Can Business Groups Survive with Institutional Development? Theory and Evidence*

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Abstract

In this paper, we attempt to understand how business groups can sustain their dominance with improvements in institutional environment, especially with increased product market competition. This question comes at a time when there is growing awareness that business groups dominate product markets even in developed markets (Boutin, 2013). Such evidence calls for revisiting the Institutional Voids theory (Khanna and Palepu, 2000) that attributes business group dominance to lack of institutional development. We develop a simple model to show that business group model is efficient when they diversify into unrelated product markets and this holds even with increase in product market competition. Such strategy also improves consumer welfare. We test these propositions on Indian market that is not only undergoing significant institutional development but also underwent a major change to improve product market competition. Using Indian data of around 38,000 firm year observations spanning 23 years (1990-2012), we find that business group affiliated firms sustain their value dominance against standalone firms for over 23 years of market development. However, business groups that diversify into related areas in the post-competition regime lose market value. Also, on average, business groups in India expand more aggressively in unrelated areas and their deep pockets adds value only when competition is high. Taken together, our results indicate that business group structure is sustainable and dominant even with institutional development. This explains why they dominate in some developed markets.

JEL Classification: G38, L25.

Keywords: Business Groups, Related and unrelated diversification, Competition policy

1. Introduction

There is growing awareness that business group model persists in both developing and developed economies. A recent study by Boutin et al.(2013) finds that, in a developed nation like France, 30% of the manufacturing firms are affiliated to business groups. More importantly, they generate 72% of sales in their respective product markets. The existing notion that business groups dominate primarily due to weak institutional environment (Khanna and Palepu, 2000) and weak corporate governance environment (Bertrand et al., 2002) implies that, as markets develop, business groups could become dinosaurs in the economy. This argument is being mellowed down by recent studies that highlight how business groups structural ability helps them to compete aggressively in product markets. And how their deep pockets and efficient allocation of resources facilitate their dominance even in highly developed, competitive, and well governed markets. Also, Boutin et al.(2013) concur that business groups improve consumer welfare by using their deep pockets to compete more aggressively in product markets. They argue that, although business group dominance creates barriers of entry for standalone firms, such aggressive competitive practices improve product quality and lower prices for consumers.

However, the question that is still wide open is how business groups transform their structure and continue to dominate the corporate landscape. Given that most of the emerging economies are going through significant institutional development and domestic business groups are transforming into global leaders[1], deeper understanding on the sustainability of business group model and corresponding consumer welfare is much needed. Such transitional phase of these markets allows observing what sort of business groups adapt and become more efficient. Almeida and Wolfenzon(2006) argue that business groups in weak legal environment can be an equilibrium

[1]For instance, Samsung group in South Korea and Tata group in India are giving stiff competition globally in their respective product markets. For instance, Fortune 500 list ranks Samsung Electronics, one of Samsung group company, to be the 14th valuable company. Likewise, two of Tata group companies, namely, Tata Steel and Tata motors are ranked 410th and 422nd respectively. It is important to note that, a decade ago, both these groups' affiliated firms were not part of Fortune 500 list.

outcome. However, business group model can be quite efficient and improves aggregate investment of the economy even with institutional development.

Although Boutin et al.(2013) study confirms that business groups are efficient and beneficial, in an environment that is highly competitive with considerable institutional development, their finding answers only part of our research question for the following two main reasons. First, their sample includes business groups that survived transition from poor to improved institutional environment. Hence, it suffers from survivorship bias. It is hard to attribute business group dominance and success to group characteristics of the survived business groups. They cannot observe what factors contributed towards failure of business groups during transitional phase of French economy.

Second, their focus is mainly to explain how business groups' deep pockets act as a competitive advantage by alleviating their financial constraints and deterring entry of competitors in product markets. We assert that competitive advantage associated with business group model is beyond deep pockets. Literature mainly posits that business group model is an outcome of institutional environment (Khanna and Palepu, 2000). Two business groups, with same amount of deep pockets, may not respond in the same way with changing institutional environment. Hence, adaption strategy plays a critical role to distinguish their competitive advantage in the improved institutional environment. In other words, when and how to use their deep pocket's strength is more critical for gaining competitive advantage. Sull et al.(2003) points out that, both Korean cheabols, Daewoo and Samsung, were of equal size with comparable financial strength during early 1990s. However, Daewoo could not sustain its growth with the advent of improvements in product market competition; On the other hand, Samsung became a global leader in some product markets. Among many other reasons, Sull et al.(2003) attribute such dramatic evolution to efficiency gains associated with Samsung group structural evolution over time.

Our main objective in this study is to understand how business group structural efficiency facilitates value creation to its affiliates, especially when markets are undergoing significant improvements in product market competition. We develop a simple theoretical model to guide us in understanding how strengthening competition law and corresponding improvements in product market competition affect business groups. We also explore which particular adaption strategy is more efficient. Our main finding is that business groups gain competitive advantage independent of deep pockets. However, deep pockets can certainly exacerbate their aggressiveness. Also, unrelated diversification is more efficient for business groups. Later, we test our theory using Indian market that underwent significant changes in the product market environment. In the year 2002, a new Competition Act provided a framework for penalizing anti-competitive practices and creating a level playing field for all market participants. This law was further improved and amended in the year 2007[2]. We argue that our empirical setting attracts less survivorship bias problem as we follow business group evolution one decade before and one decade after improvements in product market competition environment. Hence, we can observe both successful and unsuccessful business groups in our sample.

More specifically, our theoretical model shows that 1. Business group expansion, through investments in unrelated product markets, is a profitable strategy even without diversification and scale benefits. However, business groups that expand by investing in related product markets (in comparison to their existing investments) need to depend on diversification and economies of scale benefits for being profitable; 2. The effect of competition policy aimed at deterring anti-competitive behavior and not adversely affecting consumer surplus, affects business group profitability except for business groups that continue investing in unrelated product markets. 3. Under post-competition policy regime, business groups that mainly invest in unrelated areas can benefit more by increase their scale of operations. However, business group aggressive expansion

[2]See Appendix for detailed discussion on the competition law in India. Also, for reporting purposes we use year 2002 as the cutoff for classifying pre and post competition regimes. Our results are qualitatively similar by changing the cutoff to year 2007.

in unrelated areas can be a direct outcome of competition law and it is independent of business group deep pockets. However, deep pockets (in the form of increase in scale of operations) of business group can augment their aggressive expansion. One important implication of our model is that deep pockets necessity comes from exogenous environment(competition induced outcome) rather than endogenous strategy as hypothesized by Boutin et al.(2013). Also, not all business groups can benefit from their deep pockets.

Based on around 38000 firm year observations relating to the Indian market, spanning across years 1990 to 2012, we report the following main findings. 1. Business group affiliation continues to create value against standalone firms even with institutional development. However, affiliation gains are larger in the pre-competition regime. This implies that product market competition affects business group affiliation value. 2. Business groups that expand through related diversification lose market value in the post-regulatory intervention regime. This result is consistent with our theoretical model. 3. Competition Act has no significant effect on business group investment policy. This could be due to the inherent nature of business groups in India. Indian business groups, on average, invest more in unrelated product markets. This could be the reason why competition policy has no adverse effect on business group value. 4. Unrelated diversification increases business group affiliation value. 5. Deep pockets, measured as group level cash holdings, mainly create value in the post-competition regime. This is consistent with Boutin et.al.(2013). In other words, deep pockets are more a necessity in competitive markets. In summary, the empirical results are consistent with our theoretical model.

Our contribution can be better explained by using General Electric (GE) as an example. GE is considered as a benchmark for successful unrelated diversification of a business group in a developed market. It had sustained growth through aggressive investments in unrelated areas for more than 100 years. However, it is hard to attribute GE success to its unrelated diversification strategy as it is not only an exception but also attracts survivorship bias. However, if one can use a large sample of business groups that are undergoing transition due to institutional development

and if one can analyze the role of structural adaption undertaken by business groups for improving their efficiency then attribution bias is minimal. Our paper can be viewed in this spirit and our theoretical and empirical results provides robust evidence to such unverifiable conventional wisdom.

It is important to note that business group diversification strategy has been explained by researchers using several theories that include agency theory (Aggarwal and Samwick, 2003; Fulghieri and Hodrick, 2006), internal capital market theory (Stein,1997; Rajan et al., 2000 and Wulf, 2009), debt-co-insurance effect (Lewellen, 1971), value maximization model (Maksimovic and Phillips, 2002; Bernardo and Chowdhry, 2002) and corporate refocusing theory (Matsusaka and Nanda, 2002). Our research isolates from these theories to focus mainly on the interaction between business group structure and product market competition. However, it can be argued that product market competition can capture most of the variations expected out of these theoretical underpinnings. For instance, Hart(1983) shows that product market competition unambiguously reduces managerial slack (agency theory). Schmidt and Walter(2009) show that increase in product market competition increases failure probability of firms with high costs (value maximization model). Hence, our study complements with the existing theoretical underpinnings relating to diversification strategy.

Our results contradict with the established notion on the effects of unrelated diversification. For instance, Berger and Ofek (1995) find that business groups lose more value due to unrelated diversification. Where as, we find that related diversification reduces more value than unrelated diversification. Graham et al.(2002) find problem with Berger and Ofek (1995) methodology. They show that diversification discount shown by Berger and Ofek (1995), is not due to reduction of value by combining several firms rather it is due to acquiring already discounted firms. Hence, it is more a selection problem. Ours is longitudinal evidence with proper identification for the reason behind changes in both product market competition and business group diversification.

The paper is organized in five sections. This section is followed by our theoretical model (Section two) along with several hypotheses drawn from our theoretical propositions. Section three describes data and variables used for empirical analysis. The empirical results are presented in Section four. Section five concludes.

2. Model

2.1. Model Summary

In our model, firms decide to organize themselves as a business group (BGs) or as standalone firms (SAs) by comparing their profit or value in both cases. Firm's value or profit is affected by the nature, extent of diversification and the scale of operations, industry competition, and change in external environment due to regulatory intervention for better competition among product markets. In our model, efficiency of BG model stems from reduction in costs due to increase in diversification and economies of scale. Our model shows that competition policy does adversely affect the value or profit of BG *vis a vis* SA, however the effect varies across different BGs. Moreover, different BGs need to adopt different strategies to retain their viability under the competition policy regime.

We consider an economy producing two products, product 1 and 2. The two products are differentiated, they could be related i.e. they are substitutes or they could be unrelated i.e. they are complementary. Moreover, we allow for the degree of relatedness or unrelatedness to vary. Each product is produced by N firms. Thus there are $2N$ firms in the economy. At first the $2N$ firms in the economy compete in quantity *a la Cournot,* independently as SAs. The cost structure of the firm has both marginal cost and fixed cost.

Next, two firms producing different products decide to form a BG such that the two firms

become subsidiaries of the group with one headquarter. This is different from merger where two firms combine to form a single firm. The BG can draw potential advantage on three fronts. Value or profit of the group can increase through

1. Production of two differentiated products leading to reduction in competition
2. Diversification
3. Increase in scale

The increase in value or profit after formation of the group through the above three ways in turn depends on whether the two products are related or unrelated and on the degree of relatedness or unrelatedness. We show that BGs formed in unrelated product sectors are profitable even without any diversification and scale benefits. While BGs formed in related product sectors are profitable only if they are diversified or have scale advantages.

The value or profit of BG can also be affected by the external environment. In particular, we consider here the effect of competition policy on the value or profit of BG. The effect of competition policy in turn depends on the characteristics of BG as captured by the degree of differentiation of products and the extent of diversification and scale benefits. We show that only BGs in more unrelated industries do not get adversely affected by change in the competition policy. All other BGs get adversely affected by competition.

Later, we address the question on how BG reorganizes itself to either comply with the competition policy by expanding or contracting under competition policy regime. We show that BGs which are highly diversified in related industries or in less unrelated industry need to decrease diversification to comply with the competition authorities. On the other hand, BGs which are less diversified in related industry or in less unrelated industry need to diversify more to comply with the competition authority. As discussed above, BGs in more unrelated industries are not penalized by the competition authorities. Hence they can maintain their status quo. However, we

show that, if such *BGs* want to expand through diversification, they can do so only by increasing their scale of operations in order to be compliant with the requirement of the competition authorities and at the same time increase value or profit. This implies that size of unrelated expansion matters in a more competitive environment. This is consistent with Boutin et.al.(2013). We extend this analysis to intra-industry competition to find that gains of unrelated diversification follows with increase in industry level competition.

2.2. The Model

Our model is mainly divided into three parts. The first part defines *SA* and *BG* structure and compares the efficiency of *BG* structure over *SA* structure. The second part extends the model to understand the role of institutional improvements, especially in the form of competition law, on the *BG* structure. It provides *BG* structural efficiency under different adaption strategies. The final part presents results related to the extant of intra-industry competition on *BG* structural efficiency.

We formalize the model with the help of the following assumptions[3]:

1. The demand relation is captured by a linear inverse demand curve, where the products are differentiated. In particular, we assume the cross effects are less than the direct effect. In addition we also assume that the differentiated products could be related/substitutes or unrelated/complements.

2. All firms in the economy are homogenous. The market size facing the firms is same.

3. The cost function comprises of marginal cost and fixed cost. Hence total cost is declining due to the presence of fixed cost. We also assume that the cost structure is same across firms and products.

[3]All assumptions are made to simplify the model and do not affect the general direction of the results, if relaxed.

4. A BG is formed by two firms producing different products. The BG maximizes its joint profit.

5. Rest of the $2(N-1)$ firms continue to operate as SA firms producing one product each respectively and compete independently.

6. A BG draws diversification benefits and/or economies of scale benefits.

7. Competition authorities adopt a consumer welfare standard to investigate the effect of the presence of BG on competition, where consumer welfare is measured by consumer surplus. If the consumer surplus decreases after the BG formation then those BGs are penalized.

2.2.1. Notations

Let us consider the model in terms of notations:

The inverse demand for a product depends on the quantity of both the products:

$$P_i = P_i(Q_i, Q_j)$$

Where $i, j = 1, 2, \ldots, N \;\; i \neq j$, P_i is the price of product i and Q_i is the total quantity of product i.

2.2.2. Standalone firms

Linear inverse demand curve, given by

$$P_1(Q_1, Q_2) = a - Q_1 - dQ_2 \text{ and } P_2(Q_1, Q_2) = a - Q_2 - dQ_1 \quad (1)$$

Where

$$Q_1 = \sum_{j=1}^{N} q_{1j} \quad (1a)$$

$$Q_2 = \sum_{k=1}^{N} q_{2k} \quad (1b)$$

We assume,

$|d| < 1$ cross effects are less than own effects,

$d > 0$ implies the two goods are related, $d < 0$ implies two goods are unrelated. A higher value of $|d|$ implies more relatedness or less relatedness and vice versa.

The total cost function of the jth firm producing product i is given as:

$$C_i = cq_{ij} + F,\ i = 1, 2 \ldots, N \text{ and } j = 1, 2, \ldots . N \tag{2}$$

Where q_{ij} is the quantity of product i produced by each firm j. $F$and c are the fixed cost and marginal cost of the firms respectively. The profit of Firm j producing product i is given by

$$\pi_{ij} = P_i q_{ij} - cq_{ij} - F \tag{3}$$

Maximization under *Cournot* competition yields,

$$q_{1k} = q_{2j} = \frac{(a-c)\,(N+1-Nd)}{(N+1)^2 - N^2 d^2},\ k = 1, 2, \ldots N \text{ and } j = 1, 2, \ldots N,\ k \neq j \tag{4}$$

Where q_{1k} and q_{2j} are respectively the quantities of product 1 produced by Firm k and of product 2 produced by Firm j.

The total quantity produced of each product is

$$Q_1 = Q_2 = \frac{N(a-c)\,(N+1-Nd)}{(N+1)^2 - N^2 d^2} \tag{5}$$

The profit function of Firm j producing product i is given by

$$\pi^*_{ij} = \frac{(a-c)^2 (N+1-Nd)^2}{\left((N+1)^2 - N^2 d^2\right)^2} - F \tag{6}$$

Where $i, j = 1, 2, \ldots N\ i \neq j$

The Consumer Surplus is given by

$$CS^* = \frac{Q_1^2}{2} + \frac{Q_2^2}{2} = \frac{N^2 (a-c)^2 (N+1-Nd)^2}{\left((N+1)^2 - N^2 d^2\right)^2} \tag{7}$$

2.2.3. Business Group

Two firms, producing product 1 and 2, respectively, form a BG and maximize joint profit or value. Since the two products are differentiated, the joint maximization of profit/value can lead to increase in market power for the BG through reduction in competition.

The cost function of the BG is given as:

$$C_B = c.\left(q_{1B} + q_{2B}\right) - w.q_{1B}.q_{2B} + \left(1+\theta\right)F \tag{8}$$

where $\theta \in [0,1]$, captures the effect of economies of scale. $\theta = 1$ implies there are no economies of scale, the BG has the same fixed cost as two SAs. $\theta = 0$ implies the group enjoys maximum economies of scale, with the fixed cost of the BG being equal to the fixed cost of one SA firm. Economies of scale can occur due to more assets under the same ownership or reorganization of plants.

On the other hand, w captures the effect of diversification. A positive value of w implies there is cost complementarity. A multi-product cost function, say, $C(q_i, q_j)$, exhibits cost complementarity if $\dfrac{\partial C}{\partial q_i \partial q_j} < 0$. In this model, it is given by $\dfrac{\partial C_B}{\partial q_{1B} \partial q_{2B}} = -w < 0$. It implies that the marginal cost of producing one product decreases with increases in the quantity of the other product. This is due to diversification benefit associated with producing two goods under the same plant. Further the marginal cost of production for each product must be non-negative, hence the value of w is bounded above, $0 \leq w < \dfrac{c}{\overline{q_{iB}}}$, $i = 1, 2$.

The profit function or value when two firms from each product market form a BG is given by:

$$\pi_G = P_1 q_{1B} + P_2 q_{2B} - c\left(q_{1B} + q_{2B}\right) + w q_{1B}.q_{2B} - \left(1+\theta\right)F \tag{9}$$

The profit/value of the competitor *SA* firm j producing product i is given by (3). However, here

$$Q_i = q_{iB} + \sum_{j=1}^{N-1} q_{ij},\ i = 1, 2 \tag{10}$$

Maximization under *Cournot* yields,

$$q_i = \frac{(a-c)(1+d-w)}{(N+1)+2Nd+(N-1)\,d^2-Nw-d(N-1)w}\ ,\ i = 1, 2 \tag{11}$$

$$q_{iB} = \frac{(a-c)}{(N+1)+2Nd+(N-1)\,d^2-Nw-d(N-1)w}\ , i = 1, 2 \tag{12}$$

From equation (11) and (12), we can see that an increase in w for the BG implies an increase in output of both the products produced by BG and a decrease in the output of the products produced by the *SAs*.

Profit or value of *SA* j producing product i is given by,

$$\pi_{ij}^{'} = \frac{(a-c)^2(1+d-w)^2}{\Big((N+1)+2Nd+(N-1)\,d^2-Nw-d(N-1)w\Big)^2} - F \tag{13}$$

$$\pi_{G}^{'} = \frac{(a-c)^2\,(2+2d-w)}{\Big((N+1)+2Nd+(N-1)\,d^2-Nw-d(N-1)w\Big)^2} - (1+\theta)F \tag{14}$$

$$CS^{'} = \frac{2Q_i^2}{2} = \frac{(a-c)^2(2+d-w)^2}{\big((N+1)+2Nd+(N-1)\,d^2-Nw-d(N-1)w\big)^2} \tag{15}$$

The profit/value of the BG increases in w. The profit/value of the SAs decrease with the increase in w. For the competitor SAs, the increase in w reduces both the output and price, while in case of the group increase in w leads to an increase in output and decrease in price.

Given the above framework, we next consider whether and under what conditions two SAs have

an incentive to organize themselves as BG. To analyze this, we compare the profit of the BG after group formation with the profit of two SAs before BG formation. Next we introduce competition policy and analyze how the advent of competition policy affects the incentive to form a BG. We further see whether the nature of benefits accruing to the BG play a role in determining the effect of competition policy on BG. For tractability, rest of the paper considers $N = 2$. For considering the effect of industry size, we take the case of N small and large. All the proofs are given in Appendix-A.

2.2.4. Incentives associated with Business Group model

Proposition 1:

In the absence of economies of scale and diversification benefits,

1. BG in related industries is not viable.
2. BG in unrelated industries is profitable.

In the absence of economies of scale and diversification benefits, the BG in related industry in this model is not viable since after the group formation, there is a decrease in quantity, increase in price and decrease in profit. Here we assume quantity competition and the industry size is symmetric to begin with and remains symmetric after the BG formation with fifty percent of the industry forming a group and rest fifty percent remaining outside the group as SAs[4]. In this case the BG formation does not provide any market power benefits to the BG, rather the outsider SAs gain at the cost of BG.

However, BGs in unrelated industries, in the absence of scale and diversification advantages, can draw advantage from the demand side linkage between the unrelated products which in turn lead to a decrease in price, increase in output and increase in profits.

[4]This assertion does not hold when industry size is N>2 in Section 2.8.

Proposition 2:

There is an optimal range of diversification given by $w^*_{low} < w < w^*_{high}$ within which firms have an incentive to organize themselves as a BG in related industries, in the absence of economies of scale i.e. for $1 = \theta = \theta^*$. For very low levels of diversification, $w < w^*_{low}$ and/or very high levels of diversification, $w > w^*_{high}$, there is incentive to form a BG only if there is sufficient economies of scale i.e. $\theta < \theta^*$.

Here, w^*_{low}, w^*_{high} and θ^* are the threshold levels of diversification and scale, respectively, where,

$$w^*_{low} = \frac{\left(-15 - 32d - 20d^2 - 4d^3\right) - (3+2d)\sqrt{(25 + 52d + 36d^2 + 8d^3}}{2 * (-8 - 8d - 2d^2)} \tag{16a}$$

$$w^*_{high} = \frac{\left(-15 - 32d - 20d^2 - 4d^3\right) + (3+2d)\sqrt{(25 + 52d + 36d^2 + 8d^3}}{2 * (-8 - 8d - 2d^2)} \tag{16b}$$

$$\theta^* = \frac{F + 2(a-c)^2 \left[\frac{(2 + 2d - w^*_{high})}{\left(3 + 4d + d^2 - 2w^*_{high} - dw^*_{high}\right)^2} - \frac{1}{(3+2d)^2} \right]}{F} \tag{17}$$

The profit or value under a BG is given as:

$$\pi^{'}_G = \frac{(a-c)^2 (2 + d - w^*_{low})}{\left(3 + 4d + d^2 - 2w^*_{low} - dw^*_{low}\right)^2} - (1+\theta)F > 2\pi^*_{ij}, \text{ where } \theta > \theta^* \tag{18a}$$

$$\pi^{'}_G = \frac{(a-c)^2 \left(2 + d - w^*_{high}\right)}{\left(3 + 4d + d^2 - 2w^* - dw^*_{high}\right)^2} - (1+\theta)F > 2\pi^*_{ij}, \text{ where } \theta > \theta^* \tag{18b}$$

Or

$$\pi^{'}_G = \frac{(a-c)^2 \left(2 + d - w^*_{high}\right)}{\left(3 + 4d + d^2 - 2w^*_{high} - dw^*_{high}\right)^2} - (1+\theta^*)F > 2\pi^*_{ij}, \text{ where } w < w^* \tag{19}$$

In Proposition 1, we argue that BGs in related industries are not viable without any economies of scale and diversification benefits. Next, we see whether the BG is profitable with economies of scale and diversification benefits. w^*_{low}, w^*_{high} are the threshold levels of low and high diversification, at which the profit of the BG is equal to the profit of two SAs before group formation. In the absence of economies of scale, the BG needs $w^*_{low} < w < w^*_{high}$ level of diversification. Further, as the economies of scale increases, captured by a decrease in the value of θ, the threshold

level will fall since the BG in that case can be profitable with less diversification.

Similarly, θ^* is the threshold level of economies of scale at which the profit of the BG is equal to the profit of two SA firms producing products 1 and 2 respectively. In the absence of diversification, $\theta < \theta^*$ amount of economies of scale is required by the BG to be profitable. As the diversification rises, the amount of economies of scale required to make BG profitable would fall. Thus, if both economies of scale and diversification are present, BGs can be viable or profitable at lower levels of economies of scale and diversification.

Moreover, in the case of scale, the advantage accrues only to the BG vis a vis its competitor outside firms, since economies of scale does not affect the quantity and price of the product. On the other hand, in case of diversification, as argued earlier a rise in diversification for the BG leads to an increase in quantity for the BG, but decrease in the quantity of the outsider SAs. However, it leads to a decrease in the price of the product.

Corollary 1:

In case of related industries, more the relatedness of the industries, higher is the amount of economies of scale $\left(\frac{\partial \theta^*}{\partial d} < 0 \right)$ and/or diversification $\left(\frac{\partial w^*}{\partial d} > 0 \right)$ (high and low) required for BG to be profitable. If the industries are unrelated, then more the unrelatedness of the industries, lower is the amount of economies of scale $\left(\frac{\partial \theta^*}{\partial d} > 0 \right)$ and/or diversification $\left(\frac{\partial w^*}{\partial d} < 0 \right)$ (high or low) required for BGs to be profitable.

Following assumption 1, the two products considered in the model are differentiated belonging to either related or unrelated industries. Corollary 1 suggests that in case the two products 1 and 2 are related, more the relatedness, higher is the level of economies of scale and diversification required for the BGs to be profitable. On the contrary, less related the two industries, lower is

the amount of economies of scale and diversification required by *BGs* to be profitable. This is attributed to the fact that an increase in d (degree of relatedness) leads to a fall in profit of the group, hence to maintain the same level of profit, *BGs* need more economies of scale (lower θ) or more diversification (higher w).

In case of unrelated industries, higher the degree of unrelatedness, lower is the requirement of economies of scale and diversification for a BG to be profitable. Here, as d (degree of unrelatedness) rises, it leads to increase in profit and hence firms can be profitable at lower economies of scale and diversification.

2.2.5. Competition Policy

Next, we consider, how change in outside institutional environment affect the incentive of *BG* formation. In particular, we consider introduction of competition policy. We assume that competition authorities adopt a consumer welfare standard to investigate the effect of the presence of *BG* on competition. In particular, if the consumer surplus decreases after the *BG* formation then those *BGs* are penalized.

Consumer Surplus is given by (7) and (15) for pre and post BG formation.

Proposition 3:

1. *BGs* in related industries are penalized by competition authorities if $w^*_{low} < w < w^{CS}_{low}$ i.e. at very low levels of diversification and $w^*_{high} < w < w^{CS}_{high}$, i.e. at very high levels of diversification.

2. *BGs* in unrelated industries are penalized by competition authorities if the degree of unrelatedness is low and at low levels of diversification $w^*_{low} < w < w^{CS}_{low}$

w^{CS}_{low} and w^{CS}_{high} represent the threshold level of diversification at which the consumer surplus after

the BG formation is equal to the consumer surplus before the BG formation respectively, where w^* is given by (16a) and (16b).

$$w_{low}^{CS} = d \tag{20a}$$

$$w_{high}^{CS} = \frac{12 + 15d + 4d^2}{7 + 4d} \tag{20b}$$

For any $w_{low}^{CS} < w < w_{high}^{CS}$ the welfare after BG formation will exceed the welfare prior to BG formation, for BGs in related industries. However, BG can be profitable, even if $w < w_{low}^{CS}$ and $w > w_{high}^{CS}$ since $w_{low}^{*} < w_{low}^{CS} < w_{high}^{*}$ and $w_{high}^{CS} < w_{high}^{*}$. In this range, the set of profitable BGs with very low or very high diversification will be penalized by the competition authorities. For related industries, when the diversification level is low, the decrease in cost due to increase in w is not sufficient to increase the consumer surplus after BG formation above the consumer surplus before formation of the BG. BGs with very high diversification also fall under the purview of competition authorities since an increase in w leads to increase in quantity of the products produced by the BG but reduces the quantity of the competitor SA. At high level of w, the decrease in quantity of SA firm dominates leading to a fall in consumer surplus. The same argument applies to BGs producing unrelated products with low degree of unrelatedness at high levels of diversification.

Proposition 4:

Competition policy imposes greater cost for BGs in related industries with economies of scale alone as compared to BGs with only diversification benefits or both economies of scale and diversification. The effect is stronger in case of BGs in related industries and when the competition authorities adopt a consumer welfare measure.

As noted earlier, economies of scale affects only the profit of BG and does not affect either consumer surplus or the profit of the competitor SAs. Thus, under consumer surplus measure, BGs with only economies of scale are penalized since the consumer surplus after group formation is less than the consumer surplus before group formation in general, in the absence of any diver-

sification accruing to the group. Thus firms with only economies of scale benefits are penalized more in related industries. Moreover, this also holds true for *BGs* in less unrelated industries. However, the effect is stronger if *BG* is in related industry.

Proposition 5:

Given the incentive, BGs in related industries at low levels of diversification can increase diversification, while BGs in related industries and less unrelated industries at high levels of diversification can to reduce diversification in order to meet the requirements of competition authorities.

For any w, such that $w^*_{low} = w < w^{CS}_{low}$, the profit function after BG formation, $p^{'}_G$, is greater than the profit of two standalone firms, p_{ij}, while the consumer surplus post BG formation, $CS^{'}$, is less than the consumer surplus before BG formation, CS. Moreover, $|p^{'}_G - p_{ij}| > |CS^{'} - CS|$. As w rises to w^{CS}_{low}, such that the cost function given in equation 8 falls, both $p^{'}_G$ and $CS^{'}$ rises. BG can invest upto the point where $w = w^{CS}_{high}$. From (14), $\dfrac{\partial \pi^{'}_G}{\partial w} > 0$ when $d > 0$ i.e. products are related and at low levels of diversification. For related industries, the *BGs* can comply with the competition authorities' requirement by increasing diversification since it will also lead to an increase in profit.

But for *BGs* in related industries at high levels of diversification, high diversification leads to higher profitability, but reduces consumer welfare. This is attributed to the fact that an increase in diversification by *BG* leads to increase in quantity produced by the group but reduces quantity of the competitor *SA*. With further diversification, the quantity effect of the competitor *SA* firm dominates. Therefore, *BGs* need to reduce diversification to comply with the competition authorities, they have the incentive to do the same since it is still profitable for them. The same argument works in case of *BGs* in less unrelated industries i.e. when $d < 0$ and$|d|$ is low at higher levels of diversification. In case of BG with $w > w^{CS}_{high}$, if the firms reduce diversification, i.e. reduce w such that the cost function in equation (8) rises, $p^{'}_G$ falls and $CS^{'}$ will rise. Diversifi-

cation will be reduced till $w = w_{high}^{CS}$, at this point $CS^{'} = CS$ and $p_G^{'} > p_{ij}$.

$\frac{\partial \pi_G^{'}}{\partial w} < 0$ when $d < 0$ and $|d|$ is high i.e. products are more unrelated, as BG increases its diversification it leads to increase in output for the group but decrease in profit through decrease in price. Due to increase in output of the group, investing in diversification leads to increase in the consumer surplus as a result of which the competition authorities do not penalize the BG. However, since this leads to a decrease in profit, a BG does not have an incentive to invest in BG. An alternative available to BGs within highly unrelated industries could be to invest in both economies of scale and diversification. This is summarized in Proposition 6.

Proposition 6:

Highly diversified BGs in more unrelated industries at $w_{high}^{*} < w < w_{high}^{CS}$, *can further expand through increase in diversification only if they can increase economies of scale by reducing* θ *to less than* θ^{**} *under the competition policy regime.*

From Proposition 5, if BGs in more unrelated industries diversify, it will increase their quantity so consumer welfare will rise but it will decrease their profit, hence the BGs do not have any incentive to diversify further. However, if BG can also increase scale it would compensate for the decrease in profit due to diversification. Increase in scale will not adversely affect the welfare function of the competition authorities, since in case of consumer welfare measure economies of scale does not play any role. For BG in unrelated industries with w such that $w_{high}^{*} = w < w_{high}^{CS}$, if BG increases w further then the cost function in 8 will fall, however this leads to a fall in profit, while consumer surplus will rise. In this case if the BG also decreases θ, i.e. increase scale such that the cost function given in 8 will fall and profit will rise. Since θ doesnt affect the quantity produced, the consumer surplus remains unaffected.

2.2.6. Effect of Industry Competition

So far we had assumed that the firms are operating in an oligopolistic industry. Next, we consider the case of competitive industries, i.e. when N is large. The results can be summarized in terms of the following two propositions.

Proposition 7:

Profitability of BGs in unrelated sectors through diversification rises with industry competitiveness, while that of BGs in related sectors falls with increase in diversification with industry competitiveness.

With increase in competition, profit in general falls, however, if firms can derive diversification benefits then profit can rise. The diversification benefit is higher in case the *BGs* operate in unrelated industries as evident from Proposition 2, as compared to *BGs* operating in related industries. This argument can be extended to the case of competitive industries. As competition increases, if BGs diversify in unrelated areas then it would lead to increase in profit. However, if *BGs* diversify in related areas then the two divisions within the group itself would be competing with each other, reducing profitability. This effect is in particular stronger in competitive industries since here the outside competition is also high as compared to oligopolistic industries.

Proposition 8:

Under competition regime, BGs in unrelated sectors have an incentive to increase diversification at low levels of diversification and decrease diversification at high levels of diversification, while BGs in related sectors have no incentive to diversify, when operating in competitive industries.

In the case of *BGs*, in related sectors operating in competitive industries, the consumer surplus increases with increase in diversification at low levels of diversification, however in this region the *BGs* are not profitable. The *BGs* become profitable at relatively higher levels of diversification.

Hence profitable *BGs* are not able to meet the requirements of the competition authorities attracting penalties, while *BGs* which comply with the requirements of the competition policy are not profitable. Thus, post competition regime, *BGs* in related sectors in competitive industries are required to decrease diversification, however such a strategy is not profitable for them.

In case of *BGs* in unrelated sectors operating in competitive industries at low levels of diversification, there is scope for further increase in diversification. However, *BGs* which are already diversified need to reduce diversification in order to avoid being penalized by competition authorities. This is attributed to the fact that as diversification increases, the output of the BG rises while that of the competitor *SAs* fall. In a competitive industry, the number of *SAs* operating being large, the weight of the output of the *SAs* is higher in the consumer surplus measure as compared to the output of the *BGs* , hence consumer surplus falls. The effect is stronger in case of related sectors than unrelated sectors.

2.3. Testable Hypotheses

We derive the following main hypotheses based on our theoretical propositions.

1. Hypothesis-1: Business group affiliation adds value compared to standalone firms when business groups have scale and diversification benefits.

2. Hypothesis-2: Business groups that diversify in unrelated (related) areas are more (less) valuable.

3. Hypothesis-3: Business groups that extend their diversification strategy into unrelated areas will not be affected by regulatory intervention through competition law.

4. Hypothesis-4: Large Business groups create value through unrelated diversification only by increase in their scale of operations.

3. Data

3.1. Data sources

The primary data source is the Prowess database maintained by the Center for Monitoring Indian Economy (CMIE). As Siegel and Choudhury (2012) observe, data from Prowess has been used in several studies in the finance and strategy literature and is generally accepted as the most reliable database for Indian companies. Prowess provides both accounting and stock market data. Group affiliation and industry classification data are also obtained from Prowess. Khanna and Palepu (2000) document that the ownership and industry classification provided by Prowess is fairly accurate. Prowess assigns a 5 digit National Industrial Classification (NIC) Code to all companies and this is used for industry classification in this study. The NIC Code for economic activity (published by the Government of India) is based on the International Standard Industrial Classification (ISIC) of Economic Activities developed by the United Nations.

3.2. Competition Act

In the year 2002, the Indian government introduced a specific measure, called The Competition Act, for institutional development relating to product markets. The main objective of the act is to "promote and sustain competition" in the Indian economy (PwC, 2012). Appendix C provides a brief overview of this Act.

As described in Appendix C, the Act views structures or arrangements with horizontal and vertical concentration as having an "appreciable adverse effect on competition" (AAEC) and aims at targeting entities operating as complex structures with vertical and horizontal integration mechanisms. Under the Act, horizontal relationships are arrangements or agreements made between parties operating at the same level of production process and vertical relationships are arrangements or agreements made between parties operating at different levels of production

process in the value chain. Business groups are often both horizontally and vertically integrated in product markets. Firms belonging to a typical business group often have sale and purchase agreements between them, make use of the "group brand" and benefit from active intermediation by the group headquarters (Khanna and Palepu, 1999). Such arrangements come under the purview of the Competition Act which, inter-alia, regulates anti-competitive agreements and prescribes penalties for actions that impede competition in Indian product markets.

3.3. Sample description

The sample period for the study is the 23 year period from 1990 to 2012. Though Prowess has data on Indian companies from the year 1988, the coverage is very sparse pre-1990. This study focusses on an exogenous shock i.e. the enactment of the Competition Act ("Act") and the resultant effects on the value and strategy of group affiliated firms. Since the Act was passed in the year 2002, we exclude observations of that year from the sample and split the remaining sample into 2 regimes - Regime-1 (1990 to 2001)and Regime-2 (2003-2012). Regime-1 is the pre-competition reform period and Regime-2 is the post-competition reform period.

The sample consists of all non-financial firms affiliated with Indian business groups and unaffiliated Indian firms (otherwise known as standalone firms). We exclude government firms, foreign firms, and firms affiliated to foreign business groups from our sample. Further, groups with less than 3 companies (Gopalan et al., 2007) or with total deflated sales of less than one billion rupees (100 crores) in a year are excluded from the sample for that year [5] This is done to exclude very small groups from the sample. We also exclude purely financial groups from the sample (groups with more than 90% of their assets in financial industries.). Following Khanna and Palepu (2000), we assume that there is no diversification at the firm level for both group affiliated and standalone firms. In other words, we assume that each firm has substantial operations in

[5] All nominal variables are deflated using the Consumer Price Index (2001=100) to remove the effect of inflation.

only one industry[6].

3.4. Variables construction

We construct variables at three levels, namely firm level, group level, and industry level. At firm level, our main variable of interest is firm value measured by *Tobin's Q* ratio (Q). We use other firm level variables, namely *Firm sales*, *Depreciation/sales ratio*, *Leverage*, and *Firm age* to control for firm size, investment opportunities, capital structure and maturity respectively.

At group level, we use *Group scale* and *Group diversification* as two important characteristics of business groups. For *Group scale*, assets share of the group is calculated in each 2 digit NIC industry and is summed over all industries in which the group operates. Group scale is a measure of the total "scale benefits" enjoyed by the group across all its industries. *Group diversification* is measured by Entropy(Palepu, 1985). Total Entropy (TE) is calculated at the 5 digit NIC level and is decomposed into Related Entropy (RE) and Unrelated Entropy (UE). Industry segments operating in the same 2 digit NIC are considered as related and those operating in different 2 digit NIC are considered as unrelated. This definition is consistent with Berger and Ofek (1995). *Group liquidity* that captures group level "deep pockets" is measured by the total net working capital (excluding inventories) and cash flow from operations of all its member firms and *Group internal capital market intensity* is proxied by the number of financial firms (Fin Firms) owned by the group (Boutin et al., 2013).

At industry level, *Industry concentration* is measured by the Herfindahl-Hirschman Index (HHI) calculated using firm sales of industry members. If a group has more than one firm in an industry, the sales of all its firms in that industry is aggregated and is treated as one industry member. *Industry investment* (Iinv) is the sum total of investments made by all firms operating

[6]Prowess classifies firms having substantial operations in more than one industry as "Diversified" firms. Such firms are few in number (<1.5% of the observations in the preliminary sample) and have been excluded from the final sample.

in that industry. Firm investment in a particular industry is measured by the gross outlay on fixed assets purchases disclosed in firm's cash flow statement. Industries are considered at the 2 digit NIC level.

Finally, we construct group-industry investment variables to understand the effect of group presence in particular industry. *Group investment* in an industry (Ginv) is measured as the total investments made by all firms of the group operating in that industry. *Group industry liquidity* (GIL) is measured as the total net working capital (excluding inventories) and cash flow from operations of all its firms operating in that industry. Firm investment is measured by the gross outlay on fixed assets purchases disclosed in firm's cash flow statement. Industries are considered at the 2 digit NIC level. We provide detailed definitions of variables in Appendix-B. All variables that are measured as ratios are winsorized at 1% and 99% to minimize the impact of outliers.

4. Results and Discussion

4.1. Effect of Competition Act

Our empirical analysis relies on the notion that Competition Act imposed in India has indeed improved product market competition. Before we test our hypotheses, we present the general trend of product market competition and corresponding diversification strategy of business groups in Figures 2 and 3. Figure 2 graphs time series trend of average diversification strategy of India business groups. It graphs both total and proportion of unrelated diversification to total diversification. The graph also depicts regime shift in the year 2002 with a vertical line. Figure 2 shows that, on average, there is a sudden spike in the proportion of unrelated diversification to total diversification among Indian business groups. However, business groups, on average reduces their total diversification in the post-competition regime. Figure 3 reports average business group unrelated diversification in the backdrop of degree of product market competition. We measure product market competition by using industry competition measure

Herfindahl-Hirschman Index(HHI). Figure 3 shows that industry concentration reduces significantly in the post-competition regime (post year 2002). This reflects increase in product market competition. Taken together, these two figures are consistent with our assumption that Competition Act improves product market competition and as predicted by our model, average business group diversifies into unrelated areas.

4.2. Business groups versus standalone firms

Our first hypothesis predicts that business group affiliated firms are more valuable compared to standalone firms especially when business groups have scale and scope benefits. In order to test this hypothesis, we first report results that are aimed to uncover whether business group affiliated firms are significantly different in their firm characteristics compared to standalone firms in the same economy. As reported in the Table1, firm value , measured in terms of *Tobin's* Q is significantly higher for business group affiliated firms compared to standalone firms. This is consistent with the literature that business group affiliation is more valuable (Khanna and Palepu, 1999 and 2000). However, as per institutional voids theory proposed by Khanna and Palepu (1999), such value premium associated with business group affiliation should come down when markets develop with improvements in the institutional environment. Table1 tests this hypothesis by dividing the sample period into pre and post competition law periods. Contrary to the institutional voids theory, business group affiliation value persists with a similar average value spread between business group affiliated firms and standalone firms. This result indicates that business group model persists even with institutional development. This is consistent with the evidence of business groups dominance in France (Boutin et al.,2013). Also, the sale figures in Table 1 indicates that, on average, 81% of the Indian market sales are generated by business group affiliated firms during pre-competition law regime. However, improvements in product market competition has increased business group affiliated firms average sales share by 5% to 86%. This evidence further suggests that business group model dominates and persists even with

institutional development.

The results in Table1, however, indicate that business group affiliated firms' average growth opportunities, measured as a ratio of *Depreciation to Sales* have reduced with improvements in product market competition. This indicates that product market competition has improved growth opportunities for both business group affiliated firms and standalone firms. The table also shows that business group affiliated firms are more levered and older than standalone firms.

Table 2 reports results based on panel regression[7]. The table reports results testing our Hypothesis-1. Hypothesis-1 is primarily interested in understanding the determinants of firm value of business group affiliated firms and standalone firms. The following regression specification, run on both business group (BG) and standalone (SA) firms, is used to test Hypothesis-1.

Model-M1:

$$Q_{jt} = constant + \beta_1 * (BG\ dummy)_j + \beta_2 * (BG\ dummy * Regime2\ dummy)_j + \beta_3 * (Regime2\ dummy) + \beta_4 * ln(firm\ sales)_{jt} + \beta_5 * (firm\ depreciation/sales)_{jt} + \beta_6 * (firm\ leverage)_{jt} + \beta_7 * ln(firm\ age)_{jt} + \varepsilon_{jt} \quad (4..1)$$

BG dummy is business group dummy which equals 1 for group affiliated firms and 0 for standalones. Regime-2 dummy takes a value of 0 for the pre-competition reform period (1990 to 2001) and a value of 1 for the post-competition reform period (2003 to 2012). β_1 is expected to be positive and β_2 is expected to be negative indicating that group affiliated firms are valued more than corresponding standalone firms and that this value spread decreased in Regime-2. In line with extant literature, control variables are included for firm size, leverage and age. Depreciation/sales is a proxy for investment opportunities. Since investment opportunities influence

[7]We use Random Effects Generalized Least Squares (GLS-RE) panel estimation for all regression specifications. Industry dummies are included in all models to control for industry effects. t-statistics are based on heteroskedasticity-robust standard errors adjusted for clustering at the firm level or at the group-industry level as applicable. All variables that have an interaction term in the regression model are mean centered to avoid multicollinearity issues.

firm value, this is included as a control variable (Fich and Shivdasani, 2006). Firm sales and firm age are transformed to their natural log forms on account of their wide dispersion and to control for possible heteroskedasticity. Detailed variable definitions are presented as a separate table in Appendix B. The control variables in Model-M1 (i.e. firm sales to firm age) are used in all subsequent firm value models. For the sake of brevity, they are referred to as "firm level control variables" henceforth.

The table reports that the coefficient of *BG Dummy*, is positive and significant. This evidence further support that business group affiliation in Indian is valuable. The *Regime2 Dummy* coefficient is negative and significant but the sum of the 2 coefficients is positive indicating that BG firms still are valued more than standalones. In the later sections, we try to uncover the drivers behind this persistent behavior.

We test the heterogeneity of group structure across business groups to understand its effect on affiliated firm value. The following regression specification is run on a subsample of only business group (BG) firms

Model-M2:

$$Q_{jt} = constant + \beta_1 a * (Group\ scale)_{it} + \beta_1 b * (Group\ scale * Regime2\ dummy)_{it} + \beta_2 a * (Total\ Entropy)_{it} + \beta_2 b * (Total\ Entropy * Regime2\ dummy)_{it} + \beta_3 * (Regime2\ dummy) + firm\ level\ control\ variables + \varepsilon_{jt} \quad (4..2)$$

Model-M2 results are reported next to Model-M1 results in Table 2. The detailed definitions of group level variables are presented in Appendix-B. We find that, as reported by *Group scale* coefficient, business group scale of operations contribute positively to their value premium. Business groups that have larger scale of operations are more valuable. This is consistent with our Hypothesis-1. However, group diversification coefficient, measured by *Entropy* is not significant.

This indicates that business group level of diversification does not explain the variation in business group affiliates' value. This could be due to the differential effect of related and unrelated diversification that are combined in total diversification measure. In the later part of the analysis we further decompose diversification into related and unrelated diversification for uncovering the differential impact of business group diversification strategy.

4.3. Product market competition and business group efficiency

We now turn our analysis to understand the effect of within business group structural variations over time on affiliated firms' value. We also explore how changes in product market competition interacts with business group structural characteristics. Univariate results are reported in Table3. It is interesting to note that the average number of financial firms in business groups increased from on average 3.3 to 4.7 firms per business group in the post-competition law environment. This again contradicts the positive correlation between institutional voids and internal capital markets. Our results indicate that institutional development has increased the depth of internal capital markets in business groups. This result is consistent with Boutin et al. (2013) that business groups need more financial strength with increased competition. This is inline with industry level changes reported in Panel B of Table 3. The industry level data indicates that industry concentration has significantly decreased in the post-competition law period and also industry level investments have substantially increased. This indicates that product markets have become more competitive in the post-competition law period. Business group diversification variable indicates that business group have significantly expanded in the post-competition law period. However, the expansion is mainly in the unrelated areas compared to related areas. This result is consistent with our Hypothesis-3.

We now turn our attention to understand, at univariate level, how group characteristics would influence value and investments of the affiliated firms. Table 4 reports results in two panels. Panel

A reports *Tobin's Q* of group affiliated firm by grouping them based on group characteristics. Each variable is grouped based on the highest and lowest tercile groups. For instance, *Group Scale* variable indicates that business groups that have higher scale of operations(highest tercile group) are valued higher than business groups with lower scale of operations (Lowest tercile group). Likewise, *Total Entropy* variable indicates that business group expansion is more valuable in the post-competition law regime compared to pre-competition law regime. *Unrelated Entropy* variable indicates that such value addition due to group expansion is mainly due to unrelated diversification of business groups. Business groups that are highly diversified in unrelated areas create value when there is increase in product market competition. This evidence supports our Hypothesis-3. It is interesting to see that groups that have more financial firms or deeper internal capital markets are more valuable in post-competition law regime. This is consistent with Hypothesis-4. This evidence further supports the argument that internal markets support business groups to face increased competition.

Table 5 reports results extending Table 4 results in a multivariate setting based on the following regression equation.

Model-V5:

$$Q_{jt} = constant + \beta_1 a * ln(finfirms)_{it} + \beta_1 b * (ln(finfirms) * Regime2\ dummy)_{it} + \beta_2 a * (Group\ scale)_{it} + \beta_2 b * (Group\ scale * Regime2\ dummy)_{it} + \beta_3 a * (Related\ Entropy)_{it} + \beta_3 b * (Related\ Entropy * Regime2\ dummy)_{it} + \beta_4 a * (Unrelated\ Entropy)_{it} + \beta_4 b * (Unrelated\ Entropy * Regime2\ dummy)_{it} + \beta_5 * (Regime2\ dummy) + firm\ level\ control\ variables + \varepsilon_{jt} \quad (4..3)$$

As per the results reported in Table4, variable *Group Liquidity* that measures business group deep pockets as in Boutin et al.(2013) indicates that business groups lose value due to deep pockets in the pre-competition law regime. However, deep pockets helps to create value when

product market competition improves. This result suggests that the positive role of deep pockets is conditional on competition environment and deep pockets are more useful in competitive environment. This could be due to better investment opportunities associated with competitive environment. Hence, Boutin et al.(2013) result on the positive effect of deep pockets on business group efficiency could be more exogenous to market conditions than endogenous to group strategy. Similarly, *Fin firm count* variable that measure the depth of internal capital markets of the business groups indicate that internal capital market mainly helps when competition is high. Consistent with existing evidence, *Group Scale* is positive and significant. Consistent with our Hypothesis-2, business groups that diversify more into related area lose value; whereas unrelated expansion does not affect business group affiliation value.

4.4. Product market competition and business group investments

Our final analysis focuses on how business group structure and product market competition influences investments of affiliated firms. Although we don't have an explicit theoretical prediction for this analysis, understanding determinants of variations in investments among business groups helps to uncover the source of value creation. The results relating to this analysis are reported in Table6. These results are also derived by using the following regression equation[8].

Model-I5:

$$\text{Ginv}_{idt} = constant + \beta_1 a * (GIL)_{idt} + \beta_1 b * (GIL * Regime2\ dummy)_{idt} + \beta_2 a * (Group\ scale)_{it} + \beta_2 b * (Group\ scale * Regime2\ dummy)_{it} + \beta_3 a * (Related\ Entropy)_{it} + \beta_3 b * (Related\ Entropy * Regime2\ dummy)_{it} + \beta_4 a * (Unrelated\ Entropy)_{it} + \beta_4 b * (Unrelated\ Entropy * Regime2\ dummy)_{it} + \beta_5 * (HHI)_d + \beta_6 * (Iinv)_d + \beta_7 * (Regime2\ dummy) + \varepsilon_{jdt} \quad (4..4)$$

[8] All independent variables in the following regression specification are included with a one period lag

The results reported in Table6 show that *Industry investments(GIL)* has significant positive effect on business group affiliated firms investments. Given that average industry investment is driven by growth opportunities pertaining to a specific industry, investments of business group affiliated firms follow industry investment patterns. The dummy variable *Regime 2 Dummy* that capture the competition regime indicates that average investments of group affiliated firms marginally decreased in the post-competition law regime. The coefficient of *Group scale* variable indicates that higher business group scale of operations facilitates more investments. This trend increase with increase in competition as indicated by the interaction variable between group scale and competition regime dummy(*Group scale*Regime2 Dummy*). This result is consistent with Hypothesis-4. Also, it is consistent with Boutin et.al (2013) that business groups that are large are more aggressive in their product market entry or expansion decisions. The coefficient of *Unrelated Entropy* variable indicates that higher the unrelated diversification higher is the investment made by business group affiliated firms. However, competition regime has no significant effect on such unrelated expansion. Likewise, related diversification does not affect business group investments decision.

5. Conclusion

Business group is a dominant organizational structure to conduct business in many countries. However, this age old model has attracted serious attention of researchers only in the last two decades. Although there is extensive literature on conglomerates, research evidence generally concludes that they are inefficient in competitive and well developed markets. Our research is mainly motivated by Boutin et al.(2013) empirical study on business groups in France, which is a competitive and well developed market. They show that business group affiliated firms dominate product markets by aggressively investing and creating entry barriers to standalone firms. They find that it is mainly due to their access to deep pockets provided by business group internal capital markets. We extend this line of thought and contribute to our understanding on how business groups evolve and conduct business efficiently. In the process, we address the

attributes for successful business group structure even in developed markets with high product market competition. We argue that Boutin et al. (2013) study suffers from survivorship bias in their attribution to deep pockets for successful functioning of business groups as their sample includes only business groups that have survived and succeeded.

Our paper first addresses this question by providing a simple theoretical model that models business group structural evolution in two different regimes of product market competition. Our model shows that business group model is more viable especially when they diversify into unrelated areas. However, to compete more aggressively in unrelated markets, business groups need to rely on their deep pockets as they have to enter with large scale of operation. We use Indian market to test our theoretical predictions as it has undergone a major shift in product market competition due to enforcement of a new competition law. Such structural shift reduces any possible survivorship bias and we follow business groups in India for one decade before and one decade after market development. Our results are consistent with our theoretical predictions. Business groups invest more in unrelated areas as competition increases. Also, business group affiliated firms lose, in terms of their market value, by entering into related areas with increase in product market competition. Taken together, to our knowledge, we provide the first evidence on how business groups transform as markets develop and which form of business groups survive and remain efficient in developed markets.

Appendix A: Proofs

5.1. Proof of Proposition 1

At first, we compare the profit of a BG and two SA firms to consider the incentive to form a BG. From equation (6) and (14) for $N = 2$, we get,

$$\pi_G^{'} - 2\pi_{ij}^{*} = \frac{(a-c)^2(2+2d-w)}{(3+4d+d^2-2w-dw)^2} - (1+\theta)F - \frac{2(a-c)^2(3-2d)^2}{\left(9-4d^2\right)^2} + 2F$$

$$= (a-c)^2\left[\frac{(2+2d-w)}{(3+4d+d^2-2w-dw)^2} - \frac{2}{(3+2d)^2} + (1-\theta)F\right] \tag{A.1}$$

Substituting $w = 0$ and $\theta = 1$ in (A.1), we get,

For $\pi_G^{'} - 2\pi_{ij}^{*} > 0$, we require,

$$(1+d)(3+2d)^2 - \left(3+4d+d^2\right)^2 > 0 \tag{A.2}$$

This does not hold for any admissible value of d when $d > 0$. Thus, in this case, BG does not enjoy any market power when producing related products.

When $d < 0$, (A.2) holds except $d = -1$.

5.2. Proof of Proposition 2

At first, we compare the profit of a BG and two SA firms to consider the incentive to form a BG. From equation (A.1), we get,

$$\pi_G^{'} - 2\pi_{ij}^{*} = \frac{(a-c)^2(1+d-w)}{(3+4d+d^2-2w-dw)^2} - (1+\theta)F - \frac{(a-c)^2(3-2d)^2}{\left(9-4d^2\right)^2} + F$$

$$= (a-c)^2\left[\frac{(1+d-w)}{(3+4d+d^2-2w-dw)^2} - \frac{1}{(3+2d)^2} - \theta F\right]$$

The threshold level of w, for which $\pi_G^{'} = 2\pi_{ij}^{*}$ is given by,

$$w^*_{low} = \frac{\left(-15-32d-20d^2-4d^3\right)-(3+2d)\sqrt{(25+52d+36d^2+8d^3}}{2*(-8-8d-2d^2)} \tag{A.3a}$$

$$w^*_{high} = \frac{\left(-15-32d-20d^2-4d^3\right)+(3+2d)\sqrt{(25+52d+36d^2+8d^3}}{2*(-8-8d-2d^2)} \tag{A.3b}$$

For any value of $w^*_{low} < w < w^*_{high}$, $\pi^{'}_G > 2\pi^*_{ij}$ for any θ i.e. BG is profitable.

And the threshold level of θ for which $\pi^{'}_G = \pi^*_{ij}$ is given by,

$$\theta^* = \frac{F+2(a-c)^2\left[\frac{(1+d-w)}{(3+4d+d^2-2w-dw)^2} - \frac{(3-2d)^2}{(9-4d^2)^2}\right]}{F} \tag{A.4}$$

For any value of $\theta < \theta^*$, $\pi^{'}_G > 2\pi^*_{ij}$ for any w.

For any $\theta < \theta^*$, BG enjoys higher profit than two SA firms.

5.3. Proof of Corollary 1

From (A.3a) and (A.3b),

$$w^*_{low} = \frac{\left(-15-32d-20d^2-4d^3\right)-(3+2d)\sqrt{(25+52d+36d^2+8d^3}}{2*(-8-8d-2d^2)}$$

$$w^*_{high} = \frac{\left(-15-32d-20d^2-4d^3\right)+(3+2d)\sqrt{(25+52d+36d^2+8d^3}}{2*(-8-8d-2d^2)}$$

Differentiating (A.3a) and (A.3b) w.r.t d, we get,

$$\frac{\partial w^*}{\partial d} > 0 \text{ if} d > 0 \tag{A.5.1}$$

$$\frac{\partial w^*}{\partial d} < 0 \text{ if} d < 0 \tag{A.5.2}$$

(A.5.1) shows in case of related sectors, if the degree of relatedness rises, more diversification is required for firms to be profitable. (A.5.2) shows in case of unrelated sectors, if the degree of unrelatedness rises, firms would be profitable at lower levels of diversification.

From (A.4), substituting $w = 0$, we get,

$$\theta^* = \frac{F + 2(a-c)^2 \left[\frac{(1+d)}{(3+4d+d^2)^2} - \frac{(3-2d)^2}{(9-4d^2)^2} \right]}{F} \tag{A.6}$$

Differentiating θ^* in (A.6) w.r.t d, we get,

$$\frac{\partial \theta^*}{\partial d} = \frac{2(a-c)^2 \left[4d^3 + 12d^2 + 12d + 3\right]}{F} \tag{A.7}$$

$$\frac{\partial \theta^*}{\partial d} = -\left(4d^3 + 12d + 12d^2 + 3\right) < 0 \text{ if} d > 0 \tag{A.7.1}$$

$$\frac{\partial \theta^*}{\partial d} = -\left(4d^3 + 12d + 12d^2 + 3\right) > 0 \text{ if} d < 0 \tag{A.7.2}$$

(A.7.1) in case of related sectors if the degree of relatedness rises, more economies of scale is required for firms to be profitable. (A.7.2) shows in case of unrelated sectors, if the degree of relatedness rises, less economies of scale is required for firms to be profitable.

5.4. Proof of Proposition 3

From (7) and (15) for $N = 2$,

$$CS' - CS^* = (a-c)^2 \left[\frac{(2+d-w)^2}{(3+4d+d^2-2w-dw)^2} - \frac{4}{(3+2d)^2} \right] \tag{A.8}$$

The values of w for which $CS' = CS^*$ is given by,

$$w_{low}^{CS} = d \tag{A.9a}$$

$$w_{high}^{CS} = \frac{12 + 15d + 4d^2}{7 + 4d} \tag{A.9b}$$

If $w < w_{low}^{CS}$ and $w > w_{high}^{CS}$ then $CS' < CS^*$

Comparing $w^{*\prime}s$ from (A.3a) and (A.3b) and $w^{CS\prime}s$ from (A.9a) and (A.9b) respectively, we get, for all substitutes

$$w^{CS} > w^* \tag{A.10}$$

Thus, there is a set of feasible w, such that $w^* < w < w^{CS}$ for which BG is profitable but

the consumer surplus decreases. For BGs belonging to this set, the competition authorities will penalize the BG.

If $w > w^{CS}$, then $CS^{'} > CS^{*}$, and these BGs increase consumer welfare.

5.5. Proof of Proposition 4

Consider the case when BG has only economies of scale. From (A.8), substituting $w = 0$, we get,

$$CS^{'} - CS^{*} = \frac{(a-c)^2(2+d)^2}{(3+4d+d^2)^2} - \frac{4(a-c)^2(3-2d)^2}{\left(9-4d^2\right)^2} \tag{A.14}$$

$CS^{'} - CS^{*} > 0$ *or* < 0,according as,

$$\left(2+d^2\right)(3+2d)^2 - 4\left(3+4d+d^2\right)^2 > or < 0 \tag{A.15}$$

$$\left(2+d^2\right)(3+2d)^2 - 4\left(3+4d+d^2\right)^2 = -12d - 15d^2 - 4d^3 < 0 \text{ if } d > 0, \tag{A.16}$$

From (A.16), we get that when goods are related, then consumer surplus after group formation will always be lesser than the consumer surplus before group formation. Thus, competition authorities will penalize BGs having only economies of scale, under consumer surplus measure.

If $d < 0$, i.e. the goods are complementary then incorporating the sign of d, the (A.15) becomes:

$$= 12 - 15|d| + 4|d|^2 \tag{A.17}$$

(A.17) is positive, if $12 + 4d^2 > 15d$ which occurs if $|d|$is high

(A.17) is negative if $12 + 4d^2 < 15d$, this occurs if $|d|$ is low

$$CS^{'} < CS^{*} \; if \; d > 0 \tag{A.18}$$

$$CS^{'} < CS^{*} \; if \; 72d + 20d^3 < 14 + 7d^2 \text{ and } d < 0 \tag{A.19}$$

In case of unrelated sectors, (A.19) states that consumer surplus after group formation is less than consumer surplus before group formation when the degree of unrelatedness is low. Under consumer welfare measure, competition authorities would penalize those Business groups for which the degree of unrelatedness is low, in case they have only economies of scale benefits.

Let us consider the case when $w > 0$, then from (A.9a) and (A.9b)

$$w_{low}^{CS} = d$$

$$w_{high}^{CS} = \frac{12 + 15d + 4d^2}{7 + 4d}$$

w^{CS} is independent of the economies of scale measure. Hence the consumer welfare measure is not affected by the level of economies of scale of the Business group. So long as $w < w_{low}^{CS}$ and $w > w_{high}^{CS}$ the Business group will be penalized.

From Proposition 3,

If $w_{low}^{*} < w < w_{low}^{CS}$ and $w_{high}^{*} < w < w_{high}^{CS}$ for which Business group is profitable but the consumer surplus decreases. For Business groups belonging to this set, the competition authorities will penalize the Business group, irrespective of the level of economies of scale.

5.6. Proof of Proposition 5

In the presence of competition policy, a Business group thus should increase diversification i.e. the diversification should be $w^{CS} > w^{**}$. Now, substituting the value of w^{CS}, w^{**}in the profit function,

From (14) for $N = 2$

$$\pi_G^{'} = \frac{2(a-c)^2(1+d-w)}{(3+4d+d^2-2w-dw)^2} - (1+\theta)F$$

We get,

$\pi_G^{'}\left(w_{low}^{CS}\right) > \pi_G^{'}\left(w_{low}^{*}\right)$, since $\frac{\partial \pi_G^{'}}{\partial w} > 0$ and $w_{low}^{CS} > w_{low}^{*}$ if $d > 0$ at low levels of w (A.24a)

corresponding to the same level of θ. (A.24a) states that Business groups producing in related sectors have an incentive to increase diversification to meet the requirements of the competition authority since it leads to an increase in profit, under consumer welfare measure.

Again,

$\pi_G^{'}\left(w_{high}^{CS}\right) < \pi_G^{'}\left(w_{high}^{*}\right)$, $w_{high}^{CS} < w_{high}^{*}$ if $d > 0$ at high levels of w (A.24b)

corresponding to the same level of θ. (A.24b) states that Business groups producing in related sectors have an incentive to decrease diversification to meet the requirements of the competition

authority since it is still profitable, under consumer welfare measure.

$\pi_G^{'}\left(w_{high}^{CS}\right) < \pi_G^{'}\left(w_{high}^{*}\right)$, since $\dfrac{\partial \pi_G^{'}}{\partial w} < 0$ and $w_{high}^{CS} < w_{high}^{*}$ if $d < 0$ and low$|d|$ but higher levels of w (A.25a)

corresponding to the same level of θ. (A.25a) states that Business groups producing in unrelated sectors with low degree of unrelatedness have an incentive to decrease diversification to meet the requirements of the competition authority since it is still profitable, under consumer welfare measure.

$\pi_G^{'}\left(w_{high}^{CS}\right) < \pi_G^{'}\left(w_{high}^{*}\right)$, since $\dfrac{\partial \pi_G^{'}}{\partial w} < 0$ and $w_{high}^{CS} > {w_{high}^{*}}^{*}$ if $d < 0$ and high$|d|$ (A.25b)

corresponding to the same level of θ. (A.25b) states that Business groups producing in unrelated sectors do not have an incentive to increase diversification to meet the requirements of the competition authority adopting consumer welfare measure since it leads to a decrease in profit.

5.7. Proof of Proposition 6

From (A.25b)

$\pi_G^{'}\left(w^{CS}\right) < \pi_G^{'}\left(w_{high}^{*}\right)$ if $d < 0$ and high $|d|$ for the same level of θ.

In order to increase profit, Business group can increase economies of scale. The threshold amount of θ at which $\pi_G^{'}\left(w_{high}^{CS}\right) = \pi_G^{'}\left(w_{high}^{*}\right)$ is given by,

$$\theta^{CS*}= \frac{F-(a-c)^2\left[\dfrac{(1+d-w_{high}^{*})}{\left(3+4d+d^2-2w_{high}^{*}-dw_{high}^{*}\right)^2} - \dfrac{(1+d-w_{high}^{CS})}{\left(3+4d+d^2-2w_{high}^{CS}-dw_{high}^{CS}\right)^2}\right]}{F} \tag{A.28}$$

Business groups producing unrelated products with high degree of unrelatedness have an incentive to increase diversification from w_{high}^{*} to w_{high}^{CS}only if they can increase economies of scale by reducing θ to less than θ^{CS*}.

5.8. Proof of Proposition 7

The threshold level of diversification at which the profit of Business groups is same as the profit of two stand-alone firms is given by:

$$\mathrm{w}^*_{low}(N) = \frac{\left(3N^2+2N-1\right)+2d\left(5N^2-N-2\right)+Nd^2(11N-12)+4d^3(N-1)^2-(1+N+dN^2)\sqrt{(1-3N)^2+d(8-30N+26N^2)+d^2(4-5N)^2+8d^3(N-1)^2}}{4(d(N-1)+N)^2} \quad \text{(A.29a)}$$

$$\mathrm{w}^*_{high}(N) = \frac{\left(3N^2+2N-1\right)+2d\left(5N^2-N-2\right)+Nd^2(11N-12)+4d^3(N-1)^2+(1+N+dN^2)\sqrt{(1-3N)^2+d(8-30N+26N^2)+d^2(4-5N)^2+8d^3(N-1)^2}}{4(d(N-1)+N)^2} \quad \text{(A.29b)}$$

From (A.29a) and (A.29b), we get,

$$\frac{\partial w^*_{low/high}(N)}{\partial N} =< 0 \; if \; d > 0 \quad \text{(A.30a)}$$

$$\frac{\partial w^*_{low/high}(N)}{\partial N} => 0 \; if \; d < 0 \quad \text{(A.30b)}$$

5.9. Proof of Proposition 8

Comparing (7) and (15), we get,

$$w^*_{CS-low}(N) = d \quad \text{(A.31a)}$$

$$w^*_{CS-high}(N) = \frac{d - 2d^2N(N-1) - 4dN^2 - 2N(N+1)}{1 + 2dN - 2N^2 - 2dN^2} \quad \text{(A.31b)}$$

Comparing (A.30b) and (A.31b), we get for large N,

$$w^*_{CS-high}(N) < w^*_{low}(N) \text{ if } d > 0 \quad \text{(A.32)}$$

From (A.32) we get, the region for which Business groups become profitable corresponds to higher level of w as compared to the region for which the consumer welfare increases. Thus, post competition regime, Business groups in related industries do not have incentive to expand through diversification if the industry is competitive.

$$w^*_{CS(low)}(N) > w^*_{low}(N) < \text{if } d < 0 \quad \text{(A.33a)}$$

and

$$w^*_{CS(high)}(N) < w^*_{high}(N) \text{ if } d < 0 \quad \text{(A.33b)}$$

From (A.33a) and (A.33b), we get, Business groups in unrelated area can increase diversification in order to increase profitability at low levels of diversification, but at high levels of diversification, they need to decrease diversification to meet the requirements of the competition policy.

Appendix B: List of variables and their definitions

Variable name	Variable definition
Panel A: Firm level variables	
Age	Number of years since incorporation of a firm.
Business Group (BG) dummy	A dummy variable taking a value of 1 for group affiliated firms and 0 for unaffiliated firms. Groups with less than 3 companies (Gopalan et al., 2007) or with total deflated sales of less than one billion rupees (100 crores) in a year are excluded from the sample for that year. Pure financial groups (groups with more than 90% of their assets in financial industries) are also excluded from the sample.
Depreciation to Sales	Ratio of firm's depreciation expense to its net total sales. Observations with zero and negative values are excluded.
Leverage	Ratio of firm's total borrowings to total assets.
Q ratio	[Market value of Equity + Book value of Preference shares + Book value of Debt] / Total Assets.
Regime2 dummy	A dummy variable taking a value of 0 for the pre-competition reform period (1990 to 2001) and a value of 1 for the post-competition reform period (2003 to 2012)
Sales	Total sales of the firm. Observations with zero and negative values are excluded.
Panel B: Group level variables	
Fin firm count	Number of financial firms owned by the group.
Group Liquidity	Total net working capital (excluding inventories) & cash flow from operations of all its member firms.
Group scale	The sum total of assets share of the group in each 2 digit NIC industry in which the group operates. Group scale for group i present in n industries for year t is defined as $Group\ Scale_{it} = \sum_{d=1}^{n} Group\ Assets_{idt}/Industry\ Assets_{dt}$, where d indicates an industry at the 2 digit NIC level. Diversified firms are excluded but financial firms are included.
Total Entropy (TE)	Total Entropy for group i present in n industries for year t is defined as $TE_{it} = \sum_{d=1}^{n} P_{idt} * ln(1/P_{idt})$, where d indicates an industry at the 5 digit NIC level and $P_{idt} = Segment\ Sales_{idt}/Total\ Group\ Sales_{it}$. Diversified and financial firms are excluded.

Variable name	Variable definition
Unrelated Entropy (UE)	Unrelated Entropy for group i present in n industries for year t is defined as $UE_{it} = \sum_{D=1}^{n} P_{iDt} * ln(1/P_{iDt})$, where D indicates an industry at the 2 digit NIC level and $P_{iDt} = Segment\ Sales_{iDt}/Total\ Group\ Sales_{it}$. Diversified and financial firms are excluded.
Related Entropy (RE)	Related Entropy for group i present in n industries for year t is defined as $RE_{it} = \sum_{d=1}^{n} P_{idt} * ln(1/P_{idt}) * P_{iDt}$; where d indicates an industry at the 5 digit NIC level, D indicates the corresponding industry at the 2 digit NIC level, $P_{idt} = NIC5d\ Segment\ Sales_{idt}/NIC2d\ Segment\ Sales_{iDt}$ and $P_{iDt} = NIC2d\ Segment\ Sales_{iDt}/Total\ Group\ Sales_{it}$. Diversified and financial firms are excluded.
Panel C: Industry level variables	
Herfindahl-Hirschman Index (HHI)	HHI for industry D with N players in year t is defined as $HHI_{Dt} = \sum_{p=1}^{N}(S_{pt})^2$, where S_{pt} is the market share of player p in industry D in year t and D indicates an industry at the 2 digit NIC level. If a business group has more than one firm in an industry, the sales of all its firms in that industry is aggregated and is treated as one industry player.
Iinv	Industry investment (Iinv) is the sum total of investments made by all firms operating in that industry. Firm investment is measured by the gross outlay on fixed assets purchases disclosed in firm's cash flow statement. Industries are considered at the 2 digit NIC level.
Panel D: Group-Industry level variables	
GIL	Group industry liquidity (GIL) is measured as the total net working capital (excluding inventories) & cash flow from operations of all its firms operating in that industry. Industries are considered at the 2 digit NIC level.
Ginv	Group investment in an industry (Ginv) is measured as the total investments made by all firms of the group operating in that industry. Firm investment is measured by the gross outlay on fixed assets purchases disclosed in firm's cash flow statement. Industries are considered at the 2 digit NIC level.

Notes:
1. Data for all variables are from the Prowess database.
2. All group, industry and group-industry variables are calculated considering both listed and unlisted firms in the group.

Appendix C: The competition act, 2002 : A brief overview

We provide a brief overview of The Competition Act (Act) in this appendix[9]. The Act was introduced in the year 2002 to promote and sustain competition in the Indian economy. Inter alia, the Act regulates anti-competitive agreements, abuse of dominant position and business combinations. Competition advocacy became effective in 2003 and provisions regulating anti-competitive agreements & combinations became effective in 2009. The Competition Commission of India (CCI) is responsible for administering the Act.

The Act views structures or arrangements with horizontal and vertical concentration as having an "appreciable adverse effect on competition" (AAEC) and aims at targeting entities operating as complex structures with vertical and horizontal integration mechanisms. Under the Act, horizontal relationships are arrangements or agreements made between parties operating at the same level of production process and vertical relationships are arrangements or agreements made between parties operating at different levels of production process in the value chain. While AAEC is presumed to be present in structures with horizontal relationships, the burden of proving the presence of AAEC in structures with vertical relationship is on the CCI. The below figure illustrates horizontal and vertical relationships.

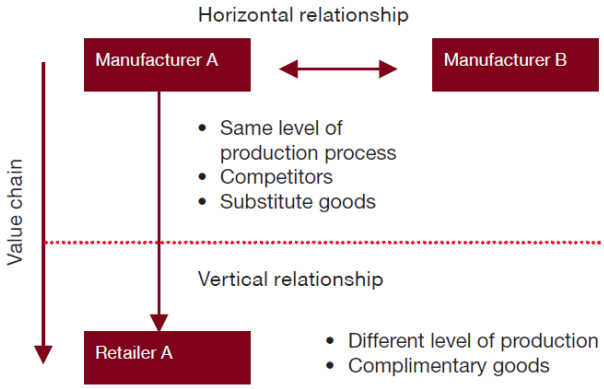

Fig. 1: Horizontal and Vertical relationships

Source : PwC (2012)

Further, the Act prohibits the abuse of dominance in a product and/or a geographical market. Market dominance can be abused either through exploitative[10] or exclusionary[11] practices. Finally, all business combinations above specified thresholds can me made effective only with the approval of the CCI.

[9]This overview is based on PwC(2012).
[10]E.g. predatory pricing, conditions on sales/purchase of goods and services etc.
[11]E.g. limited production, denial of market access etc.

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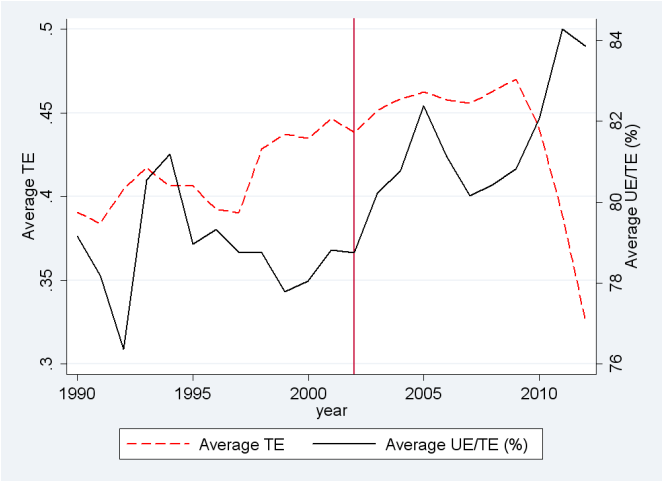

Fig. 2: Average TE and Average UE/TE

This chart plots the average Total Entropy (TE) and the average (Unrelated Entropy/Total Entropy) calculated across all groups for each year from 1990 to 2012. The vertical line indicates the year (2002) in which the Competition Act was enacted.

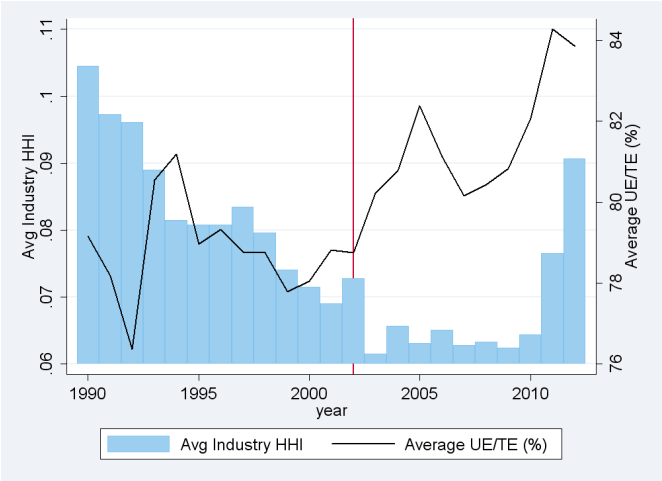

Fig. 3: Average Industry HHI and Average UE/TE

This chart plots the average Herfindahl-Hirschman Index (HHI) calculated across all NIC2d industries and the average (Unrelated Entropy/Total Entropy) calculated across all groups for each year from 1990 to 2012. The vertical line indicates the year (2002) in which the Competition Act was enacted.

Table 1: Descriptive Statistics of Group and Standalone Firms

	Regime-1 (1990-2001)			Regime-2 (2003-2012)		
	BG firms	**SA firms**	**t-stat**	**BG firms**	**SA firms**	**t-stat**
Number of firm-year observations	9241	10038		7712	11038	
Q-Ratio	1.03	0.86	16.16	1.09	0.95	10.20
Firm Sales (Rs. mn)	2,911	507	29.24	7,862	1,245	17.34
Firm Depreciation/Sales	0.08	0.11	4.76	0.10	0.10	0.82
Firm Leverage	0.43	0.39	11.58	0.38	0.34	7.95
Firm Age (Years)	24.69	14.59	41.00	33.32	23.22	38.29

This table presents means for BG and SA firms. All nominal variables are deflated using the Consumer Price Index (CPI) values obtained from the IMF website (Year 2001=100). The data is presented for the 2 regimes separately. Q ratio is [Market value of Equity + Book value of Preference shares + Book value of Debt] / Total Assets, Firm Sales is the net total sales of the firm, Firm Depreciation/Sales is the ratio of firm's depreciation expense to its net total sales, Firm Leverage is the ratio of firm's total borrowings to total assets and Firm Age is the number of years since incorporation of the firm. Q ratio is as at the end of the firm's financial year. In all cases, observations with zero and negative values are excluded. The t-statistics are for the t-test for difference in means between BG and SA firms. See Appendix B for detailed variable definitions.

Table 2: Panel regression results: Models M1 and M2

(Dependent variable : Q ratio)

Variable name	M1	M2
BG dummy	0.233***	
	[10.15]	
BG dummy * Regime2 dummy	-0.055**	
	[2.10]	
Group scale		0.194***
		[3.23]
Group scale * Regime2 dummy		0.058
		[0.73]
Total Entropy		-0.013
		[0.43]
Total Entropy * Regime2 dummy		-0.023
		[0.62]
Regime2 dummy	0.208***	0.152***
	[12.29]	[6.65]
Firm sales (log)	0.004	0.014
	[0.51]	[0.96]
Firm depr/sales	-0.021	0.035
	[0.88]	[0.97]
Firm leverage	0.693***	0.623***
	[17.12]	[9.84]
Firm age (log)	-0.223***	-0.255***
	[15.79]	[11.19]
Constant	1.307***	1.503***
	[25.20]	[13.56]
Chi-square	819	359
No. of observations	38029	16904
p-value	0.00	0.00

This table presents the results of Random Effects Generalized Least Squares (GLS-RE) panel estimation for Models M1 and M2. The dependent variable is the Q ratio and the regression is run on the sample of group affiliated and unaffiliated firms for Model-M1 and on a subsample of only group affiliated firms for Model-M2. Q ratio is [Market value of Equity + Book value of Preference shares + Book value of Debt] / Total Assets, the business group (BG) dummy takes a value of 1 for group affiliated firms and 0 for unaffiliated firms, Firm Sales is the net total sales of the firm, Firm Depreciation/Sales (Depr / Sales) is the ratio of firm's depreciation expense to its net total sales, Firm Leverage is the ratio of firm's total borrowings to total assets, and Firm Age is the number of years since incorporation of the firm. Firm Sales and Firm Age are transformed into natural log forms on account of their wide dispersion and to control for possible heteroskedasticity. Group scale and Total Entropy are group level variables and measure the size and diversification of a group. Regime2 dummy takes a value of 0 for the pre-competition reform period (1990 to 2001) and a value of 1 for the post-competition reform period (2003 to 2012). See Appendix B for detailed variable definitions. Industry dummies are included in all regressions. t-statistics presented in brackets are based on robust standard errors to correct for heteroskedasticity and adjusted for clustering at the firm level. *p<0.10 ; **p<0.05 ; ***p<0.01.

Table 3: Descriptive statistics: Group and Industry level variables

	Regime-1 (1990-2001)	Regime-2 (2003-2012)	t-stat
Panel A: Group level variables			
Number of group-year observations	4584	3896	
Group Liquidity (Rs. mn)	-526	-1,527	5.81
Fin firm count	3.34	4.73	8.88
Total Entropy	0.42	0.45	2.77
Related Entropy	0.09	0.09	0.02
Unrelated Entropy	0.33	0.36	3.19
Unrelated / Total Entropy (%)	78.79	81.15	2.59
Group Scale	0.061	0.059	0.55
Panel B: Industry level variables			
Number of industry-year observations	369	598	
HHI	0.21	0.18	1.87
Iinv (Rs. mn)	12,820	34,115	5.31

This table presents the means for group and industry level variables. Group Liquidity is the total net working capital (excluding inventories) & cash flow from operations of all member firms of a group, Fin firm count is the number of financial firms owned by the group, Total Entropy measures the total diversification of a group, Related(Unrelated) Entropy measures the diversification of a group in related(unrelated) industries and Group Scale is a proxy for group size. HHI (Herfindahl-Hirschman Index) measures the industry concentration and Iinv (Industry investment) is the sum total of investments made by all firms operating in that industry. The t-statistics are for the t-test for difference in means between Regime-1 and Regime-2. See Appendix B for detailed variable definitions.

Table 4: t-tests for firm Q and group investment across terciles of various group level measures

Group level measures	Regime-1 (1990-2001)			Regime-2 (2003-2012)			3rd Ter t-stat	1st Ter t-stat
	3rd Ter	1st Ter	t-stat	3rd Ter	1st Ter	t-stat		
Panel A: Means and t-test for firm Q								
Group Liquidity	1.10	1.03	3.62	1.22	1.16	2.22	4.38	6.62
Fin firm count	1.09	1.07	0.76	1.25	1.04	7.01	6.44	1.14
Total Entropy	1.04	1.01	1.56	1.14	1.05	3.45	5.35	1.31
Related Entropy	1.06	1.01	3.06	1.16	1.08	3.87	5.02	3.81
Unrelated Entropy	1.03	1.03	0.04	1.15	1.03	4.97	6.66	0.22
Group Scale	1.09	0.94	7.10	1.24	0.92	11.44	7.44	0.67
Panel B: Means and t-test for group investment (Rs. mn)								
Group Liquidity	1,364	1,157	0.95	2,249	4,521	4.22	2.57	5.99
Fin firm count	3,170	502	8.29	9,352	919	11.59	5.13	4.79
Total Entropy	1,896	226	9.05	4,619	398	10.38	5.05	5.07
Related Entropy	2,210	394	11.31	6,007	786	13.55	5.25	5.94
Unrelated Entropy	1,812	264	8.98	4,671	473	10.67	5.28	4.28
Group Scale	2,206	119	9.72	6,336	128	11.76	6.37	1.01

This table presents the mean firm Q (Panel A) and mean group investment (Panel B) for the 3rd and 1st tercile of various group level measures. The t-statistics under column "t-stat" are for the t-test for difference in means between the 3rd and 1st terciles in the same regime. The t-statistics under column "3rd Ter t-stat"/"1st Ter t-stat" are for the t-test for difference in means between the 3rd/1st terciles across the 2 regimes. Group Liquidity is the total net working capital (excluding inventories) & cash flow from operations of all member firms of a group, Fin firm count is the number of financial firms owned by the group, Total Entropy measures the total diversification of a group, Related(Unrelated) Entropy measures the diversification of a group in related(unrelated) industries and Group Scale is a proxy for group size. See Appendix B for detailed variable definitions.

Table 5: Panel regression results: Models V1 to V5

(Dependent variable : Q ratio)

Variable name	V1	V2	V3	V4	V5
Group Liquidity	-2.064***			-1.579***	
	[3.37]			[2.64]	
Group Liquidity * Regime2 dummy	1.673**			1.706**	
	[2.29]			[2.33]	
Fin firm count (log)		-0.007			-0.069**
		[0.26]			[2.11]
Fin firm count (log) * Regime2 dummy		0.032			0.068**
		[1.38]			[2.37]
Group scale			0.198***	0.175***	0.218***
			[3.30]	[2.97]	[3.60]
Group scale * Regime2 dummy			0.036	0.058	0.017
			[0.45]	[0.72]	[0.20]
Related Entropy			-0.009	-0.012	0.046
			[0.13]	[0.17]	[0.45]
Related Entropy * Regime2 dummy			-0.212**	-0.207**	-0.283**
			[2.33]	[2.27]	[2.39]
Unrelated Entropy			-0.011	-0.011	0.082
			[0.35]	[0.33]	[1.64]
Unrelated Entropy * Regime2 dummy			0.021	0.023	-0.082
			[0.53]	[0.57]	[1.48]
Regime2 dummy	0.143***	0.150***	0.156***	0.146***	0.186***
	[6.55]	[5.70]	[6.84]	[6.31]	[6.31]
Firm sales (log)	0.019	0.009	0.014	0.014	0.003
	[1.23]	[0.44]	[0.94]	[0.96]	[0.15]
Firm depr/sales	0.039	0.002	0.033	0.033	-0.003
	[1.09]	[0.05]	[0.92]	[0.93]	[0.09]
Firm leverage	0.621***	0.599***	0.623***	0.621***	0.596***
	[9.76]	[7.42]	[9.87]	[9.83]	[7.50]
Firm age (log)	-0.251***	-0.229***	-0.255***	-0.255***	-0.230***
	[11.16]	[7.77]	[11.22]	[11.20]	[7.87]
Constant	1.530***	1.594***	1.500***	1.511***	1.541***
	[13.85]	[9.91]	[13.58]	[13.65]	[9.54]
Chi-square	342	194	369	377	230
No. of observations	16906	11714	16904	16904	11691
p-value	0.00	0.00	0.00	0.00	0.00

This table presents the results of Random Effects Generalized Least Squares (GLS-RE) panel estimation for Models V1 to V5. The dependent variable is the Q ratio and the regression is run on a subsample of only group affiliated firms. Q ratio is [Market value of Equity + Book value of Preference shares + Book value of Debt] / Total Assets, Group Liquidity is the total net working capital (excluding inventories) & cash flow from operations of all member firms of a group, Fin firm count (log) is the natural log of the number of financial firms owned by the group, Total Entropy measures the total diversification of a group, Related(Unrelated) Entropy measures the diversification of a group in related(unrelated) industries and Group Scale is a proxy for group size. Regime2 dummy takes a value of 0 for the pre-competition reform period (1990 to 2001) and a value of 1 for the post-competition reform period (2003 to 2012). Firm Sales is the net total sales of the firm, Firm Depreciation/Sales (Depr / Sales) is the ratio of firm's depreciation expense to its net total sales, Firm Leverage is the ratio of firm's total borrowings to total assets, and Firm Age is the number of years since incorporation of the firm. Firm Sales and Firm Age are transformed into natural log forms on account of their wide dispersion and to control for possible heteroskedasticity. See Appendix B for detailed variable definitions. Industry dummies are included in all regressions. t-statistics presented in brackets are based on robust standard errors to correct for heteroskedasticity and adjusted for clustering at the firm level. *p<0.10 ; **p<0.05 ; ***p<0.01.

Table 6: Panel regression results: Models I1 to I6

(Dependent variable : Ginv)

Variable name	I1	I2	I3	I4	I5	I6
GIL		1.271			1.935	
		[0.37]			[0.55]	
GIL * Regime2 dummy		-2.930			-1.638	
		[0.73]			[0.44]	
Fin firm count (log)			0.217***			0.074
			[2.83]			[0.82]
Fin firm count (log) * Regime2 dummy			0.117*			0.010
			[1.77]			[0.12]
Group scale				0.448**	0.449**	0.302
				[2.15]	[2.16]	[1.33]
Group scale * Regime2 dummy				0.406**	0.410**	0.462**
				[2.15]	[2.16]	[2.15]
Related Entropy				0.279	0.278	-0.090
				[0.85]	[0.85]	[0.27]
Related Entropy * Regime2 dummy				0.044	0.043	0.348
				[0.14]	[0.14]	[1.05]
Unrelated Entropy				0.309***	0.308***	0.368**
				[2.61]	[2.60]	[2.40]
Unrelated Entropy * Regime2 dummy				0.004	0.004	-0.048
				[0.03]	[0.03]	[0.30]
Industry HII	0.744*	0.773*	0.744	0.866*	0.863*	0.772
	[1.75]	[1.80]	[1.41]	[1.82]	[1.82]	[1.49]
Iinv (log)	0.428***	0.390***	0.437***	0.393***	0.393***	0.426***
	[16.14]	[14.24]	[14.18]	[14.41]	[14.43]	[14.07]
Regime2 dummy	-0.156***	-0.093	-0.105	-0.106*	-0.105*	-0.168*
	[2.82]	[1.60]	[1.45]	[1.68]	[1.67]	[1.87]
Constant	-0.739***	-0.391	-0.711**	-0.457	-0.459	-0.741**
	[2.69]	[1.39]	[2.21]	[1.60]	[1.61]	[2.27]
Chi-square	276	213	234	334	336	340
No. of observations	14794	13968	9261	12626	12626	9261
p-value	0	0	0	0	0	0

This table presents the results of Random Effects Generalized Least Squares (GLS-RE) panel estimation for Models I1 to I6. The dependent variable is Ginv (Group investment in an industry). GIL (Group Industry Liquidity) is the total net working capital (excluding inventories) & cash flow from operations of all a group's firms operating in that industry, Fin firm count (log) is the natural log of the number of financial firms owned by a group, Total Entropy measures the total diversification of a group, Related(Unrelated) Entropy measures the diversification of a group in related(unrelated) industries and Group Scale is a proxy for group size. HHI (Herfindahl-Hirschman Index) measures the industry concentration and Iinv (log) is the natural log of the sum total of investments made by all firms operating in that industry. All independent variables are included with a one period lag. Industries are considered at the 2 digit NIC level. Regime2 dummy takes a value of 0 for the pre-competition reform period (1990 to 2001) and a value of 1 for the post-competition reform period (2003 to 2012). See Appendix B for detailed variable definitions. t-statistics presented in brackets are based on robust standard errors to correct for heteroskedasticity and adjusted for clustering at the group-industry level. *p<0.10 ; **p<0.05 ; ***p<0.01.