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ABSTRACT

Reforms, Entry and Productivity: Some Evidence from the Indian Manufacturing Sector*

It is now stylized that, while the impact of ownership on firm productivity is unclear, product market competition can be expected to have a positive impact on productivity, thereby making entry (or contestability of markets) desirable. Traditional research in the context of entry has explored the strategic reactions of incumbent firms when threatened by the possibility of entry. However, following De Soto (1989), there has been increasing emphasis on regulatory and institutional factors governing entry rates, especially in the context of developing countries. Using 3-digit industry level data from India, for the 1984-97 period, we examine the phenomenon of entry in the Indian context. Our empirical results suggest that during the 1980s industry level factors largely explained variations in entry rates, but that, following the economic federalism brought about by the post-1991 reforms, variations entry rates during the 1990s were explained largely by state level institutional and legacy factors. We also find evidence to suggest that, in India, entry rates were positively associated with growth in total factor productivity.

JEL Classification: L11, L52, L64, L67, O14, O17

Keywords: entry, productivity, institutions, regulations, India, reforms

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1. Introduction

Private ownership of productive resources and competition are often considered to be the key determinants of total factor productivity and this, in turn, influences financial and operating performance of firms. However, evidence on the relationship between ownership and firm performance is mixed. Megginson, Nash and Randenborgh (1994) and D'Souza and Megginson (1999), for example, have found strong evidence of an improvement in financial and operating performance of firms subsequent to being privatized. On the other hand, in a number of contexts, this relationship turns out to be either weak or not evident at all (e.g., Sarkar, Sarkar and Bhaumik, 1998; Estrin and Rosevear, 1999; Demsetz and Villalogna, 2001). This is largely due to agency conflicts among the various stakeholders of the privately owned (in some cases, newly privatized) firms. In the context of the transition economies of Central and Eastern Europe and, of developing countries in other parts of the world, some of these agency conflicts may arise on account of paucity of appropriate institutions, e.g., a legal framework that allows enforcement of contracts at a reasonably low cost.

The failure of private ownership to emerge as a panacea for low productivity in particular and, bad firm performance in general, has brought the focus firmly back on competition. Nickell (1996) argued that competition does indeed enhance firm performance, and Pilat (1996) concluded that there is a positive relationship between productivity in OECD countries and the extent to which their manufacturing firms face domestic and international competition. The link between competition and productivity growth, or even firm performance, is not necessarily universal, though. Blanchflower and Machin (1996), for example, concluded that the impact of competition on productivity might be context specific; competition raised productivity in Australia but failed to do so in the United Kingdom. However, it is now fairly stylized that competition is a desirable characteristic of a market because it encourages innovation and leads to improvement in the both the production and x- efficiencies of an average firm in an industry (Geroski, 1995; Stennek, 2000).

It is generally accepted that the degree of competition in a market is directly proportional to its contestability, i.e., on the ease with which new firms can enter the market to compete with the incumbent firms. Even though the new entrants may themselves be very heterogeneous with respect to productivity and efficiency (e.g., Aw,

Chen and Roberts, 2001), the more efficient of these entrants induce the incumbent firms to innovate so as to enhance or, at the very least retain high levels of productivity and efficiency. As such, innovation is greater in competitive markets than in non-competitive markets (Jovanovic and Lach, 1989). The firms that are unable to increase their efficiency levels through innovation, or are unable to retain high initial levels of efficiency, are forced to leave the market (Liu, 1993), thereby raising the average plant or firm level productivity (or efficiency) of the industry. Baldwin and Gorecki (1991) found that entry accounted for about 24 per cent of productivity growth in a typical Canadian industry.

Not surprisingly, therefore, the process of entry and exit and the barriers thereof have attracted a fair amount of attention. The early literature focussed on industry characteristics like the growth of profit or turnover, and on the strategic aspects of the behavior of the incumbents who have an obvious incentive to keep potential competitors out of the market. However, as highlighted by Geroski (1995), it has proved difficult to explain entry rates using conventional measures of profitability (of incumbent firms) and entry barriers. This led to rethinking about the drivers of entry, and the path-breaking study by De Soto (1989) brought to the fore the fact that institutional factors might explain net entry rates much better than industry-level and strategic factors, especially in the context of developing economies. This has triggered a literature that aims to identify the nature of impact of institutional factors on entry rates.

However, to the extent that we are interested in "entry" as a manifested outcome of liberal economic policies, one that subsequently has an impact on growth of productivity, its connotation may depend significantly on the context in which it is discussed. For a mature market economy where the observed output levels, input-output mix etc of the incumbent firms are an outcome of their optimization exercises, the *status quo* can change, leading to greater competition, only if new firms enter, or credibly threaten to enter. In a controlled economy, however, a variety of factors prevent incumbent firms themselves to operate an at output level, or with input-output mixes that are optimal. For example, prior to the 1990s, the Monopoly and Restrictive Trade Practices (MRTP) Act in India prevented incumbent firms from increasing productive capacity beyond a certain size, even if the long run optimal level of output of these firms lay beyond this threshold size. In such a context, adoption of liberal economic

policies may lead to greater competition by way of changes in the output levels and input-output mix of the incumbent firms themselves, even if new firms *per se* do not enter the product market. Indeed, in the context of a large country with significant inter-regional differences, cross-regional "entry" rates may also reflect relocation of industrial units from regions of mis-governance to regions that are better governed.

In a developing country, therefore, we can view "entry" as a phenomenon involving not only entry of a new firm with one or more new production units, but also the process of expansion of incumbent firms by way of establishment of additional production units.[1] In addition, in such a country, where local conditions and institutions might vary significantly across regions, "entry" as a phenomenon may have a spatial dimension. We will address these issues in more detail later in this paper, in the context of a discussion about the data and the empirical strategy adopted for our analysis.

In this paper, we use 3-digit industry level data from India, a developing economy that has experienced significant economic reforms since the mid 1980s, to explain inter-industry and spatial variation in entry. We then examine the possible impact of entry on growth of total factor productivity (tfp) in the manufacturing sector. Our results suggest that during the 1980s, entry was influenced mostly by industry-level factors like growth. By contrast, in the 1990s, state level factors like availability of skilled labor and accountability of the state government to the electorate emerged as the most important determinants of net entry rates. In addition, variations in entry across industries and states in the post-1991 period were largely explained by unobserved state-level factors, thereby highlighting the importance of institutional factors and governance in an era of economic federalism. Finally, we find evidence to suggest that entry and tfp growth in the Indian manufacturing sector are positively correlated.

The rest of the paper is organised as follows: In Section 2, we briefly discuss the literature on the determinants of entry and exit. The regulatory and institutional aspects of India are discussed in Section 3. In Section 4, we develop the empirical specification that is used for the subsequent analysis. The data are discussed in Section 5. Section 6

[1] By the same token, "exit" would comprise not only closure of entire firms, but also of *some* productive units of *some* of the firms.

reports the regression results. The relationship between (net) entry and tfp is explored in Section 7. Finally, Section 8 concludes.

2. A brief survey of literature

The theoretical literature on the determinants of entry rates largely addresses the question as to how incumbent firms react to entry and threats of entry. Eaton and Lipsey (1980), for example, argue that if capital is product specific and has to be replaced after a finite time period then an incumbent firm would be forced to take into consideration the threat of entry. This is easily explained: Suppose that the incumbent firm is a natural monopolist that has to replace product-specific capital every T years. During the T^{th} year, however, a new firm can buy the product-specific capital just a little ahead of the incumbent firm and become the monopolist for the next T years. A rational incumbent would know this, and would therefore try to pre-empt the entrant by replacing the capital during year T-i. But then a rational entrant would know this, and would, in turn, try to pre-empt the incumbent by buying the capital in year T-j, where j is greater than i. Hence, the incumbent firm would be forced to think of alternative strategies to keep the potential entrant out of the market in each time period t. The incentive of the incumbent firm to deter entry would be even greater if, as argued by Seabright (1996), entry by one firm facilitates the entry of many others by reducing the ability of the incumbent to produce at a low cost.

It is evident that in Eaton and Lipsey's framework, the problem for the incumbent firm is posed by an implicit assumption that when the potential entrant threatens to enter the market, the incumbent facing lower returns on its investment cannot simply bail out by selling its capital to the entrant. In other words, the problem does not lie in either the product-specificity of the capital or the economies of scale associated with natural monopoly; the threat of entry poses a problem for the incumbent only when the investment is *sunk*. This is consistent with the view of Baumol, Panzar and Willig (1982) – the first serious critique of Bain's (1956) postulate that existence of economies of scale in an industry deters entry[2] – and finds support in the research of Macleod (1989).[3]

[2] The inadequacy of scale economies in explaining entry can also be extended to a weak relationship between scale economies and exit by small firms that cannot attain the necessary

It is easy to see that if production in a market involves sunk costs, a strategic option facing an incumbent firm is to raise the extent of sunk costs faced by a potential entrant should it decide to enter the market. This led Dixit (1980) to argue that incumbent firms would invest in capacities that are beyond what is optimal in the context of a non-contestable market to deter entry.[4] It has also been argued that marketing tools like extensive advertising might be used by incumbent firms to increase the sunk cost faced by entering firms (Schmalensee, 1978; Geroski and Murfin, 1991).

It is easily seen that the effectiveness of this form of (strategic) entry barrier would increase with the difficulty with which a potential entrant can find financial resources necessary to incur the sunk cost associated with entry. Indeed, even if we do not take at face value Bain's (1956) argument that capital requirements would pose a barrier for potential entrants, and adopt Stigler's (1968) view that a potential entrant faces a barrier to entry only if it has to incur a cost that an incumbent does not have to face, access to financial resources might prove to be an important consideration in the context of entry. We need make only the reasonable assumption that a new firm aiming to enter a market would face a substantially higher cost of capital than an incumbent firm with a proven track record. Indeed, Evans and Jovanovic (1989) have argued that liquidity constraints bind such that wealthier people are more likely to become entrepreneurs than their poorer counterparts.

Finally, the literature has concluded that incumbent firms can use long-term contracts with both suppliers of input and consumers to deter entry. Chicago economists have suggested that it would necessarily be more profitable for incumbent firms to supply to new entrants inputs over which they (jointly) have monopoly control by way of such contracts, rather than refusing supply to these competitors. However, Bolton and

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minimum scale. Clarke (1984) has shown that scale economies have to be quite high to drive small firms out of the market.

[3] Dewatripont (1988) has argued that while increasing sunk cost might deter new firms from entering the market, in the presence of trade unions, the labor force would gain bargaining power if entry is deterred. Hence, an incumbent firm would have to balance the gains from entry deterrence with the losses arising out of greater bargaining power of the labor force.

[4] Spulber (1981) argued that the use of excess capacity to deter entry is inconsistent with post-entry Cournot-Nash behavior, and can therefore be observed only when the incumbent firm is a Stackelberg leader.

Whinston (1991, 1993) and Hart and Tirole (1990) have conclusively demonstrated that under certain conditions rationing or refusing supply to the new entrants would be both rational and credible. On the other end of the spectrum, Aghion and Bolton (1987) argued that incumbent firms would enter into long term contracts involving penalty clauses with consumers to prevent entry of low cost firms. Rasmusen, Ramseyer and Wiley (1991) showed that it is plausible for incumbent firms to exploit coordination failure among (numerous) consumers to enter into such contracts.

The early empirical literature on determinants of entry viewed industry characteristics as the drivers of entry and exit rates. In an oft cited study, Tybout (1997), for example, used real output growth, industry concentration as measured by the Herfinadhl index, import penetration rate, and capital-output ratio as the determinants of industry-level entry and exit rates in Chile.[5] His results indicated that, during 1979-86, entry and exit rates in Chile were influenced positively by growth of real output and negatively by industry concentration ratio, the latter being a measure of the power of the dominant incumbent firms.

In one of the first studies of its kind, Djankov et al. (2002) used data from 85 countries to explore the impact of institutions on entry rates. Their data, which was evidently influenced by De Soto's thesis, included measures of the number of procedures that a firm has to follow to get registered for business, as well as other factors that might influence the time cost of doing business legally. Their results indicate that the cost of entry is fairly high in most countries, particularly in the countries that are not within the upper quartile of income distribution. They also find that countries that do not have democratic governments tend to regulate entry more heavily, an observation that is consistent with the public choice view that governments that are not accountable to the people of a country are more likely to use regulatory barriers as a means to seeking rent (Shleifer and Vishny, 1993).

This line of argument also finds support in the research of Perotti and Volpin (2004) and Klapper, Laeven and Rajan (2005). Perotti and Volpin argue that if wealth distribution is unequal then incumbent firms are able to prevent entry by way of lobbying the

[5] In addition, the empirical exercise controlled for unobserved industry- and year-specific factors using dummy variables.

politicians for entry-deterrent regulations. They succeed in their effort to influence the decisions of the politicians because they can promise greater rent than potential entrants who can only hope to earn normal profits in a competitive industry. Entry increases when wealth distribution becomes less unequal and when the accountability of the politicians increases. Their empirical analysis, which involves data from 38 countries and 33 industries for the 1983-92 period indicates that, entry in sectors that require greater external capital increases with accountability.

Klapper et al., who use a comprehensive database of European firms, find that entry is low if the cost of entry is increased on account of regulatory factors, even if an industry is naturally a "high entry" industry.[6] Regulations remain an important determinant of entry rates even after the empirical analysis controls for factors like availability of financial resources and protection of intellectual property rights. Regulatory barriers particularly discriminate against smaller firms. However, the empirical analysis also suggests that entry rates are adversely affected by capital market imperfections, and that protection of property rights has a positive impact on these rates.

In sum, the empirical literature has concluded that while some industry characteristics like growth of output and industry concentration influence entry rates, institutional factors play an important role in determining entry. In particular, bureaucratic or regulatory barriers, which might themselves be influenced strategically by incumbent firms, have a significant and detrimental impact on entry rates. In addition, entry rates are affected by factors like access to capital and protection of property rights. While they provide a significant insight into the dynamics of entry, they suffer from the same shortcoming that afflicts all cross-country studies.

With some exceptions (e.g., Botero et al., 2004), detailed data capturing the exact nature of cross-country variation in institutions are typically unavailable. As a consequence, cross-country studies rely on the use of broad-brush controls like "democracy" or "legal origin" or "protection of property rights" that are themselves fairly heterogeneous. The Klapper et al. (2005) methodology goes a long way in addressing some of the problems associated with cross-country studies, but still does not account for divergence between

[6] An industry is defined as "high entry" if it experiences high entry rates in the United States of America, the comparator.

de jure and *de facto* implementation of regulations that may be quite significant in developing countries. One possible way to address this lacuna in the literature is to analyse entry rates at the sub-national level where the letter of the law is necessarily the same everywhere but where implementation might vary widely across regions. As noted earlier, we adopt this approach to an analysis of entry rates in this paper.

3. Reforms and industrial policy in India

The popular wisdom about India's reforms process is that it was initiated in 1991, in the aftermath of a severe balance of payments crisis. However, two recent papers (Rodrik and Subramanian, 2005; Virmani, 2004) argue that the structural change in India was more pronounced in the 1980s than in the 1990s. Using aggregate data for the Indian economy, they make the case that the data for the 1990s do not support the hypothesis that the reform process that started in 1991, and has been carried out since then, has resulted in a sharp break from the past. Rodrik and Subramanian (2005) go on to suggest that the decade of the 1980s was characterised by a pro-incumbent business policy while the 1990s was a more pro-entrant policy.

The pro-incumbent nature of the policy regime of the 1980s was evident in a number of policy initiatives. The industrial policy resolution of 1980 emphasized the need for improving productivity in existing units in order to make them globally competitive. The role of scale economies in the private sector, both in terms of new technologies and cost-effective organizational structures, was recognized for the first time since Independence. In keeping with the new vision of industrial development, in 1980, a business house was redefined as one whose combined assets exceeded INR 1 billion, i.e., five times the limit of INR 200 million set in 1973. This meant that all firms with assets between INR 200 million and 1 billion could operate in sectors in which they were not allowed entry prior to 1980. Second, business houses were allowed to operate outside their permitted list of sectors if they set up factories in economically backward areas. Third, existing units could set up new units, without restriction on size, provided the latter were 100 per cent export oriented. Fourth, access to foreign technology, hitherto severely restricted, was allowed if it resulted in either export growth or significant improvement in cost structures of the firms. Fifth, the upper limit for capital stock used for defining the small scale sector was increased from INR 1 to 2 million.

(The limit for ancillary units was increased to INR 2.5 million from the earlier 1.5 million.)

In addition to such industrial policies, a fiscal policy initiative was introduced in the mid-1980s to encourage firms to undertake long-term investment plans. Duties on project related imports were reduced, along with those on all other capital goods. At the same time, import duties on final goods continued to be high. While all these were favourable to existing companies, *status quo* was maintained with respect to the licensing procedure for most new entrants. In other words, incumbent firms were able to reduce cost of production and, at the same time, extract rent in markets that were protected from import competition. Further, while both incumbent and new firms required licenses for capacity expansion and production, respectively, the former were at an advantage on account of their continuing relationship with the government bureaucracy. As a consequence, the licensing process (and the playing field, in general) was heavily loaded in favour of incumbents (Bhagwati, 1982, 1988).

In the early 1980s, some sectors were delicensed, and this process was slightly modified in the mid-1980s. However, a more important initiative was that of broad-banding. Originally, a license was given for a specific product. This meant that a producer of two-wheelers, for example, who had a license for scooters, could not produce motor-cycles, without seeking a licence. However, with broad-banding, expansion of business into related areas became possible. This, once again, gave a boost to product development as well as economies of scope and scale. However, with the licensing requirement for new entrants still in place, broad-banding gave a clear advantage to the incumbent firms.

An important new law was enacted in the second half of the 1980s: the Sick Industrial Companies (Special Provisions) Act, or SICA, of 1985. Under this Act, a bankruptcy court, named the Board for Industrial and Financial Reconstruction (BIFR), was set up in 1987. Under the SICA, any company that has been registered for more than 7 years and whose net worth has turned negative must apply to BIFR for permission for closure. There are three important aspects to this law. First, small units were kept outside the purview of the law. Second, the application was mandatory and not voluntary as in the US Chapter 11 bankruptcy code. Third, since application to BIFR was mandatory,

creditors could not attach and liquidate assets of the defaulting companies. According to the Act, closure of an industrial unit was considered to be a social loss and, hence, this outcome was to be avoided wherever possible. In order to facilitate the operation of these sick (financially distressed) industrial units, credit was provided by government owned banks and financial institutions at subsidized interest rates. Further, and not surprisingly, all capacity and licensing restrictions were suspended if a healthy company merged with a sick one under the supervision of BIFR. Since the managers did not face any cost of bankruptcy, there were strong incentives to overlook impending financial distress (Gangopadhyay and Knopf, 1998), and facilitated the creation of non-performing assets on the balance sheets of the banks (Bhaumik and Mukherjee, 2002). Once again, it skewed the playing field against potential entrants; capital was tied up in loss-making industrial units instead of being delivered to new units of production.

By contrast, the post-1991 reforms laid strong emphases on enabling markets and globalization coupled with lower degrees of direct government involvement in economic activities. The focus was mainly on five areas: foreign investment, entry procedures, technology, monopolies and restrictive trade practices (MRTP Act), and the public sector. Quite significantly, the first policy announcement of the reform process was the abolition of licenses. For the first time in post-Independence India, licensing requirements for all projects were abolished; only those related to defence or potentially environment-damaging industries needed prior permission.[7] As of 1991, an entrepreneur only has to file an information memorandum on new projects and/or for substantial capacity expansions. Further, the MRTP Act was amended such that the need for approval from the central government for establishing a new plant, capacity expansion, merger, takeover and directors' appointments (in the private sector) was abolished.

The 1990s' reforms also encouraged technology adoption and greater participation of foreign companies in the Indian industrial sector. Until 1991, foreign ownership of equity was restricted to less than 40 per cent in all sectors, and FDI was completely disallowed in many of these sectors. In 1991, foreign direct investment up to 51 per cent equity was allowed in some of the sectors, and, over the next fourteen years, there has been a significant relaxation of the rules governing FDI across the board (see Beena et

[7] By the end of 1997-98, all but 9 industries had been delicensed.

al., 2004). By the end of the 1990s, most manufacturing units in the SEZs were allowed 100 per cent FDI under automatic approval.[8] Further, the "dividend balancing" requirement on 22 consumer goods industry was removed.[9] Procedures for the procurement of technology from abroad were also simplified, largely by way of facilitation of ways for payment of patent-related royalties. The high priority industries were given automatic permission for technology transfer.

The 1990s also witnessed the operationalisation of the long-debated policy initiatives on the role of the public sector within the country's industrial structure. Until the end of the 1980s, prices of most infrastructure and basic intermediates were controlled by the government on a cost-plus basis, under the aegis of the administered price regime (APR). This led to allocative inefficiencies and, at the same time, created conditions of supply shortages, as administered prices typically failed to clear the market. In the context of these supply shortages, it was easier for incumbent companies with existing supply chains and government contacts to procure the rationed supply of intermediate products. In the 1990s, the APR was abandoned, and the list of industries reserved for the public sector was reduced from 17 to 8. In 1993-94, the list of sectors reserved for the public sector was further reduced to 6. State monopolies in insurance, civil aviation, telecommunication and petroleum were abandoned, and the private sector was allowed participation in these sectors. In effect, entry barriers for the Indian industrial sector had been further removed.

It is evident that while changes to industrial policies were afoot since the 1980s, the reforms of the 1990s were more favourable to entrepreneurship development, and hence entry, compared to the 1980s. While both sets of reforms were more pro-industry compared to what has been happening since Independence, the 1980s' reforms were directed more at increasing the profitability of existing companies without reducing the barriers to entry faced by potential entrants. The obvious question to ask, therefore, is

[8] The following items were excluded: arms and ammunition, explosives and allied items of defence equipment, defence aircraft and warships; atomic substances; narcotics and psychotropic substances and hazardous chemicals; distillation and brewing of alcoholic drinks; and cigarettes/cigars and manufactured tobacco substitutes.

[9] Dividend balancing required that a foreign investor plough back its dividends and/or royalty from an Indian operation into the same operation for a stipulated number of years.

how the two different policy regimes impacted the actual entry and investment decisions of companies during the two decades.

Since the purpose of licensing was to achieve macro-balance and targets set by the 5-year Plans, these permissions were handed out by the central government and not by the state governments. Indeed, the Centre exercised complete control over industries prior to the 1990s in a number of other ways. For example, foreign exchange and its control was a prerogative of the central government and all foreign currency transactions were closely monitored and severely restricted through the Foreign Exchange Regulation Act (FERA). One major implication of the reforms carried out in the 1990s was that the control of the central government over the process and pattern of industrialization waned and, at the same time, states started playing a much larger role in their own industrialization. While the central government continued to have control over environmental policies, labour policies, and bankruptcy procedures, the implementation of the associated laws and regulations was passed on to the states, thereby according the states significant discretionary powers over the industrial sector. Hence, in addition to the characterization of the 1980s as pro-incumbent and the 1990s as pro-entrant, we will also have to take into account the impact of the greater federalism in industrial decisions in the 1990s.

An important aspect of this federalism in economic policy is the competition among different policy approaches. In a centralized economic system, there is very little scope for competitive experiments in policy. The only competition faced by a centrally controlled policy regime is from the approaches followed by other nations. In the case of India, this would have come from Japan and the Gang of Four in the early stages and from the Asian tigers in more recent years. However, if a country follows an explicit import substitution strategy, and is not keen to entice FDI, much of the discussion about inter-country competition within the policy space is moot. But if the policy regime *within* a country is federal in nature, states acting within the same macro-spectrum could operate very differently. There is *prima facie* evidence to suggest that, in post-1991 India, there was inter-state variation in the degree of accountability of the state governments (Besley and Burgess, 2004). As we shall argue later, political accountability may have different impact on industrialization and hence on entry of industrial units under different circumstances.

However, economic federalism has also exposed states to vulnerabilities that owe their origin to inter-state differences in endowments of resources. To the extent that firms require both general resources like skilled or semi-skilled labor, or product-specific resources like established supply chains, some states are at an advantage over others in the context of entry of new production units. The persistence of investment of a certain type in a certain region is regularly observed at the international level: China is clearly more likely than India to attract a new investment in low cost mass manufacturing industries.

In the next section, we develop an analytical paradigm that allows us to take on board both industry level and state level factors that may have influenced entry rates of industrial production units in India between 1985 and 1997.

4. Empirics of entry

Two things are evident from the above literature: First, even though industry level factors may have affected entry rates in the Indian industrial sector in both the 1980s and the 1990s, the specific industry level factors affecting growth during the pre- and post-1991 periods may have been significantly different. Second, as argued by Kochhar et al. (forthcoming), the economic federalism in India that emerged in the post-1991 era suggests that we can expect institutional factors to play a greater role in determining state level growth/performance in the 1990s than in the 1980s. Bhaumik, Gangopadhyay and Krishnan (2005) have extended this line of argument to propose that the same would hold true for performance of manufacturing units, a hypothesis that has found support in the analysis of cross-sectional variation in the pre- and post-1991 plant level labor productivity. Aghion et al. (2005) have reached similar conclusions using long panels. Further, there is evidence about post-1991 differences in the ability of states to translate economic growth into poverty reduction (Datt and Ravallion, 1998), largely on account of differences in factors like human resources. It is reasonable to presume that some of the factors that affect economic conditions like poverty might also affect choice of location of manufacturing units. It is evident, therefore, that in addition to industry level factors, state level factors are also likely to affect entry rates.

In order to capture these two dimensions of the entry dynamics witnessed in India in the 1980s and the 1990s, we think of entry rate in India being characterized by indices *i* and *j* where *i* refers to the industrial sectors and *j* refers to the states. Assuming that there are *m* industry level factors (X_m) and *n* state level factors (Z_n) that affect entry rates (Y), we, therefore, propose to estimate the following model:

$$Y_{ij} = \alpha + \sum_{i=m} \beta_i X_{ij} + \sum_{j=n} \gamma_j Z_{ij} + e_{ij} \qquad [1]$$

This aspect of our methodology is similar to the approach of Klapper et al. (2005); each of their observations is indexed by industry *j* and country *k*. However, as we shall explain later in the paper, our empirical strategy differs from that of Klapper et al. in an important way.

Following Tybout (1997), and the literature discussed earlier in the paper, entry rates are influenced by the following industry characteristics:

Growth of the industry: Not surprisingly, entry is likely to be higher for fast growing industries than for their stagnant counterparts. Indeed, net entry might actually be negative for industries that are either not growing or are experiencing negative growth.

Technology: If an industry has an old technology, the advantage lies with incumbent firms because the currency of competition in such industries is not innovation but factors like economies of scale. However, if the competitive edge in an industry is incumbent on access to technology and associated innovation, it is possible for new firms to leapfrog incumbent firms in terms of productivity and efficiency, thereby making the industry more open to new entry.

Industry concentration: If an industry is concentrated, such that a handful of incumbent firms account for a disproportionately large share of the output, these firms are in a position to earn supernormal profits, and hence have a lot to lose if entry makes the market more competitive. Incumbents in concentrated markets, therefore, are likely to lobby the governments and use other strategic measures to prevent entry as much as possible. Chari and Gupta (2005), for example, have found evidence in the Indian

context that suggest that regulations that raise entry barriers for foreign firms are more likely to be found for industries that are highly concentrated.

Number of incumbent firms: Even if a market is not concentrated, such that an individual incumbent firm does not have the capability to deter entry to a significant extent, the total number of incumbent firms is likely to influence entry rates in developing countries where resources are relatively scarce and where existing resources may be contractually tied to the incumbent firms. Indeed, some resources like able managerial labor may be organizationally embedded in incumbent firms in the form of the owner-managers of these firms. Hence, in developing country contexts, entry rate for an industry is likely to be negatively related with the number of incumbent firms in the industry.

It is more difficult to decide on the state level factors that may affect entry rates, largely because the economic factors are usually highly correlated with each other, as also with political or institutional characterizations of the states. However, on the basis of the "institutional" literature discussed earlier in this paper, we account for the following state level factors:

Economic growth: It is stylized that GDP growth rate is strongly correlated with firm entry and foreign direct investment at the national or country level. By the same token, growth of state domestic product, the state level equivalent of the GDP, should have an impact of entry, with higher growth being associated with higher entry rates.

Nature of democracy: Cross country studies (e.g., Djankov et al., 2002) have suggested that factors like democracy can play a role in determining entry rates. While the legal and constitutional aspects of democracy would be the same across India, the federal nature of the democracy implies that the nature of democracy, i.e., the relationship between the government and other stakeholders at the state level may vary considerably across the country. In particular, regional political parties, whose collective political fortune has been on the rise since the late 1980s, and who have come to dominate the political landscape in India since the 1990s, may behave very differently from national political parties whose political fortunes are more diversified across states than those of the former.

Further, precisely because democracy reduces the ability of special interest groups to influence the economic agenda of a government, and given the fact that in India the livelihood of nearly two-thirds of the people continue to be associated with agricultural activities, with formal sector employment accounting for less than 5 per cent of the labor force, it is not obvious as to whether democracy at the state level in India would necessarily favor entry into and expansion of the industrial sector. In other words, the impact of state level democracy on entry in India is an open empirical question.

Labor: Industrial development in India responded to the policy emphasis on tertiary education and the development of a capital goods sector, employment protection in the formal sector, and financial repression in the pre-1991 era by channelling the manufacturing sector into skill-intensive industries (see, e.g., Bhagwati and Desai, 1970; Joshi and Little, 1994). This trend has continued beyond 1991, the additional twist being the rise and the growth of the skill-intensive industries (Kochhar et al., 2005). Hence, at least in the post-1991 period, spatial differences in entry rates should, in principle, find an explanation in state level differences in the availability of skilled labor.

Following Botero et al. (2004) and Besley and Burgess (2004), entry rates would also depend on factors like labor regulations. Once again, while labor laws are largely uniform across India, there is considerable variation across states in the bargaining power of labor(ers) vis-à-vis the industrial units and their management. In states like Kerala and West Bengal, in which the Indian communist parties are on a strong footing, a significant proportion of formal sector laborers are unionized and often have the tacit support of the state administration when they bargain for wages and benefits with the aforementioned management. The currency for bargaining is usually industrial action. The degree of unionization of laborers is much less in some of the other states, and some state governments are viewed as being pro-industry, as opposed to being pro-labor. *Ceteris paribus*, we can expect lower entry rates in states where laborers have relatively greater bargaining power, with or without explicit political support of the state governments.

Legacy: The economic geography literature has long held that industries can enjoy significant agglomeration economies if they locate production units in geographical locations (e.g., Hoover, 1948). One implication of the presence of such economies is that certain locations within large countries attract much of the manufacturing production units, while other regions remain largely agricultural (Krugman, 1991). Hence, in the Indian context, *a priori* states like Gujarat and Maharashtra, which have had a strong manufacturing core can be expected to witness more entry relative to other states.

In sum, and in keeping with the notation introduced earlier in this section, the vector *X* includes the following industry level factors: a proxy of industry level growth, the nature of technology used for production, the degree of concentration of the industry, the initial number of production units, and a proxy of the minimum efficient scale that, in turn, determines the extent of a new entrant's required financial commitment. On the other hand, the vector *Z* includes the following state level factors: economic growth, a proxy of the nature of democracy at the state level, a proxy of the quality of available labor, a proxy of the bargaining power of the labor force, and a measure of the initial degree of industrialization at the state level. We discuss the exact measures of these variables in the next section.

5. Data

We restrict our analysis to the 1984-97 period. The years prior to 1984 were marked by war (1971), oil price shock, political crisis (1974-80), industrial strife (1982-83), insurgency in northern India (1980-84), and the assassination of Indira Gandhi (1984). Post-1997 data, on the other hand, is incompatible with the pre-1997 data because of several changes in the format in which ASI collects plant-level information. However, the 1984-97 period captures the entire time frame of the Rodrik and Subramanian (2005) analysis, and was largely stable politically. It, therefore, allows us to undertake a meaningful analysis of entry while, at the same time, contrasting the determinants of net entry in the pre- and post-1991 periods. Specifically, we contrast the determinants of net entry in the 1984-91 period with those in the 1992-97 period.

The source of our data and the measurement of the variables are described below:

5.1 Net entry

As mentioned earlier in the paper, we use primarily state-level 3-digit industry data from the Annual Survey of Industries (ASI). In the context of the spatial dimension of entry, we consider 15 states (out of the possible 32 during the period covered by the data presented here).[10] There are many reasons for restricting ourselves to these states. First, these states have existed for the entire period of the data without any change in their geographical area or administrative setup. For example, among the states that have been left out, there are many that have moved from being centrally administered to ones where they elect their own state-level governments. Second, around 95 percent of the Indian population resides in these states. Third, more than 90 percent of all factories are located in these 15 states. Indeed, in many of the states that are left out of our sample, industrialization is a very recent phenomenon and, therefore, the methodology for collecting data in these states is not the same as in the states we are studying. The data collection methodology for the 15 states included in our sample has remained largely the same throughout our period of analysis.

The ASI defines factories to be all productive units that employ l0 or more laborers and use power, as well as those that do not use power but employ 20 or more laborers. They also include *bidi* and cigar-manufacturing establishments registered under the Bidi and Cigar Workers Act 1966, i.e., once again, employing l0 or more workers if using power, and 20 or more if not using power. All the units engaged in the generation, transmission and distribution of electricity registered with the Central Electricity Authority are also covered under the ASI, irrespective of their employment size. It does not include the service sector. However, certain services and activities like cold storage, water supply and repair services are covered under the survey.

The ASI data are widely used in the context of analysis of the Indian industrial sector (see, e.g., Hasan, Mitra and Ramaswamy, 2003; Besley and Burgess, 2004; Aghion, Burgess and Zilibotti, 2004; Aghion et al., 2005; Lall and Chakravorty, 2005). The problem with ASI data lies with the construction of the annual samples. ASI classifies industrial units into the “census” sector and the “sample” sector. While the factories

[10] These states are as follows: Andhra Pradesh, Bihar, Delhi, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal.

employing 100 or more workers constitute the census sector, the remaining factories constitute the sample sector. Each year, ASI collects and reports data for *all* units in the census sector, but only one in three units in the sample sector. In other words, for any industry, the difference in the number of plants between years *t* and *t+1* does not directly provide a measure of net entry. However, the use of plant level data for discussion of creative destruction is deemed acceptable (e.g., Bartelsman, Haltiwanger and Scarpetta, 2004). Further, as we demonstrate in the Appendix, under reasonable assumptions, it yields a monotonic transformation of the true measure of net entry. We, therefore, use the ASI data to measure net entry in the context of our analysis.

For each 3-digit industry, the net entry for the 1984-91 period is defined as the number of plants in 1991 *less* the number of plants in 1984. Net entry for the 1992-97 period is similarly defined.

5.2 Explanatory variables

The industry-level variables that explain variations in net entry across industry and regions, and each of which have been obtained from ASI data, have been measured as follows:

Number of incumbent plants: For each 3-digit industry, use the number of industrial units in 1984 and 1992, respectively, as the initial values of the number of plants for the 1984-91 and 1992-97 periods.

Growth of the industry: We measure growth of each industry as the percentage change in the aggregate real (net) value added by all plants in the industry. Since net entry over a period of time would almost certainly be affected by industry-level growth of all the years in this time period, we use as the explanatory variable the average of the annual growth rates of real (net) value added for all the years within each of the two time periods.

Technology: An ideal way of measuring technology would be the vintage of the machinery and equipment used by the industrial units. However, such detailed data are not available. Following Tybout (1997), we, therefore, used the capital-labor ratio, defined as the (real) value of fixed capital divided by the number of workers, as a proxy

for technology. The underlying logic is that technology is approximately measurable by the mix of capital and labour.[11] As in the case of industry growth, we use for our analysis, the average of the capital-labor ratio, for each 3-digit industry, across each of the time periods.

Industry concentration: Industry concentration has been measured as the proportion of total sales coming from the 4 largest industrial units in each of the 3-digit industries. Since the largest units are in the census sector of the survey, each round reports the sales of these units. Hence, our data does not suffer from any informational bias. The problem once again is that the sales data corresponds to plants and not firms, and hence our measure is not a 4-firm concentration ratio in the conventional sense. But, on account of data limitations, we continue to use this measure of industry competitiveness.

The state-level variables were collected from various sources. As in the case of the industry-level variables, for most of the state-level variables, we have used for our analysis the average values across all the years for each of the two time periods. The variables are as follows:

Economic growth: The state GDP figures are taken from the archives of the Economic and Political Weekly (EPW) Research Foundation.

Nature of democracy: As we have discussed earlier in this paper, democracy refers to the accountability of a government to the electorate. In the Indian context, given the continuing widespread poverty, we feel that accountability is best measured by the fiscal allocation of a government to public goods that directly affect the welfare of the vast majority of the electorate (e.g., Pourgerami, 1988; Stasavage, 2005). We, therefore, choose a state government's per capita expenditure on health as the measure for its accountability to the people of that state.[12] The data on state-level budgetary allocation and state-level population have also been obtained from the EPW Research Foundation.

[11] Note that this measure of technology also encompasses a measure of the capital required by a new entrant, on average, to successfully enter the market. Hence, if the coefficient of this variable is significant, it would require a careful interpretation.

[12] We have verified that per capita expenditure on health and per capita income are not systematically correlated at the state level, neither across states for a given year, nor across

In addition, for each of the 1984-91 and 1992-97 periods, we construct the proportion of years during which a regional party was in power. The data on election results required to construct this variable were obtained from the Election Commission of India.

Labor: The ideal measure for high-skilled labor is the proportion of labor force with tertiary and/or technical education. However, such detailed data are not available for the states, and construction of this data from Census information is costly. We, therefore, assume that there is a high correlation of the number and/or proportion of people in different educational/skill cohorts, such that a crude measure like the literacy rate would capture the level of skill of the population or labor force at the state level. The data on literacy rate were taken from various issues of Selected Educational Statistics of the Department of Secondary and Higher Education, Ministry of Human Resource Development.

Following Besley and Burgess (2004), we use as our measure of state-level labor policy the number of man-days lost on account of industrial action. This data were collected from various editions of the Indian Labour Year Handbook. We have normalized this data using the total number of employees in the manufacturing sector of each state. The data on the number of employees were obtained from ASI.

Legacy: As explained earlier, we have to control for the initial level of industrialization of a state. For each state, we do so by using the share of the manufacturing sector in the state GDP in 1984 and 1991, respectively, for the 1984-91 and 1992-97 periods. The break down for the GDP of each state was obtained from the EPW Research Foundation.

Finally, we use two measures of governance, one of which, namely, state-level human development indices, captures accountability, growth, human capital of the people, etc, in one unified measure, we use state-level human development indices. The data for this index were taken from various issues of Health Information of India published by the Central Bureau of Health Intelligence, Ministry of Health and Family Welfare. The

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years for a given state. Hence, our measure of democracy is not collinear with, nor a proxy for, the extent of prosperity of a state.

alternative measure of governance used in our analysis is state-level technical and distribution (T&D) losses that embody accountability of the government as well as the state of infrastructure. The data for T&D loss were obtained from the International Monetary Fund.

5.3 An initial look at entry rates

While our analysis is restricted to the 1984-97 period, we report in Figures 1 and 2 trends in net entry rates for the 1980-97 period, in part to present a longer term view, and in part to justify the exclusion of the 1980-84 period from the sample. Before examining the data, however, it is important to identify a specific political event that occurred during the early eighties. In January of 1982, India witnessed the initiation of a massive industrial action in the textile industry. This industrial action continued for 18 months, and spilled over into other industries. It came to an end after the central government took over the management of 13 textile units in October 1983. The long strike in India's (then) largest industry created a severe disruption in investment and the 1982-83 net entry rate was a staggering negative 11 per cent (Figure 1), the lowest for any year since 1975-76. During the eighties, 1986-87 was the only other year where the net entry rate was negative (minus 3 per cent).

INSERT Figure 1 about here.

In the first 5 years of the 1980s, the average net entry rate was 0.55, and in the next 5 years it was 2.29, giving us an average rate of 1.42 for the decade. In the 1990s, the first half witnessed a higher net entry rate (2.68). From the summary statistics, therefore, there is not much that distinguishes second half of the 1980s from the first half of the 1990s. The statistics merely reflect the fact that the business/policy environment was more conducive for entry in the second half of the eighties than in the first half, and this can largely be explained by the industrial action and the political events highlighted above.

INSERT Figure 2 about here.

However, this aggregate data does not reveal the role of state governments and institutions (i.e., economic federalism) in influencing the variation of net entry rates

across the states. To recapitulate, prior to the nineties, the focus of the centrally controlled industrial policy was on reducing regional disparities. The liberalization policies of the nineties resulted in greater economic federalism and states had the opportunity to influence both the geographical location and the subsequent performance of industrial units by way of differences in the nature of implementation of regulations and the quality of governance, in general, across states. Earlier, location of industrial units was not based on optimal decisions on the part of the firms. But, in the nineties, industrial units were increasingly located in states that were industry friendly and had a better investment climate (Figure 2).[13] It is immediately evident that in most states the net entry rate in the nineties has been considerably higher than in the eighties, and that a drop in average entry rates are concentrated among four states: Uttar Pradesh, Madhya Pradesh, Andhra Pradesh and Bihar. With the exception of Andhra Pradesh, all these states are known for their poor governance levels, and low levels of economic prosperity. In other words, there is *prima facie* evidence to suggest that, in keeping with our empirical specification, state-level factors may indeed have affected inter-industry and inter-state variations in entry rates during the post-1991 period in India.

6. Empirical strategy and regression results

Much of the empirical analysis about entry involves the use of pooled cross-section time series data. Tybout's (1997) specification included industry level variables as well as dummy variable controls for unobserved industry characteristics and the years for which data were available for his analysis. He used ordinary least squares (OLS) with appropriate corrections for heteroskedasticity to estimate his model. Klapper et al. (2005), on the other hand, adapt the empirical strategy proposed by Rajan and Zingales (1998), using the United States of America as the benchmark country, and estimate their model for entry using OLS as well.

Our empirical strategy deviates from those of both Tybout (1997) and Klapper et al. (2005). The latter methodology helps address a question of the following type: if Gujarat is the state where the business environment (or institutions) is most favorable for entry among Indian states, what are the factors that reduce entry rates in other Indian states vis-à-vis Gujarat? While we are interested in the impact of state level variables on

[13] The states considered here account for more than 95 per cent of all industrial units and the total population.

entry rates, this is not the specific question that we are attempting to address. Our reservation about Tybout's methodology stems from the fact that any industry level and, especially, state level condition prevailing in year *t* is unlikely to explain entry rates in period *t* itself. In particular, variables that capture the nature of political institutions and resource allocation at the state level are likely to *long term* affect entry as opposed to contemporaneous entry rates.

We, therefore, adopt the following strategy: We use as our dependent variable the *change* in the number of plants belonging to industry *i* in state *j* over the 1984-91 and 1992-97 periods, those roughly corresponding to the two reforms periods mentioned in Rodrik and Subramanian (2005). We then use as our explanatory variables the *average values* for the aforementioned industry-level and state-level determinants of entry rates for each of these periods.[14] In addition, we control for the initial number of plants belonging to each industry in each state. In other words, if N_{ij} is the number of plants belonging to industry *i* in state *j*, our (modified) regression model is given by the following:

$$\Delta N_{ij} = \alpha + \sum_{i=m} \beta_i X_{ij} + \sum_{j=n} \gamma_j Z_{ij} + \lambda N_{0,ij} + e_{ij} \qquad [2]$$

The regression estimates for the 1984-91 and 1992-97 periods are reported in Tables 1 and 2, respectively. Starting with roughly the Tybout (1997) specification in column 1, we introduce in column 2 controls for unobserved 2-digit industry level factors that might affect entry rates. In column 3, we add to the specification the human development index that subsumes state level measures of both growth and development, and hence all the measures of resource endowments, institutions and governance. In a sense, the introduction of the index into the specification is similar to controlling for state level factors using dummy variables. In addition, we control for the proportion of years during each period in which a regional party was in power at the state, and the

[14] Note that the use of averaging values across time to capture long term relationships between variables is not uncommon, especially in the growth and financial economic literature (e.g., Barro, 1991; Chirinko and Elston, 2006). As pointed out by Pesaran and Smith (1995), the resultant estimates are consistent if the time span over which the averaging is done is long. In our case, the averaging is being done over six to eight years. By comparison, an average post-World War II business cycle in the United States of America has lasted about five years peak-to-peak, including about 45 months of expansion and about 11 months of recession.

number of man-days lost on account of industrial strife, per industrial laborer. In column 4, we use the alternative measure of accountability, namely, T&D loss, instead of the human development index. Following Bhaumik and Estrin (forthcoming), in column 5, we unpack these measures of accountability and, mindful of the collinearity among state level factors that might affect entry rates, we introduce instead variables that proxy the possible determinants of entry, as discussed earlier in this paper. The F-statistics suggest that our specifications are statistically meaningful, and the coefficient estimates are largely robust across the specifications.

INSERT Tables 1 and 2 about here.

The coefficient estimates reported in Table 1 indicate that, during the 1984-91 period, entry was driven very significantly by industry level growth, and unobserved industry-level factors. The state level factors played a relatively small role in explaining entry, and, as highlighted by the counterintuitive positive sign of the industrial strife variable, the state level variables do not necessarily provide an adequate explanation of the pattern of entry across industries and states.

The results reported in Table 2 suggest that industry level growth continued to have a positive impact on entry during the 1992-97 period. However, entrepreneurs were clearly thinking more strategically in the post-1991 period of competition than in the pre-1991 period that was arguably pro-incumbent (Rodrik and Subramanian, 2005). This is evident from the negative impact of industry concentration on entry, one that was not observed during the 1984-91 period. To recapitulate, firms belonging to concentrated industries adopt various strategies to reduce the likelihood of entry, including influencing the creation and enforcement of government regulations in a way that raises the entry barriers facing potential entrants (Chari and Gupta, 2005).

At the same time, state level factors played a significantly greater part in the post-1991 period than in the pre-1991 period, a result that is consistent with the conclusions drawn by Kochhar et al. (forthcoming) and Aghion et al. (2005). To begin with, net entry was positively correlated with state-level human development index, and negatively correlated with T&D losses. This indicates that net entry is during the 1990s was higher in states where governments were reforms minded, and thereby mindful of T&D losses,

and, at the same time, adopted policies that enhanced the human capital of the residents of those states. The more detailed analysis reported in column 5 of the table suggests that entry during the 1992-97 period was significantly influenced by the state level literacy rates, a proxy for educational attainments of the state residents. This is consistent with the stylized fact that India's industrialization during the post-1991 period has been driven significantly by industries like pharmaceuticals and auto ancillaries that require skilled labor, rather than by low skilled mass manufacturing industries. Not surprisingly, states with high levels of industrialization, as captured by the contribution of the manufacturing to state GDP, attracted more firms than states where the initial level of industrialization was low.[15]

Surprisingly, however, our measure of a state-level democracy, namely, per capita expenditure on health, had a negative impact on entry. As such, this is inconsistent with the findings of Djankov et al. (2002). But, at a closer look, the difference between our result and those of Djankov et al. lies in the fact that "democracy" for us implies accountability of the government to the all the stakeholders, while to Djankov et al. it was a measure of the ability of the incumbent firms to influence the government to erect regulatory and procedural barriers to entry. The continued electoral success of the communist parties in states like Kerala and West Bengal, where the governments have traditionally been pro-rural development, and the recent electoral loss of the Telegu Desam Party in Andhra Pradesh, the emerging hub of high technology industry, suggests that political accountability in a functioning democracy with a large poverty ridden population may not be consistent with phenomena like entry that are desirable from the point of view of market development. Indeed, if rapid industrial growth in a largely agrarian society increases overall income inequality among the voting population, the stability of the political regime is threatened (Muller, 1988), thereby bringing to a stop economic reforms that might be beneficial for industrial growth but ones that adversely affect the income distribution.

In order to further explore the growing importance state level factors in determining patterns of entry and, therefore, industrialization, in post-1991 India, we undertook the following exercise: We regressed the change in the number of plants during the 1984-91

[15] For example, the average entry *rate* increased substantially for Maharashtra (from 0.56 to 2.31) and Gujarat (from 0.40 to 2.35), two states that were highly industrialized prior to 1991.

and 1992-97 periods, our dependent variables for the estimates reported in Tables 1 and 2, on the initial number of plants for each industry in each state, and on 3-digit industry dummy variables and state dummy variables. For the 1984-91 period, the adjusted R-square value for the resultant regression model was 0.19, comparable with the adjusted R-square values reported in Table 1. For the 1992-97 period, however, the adjusted R-square value yielded by this exercise was 0.14, much higher than the adjusted R-square values of (about) 0.05 reported in Table 2. Experimentation with the specification suggested that much of this additional predictive power is on account of the state dummy variables. While adjusted R-square models are not strictly comparable across non-nested regression models with different sample size, this provides with a reasonably strong evidence that unobserved state level factors that we have not accounted for in our regression models had a strong influence on entry during the post-1991 era of economic federalism. The plausible classification of these unobserved factors can be made under the header "institutions and governance."

Finally, we undertook two different robustness checks. First, we took into account the possibility that while state-level factors reflect long-term steady states that are not significantly affected by policy changes and entry and exit of firms in the short run, the industry level variables are not immune to entry and policy changes, and that, therefore, using period averages of industry level variables on the right hand side of equation [2] might give rise to endogeneity. Hence, we re-estimated the models using the initial (i.e., 1984 and 1992 for Tables 2 and 3, respectively) values of the industry level variables, instead of using their period averages. Second, we took into consideration that possibility that the impact of industry level and state level variables on net entry may be different for high technology and low technology industries. We, therefore, re-estimated our regression models separately for low technology and medium-to-high technology industries, using the classification for technological intensity of the OECD. The new coefficient estimates, which are not reported in the paper, indicate that our results are robust to these exercises.

7. Impact on productivity

The traditional methodology for estimation of tfp involved estimation of a production function, usually with value added as the dependent variable and labor and capital as the explanatory variables, and treating the residuals of the regression model as tfp. Olley

and Pakes (1996) demonstrated that this traditional methodology suffers from a shortcoming, namely, it does not account for the possible endogeneity of capital, and suggested a now stylized way to correct for the associated bias. Using information on gross value added, capital stock and labor cost at the 3-digit industry level, and the Olley-Pakes algorithm, we estimate 3-digit industry level for the Indian manufacturing industries for the 1984-97 period.

Specifically, we separately estimate the following model for the 1984-91 and 1992-97 periods:

$$\ln V_i = \alpha \ln L_i + \beta \ln K_i + u_i \qquad [3]$$

when V is the value added, L is the labor cost, K is the capital stock, and i is the index for 3-digit industries. The Olley-Pakes algorithm is used to estimate unbiased values for α and β. The unbiased estimates for α and β, respectively, were 0.5272 and 0.3646 for the 1984-92 period, and 0.5232 and 0.3637 for the 1992-97 period. In other words, the marginal productivity of labor and capital were largely unchanged during the pre- and post-1991 periods. The residual u_i for an industry i in period t then is the measure of tfp for that industry in that time period.

INSERT Figure 3 about here.

The distributions of tfp across the 3-digit industries, for 1984, 1991 and 1997 are highlighted in Figure 3. Two things are immediately evident from these distributions. First, there has been an increase in tfp of manufacturing industries, on average, over time. Further, the gain in tfp between 1991 and 1997 is much more noticeable than the gain in tfp between 1984 and 1991. Second, the distribution for 1997 is thicker and flatter, indicating a wider dispersion of tfp across 3-digit industries during the 1990s. These findings are consistent with those of Aghion et al. (2005) and Ramaswamy (1999).

Next, in an attempt to link (net) entry rates with *changes in* tfp, we regress tfp *growth* on net entry rates, the units of our analysis being 3-digit industries. Note that we have

measures of tfp and net entry rates for 3-digit industries for all years for the 1984-97 period. Further, while the impact of industry-level and state-level variables on (net) entry can be meaningfully discussed only in the context of the long run, the impact of (net) entry on tfp growth can be immediate. This can happen by way of entry of firms that are, on average, more productive than the incumbents, and, correspondingly, by exit of firms that are, on average, less productive than the incumbents who do not exit. Also, competition ensuing from entry can lead to technological upgradation and other forms of productivity-augmenting restructuring within a relatively short period of time. Hence, we make use of the entire panel to establish a link between tfp growth and net entry rates.

We argue that the appropriate econometric model is given by the following specification:

$$TG_{it} = \gamma + \delta\, NER_{it} + \Phi\, D_{it} + \nu_i + \varepsilon_{it} \qquad [4]$$

where *TG* is tfp growth, *NER* is net entry rate, *D* is a vector of control variables, ν is a 3-digit industry fixed effect, and ε is the random error. Since most of the industry-level and state-level characteristics are subsumed in the net entry rate itself, we use as controls two dummy variables that capture aspects of the reforms undertaken by the Rajiv Gandhi government (1985-89) and the Narasimha Rao government (1992-97).[16] These dummy variables capture all aspects of reforms that may not have affected net entry rates but that might have an impact on tfp growth.

Next, we introduce into the specification lags of net entry rates as explanatory variables. While the contemporaneous value of *NER* is expected to capture the direct effect of

[16] The intermediate period of 1989-91, the omitted category, was a period of political flux. A breakaway faction of the Congress Party, led by Vishwanath Pratap Singh, took office in 1989, with outside support from the Hindu nationalist Bharatiya Janata Party (BJP). The VP Singh government introduced job reservations for "other backward castes" that led to widespread political demonstration around much of India, and resulted in policy paralysis. The unstable VP Singh government gave way to one led by Chandrashekhar that was in power for about three months. The political crisis and policy paralysis coincided with the first Gulf war, and the rise in global oil prices. The culmination of these factors was a balance of payments crisis in 1991, and the general election during the year brought into power a Congress government led by Narasimha Rao.

entry (and exit) on tfp growth, the lagged values of this variable are expected to capture the indirect effect by way of competitive pressure on the incumbent firms. However, since there might be some endogeneity between *NER* and the reforms captured by the dummy variables, such that fixed effects coefficients might be inconsistent, we re-estimate the model using generalized method of moments (GMM).

INSERT Table 3 about here.

The coefficient estimates from the fixed effects and GMM models are reported in Table 3. The estimates indicate the following: (a) net entry rate is positively associated with tfp growth of 3-digit industries in the Indian manufacturing sector, (b) the gain in tfp is largely on account of the direct or instantaneous impact of entry (and exit),[17] and (c) while the reforms of the 1980s did not have any impact on tfp growth, the reforms of the 1990s had a weak positive impact on it. In other words, removal of entry barriers in India benefited the industries largely by way of establishment of new production units with better technology and more efficient production modes, and perhaps, to a much lesser extent, by way of exit of less efficient firms with obsolete technology. Further, our results are consistent with the analysis of Rodrik and Subramaium (2005): *a priori* pro-incumbent reforms of the 1980s were not expected to have any impact on tfp growth, while pro-competition reforms of the 1990s were expected to have a positive impact on tfp growth, and this is what our results bear out.

8. Concluding remarks

It is now widely accepted that productivity growth is the key to competitiveness and growth of firms and, in the larger context, of countries. Economists have long argued that competition, by way of contestability of markets, is an important way to ensure that firms experience productivity growth. However, in the early years of this discussion, much of the attention was focussed on the strategic interaction between potential entrants and incumbents who wanted to deter entry. More recently, there has been growing realization among economists that, especially in the context of developing

[17] Indeed, if at all, the lagged or indirect impact of net entry rate on tfp growth is *negative*. A plausible explanation for this is that competition reduces the rent that incumbent firms earn, and this, in turn, reduces their ability to upgrade technology which, in the context of inflexible labor laws, is often the best (or even only) way to improve tfp.

countries, institutional and regulatory factors might play a bigger role in ensuring or deterring contestability than strategic factors *per se*. Our paper is an attempt to contribute to that growing literature, drawing on the experience of 3-digit manufacturing industries in India.

On account of data deficiency, our results have to be treated with caution. It can, for example, be argued that our measure of (net) entry *de facto* captures net capital formation in India's manufacturing sector, and that, therefore, the observed relationship between "entry" and tfp growth may reflect the embodied technological change associated with the capital formation. However, as we have discussed earlier in this paper, in the context of a developing country, one has to take a broader view of the processes of entry and exit. To that extent, we report strong *prima facie* evidence to suggest that the following can be said about the impact of reforms process in India, as it relates to entry and productivity: First, while net entry during the 1980s was affected mostly by observed and unobserved industry-level factors, during the 1990s, variations in net entry rate are much more closely correlated to state-level factors. In particular, unobserved state-level factors, which we may term "quality of governance", explain much of these variations during the 1992-97 period. This result is consistent with the results reported by Besley and Burgess (2004) and Kochhar et al. (forthcoming). Second, there was an increase in tfp over the years, but most noticeably between 1991 and 1997. At the same time, however, the distribution of tfp was much more unequal during the 1992-97 period than in the 1984-91 period. This is consistent with the findings of Aghion et al. (2005). Third, net entry during the 1985-91 period was positively associated with tfp growth, and much of the impact was direct or instantaneous, i.e., arising from entry of firms that are more productive, on average, than the incumbents (and perhaps exit of firms that are the least productive among the incumbents). Finally, tfp growth was not affected by the reforms of the 1980s, but was positively affected by the reforms of the 1990s. This is consistent with the analysis of Rodrik and Subramanian (2005).

Our analysis raises more questions than it answers. As such, by being restricted to the level of 3-digit industries, our analysis does not capture in the best possible way the nuances of what is essentially a firm-level phenomenon. Specifically, given our inability to identify new entrants and firms exiting the product market, we are unable to examine

the dynamics of entry, survival and exit in the manner in which Aw, Chen and Roberts (2001) were able to examine such patterns in the context of Taiwan. We also cannot identify whether the increase in tfp can be attributed more to entry of foreign firms, or to entry of *de novo* domestic firms, or to improvement in productivity of incumbent domestic firms in the face of growing competition. These deficiencies can be addressed in future research with the use of appropriate data whose collection, it is hoped, will, at least in part, be stimulated by our study.

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Figure 1
Variations in net entry rates over time

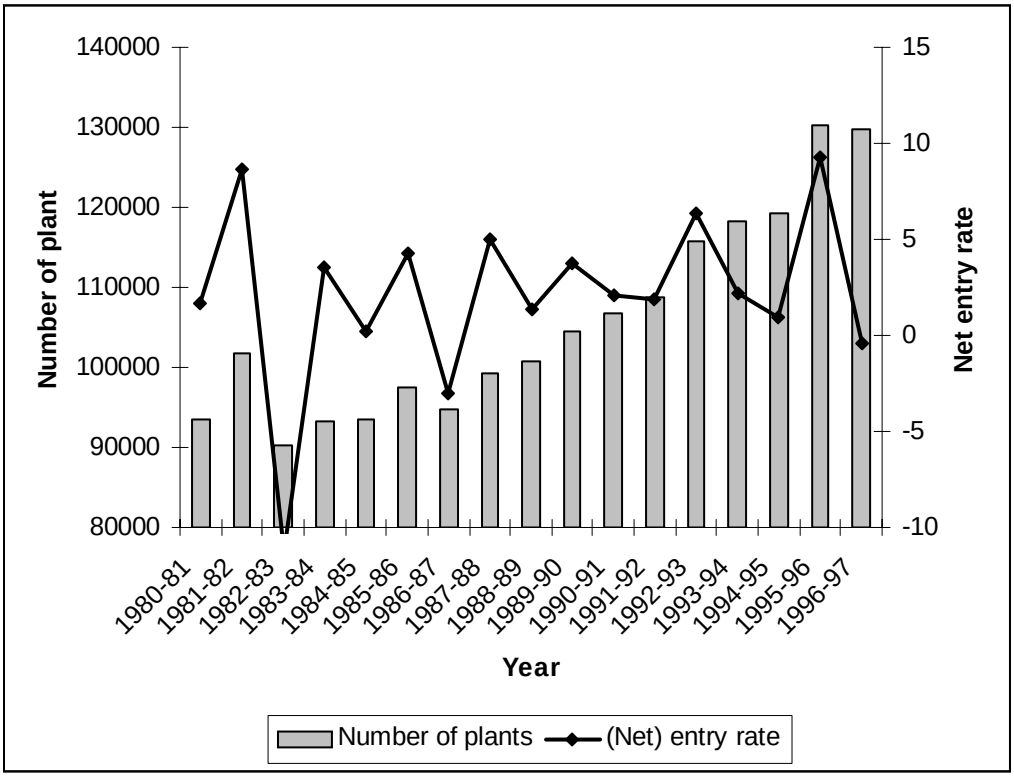

Figure 2
Variations in net entry rates across states

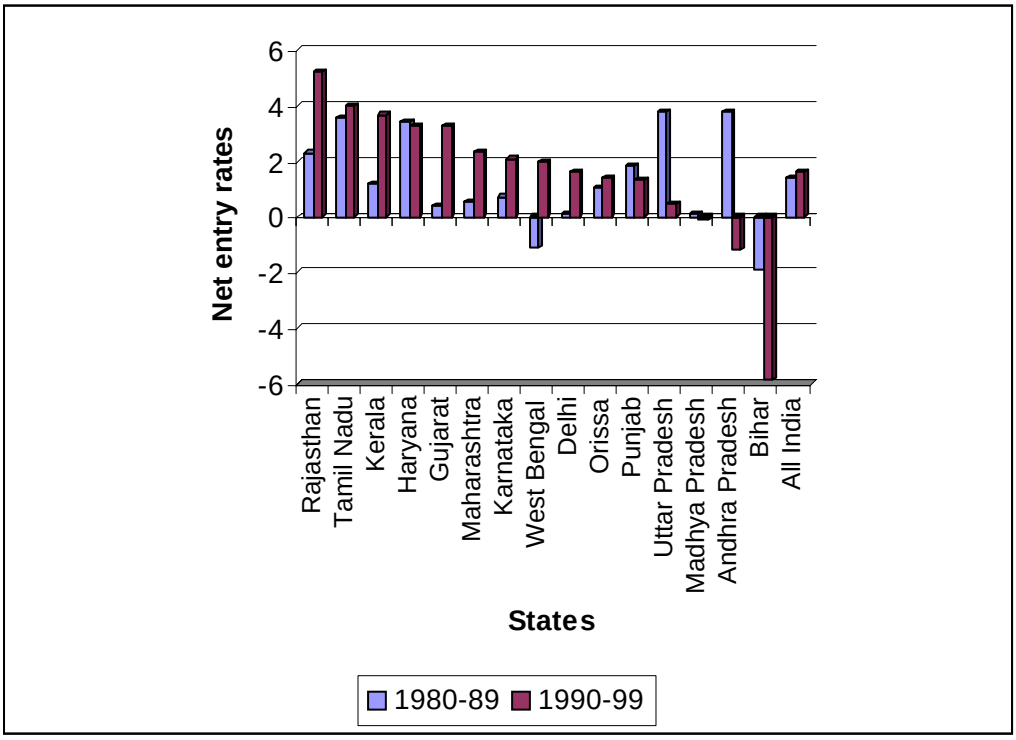

Table 1
Determinants of net entry (1984-91)

	(1)	(2)	(3)	(4)	(5)
Constant	- 28.72 ** (14.33)	- 28.32 ** (14.55)	- 38.47 * (21.82)	- 51.33 * (28.66)	- 76.11 (48.67)
Initial number of plants	0.34 (0.24)	0.34 (0.24)	0.35 (0.24)	0.34 (0.24)	0.35 (0.25)
Growth of value added	3.54 ** (1.45)	3.15 ** (1.63)	3.37 ** (1.76)	3.15 ** (1.63)	3.37 ** (1.76)
Capital-to-labour ratio	2.49 (2.79)	1.77 (3.10)	1.95 (3.24)	1.77 (3.07)	2.01 (3.20)
4-plant concentration ratio	0.08 (0.23)	0.12 (0.23)	0.13 (0.25)	0.12 (0.24)	0.13 (0.25)
Industry controls	No	Yes ***	Yes ***	Yes ***	Yes ***
Human development index			- 18.91 (23.01)		
T&D loss				0.53 (0.90)	
Man days lost because of industrial action (per worker)			58.84 * (35.91)	55.98 * (33.71)	59.37 * (34.43)
Literacy rate (percentage)					- 0.09 (0.14)
Per capita total expenditure on health					- 0.09 (0.14)
Manufacturing as percentage of state GDP					53.58 (44.71)
Growth of state GDP					3.43 (2.84)
Proportion of years governed by regional party			6.04 (4.46)	4.78 (5.77)	- 1.96 (10.90)
F-statistics Prob > F-statistics	8.91 (0.00)	5.42 (0.00)	4.40 (0.00)	4.60 (0.00)	3.75 (0.00)
Adjusted R-square	0.191	0.187	0.195	0.194	0.196
Nobs	1650	1650	1540	1650	1540

Note: The values within parentheses are robust standard errors.
***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Table 2
Determinants of net entry (1992-97)

	(1)	(2)	(3)	(4)	(5)
Constant	- 2.77 (11.41)	- 1.37 (13.13)	- 16.94 (16.98)	3.78 (16.02)	- 25.89 * (15.28)
Initial number of plants	0.04 (0.07)	0.04 (0.07)	0.04 (0.07)	0.04 (0.43	0.04 (0.07)
Growth of value added	0.74 ** (0.36)	1.03 ** (0.44)	1.02 ** (0.46)	1.03 ** (0.43)	1.03 ** (0.44)
Capital-to-labour ratio	3.84 * (2.12)	3.44 (2.57)	3.66 (2.74)	3.43 (2.57)	3.41 (2.56)
4-plant concentration ratio	- 0.19 ** (0.09)	- 0.27 *** (0.10)	- 0.28 *** (0.11)	- 0.27 *** (0.10)	- 0.27 *** (0.10)
Industry controls	No	Yes *	Yes *	Yes *	Yes *
Human development index			33.76 * (18.99)		
T&D loss				- 0.31 * (0.18)	
Man days lost because of industrial action (per worker)			11.61 (33.20)	23.99 (29.95)	3.61 (34.43)
Literacy rate (percentage)					0.43 ** (0.17)
Per capita total expenditure on health					- 19.53 ** (8.27)
Manufacturing as percentage of state GDP					48.23 ** (18.82)
Growth of state GDP					0.13 (0.18)
Proportion of years governed by regional party			- 1.93 (5.29)	- 1.86 (5.21)	- 3.62 (5.62)
F-statistics Prob > F-statistics	5.67 (0.00)	2.41 (0.00)	2.73 (0.00)	2.55 (0.00)	2.75 (0.00)
Adjusted R-square	0.032	0.037	0.039	0.037	0.041
Nobs	1560	1560	1456	1560	1560

Note: The values within parentheses are robust standard errors.
***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Figure 3
Changes in total factor productivity over time

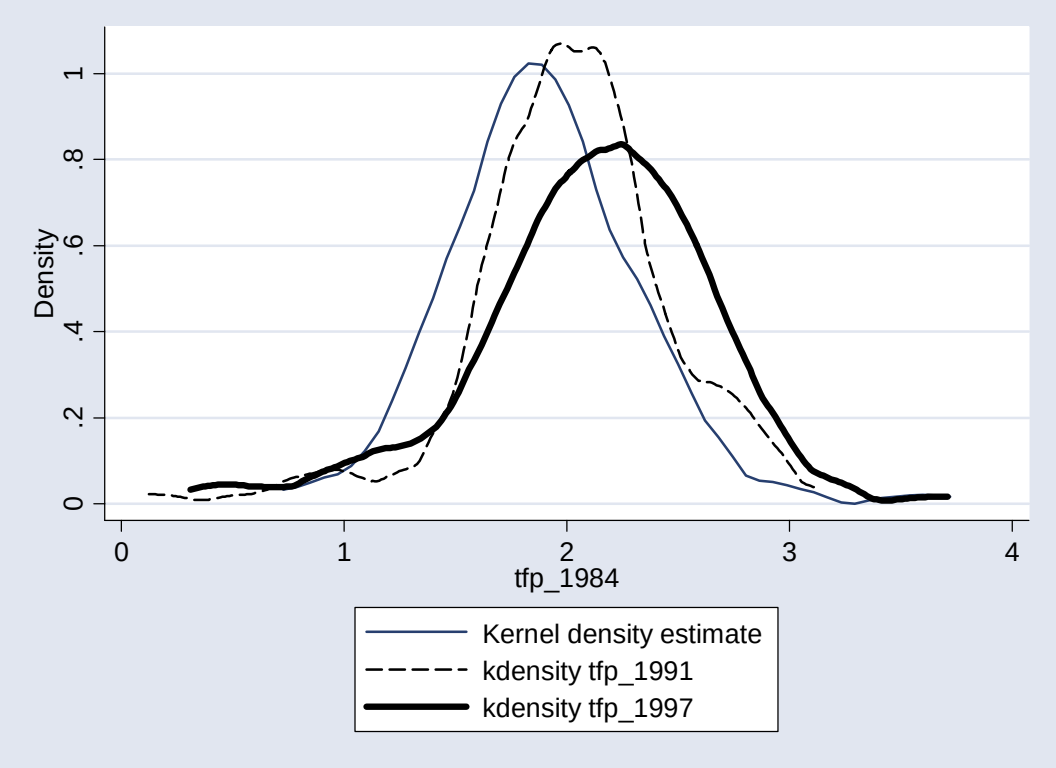

Table 3
Impact of (net) entry on TFP growth

Fixed effects model:				
	(1)	**(2)**	**(3)**	**(4)**
Net entry rate	0.3530 *** (0.0537	0.3577 *** (0.0536)	0.3768 *** (0.0568)	0.4199 *** (0.6336)
Net entry rate [-1]			- 0.1864 *** (0.0555)	- 0.1978 *** (0.0604)
Net entry rate [-2]				0.0320 (0.0634)
Dummy for 1985-89		- 0.0321 (0.0382)	- 0.0370 (0.0405)	- 0.0491 (0.0440)
Dummy for 1992-97		0.0665 * (0.0384)	0.0703 * (0.0405)	0.0667 (0.0437)
Constant	- 0.0025 (0.0161)	- 0.0131 (0.0260)	- 0.0124 (0.0279)	- 0.0162 (0.0295)
LR Chi-square	42.72 (0.00)	49.06 (0.00)	58.04 (0.00)	57.77 (0.00)
Log likelihood	- 1819.25	- 1816.08	- 1742.12	- 1543.23
No. of observations	1786	1786	1672	1465
No. of groups	130	130	130	130
GMM model:				
	(1)	**(2)**	**(3)**	**(4)**
Net entry rate	0.2750 ** (0.1209)	0.2838 ** (0.1211)	0.1985 ** (0.1028)	0.2780 * (0.1462)
Net entry rate [-1]			- 0.0727 (0.0491)	0.0466 (0.0709)
Net entry rate [-2]				0.1563 (0.1316)
Dummy for 1985-89		- 0.0378 (0.0264)	- 0.0216 (0.0233)	- 0.0501 (0.0316)
Dummy for 1992-97		0.0627 * (0.0340)	0.0782 ** (0.0297)	0.0512 (0.0351)
Constant	- 0.0008 (0.0147)	- 0.0084 (0.0254)	- 0.0209 (0.0177)	- 0.0048 (0.0206)
Hansen test Chi-sq Prob > Chi-square	129.48 (0.47)	126.46 (0.50)	123.49 (0.52)	122.91 (0.43)
AR(1)	- 2.50 ** (0.01)	- 2.50 ** (0.01)	- 2.39 ** (0.02)	- 2.71 ** (0.01)
AR(2)	0.87 (0.38)	0.86 (0.39)	0.88 (0.37)	0.65 (0.51)
F-statistics Prob > F-statistics	5.30 ** (0.02)	4.64 *** (0.00)	3.66 ** (0.01)	2.67 ** (0.00)
No. of observations	1786	1786	1675	1563
No. of groups	130	130	130	130

Note: The values within parentheses are robust standard errors.
***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

APPENDIX

Let the following be true:

B_t	=	number of large firms in period *t* that are included in the census sector of ASI data
S_t	=	number of small and medium firms in period *t* that are included in the sample sector of ASI data
a	=	number of new large firms entering the product market
b	=	number of incumbent large firms exiting the product market
c	=	number of small and medium firms growing in size and becoming part of the census sector
d	=	number of large firms that reduce in size and become part of the sample sector
e	=	number of new small and medium firms entering the product market
f	=	number of incumbent small and medium firms exiting the product market

Suppose that all large firms are captured in a survey, while only one in three small and medium firms are reported. In other words, data reported for two successive surveys provide us with the following information:

$$A \equiv \left(B_{t+1} - B_t\right) + \frac{1}{3}\left(S_{t+1} - S_t\right) = (a-b) + \frac{1}{3}(e-f) + \frac{2}{3}(c-d) \qquad [A1]$$

It is easily seen that, in the absence of the possibility to move from the census sector to the sample sector, and vice versa, the following is true:

$$B \equiv \left(B_{t+1} - B_t\right) + \left(S_{t+1} - S_t\right) = (a-b) + \frac{1}{3}(e-f) \qquad [A2]$$

which is a monotonic transformation of the actual net entry that is given by {(*a*-*b*)+(*e*-*f*)}.

It is also easily seen that *A* would be a monotonic transformation of *B*, and therefore of the actual net entry, if the following were true: $c > d$. Since small and medium firms are much more likely to grow into larger firms, while poorly performing larger firms are more likely to exit than to exist with a much diminished presence, and given that there are many more small and medium firms relative to large firms, it would be reasonable to assume that indeed $c > d$.

Hence, our measure of net entry, which is captured by *A*, is a monotonic transformation of the actual measure of net entry.