDE X	-0.113 (0.166)	-0.013 (0.008) ***	0.010 (0.002))*	-0.006 (0.005)	0.005 (0.001) 1)*	-0.003 (0.002))	0.002 (0.0009))**	-0.005 (0.001))*	-0.005 (0.000) 3)*	0.727 (0.636)
R ²	0.007									
N	360	360	360	360	360	360	360	360	360	360

Fig. 6: Graphs from panel fixed effect and panel quantile regression for HHI

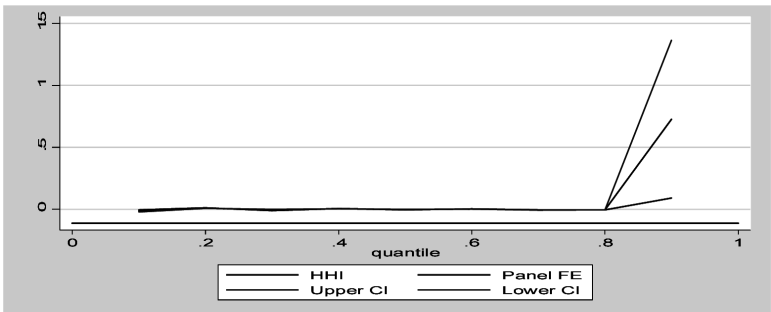


Table 6 :Quantile treatment effect results for Tobin’s q and ROA

Variables	OLS	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
Tobin’s q	5.9e+05 (9.5e+05)	-8.3e+04 (4.8e+04)*	-9.6e+04 (4.3e+04)**	-6.5e+04 (4.5e+04)	778.39 (5.5e+04)	-3.2e+04 (5.1e+04)	5.4e+04 (4.7e+04)	1.3e+05 (6.2e+04)**	-5.8e+04 (1.7e+05)	-1.1e+05 (5.0e+05)
ROA	0.038 (0.164)	-0.030 (0.035)	-0.008 (0.018)	-0.001 (0.015)	-0.013 (0.008)	-0.011 (0.010)	-0.013 (0.011)	-0.026 (0.017)	0.037 (0.019)	-0.086 (0.160)

Firm age also has no significant effect on ROA in fixed effect estimate and throughout the quantiles except quantiles at 30%, 40% and 60% levels. Thus matured firms improve ROA but not consistently throughout the conditional distribution. The effect seems to be concentrated at the middle of the distribution of ROA.

The other two control variables, viz., leverage and growth opportunity, have no significant effect in fixed effect estimates and throughout the quantiles. Thus these two variables have no significant effect on ROA along the conditional distribution of ROA.

6. Effect of Clause 49 on competition and firm performance: Empirical results

Fig. 7 shows the estimated effect from the difference –in-differences (DID) model in panel quantile regression framework for Tobin’s q. Fig.7 reveals major heterogeneity in the effects of implementation of Clause 49 in 2005 in the quantile treatment effects regression for Tobin’s q. The horizontal line shows the average treatment effect panel regression result which is constant across quantiles and statistically insignificant. However, quantile treatment effect regression shows that the estimated effects are negative for all quantiles until the 60thquantile, before turning positive at the upper part of the distribution till 70thquantile and then again become negative. This heterogeneity is consistent with our theoretical predictions: firms in concentrated industries have experienced reduction in

Fig. 7: Graphs from DID and panel quantile treatment effect regression for Tobin's q

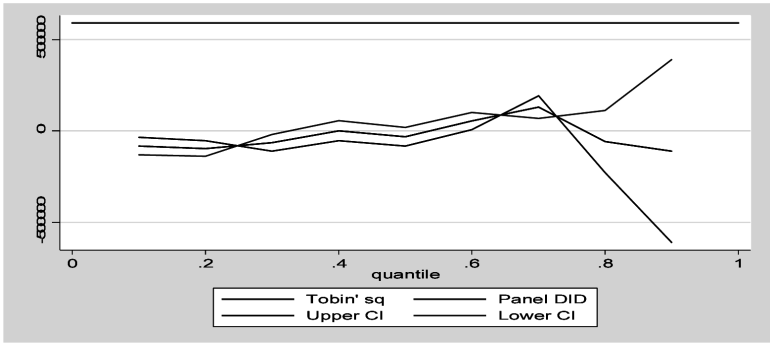
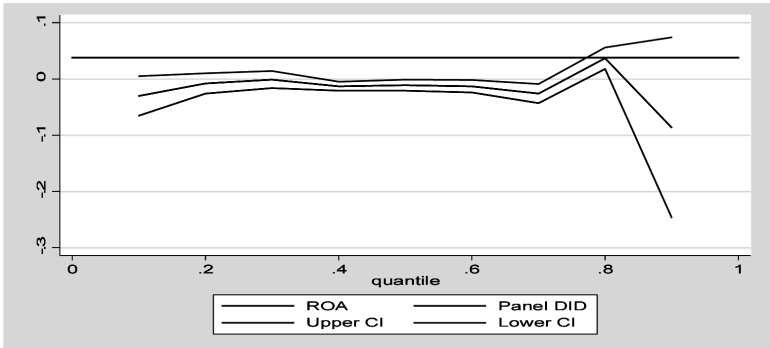


Fig. 8: Graphs from DID and panel quantile treatment effect regression for ROA



firm performance most after the implementation of Clause 49 in 2005 than firms in less concentrated industries for those firms at the bottom of the distribution of Tobin's q. This reduction in firm performance measured by Tobin's q is 0.000083 in first quantile. Similar interpretation holds for other quantiles. Due to the implementation of corporate governance reforms in 2005, firm performance increased in concentrated industries more than the less concentrated industries at the 70th quantile only, as evident from Table 6 and Fig. 7. Therefore, DID results show that the enactment of Clause 49 since December 2005 aimed at improved corporate governance in India, improved

firm performance in less competitive industries. Hence, our findings support the view that competition acts as a substitute for corporate governance. Fig. 8 shows the DID results for the other measure of firm performance, viz., ROA. Here also the treatment effects appear to be negative in all the quantiles except the 80th quantile where it is positive. However, the effects are statistically insignificant in all the quantiles. Therefore, we get more or less similar results for Tobin's q and ROA from the quantile treatment effects regression results.

When comparing the results from the quantile treatment effect regression with the estimated mean impact from the DID regression, it is clear that mean impacts miss a lot. Table 6 shows a mean impact of treatment effect is 0.0000059 for Tobin's q indicating that the implementation of Clause 49, on average, helped improve performance of the firms more in competitive industries than in the less competitive industries. However, the mean impact is imprecisely estimated and we cannot rule out a negative average effect of corporate governance reforms. Nevertheless, our non-linear quantile treatment effect results suggest that we should interpret the mean impact estimate with caution, as it masks substantial heterogeneity in the corporate governance reforms effects.

7. Conclusion

The objective of this study was to explore the relationship between product market competition, corporate governance and firm performance using a sample of Indian manufacturing industries for the period 2005-2015. Our findings show that as competition increases firm performance improves along the conditional distribution of firm performance. This result holds good mainly for Tobin's q. For the other measure of firm performance viz., ROA, the result holds good only at the middle of the conditional distribution of ROA. Therefore, initiation of economic reforms which has increased product market competition in India, led to reduced managerial slack and consequently increased firm performance. Moreover, using the implementation of Clause 49 of the Listing Agreements to the Indian Stock Exchange which was enacted in order to improve reporting standards and corporate governance practice in India and which came into

effect on December 31, 2005, we examine if this law has had different effects on firms in competitive and non-competitive industries. Our findings show that firm performance improved due to increased competition and the effect varies over the conditional distribution of firm performance, as is evident from the panel data quantile regression results. The heterogeneous effects of competition on firm performance at different quantiles are more prominent when one uses Tobin's q as the measure rather than ROA. Moreover, from the quantile treatment effect regression results we find that, firms in concentrated industries have experienced reduction in firm performance most after the implementation of Clause 49 in 2005 than firms in less concentrated industries for those firms at the bottom of the distribution of Tobin's q . Similar observation is noted for the other measure of firm performance, viz., ROA, as well.

Our findings, therefore, imply that competition acts as an external mechanism to discipline management and consequently increase firm performance. Hence, competition acts as a substitute for corporate governance. Our results have important policy implications as they suggest that policy efforts to improve corporate governance could benefit only non-competitive industries. Thus, good governance at the firm level would help improve firm performance only in non-competitive industries. The economic reforms in India, initiated in 1991, aimed at improving competition in the economy helped to reduce managerial slack and consequently helped to improve firm performance. This result, therefore, suggests that product market competition can be seen as an alternative to the need to discipline managers through enactment of corporate governance mechanism.

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