Growth responses to competitive shocks:
Market structure dynamics under liberalisation

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Abstract

Liberalisation transforms market structures through the responses of incumbent firms and entrants to freedom of choice. Market shares tend to turn more volatile, and the agility and competitiveness of small, as against large, firms determine whether markets grow more concentrated, or less. We analyse the way these processes played out in Indian manufacturing industries over the 17-year period from 1981, spanning the domestic liberalisation of 1985 and the more comprehensive reforms of 1991. An observer looking at summary measures of market concentration might conclude that not much happened under either liberalisation episode. In fact, market share grew significantly more turbulent, and the relationship between market share growth and initial share changed considerably. Domestic and comprehensive liberalisation saw different types of course corrections in these processes. But in both liberalisation episodes they tended to offset one another in their impact on observed market concentration, which therefore, changed little.

JEL Codes: L19, L60, C21, C22

Key words: Liberalisation, Competitive Shocks, Firm growth, Turbulence, Market structure, India

1. Introduction

A key intended result of liberalisation is market selection - whereby efficient firms grow by investing to enhance capabilities, productivity and quality, while less efficient firms contract and exit. Will large firms or small respond better to the freedom to grow? This will depend on the best practice technology in each industry, as well as the scope of liberalisation. Small firms, hitherto held back by the costs of complying with or circumnavigating regulation, may turn out to be more agile and successful in gaining market shares in some industries. In others, particularly those where sunk costs are high, unwinding regulations may permit large firms to outrun the small. Growth responses will also depend on the scope of liberalisation. Limited domestic liberalisation that frees domestic firms but shields them from international competition may favour smaller firms. Liberalisation of trade and foreign investment which subjects domestic firms to international competition may be harsher on smaller firms to the extent they are typically resource constrained.

In any case liberalisation should bring about fiercer battles for market shares. Investments drawn by the new found freedom should increase volatility in the configuration of market shares. There may thus be a noisy flurry of activity that follows liberalisation, but deeper, technology driven patterns of adjustment, in terms of exit or contraction of the inefficient, and entry and growth of the efficient, should win through in time.

We analyse changes in market structure in the context of significant policy shifts. The analysis of market structure in developed market economies has been based on relatively mature industries. Patterns of change in such industries are likely to be different from those in dynamic and fast growing industries in transitional economies. Against this setting, we show that changes in market structure that appear sluggish may mask acute but offsetting changes in constituent economic processes. This follows from a decomposition of market concentration *change* into two components – one due to turbulence (mobility of firms' market shares) and another due to the relationship between initial market share and its change. Our decomposition extends an earlier one by Davies and Geroski (1997), and pins down the joint evolution of market share turbulence and market share-growth for a full distribution indicator of concentration – the Hirschman Herfindahl Index.

Our analysis engages with the tension between the Chandlerian (market leadership tends to persist) and the Schumpeterian (leadership is transient) positions that has been noted by Sutton (2006) in his analysis of the persistence of leadership. These divergent forces are drivers of market structure

dynamics '… Changes in concentration occur slowly with high or low levels of concentration persisting for relatively long periods of time. On the other hand, …[it is common to find]… large changes of shares … sometimes occur over short periods of time among the group of leading firms.'' (Davies and Geroski, 1997, p.383). The intuition is obvious: when market shares of firms change, some of the changes offset each other in the calculation of concentration, for example, if firms trade places in share rankings. This will leave market concentration unchanged in spite of significant mobility within the industry. Which aspect captures the true picture of competitive rivalry?[1]

Liberalisation episodes, when competitive rivalry increases, are suitable contexts to revisit this question. Using data from an interesting period in India, we use a simple decomposition to examine how changes in market concentration were determined: on the one hand, by market share turbulence, and on the other, by the degree to which large (or small) firms gained market shares systematically. We examine these distinct elements of market structure change in the context of two reform episodes. The first, dated 1985-86, involved limited domestic reforms. In contrast, the reforms of 1991 were far reaching and encompassed substantial opening up to the international economy. We look at the growth market shares of medium and large firms in a set of 83 manufacturing industries (SIC 3 digit level) over the period 1981 to 1997, and examine the impact of the different types of shocks to the business environment in 1985-86 and 1991.

The main features of the two phases of liberalisation 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. 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 1980s 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 control over 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 trimming the regulatory system in an effort to rejuvenate industry. These reforms, collectively termed the New Economic Plan, and characterised as liberalisation by stealth, eased entry and expansion of incumbent firms by removing licence requirements over 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 the 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". (Government of India, 1985-86; Srivastava, 1996). While these initiatives increased the freedom of incumbent firms to expand, they were less effective in encouraging entry. We might expect freer play of rivalry among incumbents in the period following these reforms. It is likely that among the incumbents, the smaller benefited more from the removal of many restraints.

The second phase of reforms, which was part of the substantial structural adjustment programme of 1991, was more radical. New industrial policy lifted the rules of investment licensing. Restrictions on expansion by monopoly houses were relaxed, rules of foreign investment relaxed, and sectors reserved for the public sector were thrown open to private sector entry and competition.[2] Procedures for foreign direct investment were simplified and trade tariffs reduced. The maximum import tariff was reduced to 40 percent from 340 percent. Quantitative restrictions were eliminated for capital and intermediate goods. The substantial thrust of 1991 reforms was to expose incumbent firms to greater domestic as well as international competition. Again, one might expect to see an increase in rivalry in the period following these reforms. Larger firms with their greater resources were arguably better placed to respond to the fiercer competition with a range of investments.

The relative strengths of the reform episodes of the mid Eighties and the Nineties and the difference they created in terms of economic growth has been debated. Panagariya (2004) taking issue with

DeLong (2004) concludes that the former were "limited in scope and without a clear roadmap", but they laid the basis for the reforms in the 1990s which were "more systematic and systemic".

2.2 Literature

Cross industry studies of changes in market concentration in the traditional industrial organisation framework seek explanations in terms of other industry-level behaviour and performance variables (Scherer and Ross, 1990). In this paper, our extension to this approach takes the form of decomposing the change in market concentration into components, in order to consider the way each of these components change with policy. We describe the decomposition (extending Davies and Geroski, 1997) in the next section.

The somewhat hesitant mid 1980s liberalisation has not come under much scrutiny.[3] Srivastava (1996) and Chand and Sen (2002), focus on productivity: firms increased their use of imported raw materials, and labour productivity and capital intensity increased. Srivastava (1996) reports clear evidence of reallocation of resources at the sectoral level[4]; Chand and Sen (2002) find significant increase in total factor productivity growth.

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 were vigorous in attempts to restructure and consolidate in chosen areas. Patibandla (2002), in turn, argues that domestic firms clearly needed to improve organisational and technical efficiency to survive, while MNEs needed to invest in building local distribution networks. Chandra and Sastry (1998) report the results of a survey that found firms making significant attempts to upgrade manufacturing capability. More firms came to rely on imported technology, and a larger number of firms 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 these 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 quantitative analysis of corporate responses to liberalisation identified by their case studies is the need to allow for lags for the process to show results.

Ghemawat and Kennedy (1998) examine the market structure impact of sudden and simultaneous liberalisation in Poland along many fronts - the "big bang" of 1 January, 1990, including foreign trade, FDI, prices, and regulations relating to entry, exit and factor markets.. They highlight the disequilibrium dynamics: the need to note distortions in pre-shock structure and the lags in adjustment to new equilibrium after the reforms. Drawing on Sutton (1991, 1998) they explain the de-concentration of many markets in response to competitive shocks as an adjustment from an initial disequilibrium to new equilibrium levels. Sutton's bounds approach 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

The Demsetzian view (Demsetz, 1974) that the growth and performance of efficient firms is the proximate cause of increases in market concentration could be extended to the context of liberalisation: efficient firms may grow faster under liberalisation, particularly in industries characterised by economies of scale, with this growth further increasing efficiency and capability. The implication is that industries marked by economies of scale will see higher levels of concentration relative to those without economies of scale. On the other hand, Patibandla (1998) found that small and medium scale firms were more efficient than large firms in the pre-reform period with their growth constrained only by capital market imperfections and market transaction costs. This suggests that if reforms reduce transaction costs and capital market imperfections, we might expect efficient small firms to have increasingly contested the market positions of inefficient large firms and to have grown on the strength of their higher production efficiency. On the other hand, if small firms faced greater difficulty in obtaining external finance, as has been argued on the basis of the decline in the share of bank credit to small scale industry, then liberalisation may not have aided the growth of small firms. The net effect is uncertain.

It is also important to note that the structural shock of liberalisation is accompanied by the usual random shocks in the market environment at the firm, industry and economy-wide levels. Observed patterns in the evolution of market shares will therefore reflect the reactions of firms to random as well as structural shocks. A framework that pins down both these aspects of structural change - market

share turbulence and the way growth is related to size – would therefore be useful. It 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".

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 market share denoted by s. For firm i, change in share 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, $f(s_t)$, 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:[5]

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

The third term in the RHS of (1), henceforth called share-growth (SGRT), is a measure of the linear association between initial market share and change in market share. This 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. This term relates to the hypothesis presented as Gibrat's Law, reviewed in Sutton (1997). If the share-growth relationship is positive and high, then of course Gibrat's Law is rejected and concentration will increase. If it is small enough or negative, small firms will have, on average, gained relative to large, and concentration will decrease.[6]

The second term in the RHS of (1), $\sum_i \Delta s_{it}^2$, is a measure of mobility (MOB) - market share turbulence. MOB is a measure of gross change in market shares, and picks up both increases and decreases in market shares (Cable, 1997).[7] This concept of mobility differs from the notion that Sutton(1997) describes as turbulence.

$$\Delta H(\mathbf{s}_{t-1,t}) \equiv MOB(\mathbf{s}_{t-1,t}) + SGRT(\mathbf{s}_{t-1,t}). \qquad (2)$$

The above identity decomposes the change in concentration into a systematic share growth component, and another, total intra-distributional mobility component. The second component, marking increased turbulence, ipso-facto increases concentration. If concentration is seen to decline, that will be because smaller firms are the gainers in the reallocation of market shares. Concentration can increase because the growth rate of smaller firms, in relation to that of large, is not sufficiently high.

The decomposition is a novel one, though it is straightforward and reminiscent of similar ones in Cable (1997) and Davies and Geroski (1997). The Davies and Geroski decomposition was itself derived from Weiss (1965) where the concentration measure being decomposed is the concentration ratio and is seen as composed of the sum of market share changes of surviving firms, the joint market shares of entrants into the top 5 in year t+1 minus the joint market shares of those who exit out of the top 5 in year t+1.

3.2 Conjectures on market structure dynamics

In a liberalised environment, the market selection process will work upon differentials in the abilities of firms to pick up and exploit market opportunities, while withstanding competition. If the efficient and capable firms are the small ones, we would expect that market share movement takes the form of small firms (entering, and) gaining share relative to large, and therefore we should see a reduction in concentration. If the efficient and capable firms are the large ones we would expect large firms to increase their market shares, and we should see increased concentration. When the dust settles, technology and economies of scale will be the decisive determinants of long run market concentration.

When liberalisation opens up the scope of firm choice (to enter, to compete with others in the market, to exit), the response of potential entrants and incumbents could be increased investment, R&D,

advertisement, marketing, import or export activity, in various combinations. The heightened tempo of competition is likely to make market shares more turbulent. Turbulence, ipso-facto, increases concentration,[8] but is an indicator of competitive rivalry, and so this component of the change in concentration indicates a positive development. At the same time, in each industry, technology and scale economies will determine whether small firms or large will gain relative advantage in the longer run. The overall result might be a unruly process whereby the industry moves from some (relatively stable) pre-liberalisation market concentration level, to the equilibrium market structure in the new environment. The pre-liberalisation configuration is, in general, a disequilibrium, based on the command and control aspects of the industrial 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 are likely to 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 general, smaller firms are likely to have gained market share after the reforms of 1985-1986,, especially if they had previously been held back from the scales of best practise technology.

There was significant de-novo entry into Indian industry after the 1991 liberalisation, particularly by MNCs with superior technologies compared to local firms (Patibandla, 2002). 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 after a sudden and sharp increase in the toughness of competition there could be an increase in concentration caused by a shake out of the laggards. The dataset available to us includes entrants and MNC firms but does not allow the analysis of their separate effects (see section 4). In the more fiercely competitive climate, larger firms will have been better placed than before to upgrade their technologies, escalating exogenous and endogenous sunk cost investments.

In summary, liberalisation drives the component processes that add up to market concentration *change* (intra-industry mobility and share-related growth). In each industry, the market share volatility may

initially cloud structural, systematic growth responses, of small and large firms. To understand the change in market structure we need to disentangle these two effects and assess their separate dynamics.

4. Data

The data used in this paper are from 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 larger industrial houses, but are legally separate entities, independent in their day-to-day operations. These companies are classified into 83 three-digit industries based on majority (> 50%) output[9].

The main limitation of this dataset is that it relates only to large and medium companies. However, although full coverage across the size spectrum would have made for more accurate measurements, it must be noted that concentration measures such as the Hirschman-Herfindahl Index give larger firms more than proportionate weight. Addition of even a large number of small firms would not affect the index or its change. Nevertheless, with our focus on assessing the relative magnitudes of the real economic processes that underlie changes in market concentration, in domestic as against comprehensive liberalisation, our results can should only be considered illustrative.

On the positive side, this dataset is unique in spanning a long period, from before the reforms, through both reform episodes. This makes it possible for us to analyse the interval from 1981 through 1997. No other dataset of Indian firms is of comparable span, accuracy and coverage for this interesting period in Indian economic history.

The RBI data comes from a purposive sample designed to represent the corporate sector (public limited companies) in terms of industry groups and firm size. Relative to the public limited company population, the sample coverage is high. The companies in the sample accounted for over 60% of the total paid-up capital of Indian public limited companies in each year. On average there were 23 firms per industry per year, ranging from a maximum of 132 firms to a minimum of a single firm.

In general, sample sizes have increased over the years. The sampling rule used by the Reserve Bank of India is to retain companies in the sample if they have been included in the previous year. Nearly 75 %

of companies in the sample in any year were in the sample in the previous year as well. To illustrate, according to the RBI Bulletins of November 1992 and 1993, there were 1647 companies in common between the 2131 companies in the 1990-91 sample and 1908 companies in 1987-88 sample[10].

Firms can fall out of the panel for three reasons. They may not be sampled; they may fail to meet the size requirements; and they may fail to submit their returns to the RBI. Analogously, firms can enter the dataset because they have just reached the size threshold, because they have begun to submit their returns or because they have newly entered the industry. Given this, it is not possible to distinguish "births" and "deaths" from the changing sample composition. This is one clear limitation of the data available[11] and must be taken into account in interpreting our results. It is possible that if acquirers from outside the industry take over firms within the industry, SGRT (share-growth) would fall and MOB (mobility) rise. On the other hand, intra-industry M&A activity might raise both SGRT and MOB.

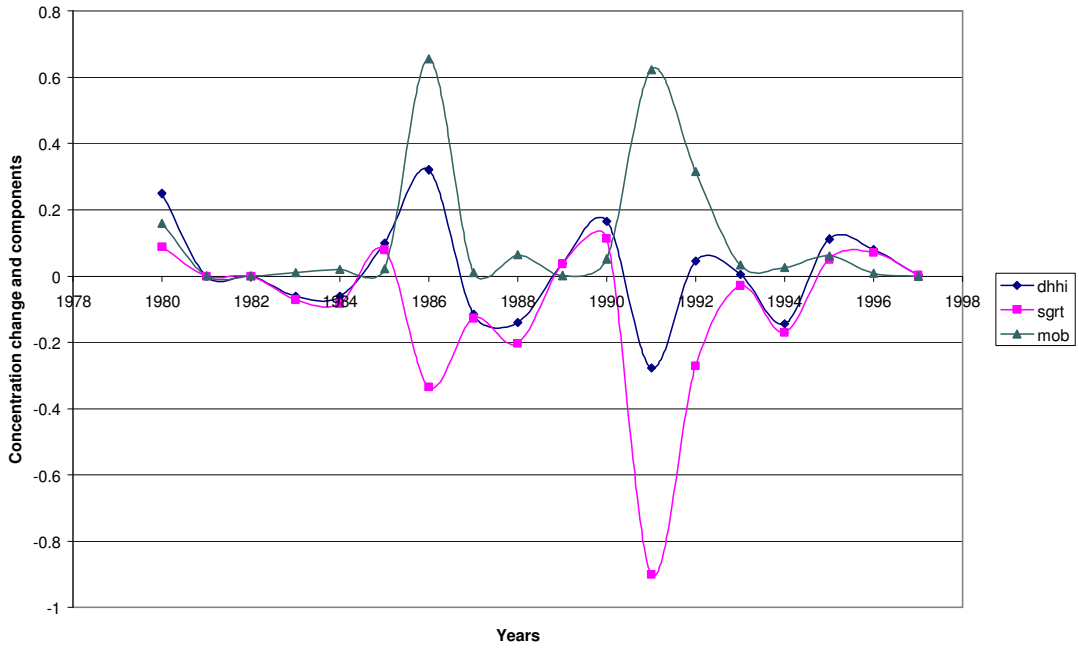
Both SGRT and MOB involve *changes* in market shares. In order to compute these indices we built a series comprising of two-year rolling panels of firms from the data for every pair of consecutive years. SGRT and MOB are based on shares of firms that are in the sample for both the years. The mechanics of building the panel was as follows: If a firm enters the data set in year t+1, and remains in it in years t+2, t+3 but is not in the data set subsequently, then that firm would be in the panels for (t+1,t+2) and {t+2,t+3}, but not in the panel for {t,t+1} or {t+3,t+4}. Creating a balanced panel across the entire 15 year period would have led to much larger degree of sample attrition and would have excluded all new entrants. The rolling panels enable us to make better use of the RBI data than if a balanced panel were used.

Our independent variables are generally measured in levels. To reduce endogeneity, we use lagged values for these variables as appropriate. For each of the industry specific explanatory variables, we used annual median values across all firms in the industry from the first years of the relevant two-year panel. The resulting panel of median values constitutes our data on explanatory variables. Mean values are affected to a greater extent by outliers, and attempts to correct for this by excluding outliers run into arbitrariness in the rule for such exclusion. It is worth noting that the correlation coefficients between the mean and the median of the three dependant variables, HHI, SGRT and MOB were 0.74, 0.85 and 0.84 respectively.

Table A1 in the appendix presents summary statistics for the variables of interest. The reported values are annual means, medians and standard deviations over industries, of median firm values for each industry and each year. The changes in the share-growth component (SGRT) and the mobility (MOB) component are high relative to the change in concentration (ΔHHI). After the reforms of 1985 MOB rose and SGRT declined (small firms began to gain share) in a noisy manner. The 1991 reforms did not see immediate responses, but the general trend since then was for MOB to decline and SGRT to rise - indicating market share gains of larger firms.

Exports and advertising picked up in both liberalisation phases, over and above a general upward trend. Capital sales ratio spiked with a lag in both reform phases. Notably, R&D to sales ratio increased sharply only after the comprehensive liberalisation.

Figure 1: Concentration change, Size-Growth and Mobility: Printing Industry

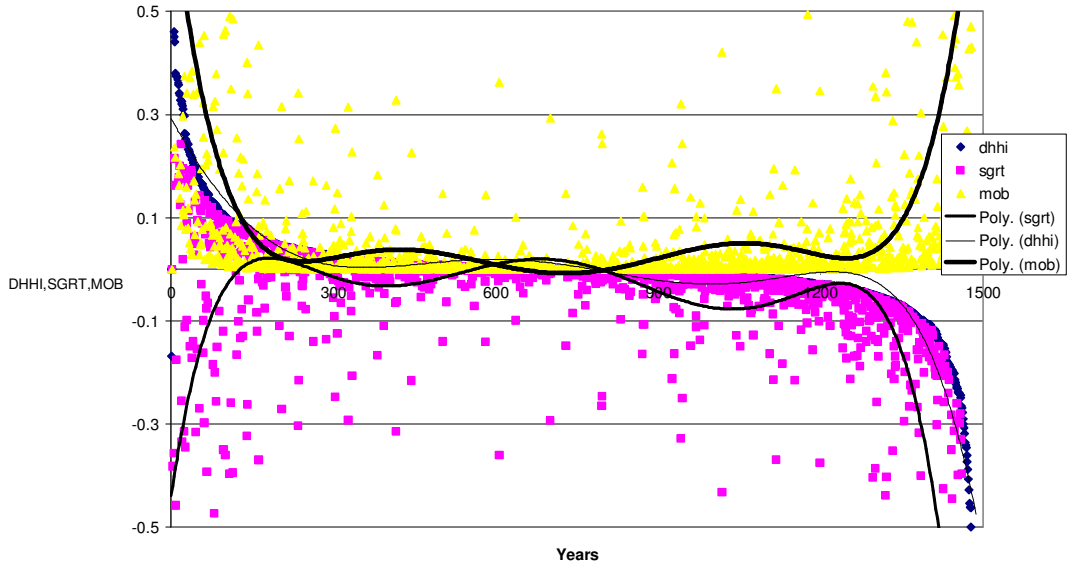


Before turning to our estimates, it is useful to examine any one example of the dynamics of market structure in a specific industry. Figure 1 is for the printing industry and illustrates the way in which the underlying processes, (SGRT and MOB) responded to the different liberalisation episodes. The immediate effect of partial and domestic liberalisation was a sharp rise in mobility (MOB) with small firms growing relative to large - SGRT dropped. In the years that followed, mobility came down again, and larger firms began gaining over small. With comprehensive liberalisation, again MOB shot

up while SGRT dropped immediately, to recover relatively quickly. These are summary statistics with no controls applied. What is worth noting in both cases is that SGRT and MOB tended to offset each other, leading to lower visible change in market structure itself.

The tendency of components of concentration change to offset each other is illustrated in more general terms in figure 2. We have plotted all industry-year data points for SGRT, MOB and ΔHHI, ordered descending according to ΔHHI, irrespective of industry or year. The scatters are summarised by simple polynomial trends. 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

Market structure models recognise structural, behavioural and performance-related drivers of market structure. The standard method is to estimate the model for concentration including the explanatory variables of all these classes of variables. We depart from this approach in modelling the determinants of the components of concentration change to see if this adds to our understanding of why (and how) concentration changes. This is based on the identity in (2).

The economic and technological drivers can then be seen as affecting concentration through their effects on market share mobility on the one hand and share growth on the other.[12] The explanatory variables in the econometric model fall into three classes: the standard Industrial Organisation variables, the variables reflecting dynamics and variables reflecting endogenous sunk costs.

5.1 The Standard Model

Our explanatory variables include:

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

PROFIT: The return on sales measures profitability, which is both determined by market structure and, in turn, determines market structure. While it could be argued that an industry with above average profit will see more entry and growth of smaller firms (increasing MOB and decreasing SGRT), arguments attributed to the Chicago school challenge this.

EXPSR: The ratio of exports to sales, can feed back to domestic market shares, through learning and good practice, as well as through the scale of operation. In their quest for scale, smaller firms may be better placed to benefit in terms of leveraging exports to gain domestic market shares.

GROWTH: Growth of market size is measured as change in industry output between two years. In growing markets incumbents will find it difficult to occupy all the niches, allowing new entry to occur and therefore increasing MOB. The effect on concentration will depend upon how agile small firms are in filling the niches that arise.

The explanatory variables are annual median values across all firms in the industry for the year.

5.2 Escalation of Endogenous Sunk Costs

Sutton (1991, 1998) has argued that an increase in the toughness of competition prompts firms to competitively escalate endogenous sunk cost investment programmes, to move up the quality ladder. In industries where advertising and R&D are important, the essence of market selection will be that some firms will be more effective in deploying these strategies.

ASR We expect to see higher average values of advertising intensity (measured by advertising-sales ratio) following liberalisation and a larger impact of this on share-growth.

RDSR: R&D-sales ratio, captures R&D intensity of the industry. We expect to see higher average values of R&D intensity and a greater impact on share-growth after the reforms.

The endogeneity of independent variables is a potential problem in models involving firm behaviour and performance. Thus, while profitability may influence investment by firms in an industry, this will in turn influence market shares of firms and thus influence profitability. The same would be true of advertising and exports too. We lag our right hand side variables (Driffield and Kambhampati, 2003; Kambhampati and Parikh, 2005). Past profitability may influence current market structure - it takes time for firms to respond to excess profits and enter the industry. This feature should hold true for a number of variables in the structure-profits relationship and we have therefore lagged exports, advertising and R&D.

5.3 Dynamics

The set of observable explanatory variables we are able to employ may not capture all firm level responses to liberalisation. To sweep up omitted effects we use dummy variables that mark out policy regime shifts. We interact these dummy variables with trends to pick up trend breaks due to domestic and comprehensive reforms. We also allow the regime dummy variables to interact with the other investment / behavioural variables to capture how, if at all, they had different impacts after the liberalisation. Thus, we have:

D86: 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 0 before 1991, and 1 for the years including and following 1991.

Interactions of D86 and D91 with trends and with other explanatory variables. Coefficients on the interacted variables, ASR*D86 and ASR*D91. capture liberalisation induced shifts in the impact of advertising intensity and likewise those on RDSR*D86 and RDSR*D91 for R&D intensity.

6. Results

We estimate separate models for SGRT and MOB to understand the basis for changes in concentration. Our data form an industry level panel built from firm level micro-data. We estimate both random and fixed effects models. The Hausman test indicates that the fixed effects specification dominates in almost all cases. The year effects are significant, and the models presented have two-way error components.

6.1 Estimates

Among the standard drivers of market structure, industry profit margins (PROFIT) are seen to have induced larger firms to grow relative to smaller firms, and at the same time, to have decreased market share mobility. Advertising (ASR) boosted the growth of smaller firms, and increased market share mobility, while research and development (R&D) helped 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 - share growth, market share turbulence and in market concentration. Over the whole period, share growth relationship (SGRT) 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 (MOB). This decline in mobility offset the increase in share growth in determining market concentration, which in turn, shows a very small, but statistically significant, negative trend.

Table 1: Full Model Estimates

	HHI		MOB		SGRT	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DEPVAR(L)	0.451***	18.78	-0.026	-0.87	-0.064**	-2.07
TREND	-0.007**	-2.31	-0.027***	-3.84	0.033***	4.124
GROWTH	0.001	0.542	-0.001	-0.17	0	0.017
PROFIT(L)	-0.062	-1.52	-0.192**	-2	0.285**	2.579
KSR	-0.005	-0.49	0.004	0.161	0.011	0.42
EXPSR(L)	0.014	0.103	0.153	0.477	-0.068	-0.18
ASR(L)	0.02*	1.79	0.089**	3.329	-0.097***	-3.16
RDSR(L)	-0.343**	-2.7	-0.651**	-2.19	0.977**	2.851
D86	0.074*	1.665	-0.19*	-1.82	0.111	0.924
TREND*D86	-0.004	-0.71	0.035**	2.878	-0.031**	-2.24
GRO*D86	-0.011	-1.33	-0.031*	-1.67	0.024	1.138
PFT(L)*D86	-0.058	-1.38	0.045	0.457	0.065	0.576
KSR*D86	0.01	0.971	-0.015	-0.66	-0.004	-0.13
EXPSR(L)*D86	-0.125	-0.87	-0.323	-0.96	0.309	0.795
ASR(L)*D86	0.001	0.049	-0.078**	-2.11	0.07*	1.649
RDSR(L)*D86	0.311	0.959	-0.987	-1.31	1.36	1.566
D91	-0.112**	-2.28	0.338**	2.961	-0.226*	-1.72
TREND*D91	0.011**	2.401	-0.024**	-2.22	0.014	1.147
GROWTH*D91	0.008	1.092	0.035*	1.967	-0.027	-1.33
PROFIT(L)*D91	0.056	1.541	-0.094	-1.1	0.003	0.026
KSR*D91	-0.013	-1.18	0	0.018	0.007	0.232
EXPSR(L)*D91	0.004	0.05	0.051	0.25	-0.105	-0.44
ASR(L)*D91	0.012	0.884	-0.015	-0.46	0.014	0.378
RDSR(L)*D91	0.007	0.022	1.808**	2.334	-2.513**	-2.82
Log L	1227.4		347.5		163.4	
Chi-Sq (b=0)	2372.7		412.2		359.3	
Hausman	259.0		114.2		113.1	
R2	0.84		0.27		0.24	
Adj R2	0.83		0.21		0.17	
F	275.0		4.1		3.5	

Note: (L) indicates that the variables are lagged once.

Table 2: Restricted Model Estimates

	HHI		MOB		SGRT	
Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
DEPVAR(L)	0.457***	19.12	-0.02	-0.69	-0.053*	-1.8
TREND	-0.006**	-2.08	-0.026**	-3.7	0.031**	3.9
D86	0.049	1.125	-0.214**	-2.15	0.187	1.625
TREND*D86	-0.002	-0.46	0.034**	2.874	-0.034**	-2.49
D91	-0.081**	-1.66	0.326**	2.929	-0.277**	-2.15
TREND*D91	0.009**	1.922	-0.024**	-2.3	0.019	1.581
Log L	1411.0		325.1		135.2	
Chi-Sq (b=0)	2739.4		367.5		302.9	
Hausman	245.3		106.7		101.6	
R2	0.88		0.25		0.21	
Adj R2	0.87		0.19		0.15	
F	96.4		4.4		3.5	

Table 1 indicates that the 1985 liberalisation (D86*TREND) reversed the trend increase in share growth (SGRT) almost entirely - smaller firms gained in relative terms over the domestic liberalisation period. This was despite capital market imperfections that remained. A part of the explanation may lie in that very large firms (governed by monopolies legislation) were not permitted to expand capacities during this round of liberalisation, while relatively smaller ones had greater freedom to do so. [13] There was a rise in the level of market share turbulence (MOB) as expected, in the domestic liberalisation period. Amongst behavioural variables – advertising intensity benefited larger firms after 1986, and MOB declined in advertising intensive industries.

The period after the 1991 liberalisation did not see any significant trend change in SGRT, after an initial step down. MOB stepped up in 1991, and from a higher point, declined in trend. Amongst behavioural variables, the effect of R&D intensity is particularly notable - significant and substantial coefficients post 1991, suggest that R&D intensity benefited small firms after comprehensive liberalisation, and MOB increased in R&D intensive industries.

There is no question that liberalisation tends to increase the importance of vertical product differentiation. Firms have greater incentive to invest in advertising and/or R&D in order to enhance consumers' willingness to pay, as these types of investments offer routes to sustainably competitive advantages. The scramble in responding to new opportunities tends to increases market turbulence, but advantages of small firms vs. large firms in the new environment will be reflected

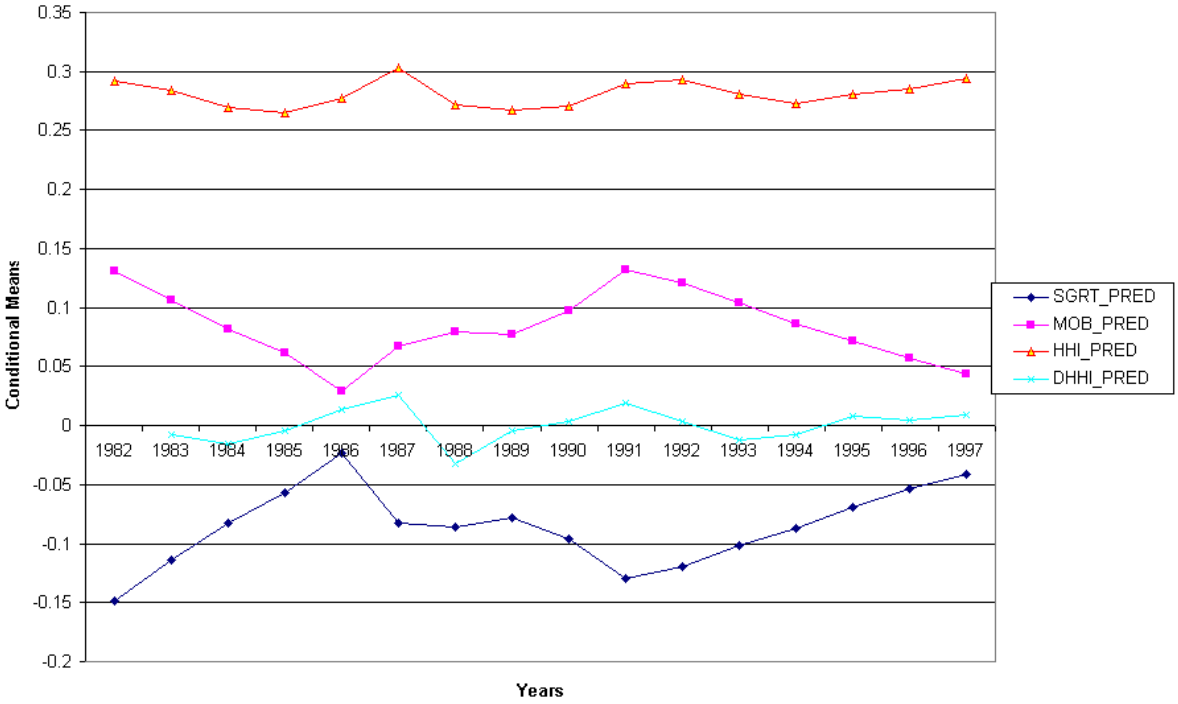
in the estimates of the SGRT equation.. It is interesting that under domestic liberalisation larger firms gained in industries that were advertising intensive, while under comprehensive liberalisation smaller firms gained in R&D intensive industries.

It is also 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. The regime shift (categorical) variables were always significant. We re-estimated the models including only these variables – see Table 2 This allows us to test whether the regime shift variables are sufficient to fully describe concentration change in industry. The likelihood ratio test rejected this for all 3 equations (SGRT, MOB and HHI) - standard IO variables do contribute to the explanation, but in a limited way. The significance and predictive power of the reform dummies and trend breaks suggest that the effects of unobserved variables, captured this way, was greater than the effects of the observed IO drivers of market structure. We interpret this to mean that liberalising reforms have an enabling impact that goes beyond the changes in rules and regulations that relate to readily observed aspects of firms' choices and behaviour. The unobservables in multi-faceted structural reform processes may be more powerful than the traditional IO variables, which all too often are the exclusive focus of empirical analysis of concentration. Efforts to try and tease out richer detail among the many elements of reform and their impact would be worthwhile.

7. Conclusions

To depict an overall summary we computed the predicted conditional mean values using coefficients in Table 1. Figure 3 presents predicted SGRT and MOB, and compares them with the change in HHI that arises from these predictions. SGRT and MOB 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 concluded 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 in India. The directions of SGRT and MOB were reversed in the domestic liberalisation phase after 1985 - SGRT began to drop and MOB to rise; suggesting that smaller firms were more able to respond to opportunities in an environment that was partially protected. These trends were reversed again in the comprehensive liberalisation phase after 1991: SGRT rose and MOB fell, suggesting that larger firms fared better than the smaller in the more competitive and turbulent environment of the 1990s. These findings point to the value of a shift in methodology in market structure studies towards a consideration of the constituent elements of changes in concentration with richer, full distribution data sets.

Appendices

Table A1: Summary Statistics by year								
Mean								
Year	**HHI**	**SGRT**	**MOB**	**PROFIT**	**KSR**	**EXPSR**	**ASR**	**RDSR**
1982	0.300	-0.145	0.127	0.304	0.676	0.014	0.219	0.013
1983	0.282	-0.114	0.117	0.290	0.670	0.012	0.147	0.007
1984	0.290	-0.120	0.101	0.300	0.714	0.011	0.186	0.003
1985	0.271	-0.025	0.025	0.298	0.725	0.015	0.138	0.003
1986	0.277	-0.023	0.038	0.303	0.749	0.018	0.139	0.004
1987	0.294	-0.076	0.072	0.300	0.765	0.016	0.134	0.002
1988	0.305	-0.162	0.119	0.315	0.800	0.012	0.206	0.001
1989	0.265	-0.002	0.004	0.272	1.298	0.015	0.218	0.000
1990	0.266	-0.125	0.135	0.320	0.963	0.015	0.194	0.001
1991	0.277	-0.101	0.113	0.325	0.668	0.018	0.199	0.032
1992	0.298	-0.145	0.139	0.335	0.632	0.028	0.214	0.039
1993	0.295	-0.079	0.066	0.331	0.693	0.029	0.304	0.040
1994	0.291	-0.127	0.116	0.340	0.665	0.030	0.361	0.040
1995	0.279	-0.133	0.130	0.327	0.681	0.031	0.287	0.033
1996	0.292	-0.022	0.021	0.326	1.972	0.022	0.645	0.028
1997	0.290	-0.020	0.030	0.339	0.850	0.024	0.302	0.031
Median								
1982	0.219	-0.020	0.013	0.260	0.514	0.000	0.030	0.000
1983	0.199	-0.030	0.023	0.264	0.518	0.000	0.017	0.000
1984	0.191	-0.015	0.009	0.271	0.553	0.000	0.021	0.000
1985	0.184	-0.005	0.006	0.264	0.607	0.000	0.026	0.000
1986	0.189	-0.003	0.005	0.274	0.604	0.000	0.035	0.000
1987	0.214	-0.024	0.011	0.273	0.641	0.000	0.024	0.000
1988	0.203	-0.036	0.020	0.282	0.660	0.000	0.047	0.000
1989	0.177	-0.002	0.001	0.269	0.630	0.000	0.039	0.000
1990	0.175	-0.015	0.032	0.280	0.594	0.000	0.044	0.000

Median								
Year	**HHI**	**SGRT**	**MOB**	**PROFIT**	**KSR**	**EXPSR**	**ASR**	**RDSR**
1991	0.219	-0.026	0.022	0.295	0.551	0.000	0.042	0.000
1992	0.225	-0.025	0.037	0.303	0.536	0.000	0.044	0.000
1993	0.220	-0.017	0.014	0.305	0.595	0.002	0.063	0.000
1994	0.207	-0.033	0.025	0.309	0.564	0.005	0.058	0.000
1995	0.209	-0.033	0.031	0.282	0.635	0.002	0.060	0.000
1996	0.218	-0.002	0.002	0.292	0.613	0.003	0.058	0.000
1997	0.221	-0.001	0.002	0.301	0.664	0.004	0.051	0.000
Standard Deviation								
Year	**HHI**	**SGRT**	**MOB**	**PROFIT**	**KSR**	**EXPSR**	**ASR**	**RDSR**
1982	0.254	0.378	0.353	0.175	0.609	0.031	0.517	0.059
1983	0.234	0.305	0.298	0.159	0.585	0.028	0.350	0.038
1984	0.239	0.323	0.279	0.150	0.594	0.052	0.463	0.020
1985	0.217	0.141	0.075	0.148	0.579	0.056	0.278	0.018
1986	0.234	0.101	0.089	0.147	0.625	0.074	0.304	0.026
1987	0.245	0.231	0.173	0.146	0.630	0.069	0.308	0.016
1988	0.259	0.363	0.279	0.154	0.627	0.041	0.478	0.010
1989	0.231	0.022	0.008	0.358	5.066	0.072	0.466	0.000
1990	0.233	0.327	0.248	0.164	2.523	0.062	0.448	0.007
1991	0.222	0.227	0.215	0.157	0.467	0.062	0.411	0.083
1992	0.247	0.348	0.252	0.164	0.380	0.102	0.561	0.081
1993	0.247	0.202	0.180	0.157	0.470	0.071	0.779	0.080
1994	0.246	0.253	0.255	0.164	0.425	0.067	1.025	0.092
1995	0.247	0.379	0.285	0.160	0.398	0.081	0.743	0.099
1996	0.251	0.129	0.109	0.171	11.592	0.045	3.473	0.073
1997	0.243	0.120	0.131	0.162	1.065	0.042	0.880	0.076

Table A2: List of Industries

Code	Industry Name	Code	Industry Name	Code	Industry Name
110	Tea Plantations	420	Aluminium	470	Matches
120	Coffee Plantations	430	Other non-ferrous metals (Basic)	490	Miscellaneous
130	Rubber Plantations	441	Automobile – vehicles	510	Mineral oils
190	Misc. Plantations	442	Automobile - Components etc..	521	Cement (hydraulic)
210	coal mining	443	Railway equipment	522	Asbestos & As. Cement prods
220	Metal Mining	444	Other Transport equipment	531	Structural clay products
230	Petroleum Mining	445	Cables	532	Pottery,china & earthenware
290	Other Mining	446	Dry Cells	541	Tyres and tubes
310	Grains & Pulses	447	Electric Lamps	542	Other rubber products
320	Edible oils	448	Other Electrical Machinery	551	Paper
331	Sugar	449	Machine Tools	552	Products of pulp & board
332	Other food products	450	Textile Machinery and parts	553	Wood products and furniture
341	Cigarette	451	Misc. Mechinery	561	Glass containers
342	Other tobacco	452	Steel tubes & pipes	562	Other Glass products
351	Cotton Textiles - Spg.	453	Steel Wire ropes	571	Printing
352	Cotton Textiles - Wvg.	454	Steel Forgings	572	Publishing
353	Cotton Textiles - Comp	455	Foundries and Engg. Workshops	573	Printing, Publishing etc.
354	Cotton Textiles - Others	456	Aluminium Ware	580	Plastic products
355	Jute Textiles	457	Other Ferrous / non-ferrous metal	589	Diversified
356	Silk & Rayon Textiles - Spinning.	461	Chemical Fertilisers	590	Miscellaneous
357	Silk & Rayon Textiles - Weaving.	462	Dyes & Dyestuff	610	Construction
358	Silk & Rayon Textiles – Composites	463	Man made fibres	620	Electricity generation and supply
359	Woolen Textiles	464	Plastic Raw materials	640	Trading
360	Ginning, pressing	465	Other basic industrial chemicals	650	Land & Estate
370	Breweries & Distilleries	466	Medicines & Pharma. Preps	660	Road Transport
380	Leather & Leather products	467	Paints, Varnishes etc.	670	Shipping
390	Miscellaneous	468	Other chemical products	680	Hotels, restaurants
410	Iron & Steel	469	Industrial & medical gases	690	Miscellaneous

Notes

[1] Davies and Geroski (1997) used a framework that combined market concentration and market share turbulence in order 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 (Cr_5).

[2] However, some sectors continued to be reserved for small-scale enterprises. The government accepted the need for redundancies, and began a process of withdrawal from involvement in employer-employee negotiations, but few significant steps were taken towards the removing exit barriers.

[3] On the growth results of reforms, see Joshi and Little (1994), Ahluwalia (2002), Srinivasan and Tendulkar (2003) and Desai (1990).

[4] 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.

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

[6] SGRT can be written in terms of the β coefficient of a cross-sectional mean reversion equation. Consider a linear cross sectional relationship $\Delta s_{it} = \alpha + \beta s_{it-1} + \varepsilon_i$ - 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. With the data on public companies, the distribution is less skewed than the case with all firms. Such a regression provides an estimate through the sign and magnitude of $\hat{\beta}$, of the degree of mean reversion (or its converse: larger firms grow at a higher rate) as the cross section evolves. The OLS estimate $\hat{\beta} = Cov(s_{it-1}, \Delta s_i)/V(s_{it-1})$, the last term in the RHS of the decomposition can be rewritten in terms of $\hat{\beta}$ as: $2\hat{\beta}V(s_{it-1}) + nE(s_{it-1})E(\Delta s_i)$. Alternatively this term can be written as: $2\hat{\beta}\sigma^2(s_{it-1}) + 1/n - H(\mathbf{s})$, or as $\rho\,\sigma(s_{it})\sigma(s_{it-1}) + 1/n - H(\mathbf{s})$ where ρ is the correlation coefficient between market shares at date t-1 and date t.

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

[8] Concentration, proxied variance of market shares can increase even when small firms grow faster, i.e., when $\beta < 1$, if $V(\varepsilon_{it})$ offsets the tendency: $V(s_{it}) = \beta^2 V(s_{it-1}) + V(\varepsilon_{it})$.

[9] The data set provides no information on the variety of products produced by a firm or on the degree of their diversification. 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. It looks likely that, though firms produce a number of different products, these products fall within the same industry group.

[10] Combined balance sheet analysis published by the RBI in 1993 (December Bulletin) and 1992 (November Bulletin).

[11] 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) pp. 599, 616 and 643.

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

[13] We are grateful to an anonymous referee for this explanation

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