Growth response to competitive shocks:
Market structure dynamics under liberalisation
- the case of India

ESRC Centre for Business Research, University of Cambridge
Working Paper No. 263

by

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June 2003

Abstract

Liberalisation transforms market structures through the behavioural responses of incumbent firms and entrants, large firms and small, to enhanced freedom of choice. Change in market share volatility, and change in the effective agility of small and large firms underpin changes in market structure. We analyse these processes for Indian manufacturing industries over the 18-year period from 1980, spanning the domestic liberalisation of 1985 and the more comprehensive reforms of 1991, using a data set of large and medium firms in 83 industries. We find that while market structures themselves appeared to change little, turbulence in market shares, as well as the way growth is related to size responded markedly, differing in direction and magnitude, depending on whether the liberalisation was partial and domestic, or comprehensive. We find that they tended to offset each other, leading to little visible change in market structure itself. We also find that while drivers of market structure traditionally recognised in industrial organisation studies had significant impacts on both components of concentration change, their dynamics are captured very well by a parsimonious model that has just the announcement effects - the reform dates.

1. Introduction

A key intended result of greater freedom conferred upon firms to choose competition strategies is readier market selection - whereby efficient firms enter and grow by investing to enhance capabilities, productivity and quality, while less efficient firms contract and exit. New investments, depending on their magnitude and effectiveness, should lead to changes in the configuration of market shares. There may be a "noisy" flurry of activity that follows liberalisation, but deeper patterns of adjustment, in terms of exit or contraction of the inefficient and entry and growth of the efficient, should win through as the dust settles. However, liberalisation will also mean fiercer battles for market shares, and one should expect less stability in the configuration of market shares.

Which types of firms respond to the new found freedom in terms of growth? The best practice technology in each industry will determine whether they are small firms or large. In some industries, small firms hitherto sheltering behind regulations may turn out to be the more agile and successful in gaining market shares. In others, particularly those where advertising and R&D are critical, unwinding regulations may permit large firms to outrun small. Growth responses will also depend on the scope of liberalisation. Limited domestic liberalisation that frees domestic firms, shielding them from international competition could favour larger domestic firms. Liberalisation of trade and foreign investment, subjecting domestic firms to international competition may be harsher on the largest firms if they do not restructure rapidly. As competition increases sharply, market shares may grow volatile and gainers of market shares will be less able to maintain them as a matter of course.

At the heart of our analysis is a reconciliation of divergent aspects in market structure dynamics. Market concentration generally changes very slowly, but market shares of individual firms may change rapidly. Which aspect captures the true picture of competitive rivalry (Davies and Geroski, 1997)?[1] Liberalisation episodes, when competitive rivalry increased, are a suitable context to revisit this question. Using data from an interesting period, we use a simple decomposition framework to examine how changes in market concentration related, on the one hand, to market share churning and, on the other, to the degree to which large (or small) firms gained market shares systematically. We examine these distinct component elements of market structure changes in the context of two episodes of reforms in India. The first, dated at 1985-86, involved limited domestic deregulation. In contrast, the reforms of 1991 were far reaching and encompassed substantial opening up to the international economy. We look at the growth responses of medium and large firms in a set of 83 manufacturing industries

(defined at the SIC 3 digit level) over a period 1980 to 1998, and examine the impact of the very different types of shocks to the business environment in 1985 and 1991.

The main features of the two liberalisation phases are outlined in the next section. In section 3, we set out a framework for our analysis and review issues in market structure dynamics. Section 4 describes the data and provides a preliminary characterisation of the variables of interest. Section 5 sets out our econometric model that is estimated in a panel framework. The results are discussed in section 6, with an assessment of the dynamics of the components of market structure change, in relation to each other and to their total. Section 7 concludes.

2. Background

2.1 Liberalisation in India: 1985 and 1991
Till the mid 80s India followed a strategy of planned economic development based on import substitution. The 1951 Industrial Development Regulation Act had set out the basic cast and machinery of industrial policy. This involved a comprehensive regulation of the direction and volume of investment through licenses, a large public sector, and foreign exchange controls. Planned import substitution tilted investment flows initially towards heavy and capital goods industries and later towards chemicals, petroleum and durable consumer goods. It is now universally accepted that this highly regulated and protectionist regime spawned a sluggish and high cost manufacturing system that was also dynamically inefficient (Bhagwati and Desai, 1970; Bhagwati and Srinivasan, 1975; Ahluwalia, 1985).

In 1985, the Rajiv Gandhi administration (1984-1991) crystallised the logic for reducing the stranglehold of regulation that had been gathering strength over time, into the first significant effort to rejuvenate the industrial system in over forty years. The reforms collectively termed the New Economic Plan, eased entry and expansion of incumbent firms by de-licensing capacity expansion for many classes of firms: firms with assets below a moderate threshold; those located in "backward" areas; firms in scale-critical industries, and firms that were "modernising". Modernisation was encouraged through relaxing controls on import of capital equipment and technical know-how. Licenses were "broadbanded" to allow enterprises to adjust their product mixes more easily to changing market conditions. There was some relaxation of the restrictions on "monopoly houses", if their expansion were in "priority industries". (Economic Survey, 1985/6; Srivastava, 1996). These initiatives generally increased the

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freedom of incumbent firms to expand. Encouragement of de-novo entry was less effective.

The second phase of reforms, which was part of the substantial structural adjustment programme of 1991 under IMF injunctions, was more radical. Trade liberalisation was the most significant aspect (Bhaduri and Nayyar, 1996; Joshi and Little, 1996) of this phase. Procedures for foreign direct investment were simplified and trade tariffs reduced. The maximum import tariff was reduced to 40 percent from a high of 340 percent. Quantitative restrictions were eliminated for capital and intermediate goods. On the domestic front, more industries were de-licensed. Restrictions on expansion by monopoly houses were further relaxed, and sectors reserved for the public sector were thrown open to private sector entry and competition.[2] The substantial thrust of 1991 reforms was to expose incumbent firms to greater competition, particularly international competition, but also from new entrants.

2.2 Literature

The somewhat hesitant 1985 liberalisation has not come under much scrutiny, followed as it was by the radical 1991 reforms. The one detailed study Srivastava (1996), focussed on productivity and did not examine market structure changes: firms increased their use of imported raw materials, and labour productivity and capital intensity increased. Srivastava reports clear evidence of reallocation of resources at the sectoral level[3] and a modest increase in total factor productivity.

Basant (2000) provides an analytical narrative of corporate responses to the reforms of 1991. Multinational Enterprises (MNEs) offered significant competition to domestic incumbents, engaging in mergers and acquisitions to enter Indian markets. In response, domestic firms have been vigorous in attempts to restructure and consolidate in chosen areas. Domestic firms clearly needed to improve organisational and technical efficiencies to survive, while MNEs needed to invest in building local distribution networks (Patibandla, 1998). Chandra and Sastry (1998) report the results of a survey that found firms making significant attempts to upgrade manufacturing capability. More firms have come to rely on imported technology, and a larger number of firms have embarked on export based growth paths.

Ghemawat and Khanna (1998) report on two case studies of the responses of diversified Indian business groups to the reforms of 1991. With the sudden increase in competitive intensity their chosen subject business groups undertook tremendous restructuring, involving staged re-focussing of business portfolios using a variety of partial and complete exit and entry options. One of the

important pointers for large sample work on corporate responses to liberalisation identified by their case studies is the need to allow for lags in the process showing results.

Close in spirit to the current study is the work of Ghemawat and Kennedy (1998) who examined the impact of sudden and simultaneous liberalisation in Poland along many fronts (the "big bang" of 1 January, 1990, encompassing foreign trade, FDI, prices, and regulations on entry, exit and factor markets) on market structure. They highlighted the disequilibrium dynamics and the need to note distortions in pre-shock structure and the lags in adjustment to new equilibrium after the sudden increase in the role of market forces. Drawing on Sutton (1991, 1998) they explained the deconcentration of many markets after competitive shocks in terms of adjustment from an initial disequilibrium to new equilibrium levels that (given high levels of initial concentration) were lower. Sutton's bounds approach also suggests that the adjustment will depend on the structural attributes of the industry: the lowest sustainable levels of concentration will increase with advertising, R&D and asset intensity.

3. Market Structure Dynamics: Growth and Turbulence

3.1 Concentration, Mean Reversion and Mobility: A decomposition scheme

The view that the growth of efficient firms is the cause of increases in market concentration could be extended to the context of liberalisation: efficient firms may grow faster under liberalisation. The implication is that concentration will increase if efficiency requires larger scales of operation, but concentration should decrease if the efficient firms are the small firms. In this paper we focus on the growth responses of large and small firms to liberalisation. This appears to us to be a more useful exercise than relating pre-liberalisation efficiency with post liberalisation growth.

However, the structural shock of liberalisation is accompanied by the inevitable myriad of random shocks in the market environment - firm specific, industry wide or economy wide. Observed patterns in the evolution of market shares will reflect firm reactions to random shocks as well as structural shocks. What would be useful is a framework that pins down the joint evolution of market share turbulence and size-related growth. This would address the `disjunction' noted by Davies and Geroski (1997) " . . . between studies of . . . industrial concentration and the studies of market shares of individual firms . . . Even the obvious link, via aggregation of market shares . . . has been insufficiently explored".

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Full distribution measures of concentration permit simple exact decompositions of concentration change into components that relate to turbulence and size related growth. Consider a set of firms in a cross section, indexed by i, and the variable of interest, firm size denoted by s. For individual i, change in size over time is by definition, $s_{it} \equiv s_{it-1} + \Delta s_{it}$. If market concentration, the cross section distributional feature of interest is measured by the real valued function of the vector of market shares, say f(s$_t$), then $f(\mathbf{s_t}) \equiv f(\mathbf{s_{t-1}} + \Delta\mathbf{s_t})$. If the statistical function f(.) is additive in the sense that it can be written: $f(\mathbf{s_t}) = f(\mathbf{s_{t-1}}) + f(\Delta\mathbf{s_t}) + g(\mathbf{s_t}, \Delta\mathbf{s_t})$ the cross sectional feature measured by f(.) increases with $f(\Delta\mathbf{s_t})$, a summary measure of all changes of market shares, and $g(\mathbf{s_t}, \Delta\mathbf{s_t})$, a summary measure of the systematic relationship between current market shares and changes in market shares.

In this paper we work with the Hirschman-Herfindal index. The HHI has the advantage in common with other full distribution measures of concentration, of reflecting both the size inequality and firm numbers in the industry. It is one of the most commonly used measures and is therefore well understood. If the size share of firm i, is represented by s$_{it}$, and the vector of market shares is s$_t$, then HHI at time t is defined as $H(s_t) = \Sigma_i(s_{it})^2$. HHI at time t is:[4]

$$HHI_t = HHI_{t-1} + \sum_i \Delta s_{it}^2 + 2\sum_i s_{it-1}\Delta s_{it}$$

Eq. 1

The second term in the RHS, $\sum_i \Delta s_{it}^2$, is a measure of market share turbulence, or mobility, (MOB) (Cable, 1997). MOB is a measure of gross change in market shares, and picks up both increases and decreases in market shares. [5]

The third term in the RHS of is a measure of the linear association between initial market share and change in market share. This term (SGRT) weights the change in market share of each firm with its starting market share. Thus it gives greater weight to market share changes of large firms. A negative SGRT will imply that small firms have, on average, gained relative to large.[6] Therefore:

$$\Delta H(\mathbf{s}_t) \equiv MOB + SGRT .$$

Eq. 2

This identity decomposes the change concentration into a systematic size related growth component, and another, total intra-distributional mobility component.

3.2 Conjectures on market structure dynamics
In a liberalised environment, the market selection process should, in course of time, highlight any systematic differentials in the abilities of firms to pick up and

leverage market opportunities while withstanding competition. If the capable firms are the small ones, we would expect that market share movement takes the form of small firms gaining share relative to large, and therefore a reduction in concentration. If the efficient firms were the large ones we would expect large firms to increase their market shares, and increased concentration. The overall argument implies that technological economies of scale determine the long run market concentration.

But models of market structure highlight the way firm behaviour ("conduct") in pursuit of market power successfully maintains concentration at high levels. By increasing firm choice of firms liberalisation reinforces the role of firm level efforts (to enter, to prevent entry, and to compete with others in the market). The corollary is that attained market shares are under fiercer challenge, and competitive shocks may increase the volatility in market shares. Increase in mobility ipso-facto, increases concentration,[7] and since turbulence is an indicator of competitive rivalry, increase in concentration is not a negative development. Increases or decreases in concentration only carry information on whether, on balance, small firms or large are winning in the market.

The immediate response of potential entrants and incumbents to a relaxation of constraints could be increased investment, employment, R&D, import or export activity, in various combinations. The heightened tempo of competitive activity might translate into an initial phase of increased turbulence in market shares, which should cloud around the underlying systematic adjustment process of industries moving from (relatively stable) pre-liberalisation market concentration levels, to equilibrium market structures in the new environment. The pre-liberalisation configuration was relatively stable, and has been characterised as a disequilibrium, based as it was on a pervasive command and control system. For each industry, the speed of adjustment is likely to depend on the deviation of this pre-liberalisation concentration level from the post-liberalisation equilibrium.

The implications of domestic liberalisation should be different from those of comprehensive liberalisation. Till the mid 1980s, industrial, trade, public sector, foreign investment and foreign exchange policies constrained and protected firms from internal and external competition, and directed their efforts towards rent seeking and lobbying. Small-scale sector policies prevented firms from reaching economies of scale in many sectors. In the new climate of domestic freedom created by the reforms of 85-86, incumbent firms would have been at advantage in gaining market shares. If firms had been held back from the scales of the best practise technology, one might have expected them to grow. In industries where advertising and R&D are natural instruments of vertical product differentiation,

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large firms may have the relative advantage and firm level "escalation" of endogenous sunk cost investments could have led to increases in market concentration.

When foreign firms gained substantial access to the domestic market in 1991, large Indian firms clearly began paying more attention to upgrading capabilities, and product differentiation through increased advertising, R&D and marketing expenditures, but it is not clear that these efforts were sufficient to meet the competitive challenge (Basant and Chandra, 2002). Sutton's model (1991,1998) predicts that the resulting equilibrium after a sudden and sharp increase in the toughness of competition could be an increase in concentration after a shake out of the laggards in restructuring.

In summary, liberalisation can lead to interesting patterns in the dynamics of two components of market structure. In each industry, the market share volatility will cloud the structurally based, systematic growth response of firms, small and large, that depends on the advantage or disadvantage of size in the new competitive milieu. To understand the change in market structure we need to disentangle the contribution of the size related growth component from that of the market share volatility component, and assess their separate dynamics.

4. Data

The data used in this paper is the Reserve Bank of India (RBI) compilation of firm level profit and loss accounts and balance sheets of the large and medium, non-government, non-financial, public limited companies registered in India. The data relate to individual companies, which may be parts of much larger industrial houses, but are legally separate entities, independent in their day-to-day operations. These companies fall in 83 three-digit industries. The assignment is based on majority (> 50%) output[8]. We use data for the period 1980-1998.

The RBI data comes from a purposive sample designed to adequately represent companies belonging to different industry groups and size classes. The sample size is relatively large both in terms of numbers (and in terms of paid-up capital - accounting for nearly 65% of the total paid-up capital of the entire population of public limited companies). On average there were 23 firms per industry per year, ranging from a maximum of 132 firms, to a minimum of a single firm. The size of the sample in terms of number of companies has been increasing over the years, and over 75% of companies are retained from one year to the next[9]. But it is not possible to distinguish "births" and "deaths" from the changing sample composition. This is one clear limitation of the data available[10].

For the purposes of computing the indices of concentration, size-growth and mobility, we constituted two-year rolling panels of firms from the data. For each of the industry specific explanatory variables, we computed annual median values across all firms in the industry from the first years of the rolling panels - the means were affected by outliers. The panel of median values constitutes our data on explanatory variables.

Our focus in this paper is on understanding real economic processes that underlie changes in market concentration, and on assessing their relative magnitudes in domestic as against comprehensive liberalisation. It must be re-iterated that the data does not permit us to estimate true levels of market concentration; the purposive sampling frame is designed to provide coverage of large and medium firms. This data set is the only one that spans the period of interest; the selective coverage does mean that the results we report are specific to this population.

Figure 1: Concentration change, Size-Growth and Mobility: Printing Industry
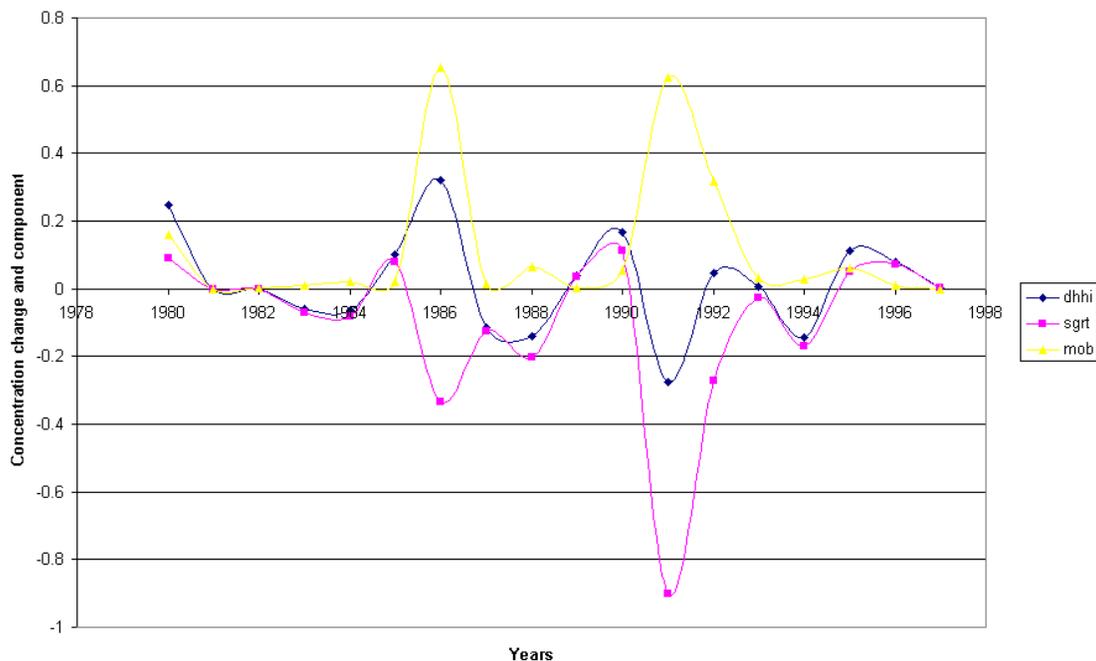
Figure 1 above uses data on the printing industry alone to illustrate the way in which the underlying processes, (the way growth is related to size, and market share turbulence) responded to the different liberalisation episodes. When liberalisation was partial and domestic, mobility (MOB) shot up and small firms grew relative to large, leading to a reduction in the size-growth component (SGRT). In the comprehensive liberalisation episode, again this was repeated. In

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both cases they tended to offset each other, leading to lower visible change in market structure itself.

The tendency of the components to offset each other is illustrated in figure 2. Here we have plotted all industry-year data points for SGRT, MOB and ΔHHI, ordered descending according to ΔHHI, irrespective of industry or ear. The scatters are summarised by simple polynomial trend plots. It is obvious that the underlying processes offset each other and in the majority of cases, produce changes in market structure that are much smaller than the components themselves.

Figure 2 : Change in Concentration and Components: Size Growth and Mobility
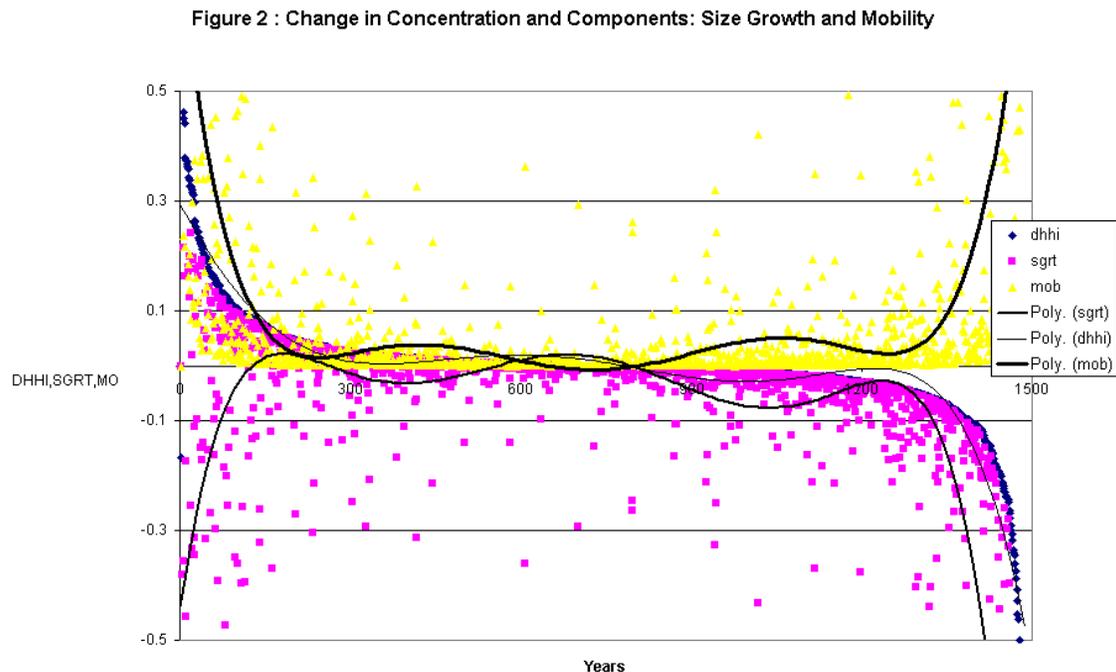
5. Estimation

Capital intensity, advertising and R&D intensity have been identified as significant determinants of market structure in many empirical IO studies. In addition, the rate of growth of the market and export propensity have also been seen to matter. The standard method of explaining market structure would be to estimate a model for concentration including the above as explanatory variables. In this paper, we depart from this, by explicitly modelling the change in concentration as being composed of two processes - size related growth and market share mobility. We then model the determinants of each of these components, together with the determinants of concentration, to see if the former adds to our understanding of why (and how) concentration changes.

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Our modelling strategy is based on the identity:

$$\Delta H(\mathbf{s}_{t-1,t}) \equiv MOB(\mathbf{s}_{t-1,t}) + SGRT(\mathbf{s}_{t-1,t}) .$$

<div align="right">**Eq. 3**</div>

The economic and technological drivers mentioned above (capital intensity, advertising, R&D, growth and exports) can then be seen as affecting concentration through their effects on market share mobility on the one hand and size-related growth on the other.[11] The explanatory variables in our econometric model fall into three classes:

5.1 The Standard Model

Traditional SCP models recognise structural, behavioural and performance-related drivers of market structure, which work either at the firm, or the industry, level. Our standard model includes:

KSR: The capital-sales ratio represents exogenous sunk costs through the capital intensity of the industry. In general, one might expect that in a high KSR industry, advantage falls to larger firms, increasing SGRT.

PFT: The return on sales measures profitability, which is both determined by market structure and, in turn, determines market structure[12]. An industry with above average PFT can be expected to encourage the entry and growth of smaller firms increasing MOB and decreasing SGRT.

EXP: The ratio of exports to sales, can feed back to domestic market shares, through learning and good practice, as well as through scale of operation. Typically, the smaller (of the large and medium) firms should be better placed to benefit in terms of leveraging exports to gain domestic market shares.

GRT: Growth of market size is measured as change in industry output between two years. In growing markets incumbents may find it difficult to occupy all the niches. New entry might be faster, and MOB greater. The effect on concentration will depend upon how agile small firms are in filling the niches that arise.

ASR: Industrial Organisation (IO) studies generally expect that brand loyalties will be reinforced by pre-emptive advertising campaigns, which in turn reinforce the existing monopolistic positions. From the point of view of our analysis in this paper, however, this would imply that there would be

relatively little volatility and large firms may gain further, increasing SGRT.

5.2 Dynamics

As indicated earlier, one of the major drivers of structural change during this period was the liberalisation that was undertaken in the mid-1980s and then later in the early 1990s. This liberalisation may be expected to have a direct impact on market structure via entry into and exit from the industry. However, it may also have an impact by changing the way in which firms deploy certain behavioural expenditures (like advertising and R&D) or take advantage of exports markets. To take the former into account, we include two dummy variables (D86 and D91) into our models. To take the latter into account, we allow these dummy variables to interact with each of our other behavioural variables (to see how, if at all, they change after the liberalisation). Thus, we have:

D86: which is a dummy variable and is =0 before 1986 and =1 for the years including and following 1986, marking out the domestic liberalisation.
D91: marks out the comprehensive liberalisation in 1991 and is a dummy variable =0 before 1991 and is =1 for the years including and following 1991.

We also include D86 and D91 interacted with standard model variables (D86*ASR, D86*RDSR, D86*PFT and so on), to capture variations in the impacts of these variables after each of the liberalisation episodes.

In addition to these variables that attempt to capture the impact of liberalisation, we also include two other dynamic variables – Trend and Lag – to capture other longer-term dynamic patterns. Trend captures the long-term trend and we also interact it with D86 and D91 to see if there are any changes or breaks in these trends following the two reforms periods. Finally, Lag attempts to control for autoregressive patterns in our variables.

5.3 Endogenous Sunk Costs and Escalation

Sutton (1991, 1998) has argued strongly that an increase in the toughness of competition prompts firms to competitively escalate (endogenous sunk cost) investment programmes, to move up the "quality" ladder. One would expect that in industries where endogenous sunk costs (such as Advertising and R&D) are important, the essence of market selection will be that some firms will be more agile and effective in deploying these strategies than others. We should expect to see higher average values of advertising and R&D intensity, having a larger impact on market structure and its components. To test for this, we included, in

addition to ASR, advertising-sales ratio, mentioned above, among the standard model variables,

RDSR: R&D-sales ratio, capturing R&D intensity of the industry.[13]
ASR*D86 and ASR*D91: to capture liberalisation induced trend shifts in the impact of advertising intensity.
RDSR*D86 and RDSR*D91: to capture liberalisation induced trend shifts in impacts of R&D intensity.

It is worth mentioning that in exploratory work we attempted to capture the degree of escalation in these strategies in individual industries by including annual intra-industry dispersions of these variables – annual intra-industry inter-quartile ranges/variances of these variables. We found that these were not satisfactory proxies for the escalatory spread of strategy variable across firms within the industry, and dropped them from this final analysis.

6. Results

Our panel consists of data on 83 industries from 1980 to 1998. We estimate separate models for SGRT and MOB, and use these to understand changes in concentration, which is also separately analysed. Since the data are a panel, we estimate our model using both random and fixed effect methods. The Hausman test, however, indicates that the fixed effects specification dominates over the random effects in almost all cases. We therefore only present these estimates in Table 1 below.

In addition to the above, we estimate two versions of our model – the full model and the restricted dynamic model. The full model includes both the standard IO variables as well as the dynamic variables. The restricted dynamic model, on the other hand, includes only the dynamic variables and is presented in the right hand side panel of Table 1. The model is estimated because the standard IO variables were found to be of very limited significance in the full model. Estimating the restricted dynamic model separately (as a model nested within the full model) allows us to test this hypothesis formally using a likelihood ratio test. We find that the likelihood ratio test is rejected in all 3 equations (SGRT, MOB and HHI) leading us to conclude that the standard IO variables do contribute to the explanation. However, their contribution is limited, and this is clear when we compare the values predicted by the restricted dynamic model to that of the full model (Figure 4). We therefore present these estimates as well in Table 1 below.

Table 1: *Estimation Results*

	Full Model									Restricted Dynamics Model								
	SGRT			MOB			HHIYR			SGRT			MOB			HHIYR		
	Coefficient	t-ratio		Coefficient	t-ratio		Coefficient	t-ratio		Coefficient	t-ratio		Coefficient	t-ratio		Coefficient	t-ratio	
LAG	-0.0682	-2.23	**	-0.0215	-0.73		0.4521	18.82	***	-0.0001	-0.39		0.0001	0.43		0.4574	19.12	***
TREND	0.0329	4.1	***	-0.0266	-3.82	***	-0.0068	-2.28	**	0.0315	3.93	***	-0.0257	-3.72	***	-0.0062	-2.08	**
GR	0	-0.01		-0.001	-0.19		0.0012	0.55										
MD PFT(L)!	0.2704	2.47	**	-0.1779	-1.87	*	-0.0516	-1.26										
MD KSR	0.0105	0.39		0.0046	0.2		-0.0043	-0.43										
MD EXP(L)	-0.1418	-0.39		0.2236	0.71		0.0676	0.5										
MD ASR(L)	-0.0992	-3.23	***	0.0897	3.36	**	0.0213	1.87	*									
MD RDSR(L)	0.9648	2.82	***	-0.6384	-2.15	**	-0.3343	-2.62	***									
Domestic Liberalisation																		
D86	0.1087	0.9		-0.1877	-1.8	*	0.0762	1.7	*	0.1866	1.62	*	-0.2152	-2.17	**	0.0487	1.13	
D86*TREND	-0.0308	-2.23	**	0.0346	2.88	***	-0.0037	-0.72		-0.0345	-2.5	***	0.0344	2.9	***	-0.0024	-0.46	
GRT*D86	0.0238	1.12		-0.0308	-1.67	*	-0.0105	-1.32										
MD PFT(L)*D86	0.0702	0.62		0.0382	0.39		-0.0624	-1.49										
MD KSR*D86	-0.0032	-0.12		-0.0159	-0.68		0.0093	0.93										
MD EXP(L)*D86	0.3361	0.87		-0.35	-1.04		-0.1452	-1.01										
MD ASR(L)*D86	0.0692	1.63		-0.0765	-2.08	**	0.0015	0.1										
MD RDSR(L)*D86	1.3621	1.57		-0.9844	-1.3		0.3095	0.95										
Comprehensive Liberalisation																		
D91	-0.2223	-1.69	*	0.3335	2.92	***	-0.1147	-2.35	**	-0.2682	-2.08	**	0.323	2.9	***	-0.0806	-1.66	*
D91*TREND	0.0145	1.19		-0.024	-2.27	**	0.0105	2.32	**	0.0187	1.54		-0.0241	-2.29	**	0.0088	1.92	**
GRT*D91	-0.0271	-1.32		0.0354	1.98	**	0.0083	1.1										
MD PFT(L)*D91	-0.0255	-0.27		-0.0661	-0.81		0.077	2.21	**									
MD KSR*D91	0.0095	0.31		-0.0014	-0.05		-0.015	-1.32										
MD EXP(L)*D91	-0.1705	-0.75		0.1131	0.57		0.052	0.61										
MD ASR(L)*D91	0.0172	0.48		-0.0176	-0.56		0.0094	0.7										
MD RDSR(L)*D91	-2.5817	-2.91	***	1.8643	2.41	***	0.0561	0.17										
Log-Likelihood	163.42			347.61			1454.97			134.05			325.61			1411.03		

Note: MD represents median values of these variables and (L) indicates that they were lagged once.

6.1 Model Estimates

Among the standard drivers of market structure, industry profit margins (PFT) induced larger firms to grow relative to smaller firms, and at the same time, decreased market share volatility. Advertising (ASR) benefited the growth of smaller firms, and increased market share volatility, while research and development (R&D) benefited the growth of larger firms and decreased mobility. R&D appears to have been a more effective barrier to small firm growth in India than advertising.

There were significant long-term trends in all three dependent variables - size-related growth, market share turbulence and in market concentration. Over the whole period, the size growth relationship trended upwards, suggesting an overall tendency for the larger firms to grow faster than the smaller, ceteris paribus. Likewise, there was a decreasing trend in market share mobility. This decline offsets the increase in size related growth in determining market concentration that shows a minuscule, but statistically significant, negative trend.

The 1985 liberalisation (D86*TREND) reversed the trend in size-related growth, suggesting that smaller firms gained in this period. This was accompanied by a step up in the level of market share turbulence. The 1991 liberalisation seemed to have had no significant impact on size-related growth, but it influenced the level of mobility. MOB stepped up in 1991 (positive D91) and from this high point, declined in trend. Growth in market size also had a significant positive impact on MOB after 1991.

It is notable that neither of the liberalisation episodes led to any significant change in the impact of profit margins, capital use, advertising, or exports on market structure or its components. Amongst behavioural variables, only R&D has a significant differential in the second liberalisation episode. Although the R&D intensity benefited large firms (see above), after the 1991 liberalisation, its impact shifted in favour of smaller firms, increasing mobility as well.

Since our estimations indicate that the dynamic variables (lags, trend and liberalisation dummies) were by far the most significant variables in these models, we re-estimated the models including only the dynamic variables (see Restricted Dynamic Model in Table 1). The likelihood ratio test of the unrestricted against the restricted model shows the restrictions to be significant. However, we present these results because our simulations indicate that in the presence of significant structural changes, the contribution of standard IO variables to the explanation of market structure diminishes and the role of dynamic changes becomes more significant. This, of course, is not surprising, given that most IO models assume mature economies with stable (if not equilibrium) market structures.

6.2. Conditional means over time

To secure an overall picture we present the annual conditional mean values predicted by the models. Figure 3 presents predicted values of SGRT and MOB, and compares them with the change in HHI that arises from these predictions. SGRT and MOB on the other hand have very pronounced dynamic patterns, but they offset each other; as a result, annual changes in HHI are very small.

Figure 3: Trends in Conditional means of Concentration, Size-Growth and Mobility
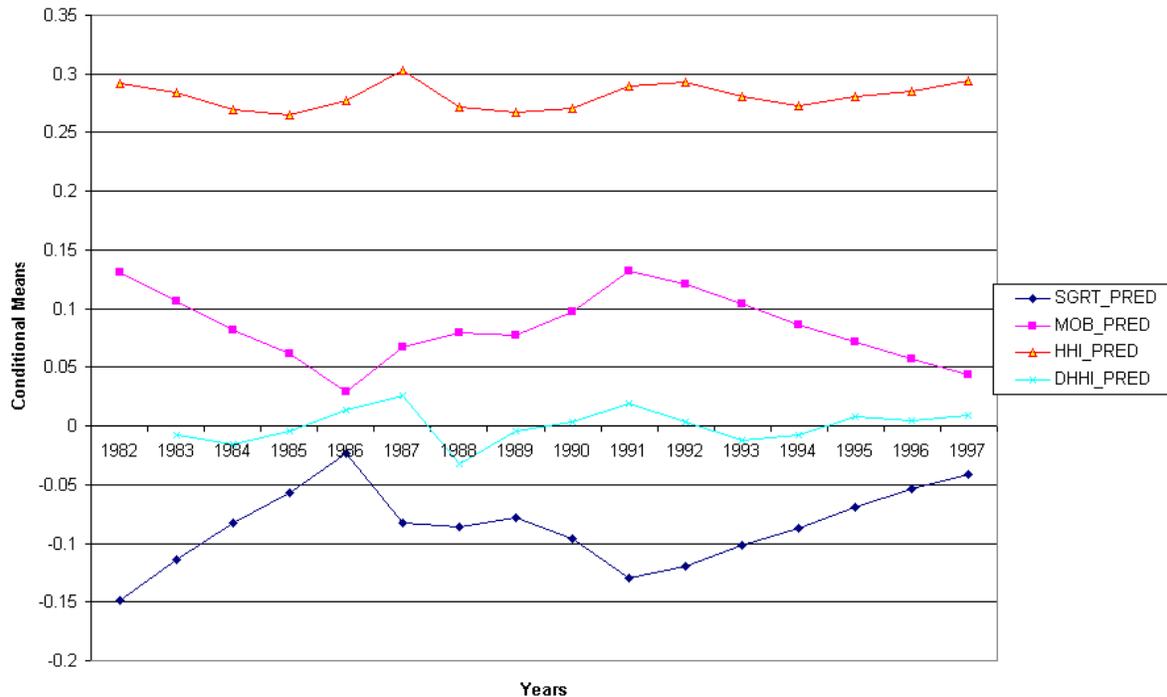
An observer looking only at HHI and its change might have inferred that little of import happened with either episode of liberalisation. In fact, much did happen. Prior to 1985, larger firms were growing faster (SGRT was rising) and market share volatility (MOB) was in decline. The directions changes in SGRT and MOB were reversed in the domestic liberalisation phase - SGRT fell and MOB rose; suggesting that smaller firms were quicker to take up of new opportunities in an environment that was partially protected. These trends were reversed again in the comprehensive liberalisation phase, SGRT rose and MOB fell, suggesting that larger firms fared better than the smaller in the more competitive and turbulent environment of the 1990s

Figure 4: Mobility and Size-Growth: Trends in Conditional means from the full model and Restricted (dynamics) model

Figure 4 shows that restricted models including only the dynamics terms (LAG, TREND, D85, D91, D86*TREND, D91*TREND) decompose the mean tendencies of MOB and SGRT into constituents: the standard model and the dynamics. In both cases, the dynamics has most of the explanatory power of the full model. The trends are captured almost entirely.

7. Conclusions

From the point of view of the literature on the determinants of market structure, we have sought to revisit the difference between concentration and turbulence as measures of competition. The standard interpretation would lead us expect lower concentration with liberalisation, and increased market share churning. But increased turbulence, ipso-facto, increases concentration, and it is the change in size-growth relationship that drives a wedge between the two. If concentration declines while turbulence increases that will necessarily be because in the reallocation of market shares, agile smaller firms are the gainers.

Two factors distinguish this paper from others in this field. First, we consider the determinants of market structure in terms of the determinants of its components – size-related growth and mobility. Figure 1 confirms the usefulness of this decomposition; in India both the size-growth relationship and market share mobility

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changed considerably in response to the two liberalisation episodes. By virtue of their offsets, the net effect on concentration was very small. Examining market structure changes alone would have led us to underestimate the impact of liberalisation on processes driving market structure. It also further strengthens the need for a change in methodology away from a consideration of market structure alone towards a consideration of the components of this change.

The second relates to our findings rather than our methodology. Contrary to most other papers in the field, we find that the dynamic variables (structural breaks, trends and lags) explain most of the changes in the components of market structure. In retrospect, this is not surprising because the standard IO model has been conceptualised as relating to a relatively mature (and perhaps close to equilibrium) market structure, whereas the Indian economy in general (and particularly in the 1980s and 1990s) was very far from this. It is therefore not surprising that structural changes that are absorbed into the pure dynamics of liberalisation turn out to explain almost all that can be explained.

Notes

[1] They used a framework that integrated market concentration and market share turbulence to determine which of the two stylised facts captured the true picture of competitive rivalry. For the UK they analysed how the dynamics of market shares of largest firms feed into the concentration ratio (C5).

[2] However, reservations for small-scale industry continued. While the government also accepted the need for redundancies, and began a process of withdrawal from involvement in employer-employee negotiations, few significant steps have been taken towards the removing exit barriers.

[3] Away from metal based and heavy machinery sectors towards electrical machinery, chemicals, non-metallic mineral products and products such as leather, rubber, plastics and petroleum products.

[4] Entry and Exit can be accommodated by letting s_{it-1} or s_{it} as appropriate, to be 0.

[5] As MOB includes all market share changes, this includes both (a) the case of large firms further increasing their market shares (regression away from the mean) as well as (b) the case of small firms increasing their market shares, which sometimes carries the specific connotation of mobility.

[6] SGRT can be written in terms of the β coefficient of a cross-sectional mean reversion equation. Consider a linear cross sectional relationship $\Delta s_i = \alpha + \beta s_{it-1} + \varepsilon_i$. (This is the Galtonian regression model - in terms of market shares rather than log size. If the distribution of s_{it} is skewed, the estimation results would be dominated by the largest firms. In our context, with the focus on public companies, the distribution is less skewed than the case with all firms.) Such a regression provides an estimate of the degree of "mean reversion" (or converse) as the cross section evolves. The sign and magnitude of $\hat{\beta}$ tells us whether firm sizes are reverting to mean size, or whether larger firms are growing larger. Since the OLS estimate $\hat{\beta} = Cov(s_{it-1}, \Delta s_i)/V(s_{it-1})$ the last term in the RHS can be rewritten in terms of the mean reversion coefficient, as: $2\hat{\beta}V(s_{it-1}) + nE(s_{it-1})E(\Delta s_i)$. Alternative ways in which this term can be written are: $2\hat{\beta}\sigma^2(s_{it-1}) + 1/n - H(\mathbf{s})$, and $\rho\sigma(s_{it})\sigma(s_{it-1}) + 1/n - H(\mathbf{s})$ where ρ is the correlation coefficient between market shares at date t-1 and date t.

[7] It is easy to see that concentration, proxied Variance of market shares can increase even when small firms grow faster, $\beta < 1$, if $V(\varepsilon_{it})$ offsets the tendency : $V(s_{it}) = \beta^2 V(s_{it-1}) + V(\varepsilon_{it})$.

[8] The data set provides no information on the variety of products produced by a firm or on coverage ratios. Earlier studies (Shanker, 1988; Siddharthan, 1981) have indicated that firms in India tend to diversify narrowly (within the same 3 digit industry category) though industry houses span wider industries. Government licensing also played a role in maintaining such a narrow range of diversification. Given this, it looks likely that, though firms may produce a number of different products, these products are likely to fall within the same industry group.

[9] For example, the combined balance sheet analysis based on the data published by the RBI in 1993 (Bulletin, December) reported results for 1988-89, 1989-90, and 1990-91 based on a sample of 2131 companies. A similar analysis in 1992 (Bulletin, November) reported results for 1908 companies for 1987-88, 1988-89 and 1989-90. The two samples had 1647 companies in common.

[10] There is the implicit assumption that the method by which successive samples are selected should not have undergone a change. For further details on the extent of coverage for each sample survey ref. Uma Datta Roy Chaudhari (1992), Journal of Indian School of Political Economy, Vol.4 No.4, pp. 599, 616 and 643.

[11] An alternative method, one we do not pursue here would be to estimate a system of equations imposing the identity as a restriction.

[12] This two-way causality is common to many variables included in IO studies. We take account of it here by lagging the variables, where appropriate. Thus, our model includes lagged values of PFT, ASR and RDSR, on the grounds that it would take time for entry (or a barrier to entry) to influence market structure.

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