Outreach of Banking Services, Infrastructure Penetration, Labour Regulation and Industrial Growth: Evidence from Indian States

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Abstract

This paper analyses the impacts of outreach of banking services, infrastructure penetration, and labour market rigidity on growth of manufacturing industries across 14 major states in India in the post-liberalisation period (1991-2002). It documents that both outreach of banking sector and infrastructure penetration has significant positive impact on growth of industries. Interestingly, the counteracting effect of rigid labour market regulation does not appear to be significant, if the effects of infrastructure and banking services are controlled for. This paper also assesses the relative magnitudes of the impacts of these three institutional factors on industrial growth.

Keywords: banking services, industrial growth, infrastructure, labour regulation

JEL Classifications: O4, G2, J5, L6

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1. Introduction

Does greater outreach of banking services fosters industrial growth of sub-national regions? If yes, how does the magnitude of the impact of banking sector's outreach compare with the magnitudes of the possible positive impact of infrastructure penetration and the counteracting effect of stringent labour regulations on growth of manufacturing industries across sub-national regions? We are interested in answering these questions.

There is a large literature establishing a positive association between industrial growth and financial development. This literature is concerned with the relation of growth of industries or firms to the financial development, structure of financial system, and legal aspects of countries. It also attempts to trace channels through which financial development and financial structure influence growth (see for example, Rajan and Zingales 1998, Cetorelli and Gambera 2001, Levine 2002, Beck and Levine (2002), Carlin and Mayer 2003, to name a few). However, these studies are at cross-country level and assume uniform financial development, and industrial growth, across sub-national regions of a country at any point of time. In reality, many countries are composed of diverse sub-national regions having different levels of financial development, which may be associated with differential growth patterns of industries across regions within a country. Democratically elected governments and partial policy autonomy of federal states of countries, like India, might add additional dimensions to differential pattern of financial development and industrial growth, particularly in the post-liberalisation period since liberalisation has empowered states with greater freedom and autonomy (Ahluwalia 2000).

From theoretical point of view, in a financially liberalised country with developed capital markets sub-national regions are ought to be financially integrated. In such a scenario, financial development of sub-national regions is not likely to have significant effect on industrial growth across regions. However, if national capital markets are not properly integrated, firms are likely to finance themselves largely in their own region. In other words, if there are frictions in national capital markets, outreach of financial services in a

state likely to affect its industrial growth.[1] This paper chooses India as a case study and aims to examine the role of outreach of banking services on differential growth pattern of industrial sector across Indian states in the post liberalisation period.

This paper also attempts to compare the magnitudes of the impact of infrastructure penetration and labour regulations on differential growth pattern of Indian states with that of banking sector's outreach. In existing literature, the counteracting effect of labour market rigidity has been examined in isolation, without taking explicit accounts for the effects of differential availability of banking services and infrastructure penetration across states. In an influential study, Besley and Burgess (2004) argue that pro-labour amendments of labour laws by some state governments has led to decline in manufacturing output in those states in the pre-reform period. Sanyal and Menon (2005) document that higher industrial disputes act as significant disincentive on firm location. Moreover, it is argued that industries in states with pro-labour environments grew slower than those in pro-employer environments after de-licensing, an important component of industrial reform in India, of industries (Aghion et al. 2008). However, none of these studies offer any comparison of the magnitude of counteracting effects of labour market rigidity to the magnitude of possible impacts of other institutional factors responsible for differential growth pattern of states, in spite of the importance of such comparison to design appropriate policy instruments to promote balanced expansion across regions in the interests of equitable growth and development. This study attempts to fill this gap.

This paper employs a methodology in the spirit of Rajan and Zngales (1998). Major advantage of this methodology is that it helps to identify the causal impact of financial development on growth of industries dependent on external finance without bringing in much complication.[2] We employ three alternative measures of outreach of banking sector across states: (a) an index of banking sector's outreach across states, which

[1] Determination of the extent of integration of national capital markets remains an empirical issue. This paper doesn't delve this issue directly, due to unavailability of required data. Rather, it takes an indirect root. If national capital markets are frictionless, that is expected to be reflected in our results.

[2] Using the same methodology, Claessens and Laeven (2003) examines whether industries more dependent on tangible assets benefit more from the protection of property rights, Carlin and Mayer (2003) examines the effect of financial structure on growth and investment of industries, , Fisman and Love (2003) studies whether industries more dependent on trade credit benefit more from financial development or not.

encapsulate indicators of access to banking services together with the measures of its use in to a single measure, (b) credit-income ratio across states, and (c) share of banking sector to state domestic product (SDP) across states. Clearly, our measures of outreach of banking services can also be seen as proxies for strength of banking services, i.e., of financial development, across states in India. In the rest of the paper, we will use these terms synonymously. We use availability of roads and extent of man-days lost due to industrial disputes as proxies for infrastructure penetration and labour regulations respectively.

We find that outreach of banking services has significant positive impact on the growth of manufacturing industries across states in India during the period of study (1991-2002). It indicates that capital markets in India are far less than perfectly integrated. We also document that infrastructure penetration promotes industrial growth. Interestingly, we find that the counteracting effect of rigid labour regulations on industrial growth is not significant, if the effects of outreach of banking services and infrastructure penetration are controlled for. It sharply contrasts with the existing literature that examines the role of labour market conditions on industrial growth in the context of India.

Comparison of magnitudes of the effects of above mentioned institutional factors on growth of industries reveals that, ceteris paribus, one percent increase in outreach of banking services (measured by 'index of banking') in a state can potentially increase the annual growth rate of real value added of the 'average industry', which has average levels of dependence for external finance, infrastructure dependence and labour intensiveness, by 1.04%. Given that the average annual growth rate of manufacturing industries in India during the period of study is 4.3%, the incremental effect of a percentage increase in outreach of banking services is quite large. To observe an equivalent increase in the growth rate of the 'average industry' in that state by increasing the infrastructure penetration, ceteris paribus, expansion of roads by 32.86 kilometer per 1000 square kilometer (or equivalent increase in the mix of components of infrastructure) is required. Though labour market factor is not significant, in order the gauge its relative position we compute its relative magnitude. It is found that in order to counteract the positive effect

of one percent increase in outreach of banking services in a state on the growth of the 'average industry' in that state, there needs to be as high as 205% increase in man-days lost per worker (or equivalent increase in labour market rigidity) in that state. Our results indicate that there are alternative policy instruments, such as increase in outreach of banking services, or increase in credit availability, and deepening infrastructure penetration in lagging states, which can potentially overcompensate the counteracting effects, if any, of existing labour market rigidity.

The rest of the paper proceeds as follows. The next section specifies the model to test possible impacts of institutional factors on growth of industries. Section 3 describes the data, variable construction, and presents some descriptive statistics. Section 3.1 briefly describes the growth pattern across states and industries during 1991-2002. Section 3.2 and Section 3.3 presents the characteristics of states and industries, respectively. Results are discussed in Section 4. Section 5 concludes. All tables are relegated to Appendix.

2. Model Specification:

It is argued that financial development disproportionately helps industries that are more dependent on external finance. The implication of this argument is that industries that are more dependent of external finance will grow faster in more financially developed regions. Based on this understanding, Rajan and Zingales (1998) have attempted to identify an industry's need for external finances. To do so, they have argued that an industry's demand for external finance is constant across the globe; it does not vary with its geographical location or the environment in which the industry is operating or on the nature of entrepreneurs. That means, an industry's (for example publishing and printing industry's) demand for external finance, which might be dependent on the demand for capital use, should be same irrespective of whether that industry is located in US or in India or somewhere else. Though it has some appeal, the invariance property of capital dependence, and hence of dependence on external finance, is not very convincing due to following reasons. First, in reality there is substitutability of inputs, say labour and capital, at least up to a certain degree in almost all industries. Second, composition of input uses by an industry largely depends on availability of resources and their relative

costs in the region of location. An industry located in a labour-rich region is likely to benefit by depending more on labour than on capital. Third, given the constraints, an industry is likely to innovate the ways to function more efficiently in that environment. Fourth, an industry's dependence on external finance depends on the type of entrepreneurs of that industry. If entrepreneurs are more capable in generating funds by themselves, their dependence on external finance will be less. Therefore, we use observed dependence on external finance of an industry, which varies across regions, as a proxy for that industries dependence on external finance.

As financial development disproportionately help industries that are more dependent on external finance, infrastructure development also may induce faster growth of industries which are more dependent on infrastructure. Also, more favourable labour market environment may disproportionately help industries that are more labour intensive. Similar to the case of financial dependence, we consider observed dependence on infrastructure and labour as proxies for infrastructure dependence and labour intensiveness of industries across states. Given this backdrop, we estimate following models in order to examine the impact of outreach of banking services, development, infrastructure penetration, and labour regulations on growth of manufacturing industries across 14 major states in India during 1991-2002. In the following models, the subscript *i* denotes industry, and *s* denotes state.

(1) $$Growth_{i,s} = \beta_1 \, (Share\ of\ manufacturing\ in\ 1991)_{i,s} + \beta_2 (External\ \ Dependence)_{i,s} (Financial\ \ Development)_s + Industry\ \ dummies\ \ + State\ \ dummies\ \ + u_{i,s}$$

$$(2)\qquad Growth_{i,s} = \beta_1\,(Share\ of\ manufacturing\ in\ 1991)_{i,s} + \beta_2\,(External\ Dependence)_{i,s}(Financial\ Development)_s + \beta_3\,(Infrastructure\ Deependence)_{i,s}(Infrastructure\ Penetration)_s + Industry\ dummies + State\ dummies + u_{i,s}$$

$$(3)\qquad Growth_{i,s} = \beta_1\,(Share\ of\ manufacturing\ in\ 1991)_{i,s} + \beta_2\,(External\ Dependence)_{i,s}(Financial\ Development)_s + \beta_3\,(Labour\ Intensiveness)_{i,s}(Labour\ \mathrm{Re}gulation)_s + Industry\ dummies + State\ dummies + u_{i,s}$$

$$(4)\qquad Growth_{i,s} = \beta_1\,(Share\ of\ manufacturing\ in\ 1991)_{i,s} + \beta_2\,(External\ Dependence)_{i,s}(Financial\ Development)_s + \beta_3\,(Infrastructure\ Deependence)_{i,s}(Infrastructure\ Penetration)_s + \beta_4\,(Labour\ Intensiveness)_{i,s}(Labour\ \mathrm{Re}gulation)_s + Industry\ dummies + State\ dummies + u_{i,s}$$

The advantage of formulating the econometric model as above is it helps to predict within-state differences between industries based on interaction terms between industry characteristics and state characteristics, and also estimates are less likely to suffer from bias due to misspecification of the model (see Rajan and Zingales 1998 for details). We also estimate the models, as specified above, using 'capital dependence', ratio of fixed capital to value added, of industries in place of 'external dependence' for the purpose of robustness check.

3. Data, Variable Construction and Descriptive Statistics

Data for this study comes from various sources. First, data on industry characteristics comes from the Annual Survey of Industries (ASI) produced by the Central Statistical Organisation (CSO) of India. Second, data related to states' financial development is compiled from Basic Statistical Returns of Scheduled Commercial Banks, Reserve Bank of India. Third, data on man-days lost due to industrial disputes across states are collected from various issues of Indian Labour Year Book, Ministry of Labour, Government of India. Fourth, data on availability of roads comes from the Statistical Abstract, Department of Road Transport and Highways, India. To transform nominal variables in to real, we use Gross Domestic Product (GDP) deflator (base year 1993-94), based on GDP data provided by the CSO.

In line with the standard practice of comparing the economic performance of states that treats north-eastern, other special category states and smaller states differently (see, for example, Ahluwalia 2002, Nachane *et al* 2002, Ahluwalia 2000), we confine our attention to 14 major states (see Table 11 for the list of states). ASI provides two series of data on industry characteristics. The first series gives (two-digit X state) level data for the year up to 1997, which is based on 1987 National Industrial Classification (NIC). The second series gives (three-digit X state) level data for the period 1998-2002, which is based on 1998-NIC. To have a comparable data series for the period 1991-2002, we match these two series according to the Concordance Table provided by the Central Statistical Organisation, which requires clubbing (a) NIC-20 and 21 together, (b) NIC-23, 24 and 25 together, and (c) NIC-35 and 36 together. Therefore we have data on 16 industry groups. We provide the list of industries in Table 10. To summarise, the analysis of this paper is based on data from 16 manufacturing industry groups across 14 major states in India.

3.1 Growth Performance of States and Industries

We consider, following Carlin ad Mayer (2003), average annual growth of real value added of industry *i* in state *s* as the dependent variable. Table 1 records the annual

average growth rates of 16 manufacturing industry groups across 14 major states in India over the period from 1991 to 2002. We observe the following about the growth performances of manufacturing industries across states and industry groups.

(i) Gujarat, Haryana, Andhra Pradesh, and Karnataka have highest growth rates of real value added in manufacturing industries while Bihar, Madhya Pradesh, and West Bengal have the lowest. The range of variation in growth rate of real value added during 1991-2002 is from a low of 0.1 % per year in Bihar to a high of 11% in Gujarat, a factor exceeding 11. While, the average growth rate of all states taken together is 4.3%. Clearly, there is wide variation in terms of growth of manufacturing industries across states during the period of study.

(ii) Coke, petroleum products, chemicals, plastic etc. industries (NIC-23-24-25), and other transport equipment and furniture industries (NIC-36-36) have lowest growth rates, less than 2%, while other manufacturing industries (NIC-38) and basic metals industries (NIC-27) have the highest growth rates, about 14%. Clearly, the growth pattern is very different for different industries.

(iii) As one would expect, there is considerable variation in the performance of industries across states. Moreover, the same industry is growing faster than the average in some states and slower in other states. For example, motor vehicles, trailers and semi-trailers industry (NIC-34) have grown at 26.9% in Rajasthan, but declined at 9.2% in Bihar; whereas in India as a whole the average growth rate of this industry is 5.2%.

3.2 Characteristics of States

In this section we briefly discuss policy background and the measures of outreach of banking services, infrastructure penetration, and labour regulations across states.

Public policy in India related to banking system can be separated in to two phases. The first phase of public policy towards promoting greater access to financial services started with the bank nationalisation, beginning July 1969, where the state took control of the banking sector. Bank nationalisation led the advent of ‘social banking’. In the first phase, banking sector has made significant progress in a balanced manner particularly due to

'social banking'. The era of 'social banking' ended in 1990 with the abolition of 1:4 license rule, which required banks to open four branches in un-banked locations in order to open a branch in a location with one or more branches. The second phase of public policy started with the financial sector reform in India during early 1990s. Salient features of post-reform period include lower pre-emption by the government sector, market-determined interest rates, increased competitiveness with entry of private banks and liberal entry of foreign banks. Clearly, balanced growth of banking sector across states did not receive much importance in the post-reform period. We use three alternative measures of financial development as follows.

(a) Index of Banking**:** It is well documented in the literature that (i) broad access to financial services facilitates undertaking high return investment projects by entrepreneurs, particularly by small and medium entrepreneurs (Galor and Zeira, 1993), (ii) better access to finance facilitates new entry of firms (Klapper, Laeven and Rajan, 2004), (iii) access to finance for larger parts of the population is crucial for the market economy (Rajan and Zingales, 2003). However, along with access to finance, actual use of financial services is also important. Since, in spite of having access, economic agents may not use it because of high opportunity cost (Beck et al 2007). Therefore, it is necessary to combine measures of these two aspects, access to banking services and use of banking services, together in order to arrive at a consolidated measure of banking sector's strength in a state. We consider following six indicators to construct an index of banking: (i) demographic branch penetration: number of bank branches per 10 lakh people; (ii) geographic branch penetration: number of bank branches per 1000 square-km; (iii) deposit accounts per capita: number of deposits per 1,000 people; (iv) credit accounts per capita: number of loans per 1,000 people; (v) ratio of deposit to income; and (vi) ratio of credit to income.[3] We construct the methodology using the similar methodology as in Sarma (2008), which constructs the index at the country level. We first construct the index for each state and each year starting

[3] Beck et al. (2007) present aggregate cross-country data on similar indicators of banking sector outreach and show that these indicators closely track more difficult and costly to collect micro-level statistics of household and firm use of banking services.

from 1991 to 2002.[4] Next, we calculate the average value of the index for each state over years (1991-2002), to measure the outreach of banking sector across states during the period of study. We use this index as a proxy for outreach of banking services in much of the paper. Table 2 reports the average value of the index for each state. Higher value of the index represents better outreach of banking sector in that state. There are variations in terms of outreach of banking services across states. We find that Madhya Pradesh and Bihar have lowest outreach of banking services (value of the index is 0.085), whereas Kerala (0.190), Karnataka (0.158), and Punjab (0.153) have highest.

(b) Credit Availability: It is argued that credit constraints are holding back small and medium sized firms from expanding in India (Banerjee and Duflo 2003, Nagaraj 2005). Moreover, credit is considered to be very important factor for industrial growth in general. Therefore, we also consider explicit measure of supply of credit. We use credit availability, measured as the proportion of bank credit to income, as a proxy for banking sector's strength in a state. As in terms of index of banking, there are wide variations across states in terms of credit availability: highest in Maharashtra (0.477) followed by Tamil Nadu (0.375), whereas in Bihar it lowest (0.15).

(c) Share of Banking: Share of banking is the ratio of value added of banking sector to the State Domestic Product (SDP). It is a direct measure of banking sector's strength in a state. In sates like Orissa and Bihar the share of banking is less than 0.03, whereas Tamil Nadu, Gujarat, Karnataka, West Bengal, and Maharashtra the share of banking sector is more than 0.06.

Table 3 reports correlation coefficients of these three measures. Note that, index of banking has positive and significant correlation, as expected, with credit availability and share of banking. For much of this study, we use index of banking as a proxy for outreach of banking services. We will instrument index of banking with a measure of governance

[4] Needless to mention, the maximum and minimum values to standardize the variables has been chosen from the entire panel.

of the period 1979-90, which predate the period of this study, and also with index of banking of the period 1979-90 to see that the results do not suffer from potential endogeneity problem.

We use availability of roads, measured as kilometers of road per 1000 square kilometer land area, as a proxy for infrastructure penetration in a state. We note that, other than transportation, power supply and telecommunications are also important components of physical infrastructure. Also, quality of infrastructure is important. However, due to data limitations, we consider only availability of roads. We presume that availability of roads, power supply and telecommunications are positively correlated. We note that transmission and distribution loss (T&D loss) of electricity have been used as a proxy for infrastructure (Kochhar et al 2006). However, a large part T&D loss of electricity is due to theft of electricity. For example, Karnataka Power Transmission Corporation reports that only a minimum power loss is due to technical reason, while the rest (about 50% to 80% of total loss, depending on sub-regions) is due to electricity theft in Karnataka (Times of India, Bangalore, August 18, 2008). Kodwani (2006) documents that theft and un-metered supply of electricity causes about 60% of total T&D loss of electricity in India. Therefore, T&D loss largely reflects the quality of governance in a state, not necessarily quality of infrastructure. Note that T&D loss and availability of roads are negatively correlated (see Table 3).

Next, we turn to labour regulations across states. In India labour regulations fall in the Concurrent List. That is, both the central and the state governments have jurisdiction over labour legislation. Guidelines for conflict resolution in the process of collective bargaining are provided by the key central legislation, the Industrial Dispute Act 1947. Most of the state governments have used this opportunity to strengthen or weaken various provisions of this act time to time (see Besley and Burgess 2004). As a result, labour practices, and hence degree of labour market rigidity, varies across states. It is argued that higher degree of labour market rigidity hampers economic growth. However, measuring the nature of labour regulations, i.e., measuring the degree of labour market rigidity is an issue. Besley and Burgess (2004) use a categorical variable based on coding of

amendments by state governments as a measure of labour market rigidity. They code pro-worker amendments as a one, neutral amendments as a zero, and pro-employer amendments as minus one. Following Besley and Burgess (2004), many studies have used this measure of labour market regulation (see for example Hasan et al 2007, Aghion et al 2008). However, Bhattacharjea (2006) raises important concerns regarding the coding of state legislation amendments by Besley and Burgess (2004). Therefore, we opt for an alternative measure of labour market rigidity on the basis of observed situation of industrial relations across states. It is expected that states with more rigid labour markets, will experience more industrial disputes, and hence more man-days lost due to industrial disputes. We consider man-days lost due to industrial disputes per worker as the proxy for labour market rigidity. Table 2 reports state-wise average man-days lost per worker during 1991-2008. It indicates that in West Bengal labour market is most rigid, followed by Kerala and Maharashtra; while in Gujarat labour market is most flexible, followed by Punjab.

A number of correlations between state characteristics are noteworthy. First, banking sector is more developed in richer states. The correlation of per capita NSDP with index of banking, credit availability and share of banking are 0.526, 0.459, and 0.620, respectively, and significant at 1% level (see Table 3). Second, infrastructure penetration also seems to be higher in richer states. The correlation between roads availability and per capita NSDP is positive and significant. However, the correlation coefficient is small (0.15). Third, rigid labour market situation is negatively correlated with per capita NSDP, but the correlation is not significant (at 10% level).

3.3 Characteristics of Industries:

In this section we discuss the measures of industries' external dependence, capital dependence, infrastructure dependence, and labour intensiveness.

We consider the proportion of outstanding loan to invested capital as the measure of an industry's external dependence.[5] Higher proportion of loan to invested capital indicates

[5] Gupta et al (2008) also employed the same measure.

higher external dependence for finance. As discussed before, we consider observed dependence on external finance of an industry in a state as measure for that industry's external dependence in that state. Table 4 reports average external dependence of each industry. As expected, there is wide variation in terms of external dependence across industries. For the industry group 23-24-25 it is as high as 0.915, whereas for the industry group 39 it is only 0.132.[6] For seven out of 16 industries the average external dependence is more than the mean level (0.538).

In order to examine whether industries, which are more dependent on capital, grows faster in states with more developed banking system or not, we consider the ratio of fixed capital to value added as a proxy for capital dependence of industries.[7] As in terms of external dependence, industries also vary widely in terms of capital dependence (see Table 4). Dependence on capital is positively correlated with external dependence. The correlation coefficient is 0.379 (significant at 1% level).

We use the ratio of fuel expenditure to value added as the proxy for infrastructure dependence of an industry. We note that more appropriate measure of infrastructure dependence could be the ratio of expenses on transportation, fuels, and communication to value added. However, due to unavailability of required data we consider expenditure on fuel only. Table 4 reports average infrastructure dependence of each industry during 1991-2002. Industry groups 38, 35-36 and 39 have the lowest dependence on infrastructure, whereas industry groups 32 and 33 have the highest.[8]

Number of workers per unit of fixed capital, i.e., worker-capital ratio, indicates an industries labour intensiveness, relative to capital. We use it as the measure of labour intensiveness of industries, where fixed capital is in lakhs (1993-94 prices). Higher value

[6] NIC-23-24-25 = Coke, Petroleum Products and Nuclear Fuel; Chemicals; Rubber and Plastic Industry, NIC-39 = Repair of Capital Goods Industry.
[7] Alternatively, we can use the ratio of invested capital to value added as a proxy for capital dependence. The correlation coefficient between (ratio of fixed capital to value added) and (ratio of invested capital to value added) is 0.927 and is significant at 1% level.
[8] NIC-38 = Other Manufacturing Industries, NIC-35-36 = Other Transport Equipments and Furniture, NIC-39= Repair of Capital Goods, NIC-32= Radio, Television and Communication Equipments, NIC-33= Medical, Precision and Optical Instruments, Watches and Clocks.

of this ratio indicates higher labour intensiveness. We report average labour intensiveness of each industry in Table 4. As expected, there is wide variation in terms of labour intensiveness across industries. Average labour intensiveness of industry 39 is as high as 5.269, i.e., more than five workers are employed per lakh rupees (in 1993-94 price) of investment in fixed capital. On the other hand, average labour intensiveness of industry 30 is only 0.243.[9]

4. Results

In Section 4.1, we report the results obtained by estimating model (1), as specified in Section 2. In Section 4.2, we describe the results using additional interactions as specified in model (2), (3) and (4) in Section 2.[10] Our dependent variable is the average of annual growth rates in real value added over the period 1991-2002. We estimate the models using OLS, robust standard errors. We also employ two-stage least squares method (2SLS) to estimate model (1) using instruments for index of banking. Since the effects of unobserved state-specific effects and industry specific effects are controlled due to the use of state dummies and industry dummies, only the effects of the variables that vary both across industries and also across states are identified. Therefore, we report only the coefficient(s) of the interaction term(s) and the coefficient of the industry's share of total value added in manufacturing in the first year of the study period, 1991.

4.1 Role of Banking Services

Table 6 reports the estimates of model (1) obtained by using various measures of availability of banking services. We start with the index of banking as the measure for outreach of banking services. The coefficient of the interaction term is positive and significant (at 5% level); see the first column of Table 6. Clearly, it seems that outreach of banking services across states has positive effect on industrial growth. We can say that, for any given level of external dependence of an industry, better outreach of banking services in a state fosters its growth in that state. One percent increase in outreach of

[9] NIC 39= Repair of Capital Goods. NIC 30= Office, Accounting and Computing Machinery

[10] In order to check non-linear relation of growth to interaction term(s), we estimate all models using the square of interaction term(s). It turns out that the coefficient(s) of square term(s) are insignificant (at 10% level). So, we don't report those regression results. Moreover, inclusion of dependence terms separately does not influence our results.

banking services (measured by the index of banking) in a state leads to 1.4% increase in growth rate of an industry that has average level of dependence on external finance (0.538) in that state, ceteris paribus. Note that the real average annual growth rate during the period of study, 1991-2002, is 4.3%. Moreover, industries which are more dependent on external finance in a state grow faster in that state if there is better outreach of banking sector, compared to industries which are less dependent on external finance.

The second and third columns of Table 6 include availability of bank-credit and share of banking, respectively, as proxies for outreach of baking services. Both coefficients are positive and significant (at 5% level), as in case of index of banking. It suggests that our result is not sensitive to the measure of outreach of banking services.

To address the potential concern about endogeneity, we use two instruments for index of banking: (a) index of banking for the pre-reform period (1979-1990), (b) (1 – T&D loss) of the pre-reform period. As argued in Section 3.2, (1- T&D loss) can be viewed as a measure of quality of governance. The fourth and fifth column of Table 6 reports results corresponding to the first and second instrument, respectively. It shows that the coefficient of the interaction term remains positive and significant. The coefficients are also very similar in magnitude to the coefficient in the first column. It indicates that there is no potential endogeneity problem, and, hence, causal inferences drawn from regressions are indeed valid.

Next, we examine whether greater outreach of banking services promotes growth of industries by facilitating to meet the need for capital. We estimate model (1) using capital dependence in place of external dependence. Results corresponding to index of banking, credit availability, and share of banking as proxy for availability of banking services are reported in the first, second, and third column of Table 7, respectively. Coefficients of interaction terms are all positive and significant (at 5% level). Therefore, it seems that higher availability of banking services in a state leads to higher growth of industries in that state. Also, it appears that, industries that are more dependent on capital grows faster

in a state with stronger banking system compared to industries that are less dependent on capital and/or located in state with weaker banking system.

Our findings are consistent with the results of cross-country analyses. Significant impact of outreach of banking services on growth of industries across states in India indicates lack of integration of capital markets in India during the period of study. In other words, it seems that, firms largely finance themselves in their own regions.

4.2 To What Extent Do Infrastructure Penetration and Labour Regulation Matter?

In this section we discuss the role of banking services vis-à-vis the role of infrastructure penetration and the role of labour regulation. Table 8 and Table 9 reports estimation results of model (2), (3), and (4) corresponding to two alternative measures of outreach of banking services: index of banking and credit availability, respectively. The first column of each of these two tables reports respective baseline results, which are same as in the first column of Table 6 and Table 7.

In the second column of Table 8, we report the estimation results of model (2), where we include the interaction between external dependence and index of banking and the interaction between infrastructure dependence and roads availability. Coefficients of both interaction terms are positive and significant (at 5% level). It validates our result that greater outreach of banking services has positive and significant impact on growth of manufacturing industries, even after controlling for possible impacts of infrastructure penetration. From the estimates of these two coefficients we can say that, for an industry that has average level of external dependence (0.538) and average level of dependence on infrastructure (0.316) in a state, one percent increase in index of banking is equivalent to expansion of roads by 33.54 kilometers per thousand square kilometer land area of that state, ceteris paribus, both will lead to the same increase in growth rate of that industry (by 1.06% per annum).[11] Comparing the impact of infrastructure penetration with the

[11] Ceteris paribus, 1% increase in index of banking in a state leads to (1.973 * 0.538)*100 % = 1.06% increase in annual growth rate of an industry that has average level of external dependence (0.538) in that state. Similarly, ceteris paribus, expansion of road availability by 1 km per 1000 sqkm area in a state leads to (0.001 * 0.316)*100 = 0.0316% increase in annual growth rate of the industry that has average level of

impact of credit availability, results of which are in the second column of Table 9, we find that one percent increase in credit availability in a state is equivalent to expansion of roads by 20.65 kilometers per thousand square kilometer land area of that state, ceteris paribus, for the industry that has average levels of external dependence and infrastructure dependence.[12]

Next, we compare the impacts of banking services and labour regulations on growth of manufacturing industries. The third column of Table (8) reports the estimation results of model (3), where we include the interaction between external dependence and index of banking and the interaction between labour intensiveness and man-days lost. As expected, it shows that the coefficient of the first interaction term is positive and significant, as earlier; but the coefficient of the second interaction term is negative and significant. It seems that more rigid labour regulations counteract positive effects of financial development. To get better idea about the order of magnitudes of this two opposing effects, as before, let us consider an industry that has average level of external dependence (0.538) and average level of labour intensiveness (1.689). From coefficients of the third column of Table 8, we can say that, ceteris paribus, (a) one percent increase of index of banking leads to about 1.36% increase in annual growth rate of an industry that has average level of external dependence and (b) 160.67% increase in man-days lost per worker leads to about 1.36% decrease in annual growth rate of an industry that has average level of labour intensiveness. Therefore, ceteris paribus, for an industry in a state that has average levels of external dependence and labour intensiveness, the positive effect of one percent increase in index of banking can be completely nullified if man-days lost increases by 160.67%, which is quite large, in that state. Comparing the coefficients of the third column of Table 9, it seems that one percent increase in credit availability in a state leads to about 0.79% increase in annual growth rate of an industry in that state that has average level of external dependence. If that industry also has average level of labour

dependence on infrastructure (0.316) in that state. Comparison of these two implies that 1% increase in index of banking is equivalent to expansion of roads by 33.59 km per sqkm land area for an industry in a state that has average level of external dependence and also average level of dependence on infrastructure.

[12] 1% increase in credit availability leads to about 0.65% percent increase in annual growth of an industry that has average level of external dependence.

intensiveness, increase in man-days lost per worker in that state by 117.06% will counter balance the positive impact of one percent increase in credit availability.

However, when we also include the interaction between infrastructure dependence and roads availability as in model (4), the coefficient of the interaction between labour intensiveness and man-days lost becomes even smaller. Moreover, that coefficient becomes insignificant irrespective of whether we use index of banking or credit availability as measure of financial development (see last columns of Table 8 and Table 9), while the effects of both the interactions involving measures of financial development and infrastructure penetration, respectively, remains positive and significant. It suggests that, though it seems labour regulation has negative effect, which is quite small compared to the effects of other two factors, it is not significant (at 10% level) if we control for possible effects of financial development and infrastructure penetration. The final set of regressions indicates that when we examine the impact of labour regulation without controlling for infrastructure penetration, the interaction term involving measure of labour regulation is actually picking up the effects of the interaction between infrastructure dependence and roads availability. This result is in contrast to the existing literature that examines the impact of labour regulations on performance of industries across states in India. Comparing the relative magnitudes of the impacts of the above mentioned institutional factors, from the coefficients of interaction terms of these final regressions (last columns of Table 8 and Table 9), on annual growth rate of real value added of the average industry, which has average levels of external dependence, dependence on infrastructure and labour intensiveness, we find that one percent increase in outreach of banking services (or 1.62% increase in credit availability) in a state can lead to about 1.04% increase in annual growth rate of an average industry in that state, ceteris paribus. Alternatively, an expansion of roads by 32.86 kilometer per 1000 square kilometer, ceteris paribus, can match the increase in growth rate of that industry by similar magnitude. An increase in man-days lost per worker by 205% may nullify the effect of 1% increase in outreach of banking services or the effect of equivalent increase in infrastructure penetration on the growth of the average industry in that state. However, note that the effect of labour market rigidity is not statistically significant.

5. Conclusion

In the context of literature on differential industrial growth across sub-national regions, this paper provides fresh evidence that imperfection in financial market plays important role to shape the pattern of industrial growth across sub-national region. In particular, analysing data of the post-reform period from 14 major states of India, it shows that outreach of banking services has significant positive impact on growth of manufacturing industries.

It also examines the role of infrastructure penetration and labour regulation on growth of manufacturing industries across states in India in the post-reform period. It shows that (a) infrastructure penetration facilitates industrial growth and (b) the counteracting effect of rigid labour market is not significant. The last result is in sharp contrast to the findings of the existing literature that analyses the role of labour regulations on industrial growth in the context of India

Finally, it attempts to compare the magnitude of the impact of financial development on industrial growth with that of infrastructure penetration and labour regulations, which is important to design appropriate policy instrument in order to promote balanced expansion across regions in the interests of equitable growth and development. It appears that the magnitude of counteracting effect, if there is any, of rigid labour regulation is quite small compared to the magnitude of positive effects of the outreach of banking services or that of infrastructure penetration. It shows that there are alternative policy instruments, such as increase in outreach of banking services, or increase in credit availability, and deepening infrastructure penetration in lagging states, which can potentially overcompensate the counteracting effects, if any, of existing labour market rigidity.

Appendix

Table 1: Growth of Real Value Added (1991-92 to 2002-03) Across States and Industries

Industry (NIC 1987)	States														
	AP	BIH	GUJ	HARY	KARN	KER	MAH	MP	ORIS	PUNJ	RAJ	TN	UP	WB	**All States**
20-21	0.087	0.090	0.062	0.119	0.109	0.079	0.091	0.466	0.337	0.089	0.213	0.017	0.049	0.000	**0.048**
22	0.095	0.026	0.208	0.146	0.356	0.087	0.162	0.144	0.539	0.060	0.238	0.211	0.114	0.424	**0.072**
23-24-25	0.030	0.322	0.010	0.052	0.083	0.006	-0.032	0.080	-0.108	0.035	-0.012	0.024	-0.037	0.022	**-0.002**
26	0.309	-0.054	0.145	0.322	0.306	0.317	0.080	0.580	0.388	0.061	0.186	0.176	0.140	0.166	**0.126**
27	0.506	0.058	0.150	0.523	0.273	0.134	0.756	0.039	0.030	1.039	0.511	0.166	0.418	0.192	**0.140**
28	0.070	0.284	0.152	0.032	0.058	0.452	0.056	0.003	0.082	0.455	0.346	0.116	0.060	0.048	**0.053**
29	0.900	0.407	1.346	0.207	0.674	0.657	0.197	0.267	-0.138	0.119	0.388	0.034	0.110	0.329	**0.036**
30	0.215	0.778	0.124	0.111	0.162	0.035	0.069	0.059	0.590	0.158	0.239	0.040	0.081	0.087	**0.064**
31	0.276	0.101	1.172	0.129	0.449	0.130	0.139	0.230	0.314	0.121	0.100	0.013	0.088	0.154	**0.094**
32	0.091	0.373	0.112	0.003	0.019	0.024	0.040	0.017	0.024	0.712	0.312	0.033	0.017	0.094	**0.038**
33	0.453	0.012	0.223	0.273	0.135	0.179	0.623	0.275	0.041	0.214	2.042	0.084	0.175	0.043	**0.036**
34	0.133	-0.092	0.112	0.164	0.147	0.173	0.051	0.094	0.004	0.055	0.269	0.136	0.178	0.003	**0.052**
35-36	0.023	0.291	0.050	0.064	0.070	0.064	0.019	0.022	0.032	0.040	0.063	0.022	0.060	-0.003	**0.017**
37	0.254	0.006	0.166	0.174	0.128	0.032	0.091	0.115	0.449	0.071	0.371	0.078	0.055	-0.052	**0.061**
38	0.403	0.454	0.175	0.126	0.220	0.033	0.210	0.345	0.116	0.173	0.395	0.163	0.102	0.921	**0.146**
39	0.108	1.147	0.243	0.051	0.510	0.187	0.066	0.541	0.392	0.143	0.111	0.171	0.049	0.282	**0.128**
All Industries	**0.070**	**0.001**	**0.110**	**0.078**	**0.070**	**0.035**	**0.042**	**0.008**	**0.035**	**0.040**	**0.053**	**0.029**	**0.023**	**0.018**	**0.043**

Table 2 : Measures of Outreach of Banking Services, Infrastructure Penetration, and Labour Regulation Across States During 1991-2002

State	Index of Banking	Credit Availability	Share of Banking	T&D Loss	Roads Availability	Man-days Lost Per Worker	Per Capita NSDP
AP	0.131	0.252	0.041	0.240	557.585	4.180	7059.937
BH	0.085	0.150	0.030	0.240	619.447	3.272	3201.207
GUJ	0.106	0.228	0.064	0.210	434.992	1.360	9769.677
HARY	0.112	0.213	0.031	0.270	586.157	2.847	10586.390
KARN	0.158	0.326	0.064	0.224	680.735	2.669	7634.698
KER	0.190	0.272	0.053	0.205	3407.752	7.937	8539.200
MAH	0.119	0.477	0.109	0.176	732.987	6.455	10678.750
MP	0.085	0.175	0.034	0.220	326.304	1.909	6090.037
ORIS	0.106	0.167	0.029	0.282	1191.344	1.592	4803.658
PUNJ	0.153	0.277	0.040	0.187	1040.322	1.366	11949.910
RAJ	0.086	0.159	0.034	0.254	313.362	3.859	6342.858
TN	0.150	0.375	0.061	0.179	1270.586	3.998	8462.961
UP	0.088	0.160	0.035	0.248	649.897	1.484	4866.975
WB	0.107	0.271	0.074	0.216	726.683	19.345	6831.501

Notes: Index of Banking is the index of the outreach of banking services, Credit Availability is the ratio of bank credit to state domestic product (SDP), Share of Banking is the contribution of banking sector to SDP, T&D Loss is the transmission and distribution loss of electricity to total generation, Roads Availability is the kilometers of roads per thousand square kilometer, Man-days Lost Per Worker is the ratio of total man-days lost due to industrial dispute to total number of workers, and Per Capita NSDP is the per capita net SDP.

Table 3: Correlation between Measures of Outreach of Banking Services, Infrastructure Penetration, and Labour Regulation

	Index of Banking	Availability of Credit	Share of Banking	T&D Loss	Roads Availability	Man-days Lost Per Worker
Index of Banking	1					
Availability of Credit	0.298***	1				
Share of Banking	0.568***	0.873***	1			
T&D Loss	-0.494***	- 0.704***	-0.765***	1		
Roads Availability	0.743***	0.081	0.202***	- 0.065	1	
Man-days Lost Per Worker	0.104	0.476***	0.271***	- 0.197***	0.204***	1
Per Capita NSDP	0.526***	0.459***	0.620***	- 0.376***	0.150**	-0.009

Notes: * = significant at 10% level, ** = significant at 5% level, and *** = significant at 1% level.

Table 4: Pattern of Dependence on External Finance, Capital, Infrastructure, and Labour Intensiveness across industries in India During 1991-92 to 2002-03

Industry (NIC-1987)	Dependence on External Finance [Loan / IC]	Capital Dependence [FC / VA]	Infrastructure Dependence [Fuel Cons. / VA]	Labour Intensiveness [(No. Workers) / (FC lakhs)]
20-21	0.499	1.444	0.270	1.806
22	0.405	1.041	0.154	3.774
23-24-25	0.915	1.709	0.388	1.675
26	0.562	1.195	0.134	2.811
27	0.544	1.524	0.199	2.349
28	0.539	2.261	0.460	0.680
29	0.527	1.843	0.161	2.106
30	0.844	3.115	0.636	0.243
31	0.446	2.492	0.245	0.467
32	0.538	2.315	0.845	0.936
33	0.501	3.491	0.853	0.373
34	0.604	1.172	0.202	1.370
35-36	0.493	1.140	0.115	0.701
37	0.492	1.657	0.158	1.213
38	0.575	1.394	0.096	1.245
39	0.132	0.674	0.132	5.269

Notes: Dependence on External Finance = [(Outstanding Loan) / (Invested Capital], Capital Dependence = [(Fixed Capital) / (Value Added)], Infrastructure Dependence = [(Fuel Consumption) / (Value Added)], and Labour Intensiveness = [(Number of Workers) / (Fixed Capital in lakhs in 1993-94 prices)].

Table 5: Summary Statistics of Industry Characteristics

A: Summary Statistics

	Mean	Standard Deviation	Number of Observations
Industry's Share of Total Value Added in 1991	0.063	0.080	222
Dependence on External Finance [(Outstanding Loan) / IC]	0.538	0.397	224
Capital Dependence [FC / VA]	1.779	1.213	224
Infrastructure Dependence [Fuel Consumption / VA]	0.316	0.294	224
Labour Intensiveness [(No. of Workers) / (FC in lakhs)]	1.689	2.091	224

Note: For Kerala and Rajasthan, industry 29's data on value added in 1991 is not available.

B: Correlation between Measures of Dependence

	Dependence on External Finance	Capital Dependence	Infrastructure Dependence
Dependence on External Finance	1		
Capital Dependence1	0.379***	1	
Infrastructure Dependence	0.252***	0.681***	1
Labour Intensiveness	-0.119**	-0.380***	-0.282***

Note: *** = significant at 1% level, ** = significant at 5% level.

Table 6: Industry Growth, External Dependence and Measures of Outreach of Banking Services

Variables	Index of Banking	Credit Availability	Share of Banking to SDP	Instrumental Variable – 1	Instrumental Variable – 2
Interaction (External Dependence X Index of Banking)	**2.610** (0.037)	–	–	**2.697** (0.042)	**2.420** (0.030)
Interaction (External Dependence X Credit Availability)	–	**1.510** (0.038)	–	–	–
Interaction (External Dependence X Share of Banking)	–	–	**8.169** (0.049)	–	–
Industry's Share of Total Value Added in Manufacturing in 1991	-0.037 (0.937)	-0.029 (0.950)	-0.025 (0.958)	-0.027 (0.954)	-0.058 (0.898)
Industry Dummies	Yes	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes	Yes
R^2	0.180	0.184	0.190	0.180	0.180
Number of Observations	222	222	222	222	222

Notes: The dependent variable is the average of annual growth rates in real value added over the period 1991-2002 of each industry in each state. External dependence is the fraction of capital expenditure financed by taking loans by the same industry in the same state during 1991-2002. The interaction variable is the product of external dependence and availability of banking services in that state. Availability of banking services is the index of outreach of banking services during 1991-2002 in the first column; availability of credit, which is the ratio of bank credit to SDP, in the second column; and share of banking, which is the contribution of banking sector to SDP, in the third column. The fourth and fifth columns are estimated with the index of outreach of banking services during 1979-90 and the average of (1 – T&D loss) during 1979-90, respectively, as instruments for the index of outreach of banking during 1991-2002. All regressions include both state and industry specific fixed effects (coefficient estimates are not reported). p-values, corresponding to heteroscedasticity robust standard errors, are reported in parentheses.

Table 7 : Industry Growth, Dependence on Capital and Measures of Outreach of Banking Services

Variables	Index of Banking	Credit Availability	Share of Banking to SDP
Interaction (Capital Dependence X Index of Banking)	**1.418** (0.016)		
Interaction (Capital Dependence X Credit Availability)		**0.891** (0.017)	
Interaction (Capital Dependence X Share of Banking)			**5.258** (0.014)
Industry's Share of Total Value Added in Manufacturing in 1991	-0.356 (0.269)	-0.184 (0.593)	-0.168 (0.607)
Industry Dummies	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes
R^2	0.382	0.419	0.504
Number of Observations	222	222	222

Notes: The dependent variable is the average of annual growth rates in real value added over the period 1991-2002 of each industry in each state. Capital Dependence is the ratio of fixed capital to value added for the same industry in the same state during 1991-2002. The interaction variable is the product of external dependence and outreach of banking services in that state. Outreach of banking services is the index of banking services during 1991-2002 in the first column; credit availability, which is the ratio of bank credit to SDP, in the second column; and share of banking, which is the contribution of banking sector to SDP, in the third column. All regressions include both state and industry specific fixed effects (coefficient estimates are not reported). p-values, corresponding to heteroscedasticity robust standard errors, are reported in parentheses.

Table 8: Outreach of Banking Services, Infrastructure Penetration, Labour Regulation and Industry Growth

Variables	Index of Banking	Index of Banking and Infrastructure	Index of Banking and Labour	Index of Banking, Infrastructure and Labour
Interaction (External Dependence X Index of Banking)	**2.610** (0.037)	**1.973** (0.044)	**2.522** (0.035)	**1.930** (0.043)
Interaction (Infrastructure Dependence X Roads Availability)	–	**0.001** (0.000)	–	**0.001** (0.000)
Interaction (Labour Intensiveness X Man-days Lost)	–	–	**-0.005** (0.040)	-0.003 (0.162)
Industry's Share of Total Value Added in Manufacturing in 1991	-0.037 (0.937)	-0.003 (0.995)	-0.0117 (0.980)	0.012 0.977
Industry Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
R^2	0.180	0.253	0.186	0.255
Number of Observations	222	222	222	222

Notes: The dependent variable is the average of annual growth rates in real value added over the period 1991-2002 of each industry in each state. External dependence is the fraction of capital expenditure financed by taking loans by the same industry in the same state during 1991-2002. Infrastructure Dependence is the the ratio of fuel expenditure to value added. Labour Intensiveness is the number of workers per lakh of fixed capital (in 1993-94 prices). Index of Banking is the composite measure of outreach of banking services in states. Roads availability is the kilometers of road per 1000 square kilometer land area of states. Man-days Lost is the man-days lost due to industrial disputes per worker in states. All regressions include both state and industry specific fixed effects (coefficient estimates are not reported). p-values, corresponding to heteroscedasticity robust standard errors, are reported in parentheses.

Table 9: Credit Availability, Infrastructure Penetration, Labour Regulation and Industry Growth

Variables	Credit Availability	Credit Availability and Infrastructure	Credit Availability and Labour	Credit Availability, Infrastructure and Labour
Interaction (External Dependence X Credit Availability)	**1.510** (0.038)	**1.213** (0.042)	**1.47** (0.037)	**1.194** (0.042)
Interaction (Infrastructure Dependence X Roads Availability)	–	**0.001** (0.000)	–	**0.001** (0.000)
Interaction (Labour Intensiveness X Man-days Lost)	–	–	**-0.004** (0.038)	-0.003 (0.153)
Industry's Share of Total Value Added in Manufacturing in 1991	-0.029 (0.950)	0.018 (0.967)	-0.002 (0.997)	0.034 0.938
Industry Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
R^2	0.184	0.256	0.190	0.259
Number of Observations	222	222	222	222

Notes: The dependent variable is the average of annual growth rates in real value added over the period 1991-2002 of each industry in each state. External dependence is the fraction of capital expenditure financed by taking loans by the same industry in the same state during 1991-2002. Infrastructure Dependence is the the ratio of fuel expenditure to value added. Labour Intensiveness is the number of workers per lakh of fixed capital (in 1993-94 prices). Credit Availability is the proportion of bank credit to income in a state. Roads availability is the kilometers of road per 1000 square kilometer land area of states. Man-days Lost is the man-days lost due to industrial disputes per worker in states. All regressions include both state and industry specific fixed effects (coefficient estimates are not reported). p-values, corresponding to heteroscedasticity robust standard errors, are reported in parentheses.

Table 10: List of Industries

NIC-1987 Code	Industrial Sector
20-21	Wood Products, Straw and Plating Materials, and Paper Products
22	Publishing and Printing
23-24-25	Coke, Petroleum Products and Nuclear Fuel; Chemicals; Rubber and Plastic
26	Other Non-Metallic Mineral Products
27	Basic Metals
28	Fabricated Metal Products
29	Machinery and Equipments
30	Office, Accounting and Computing Machinery
31	Electrical Machineries
32	Radio, Television and Communication Equipments
33	Medical, Precision and Optical Instruments, Watches and Clocks
34	Motor Vehicles, Trailers and Semi-Trailers
35-36	Other Transport Equipments and Furniture
37	Recycling
38	Other Manufacturing Industries
39	Repair of Capital Goods

Table 11: List of States

State Code	Name of the State
AP	Andhra Pradesh
BH	Bihar
GUJ	Gujarat
HARY	Haryana
KARN	Karnataka
KER	Kerala
MAH	Maharashtra
MP	Madhya Pradesh
ORIS	Orissa
PUNJ	Punjab
RAJ	Rajasthan
TN	Tamil Nadu
UP	Uttar Pradesh
WB	West Bengal

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