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Meghana Ayyagari
Asli Demirguc-Kunt
Vojislav Maksimovic

June 30, 2014

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Abstract

We examine the relation between establishment size and age in the formal sector using survey data from 120 developing countries. Existing research suggests that manufacturing establishments in developing countries do not grow over time, most likely due to market imperfections and regulations. To the contrary, we find that the average plant in developing countries that is over 40 years old employs almost five times as many workers as the average plant five years or younger. We find consistent evidence when we look within a large country, India, using detailed manufacturing census data over 23 years. We also find that differences in financial development across Indian states, while substantial, have a minor effect on firm growth, consistent with inefficiency of state-owned financial systems. These results hold controlling for differences in labor regulations across states, capital intensity, labor regulations, and for firms born before and after the major reforms.

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*Ayyagari: School of Business, George Washington University, ayyagari@gwu.edu, Ph: 202-994-1292; Demirgüç-Kunt: World Bank, ademirguckunt@worldbank.org, Ph: 202-473-7479; Maksimovic: Robert H. Smith School of Business at the University of Maryland, vmaksimovic@rhsmith.umd.edu, Ph: 301-405-2125. We would like to thank Miriam Bruhn, Roberto Fattal Jaef, Hiau Looi Kee, Aart Kraay, David McKenzie, and Sergio Schmukler for their valuable comments and suggestions and Xiaoyuan Hu for excellent research assistance. This paper was previously circulated as a World Bank working paper under the title "Size and Age of establishments: Evidence from developing countries." The paper's findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent.

Introduction

The determinants of firm size and more broadly, firm lifecycle is still largely a black-box. We do know that in developed countries such as the U.S. new businesses start small and, if they survive, grow fast as they age (e.g. Evans, 1987; Dunne, Roberts, and Samuelson, 1989; Davis, Haltiwanger, and Schuh, 1996; Caves, 1998; Hsieh and Klenow, 2013). It is an open question as to whether firms in developing countries face a similar size-age profile as in the US given that they face entirely different business environments and operating conditions. An understanding of firm life cycle in developing countries and their determinants is critical to the policy debate on productivity improvements and achieving convergence between the rich and poor countries.

In this paper, we examine the relationship between plant size, age, and growth in the formal sector across 120 developing economies. Specifically we examine if older plants are much larger than young plants and if there are any differences in the size-age relationship across country income groups and industries. To overcome concerns with cross-country analysis, we investigate the firm size-age relation using detailed manufacturing census data from India. We then try to understand how financial institutions are associated with the size-age gap.

Our cross-country sample consists of 69,224 formal firms in 120 countries, surveyed over the period 2006-2012. The strength of our data is that we cover most of the developing countries in the world - the country with the highest GDP/capita in our sample of countries is Slovenia. Our data is comparable across countries since it is sourced from the World Bank Enterprise Surveys (ES) database which samples formally registered firms from over 100 countries to study the business climate constraints to private sector growth and performance. The surveys use

standardized survey instruments and a uniform sampling methodology to minimize measurement error and to yield data that are comparable across countries.[1]

Our India sample comprises of repeated cross-section census data for the formal manufacturing sector at roughly five year intervals - 1983/84; 1989/90; 1994/95; 2000/01; and 2004/05[2] and census data on the informal sector for 1994/1995. India offers an ideal laboratory for testing the role of institutions on firm lifecycle given the large persistent differences in institutions, business environment, and income across different regions in India (Ahluwalia, 2002). Being the seventh largest and second most populous country in the world, the size and income of each of its different states and territories can be likened to other developing countries. For instance, in an interesting comparison, the *Economist* magazine matches India's most populous state, Uttar Pradesh, to Brazil in terms of population, Qatar in terms of size of the economy, and Kenya in terms of its GDP/capita. Maharashtra, on the other hand is one of India's richest states and is equivalent to Mexico in terms of population, Singapore in terms of GDP, and Sri Lanka in terms of GDP/capita.[3] Importantly, there is substantial and well researched heterogeneity in financial and labor institutions across these states. At the same time, comprehensive and centrally collected Census data at firm-level is available to researchers, thereby sidestepping many of the concerns arising from data comparability in cross-country studies. India is also an interesting case study because some recent studies (e.g. Hsieh and

[1] The mean response rate across our sample of countries is 70% which is superior to most other survey based studies. For instance, Campello, Giambona, Graham, and Harvey (2011) report response rates of 3 to 7% in their survey of how companies use credit lines during a financial crisis. Other studies in corporate finance report response rates between 7%-9% including Graham and Harvey (2001), Brav, Graham, Harvey and Michaelu (2005), and Lins, Servaes, and Tufano (2010).

[2] Repeated cross-sections helps us look at life-cycle patterns over a longer period of time in addition to providing us more observations at each point in the life-cycle. It also allows us to examine if our results are consistent over different periods of institutional change in India such as financial liberalization and industry de-licensing.

[3] All the comparisons are based on 2009 values. See "Comparing Indian states and territories with countries," *The Economist Magazine, June 21, 2011.*

Klenow, 2013) suggest that India has a flat life-cycle where forty year old plants are no larger than young plants.

We have the following main findings: First, our cross-country analysis shows that in the formal sector in developing countries, older firms are substantially larger than younger firms. While the average mid-aged firm between 10-19 years of age is only twice the size of the average plant under the age of 5 years, the average plant that is 40 years and older is 4.65 times the size of the average plant under the age of 5 years in terms of employment.[4] The significantly upward sloping age-size profile is pervasive in the vast majority of countries and in only less than 10% of the countries, the average 40+ year plant is not at least as big as plants younger than 5 years. One possible explanation for our findings is selection effects due to firm exits since we have data only on surviving firms. To improve on our cross-sectional evidence, we look at employment at two points in time – last year and three years back. We find that on average, firms are approximately the same size as two years ago suggesting that the surviving plants we examine are not the fastest growing in the distribution and that our results are unlikely to be driven mostly by plant exits.

Second, when we study the life-cycles of Indian plants, we find that the average 40 year old plant in the formal sector in India is 2 to 4 times the size of plants less than five years of age, both when compared contemporaneously and when comparing older and younger firms within the same cohort. Our results hold true when we take sampling weights into account and look at the entire population of firms, and also when we study just the Census sector firms that are

[4] Our results are robust to considering only manufacturing plants and taking into account survey sampling weights. We obtain similar patterns when we look across country income groups. Our results are also robust to dropping firms with government ownership, dropping former Socialist economies where they may a discrepancy in age reported due to large-scale privatization, and also to dropping firms that started operations before countries' independence. This finding also holds controlling for industry and country fixed effects in a multivariate analysis.

surveyed each year. Thus, while plants in India may not be growing at the same rate as in developed countries such as the US, especially during their early lifecycle, there is clear evidence that older plants in the formal manufacturing sector are larger than younger plants.

Third, we find that technological differences across industries shape establishment life cycle in India. We use the identification strategy introduced by Rajan and Zingales (1998) for classifying industries into financially dependent and financially independent depending on the extent to which firms can support their capital expenditures using cash flow from operations, based on the experiences of US firms in the same industries. We find that firms in financially dependent industries are larger at all stages of their life-cycle. Thus, there is no evidence that financial dependence affects growth rates of established Indian firms relative to firms in industries that are not financially dependent. [5]

Fourth, we find stark differences in firm lifecycle in the formal and informal sectors: We find that older firms in the unorganized manufacturing sector in India employ fewer people than firms younger than 5 years old. This is consistent with recent findings in La Porta and Shleifer (2008) who show that informal firms look very different from formal firms in terms of size, productivity, and education level of managers and find little evidence that growth occurs by informal firms eventually becoming large formal establishments.

Fifth, we study the impact of institutional differences on firm life-cycle in India. Despite considerable differences in financial depth across Indian states we find the role of state-level financial development to be marginal in explaining firm lifecycle in the broad population of firms and in most of the sub-samples we analyze. These results are robust to a number of checks including looking at just the firms in the right tail of the size distributions, across states with

[5] Rajan and Zingales (1998) show that financially dependent industries grow *less fast* than financially independent industries using a sample of developed and developing countries.

flexible versus rigid labor market regulation, and using alternate indicators of financial development. We also find no differential impact of financial development on firm lifecycle when we look at firms born after India's financial liberalization in 1991 or looking at periods after industry de-licensing. We also find only marginal differences in the proportion of manufacturing employment in old and new firms across different levels of financial development. Our results are consistent with the conjecture that the state-owned and controlled financial sector in India is not significantly contributing to firm growth.

Following Beck et al. (2008), we classify industries into small firm dominated and large firm dominated categories using the US industry composition as an instrument. Beck et al. measure an industry's "technological" composition of small firms relative to large firms as the share of employment in firms with less than 20 employees in the United States (a country with a relatively frictionless financial system) in 1997. We also classify industries into labor intensive and capital intensive industries using the classification in Hasan and Jandoc (2012). Using a difference-in-difference set-up we find that establishments in large-firm dominated industries are larger at each stage of the life-cycle, both in the case of capital intensive and labor intensive industries.

These findings contrast with the literature that finds significant effect of within-country institutional differences on firm performance. For example, Jayantre and Strahan (1996) and Dehejia and Lleras-Muney (2007) show that differences in state-level bank regulation in the United States affects financial development. Similarly, Guiso et al. (2004) examine differences in financial development across regions in Italy, particularly on small firms and entrepreneurship and find a significant effect.

However, the literature also shows that in a large cross-section of countries, higher government ownership of banks is associated with slower subsequent financial development and lower income per capita growth and productivity (La Porta et al, 2002; Barth et al. 2001), as well as poorer financial access by small firms (e.g. Beck, Demirguc-Kunt and Maksimovic, 2005). Our findings are also consistent with those of Boyreu-Debray (2003) and Boyreau-Debray and Wei (2005) who show that the depth of the financial sector does not promote growth of provinces in China, another country where the banking system is largely state owned and controlled. Hence, our findings on India provide additional evidence that state-ownership in banking hampers the impact of finance on growth.

The finding that differences in financial depth in a state-owned financial system do not affect the life-cycles of firms does not imply that there are no qualitative differences in financial access within those systems and that they do not benefit individual firms. For example, Cole (2009)'s Indian study uses a regression discontinuity design and finds that government ownership of banks adversely affects the development of small enterprises in villages in which these banks have branches. In another study of Chinese banks and enterprises, Ayyagari, Demirguc-Kunt and Makimovic (2010) find that controlling for local financial development, firms that receive bank financing outperform firms that do not. However, Ayyagari et. al. do not address the question of whether differences in financial depth at the province level materially affect the aggregate province level growth or the life-cycles of the firms comprising the whole of the manufacturing sector.

Our results also contribute to the large literature on firm size and age (Dunne, Roberts, and Samuelson, 1989; Davis, Haltiwanger, and Schuh,1996; Cabral and Matta, 2003, Foster, Haltiwanger, and Syverson, 2012). Given the idiosyncratic distortions in the business

environment, it is not clear what type of size-age gap to expect in developing countries. A recent paper by Hsieh and Klenow (2013) suggests that in India and Mexico, in contrast to the case of the U.S., the lifecycle of manufacturing plants is relatively flat - that in fact on average the surviving manufacturing plants in India shrink in size between ages of 5 and 35. The dual economy view in development economics (originally associated with Harris and Todaro, 1970) predicts that informal firms should look very different from formal firms in terms of size, productivity, wages paid, and the industries/markets they operate in. Recent studies such as La Porta and Shleifer (2008) also show that while informal firms account for a large portion of economic activity in developing countries, growth and development comes from the creation of highly productive formal firms. Strikingly, Hsieh and Klenow find that plants in both the formal and the informal sector share the same trajectories. Our results using data for the same year 1994/95 as in their paper stand in sharp contrast with their findings on the formal sector. Given the heterogeneity in firm formation we study the formal sector and informal sectors separately in this paper and do find differing life-cycle patterns.

The remainder of the paper is organized as follows. In section II we describe the data. In section III we discuss in detail the relationship between establishment size and age in our cross-country sample. In section IV we examine plant lifecycle in India. Section V concludes.

II Data

A. Cross-Country Sample

We use the World Bank Enterprise Surveys (ES) that are an on-going initiative of the World Bank to benchmark the investment climate in different countries across the world and to analyze firm behavior and performance. The Enterprise Surveys survey from the universe of

eligible firms obtained from the country's statistical office[6] using stratified random sampling with replacement to generate a sample representative of the whole non-agricultural private economy (so fully government owned firms are excluded from the sampling universe) in the country. The surveys are stratified according to three criteria: *Sector of activity* (population of industries include manufacturing sectors, construction, services, transport, storage, communications, and computer and related activities), *Firm size* (the strata include small firms (5-19 employees),[7] medium firms (20-99 employees), and large firms (100 or more employees)), and *Geographical location* (selected based on centers of economic activity in the country).

While the ES have been produced since 2002, we restrict our sample to surveys administered during 2006-2012 since these provide sampling weights that address the varying probabilities of selection across different strata and are thus indispensable to making assertions about the whole population.[8] For countries that were surveyed twice during this period, we retain the most recent survey data for each country. Our results are also robust to retaining data for the year with the largest number of firms surveyed.

Establishment Size is the number of permanent, full-time employees in the establishment where permanent, full-time employees are defined as all paid employees that are contracted for a term of one or more fiscal years and/or have a guaranteed renewal of their employment contract and that work 8 or more hours per day. The survey asks establishments to report the employment numbers at the end of the last fiscal year. We compute the average

[6] The master list of firms is sometimes obtained from other government agencies such as tax or business licensing authorities. In some cases, the sampling universe is generated from lists maintained by the Chamber of Commerce and business associations or marketing databases where registration is voluntary. In a few cases, the sample frame is created via block enumeration.

[7] We have a few firms in the sample that report having less than 5 employees. All our results are robust to dropping these firms. Our results are also robust to dropping firms that started out as informal enterprises and were formally registered after starting operations.

[8] Most surveys contain three sets of weights – strict, median, and weak weights depending on the eligibility criteria used to construct the sample universe. The survey implementation manual recommends the use of median weights for cross-country comparisons which is what we use in this paper.

establishment size in each age bin. As an alternate measure of average size in each age bin, we use Total Employment/Total # of establishments where Total employment is derived by aggregating the employment reported by each establishment multiplied by its sampling weight.

Establishment Size Ratio is the ratio of current establishment size to the size of the establishment when it first started operations.

Establishment Age is defined as the number of years since the establishment began operations in the country. We compute age at the end of the last fiscal year to be consistent with the employment question. As before, we construct the following 9 age bins: <5, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+.

We drop missing observations on size and age, drop observations where the date the establishment began operations is before 1800 and obvious data errors (such as one observation where date the establishment began operations is reported to be 2205). We also drop bottom and top 1% of the employment variable.[9] This leaves us with a final sample of 53,821 firms across 119 countries.[10]

Insert Table 1 here

Table1 presents the summary statistics and correlations between the main variables. Panel A of Table 1 shows that the mean establishment size in our sample is 70 employees. The mean establishment size ratio is 6.078 suggesting that the average firm in our sample is 6 times its size when it started operations though the ratio extends from a very small number to 1250. The firms with ratios in excess of 100 are spread out across countries and industries. For instance, the establishment with a size ratio of 1250 is a Brazilian establishment surveyed in 2009 in the

[9] Our results are robust to winsorizing the employment numbers at 1% rather than dropping the top and bottom 1%.
[10] The Enterprise Survey database was downloaded in Dec 2012.

industry sector *Other: Construction, Transportation, etc* which is privately held and started operations in 1995 with 1 employee and had 1250 employees in 2009.

Panel B shows that Size and Age are positively correlated suggesting that older firms are larger in our sample. Establishment Size Ratio and Age are also positively correlated suggesting that firms grow as they age.

Our cross-country data is subject to some caveats. First, the Enterprise Surveys sample only the formal sector in each country and exclude the informal sector. In addition, since the sampling frame is restricted to 5 employees or above, our results do not speak to the micro enterprises.

Second, our data is only on the continuing/surviving firms and hence we have no data on firm exit rates. On a related note, the surveys are stratified only by industry, firm size, and geographical location and so we may not have a completely representative sample of firm ages, though the firms within the strata are randomly sampled.

Third, our analysis is at the establishment level and not at the firm level since the sampling unit in the Enterprise Surveys is the establishment.[11] While this has the advantage that our employment measures are well defined and capture actual jobs at the establishment rather than changes from mergers, acquisitions, and divestitures, we are not able to measure firm size accurately for multi-establishment firms. However we are helped to some extent that the establishments in our sample report whether they are part of a larger firm or whether they are stand-alone. While most of the establishments in our data are stand-alone establishments (86%) and hence can be treated as firms, for robustness, we repeat the analysis on the sub-sample of

[11] In the Enterprise Surveys, the establishment is defined as a physical location where business is carried out and where industrial operations take place or services are provided. In addition, an establishment must make its own financial decisions, have its own financial statements separate from those of the firm, and have its own management and control over its payroll.

firms that report that they have a single establishment and find that all our results hold. Henceforth, we will use the term establishment and firm interchangeably in our discussion of ES data. Fourth we are unable to identify mergers in our data.

Finally, the ES data is based on survey data rather than individual country census. However, our enquiries with the survey implementation team reveal that mean response rates across our sample of countries is 70% which suggests that we have a representative sample of firms across economies.

B. India Sample

We use data on formal manufacturing plants in India from the Annual Survey of Industries (ASI), which is conducted by the Indian Ministry of Statistics and Program Implementation. The ASI sampling frame consists of all registered factories employing 10 or more workers using power or 20 or more workers without using power. The sampling frame consists of the "Census" sector which are surveyed every year and the "Sample" sector where plants are sampled randomly and unit multipliers are provided to take into account sampling probabilities. The definitions of the Census and Sample sectors have changed over the years as described in the table in Appendix A.[12] In robustness checks, we find all our results to hold when we just analyze the Census sample. We use data from five years: 1983/84; 1989/90; 1994/95; 2000/01, and 2004/05.

[12] The ASI also contains some establishments outside of manufacturing. Thus while the primary unit of enumeration in the survey is a factory in the case of manufacturing industries, it could also be a workshop (for repair services), an undertaking or a licensee (electricity, gas & water supply undertakings) or an establishment (bidi & cigar industries). According to the Ministry of Statistics, "the owner of two or more establishments located in the same State and pertaining to the same industry group and belonging to census scheme is, however, permitted to furnish a single consolidated return. Such consolidated returns are common feature mostly in the case of bidi and cigar establishments, electricity and certain public sector undertakings"

The specific ASI variables we use are described below: **Establishment Age** is defined as the year of the census - year of initial production reported by the firms. As in Hsieh and Klenow (2013) , we define 9 age bins as follows : <5, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. **Establishment Size** is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. As a measure of growth rates, we construct **Establishment Size Ratio** which is the ratio of each firm's establishment size scaled by the average establishment size of all firms in its birth cohort. Thus, we scale the employment of the each firm in youngest age bin (<5) in 2004 by the average size of that age bin in 2004, of the firms in the age bin (5-9) in 2004 by the average size in the youngest age bin (<5) in 1999, of the firms in the age bin (10-14) in 2004 by the average size in the youngest age bin (<5) in 1994, of the firms in the age bin (15-19) in 2004 by the average size in the youngest age bin (<5) in 1989, of the firms in the age bin (20-24) in 2004 by the average size in the youngest age bin (<5) in 1983, and so on. Since our sample period extends from 1983/84 to 2004/05 we are able to construct this ratio for only the following age bins - <5, 5-9, 10-14, 15-19, and 20-24.

To deal with outliers, we winsorize the bottom and top 1% of all plant-level variables and drop firms that stated initial year of production to be before 1800 and clear data errors where the year of initial production is given to be after the year of the survey. The data also provides National Industry Classification (NIC) codes that map onto different revisions of the International Standard Industry Classification (ISIC) codes.[13] Using this we construct three digit

[13] The census years 1983/84 uses NIC-70 which maps onto ISIC-Revision 2 at the 3-digit level. The 1989/90 and 1994/95 censuses use NIC-87 which maps onto ISIC-Revision 3 at the 3-digit level. The 1999/00 and 2000/01 censuses use NIC-98 which maps onto ISIC-Revision 3 at the 3-digit level. The 2004/05 census uses NIC-04 which maps onto ISIC-Revision 3.1 at the 3-digit level.

NIC industry dummies that are consistent across all census-years and restrict the data to only the manufacturing sector.[14]

To explore industry heterogeneity, we use three different classifications of industries. First, we follow the procedure in Rajan and Zingales (1998) and estimate an industry's dependence on external financing using data on US corporations (RZ index). The RZindex is based on the assumption that since U.S. financial markets are developed, sophisticated, have fewer market imperfections and relatively open they should allow US firms to achieve their desired financial structure. Thus assuming that there are technological reasons why some industries depend more on eternal finance than others, the RZindex offers an exogenous way to identify the extent of external dependence of an industry anywhere in the world. The methodology does not require that the US markets are perfect but rather that market imperfections in the US do not distort the ranking of industries in terms of the technological dependence on external financing.

We reconstruct the RZ index for the period 1980-2012 by computing external dependence as (Capital Expenditures-Operating Cash Flow)/Capital Expenditures for each domestic US firm in Compustat. The median value across firms in each industry is a measure of that industry's dependence on external finance. This index of external dependence is constructed at the SIC 2/3 digit level which is then manually matched to 3-digit ISIC codes that map onto the Indian NIC classification. Appendix C provides the concordance used in the paper. We construct **EFD,** a dummy variable that takes the value 1 if industry's dependence on external finance is ≥ median value of dependence on external finance across industries and 0 if it was < the median across industries.

[14] We drop recycling from the manufacturing sector since it is not included under manufacturing in the ISIC classification.

Second, we create **Small Firm Industry** which is a dummy variable that takes the value 1 if the industry's share of employment in firms with less than 20 employees is ≥ median value of the Index of small firm domination from Beck, Demirguc-Kunt, Laeven, and Levine (2008) and takes the value 0 if it is < the median index value. Beck et. al. (2008) use the methodology in Rajan and Zingales (1998) described above to argue that each industry has a technological firm size that depends on that industry's particular production process and that these technological differences should persist across countries. They construct each industry's share of employment in firms with less than 20 employees in the US using data from the 1997 US Census. [15]

Finally, we follow Hasan and Jandoc (2012) in constructing **Labor Intensive Industries** which is a dummy variable that takes the value 1 for labor intensive industries and 0 for capital intensive industries.[16]

We use data on informal firms from the Unorganized Manufacturing sector for 1994/95 that is collected by the National Sample Survey (NSS) Office of the Ministry of Statistics. The survey uses a stratified two-stage sampling design where the first-stage units are the villages in the rural areas and urban blocks in the urban areas and the second-stage units are the enterprises. The allocation of sample first stage units between rural and urban areas is in proportion to population as per 1991 census with double weightage to the urban sector. As seen in Appendix B, the informal sector in India is very large and dwarfs the formal sector in terms of the number of firms. Establishment Size and Age variables are calculated similar to the formal manufacturing census described above.

[15] Beck et. al. present alternate indices including using 100 employees as the cut-off and using 1992 census to construct the index. Our results are robust to these alternate classifications.

[16] Hasan and Jandoc (2012) classify the following industries in India to be capital intensive industries: Machinery, Electrical Machinery, Transport, Metals and Alloys, Rubber/Plastic/Petroleum/Coal and Paper/Paper Products. The labor-intensive industries are: Beverages and Tobacco, Textile Products, Wood/Wood Products, Leather/Leather Products and Non-Metallic Products. The remaining industries are not as clearly distinguishable and include: Food Products, Textiles, Basic Chemicals, Metal Products and Other Manufacturing

B.1. Finance and Labor Market Institutions in India

To take into account institutional differences that may affect firm life-cycle, we focus on the level of financial development and the stringency of labor regulations across different states of India. We first describe India's banking sector and the measures we construct followed by the stringency of labor regulation in India and the associated measures.

India has a rich and mature banking history with the first banks being established by the British East India Company towards the end of the 18th century. India's largest bank today, the State Bank of India originated in 1806 as the Bank of Calcutta. Following India's independence, in 1949, the Banking Regulation Act vested the Reserve Bank of India (RBI), India's Central Bank, with extensive powers for supervision of banking in India. In two waves of nationalization in 1969 and 1980, the Indian government nationalized the major private banks running them as profit-making public sector undertakings that were allowed to compete and operate as commercial banks.[17] This increased the public sector banks' share of deposits to 92% (Hanson, 2001). The Government also experimented with a social banking program during this period to improve access to banking services for the poor leading to a huge expansion in the number of bank branches (Burgess and Pande, 2005).

In response to a fiscal and balance of payments crisis in 1991, India went through a large-scale financial liberalization. Following the recommendations of the Narasimhan Committee Report that suggested reforms in the Indian banking sector, the Government allowed for the entry of new private sector banks (including foreign banks) in 1993. Despite the massive growth

[17] In 1969, 14 banks with deposits over Rs 50 crores were nationalized. In 1980, 6 private sector banks were nationalized. A few of the private sector banks were not nationalized because of their small size and regional focus.

of private sector banks, India's banking system is still largely state dominated. As of 2012, India's state owned banks have 73% of market share of assets and 83% of branches.[18]

Even within this government dominated banking sector, there is a large variation across India's states in level of financial development. Bajpai and Sachs (1999) note that there has been a wide variation in the adoption of economic reforms with states like Maharashtra being very reform oriented while others, especially the poorest BIMARU[19] states (Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh) being laggards. Aghion et al. (2005) also note the reforms in the 1990s to be associated with increasing cross-state inequality in industrial performance.

Insert Table 2 here

Our measure of financial development is the ratio of total Commercial Bank Credit outstanding to the Net State Domestic Product (SDP) in each census year and gauges the depth of financial development. The data is sourced from Burgess and Pande (2005) with updates from the Reserve Bank of India (http://dbie.rbi.org.in). According to statistics by the Reserve Bank of India, in March 2006, there were about 217 commercial banks in operation, with 161 of them state owned (includes nationalized banks and regional rural banks), 27 private sector banks and the rest 29 foreign banks.[20] Despite the entry of private banks, state controlled banks still account for three-quarters of all loans in India. India's largest commercial bank, the State Bank of India, is over two hundred years old and is government owned. Banerjee, Cole, and Duflo (2004) state that 83% of banking business in India is through government owned banks and even the private banks are subject to extensive regulations on who they can lend to.

[18] Speech by Dr Duvvuri Subbarao, Governor of the Reserve Bank of India, at the FICCI–IBA (Federation of Indian Chambers of Commerce & Industry – Indian Banks' Association) Annual Banking Conference, Mumbai, 13 August 2013. http://www.bis.org/review/r130813b.pdf?frames=0.
[19] BIMARU resembles the Hindi word "Bimar" meaning sick.
[20] http://rbidocs.rbi.org.in/rdocs/Publications/PDFs/78903.pdf

We only have data on financial development across 15 Indian states but these are the major states of India with the highest SDP, accounting for 95% of India's population and 90% of India's GDP in 2004/05. Table 2 shows a wide variation in Credit/SDP across the states ranging from 0.073 in 1983 in Assam, one of India's poorest states to 0.477 in Maharashtra, one of the richest Indian states with a median value of 0.19 (Gujarat) in 1983. These differences persist over our sample period and the values in 2004/05, the last year in our sample, are 0.171 in Assam and 1.148 in Maharashtra. Based on Credit/SDP, we construct a dummy variable, **FD**, which takes the value 1 for a particular state in a particular year if that state is at the median or above the median value of financial development in that year across states and 0 for states that are below the median value of financial development. Across the years, we find six states to always be classified as financially developed – Punjab, Andhra Pradesh, Kerala, Karnataka, Tamil Nadu, and Maharashtra. Only two of the states, Rajasthan and Madhya Pradesh, switch from being classified as being financially under-developed to developed in 2004/05 while Gujarat and West Bengal are classified as under-developed in the last year.

India's labor regulations have been known to be among the most stringent in the world and responsible for the stagnant share of manufacturing outputs in India's GDP (Dougherty, 2009). Under the Indian Constitution, both central and state governments have joint jurisdiction over labor market regulation. One of the most important set of labor regulations governing Indian industry is the centrally legislated Industrial Disputes Act of 1947 which lays out the arbitration and adjudication procedures in industrial disputes, and which has been extensively amended by state governments. A large literature has evolved quantifying labor market regulations across different states of India, the most well-known being Besley and Burgess (2004), that code the legislative state-level amendments to IDA to classify states as pro-worker

(score of +1) or pro-employer (-1) or neutral (0) over the period 1958 to 1992. Given the limited time-series variation within states, Hasan, Mitra, and Ramaswamy (2007) build on the Besley-Burgess dataset to cumulate the coded scores in net years into a time-invariant index of the general direction in labor regulations, classifying states with anti-employee amendments as those with flexible labor markets and the others as inflexible labor markets. They argue that the scores on cumulative amendments between 1980 and 1997 do not vary much over time within states, with eight of the states showing no amendment activity since 1980. Dougherty (2009) further reports that only 8 amendments (in 3 states) have been recorded since 1990, and only one amendment passed in 2004 appears to be of material importance to labor market outcomes. Gupta et al. (2008) build a composite index based on a simple majority rule across the indicators proposed in Besley and Burgess (2004), Bhattacharjea (2006), and Dougherty (2009), and classify five states to have flexible labor regulations, (Andhra Pradesh, Karnataka, Rajasthan, Tamil Nadu, and Uttar Pradesh), three states to have inflexible labor market regulations (Maharashtra, Orissa, and West Bengal and the remaining seven to be neutral (Assam, Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, and Punjab). [21]

Following Gupta et al. (2008)'s composite classification, we create a **Flexible State** dummy that takes the value 1 for states with flexible labor regulation and 0 for states with rigid or neutral labor regulations as shown in panel B of Table 2. We make one change to the Gupta et al. classification of using the pre-2000 state boundaries in classifying states. So our flexible states classification includes Uttaranchal (which split from Uttar Pradesh in 2000) and inflexible states classification includes Jharkhand and Chattisgarh that were formerly part of Bihar and Madhya Pradesh respectively).

[21] The labor market regulation index is not available for the following states and union territories: Jammu & Kashmir, Chandigarh, Nagaland, Manipur, Tripura, Meghalaya, Daman & Diu, Dadra & Nagar Haveli, Pondicherry, Lakshadweep, and Andaman & Nicobar Islands.

Insert Table 3 here

Table 3 presents summary statistics and correlations for our main variables from the formal manufacturing Census. Table 3 shows that after winsorizing, Establishment Size ranges from 1 to 1616 employees with a mean of 121 employees. The mean Establishment Size Ratio is 1.38 suggesting that the average firm in our sample is 1.38 times the size of its birth cohort. 62% of the firm-year observations are classified as small firm industries, 23% are classified as labor intensive and 42% are classified as being in industries that are highly dependent on external finance. 69% of the establishments are in states with flexible labor regulations and 73% are in financially developed states.

Panel B presents the correlation matrix between these variables. The sample correlations with age dummies show that older firms are larger and growing faster. When we look at the industry classifications we find that none of the correlations between the industry categories are larger than 0.19 suggesting that the three measures – Small Firm Industry, Labor Intensive, and EFD – are capturing three different aspects of industry technology. Overall we find that small firm industries are positively correlated with labor intensive industry and negatively correlated with external finance dependence. The correlations with Establishment Size and Establishment Size Ratio show that firms are larger and grow faster in large firm dominated industries, in capital intensive industries and in industries that are not highly dependent on external finance. The raw correlations also show that firms in financially developed states are larger and grow faster. On the other hand, while firms in states with flexible labor regulations are smaller, they are growing faster.

III. Establishment Size and Age in Developing Countries

A. Summary Statistics

In this section we present stylized facts on the size of establishments as they age in developing countries. We begin by presenting evidence on the relationship between average plant employment and age in the cross-section in Figure 1. We first compute the mean employment in each age bin in each country. We then compute an index for each country where the index takes the value 1 for establishments less than five years old. For all other age bins, the index is the ratio of the mean employment in that age bin to the mean employment for firms under five years of age. Figure 1 plots the mean and 95% confidence intervals of the index for each age bin.

We find that in developing countries, across all industries, the average size of a plant that is less than 20 years old is only twice as large as the average size of plant that is less than 5 years old but after that there is a large increase in the size-age gap. The plant that is 40 years or older on average employs nearly 5 times as many people as the plant that is less than five years old.[22] The 95% confidence intervals show that this number could vary between 4 and 5.3.

The findings in Figure 1 are very robust. The upward sloping size-age profile is pervasive in our sample of countries. In less than 10% of the countries, the plant that is 40 years or older is not at least as big as the plant that is younger than five years old. In Figure 2, we find similar results when we take sampling weights into account and compute average establishment size as Total Employment/Total # of establishments - the 40+ year old plant employs 5 times as many workers as the typical plant five years or younger. When we look at just manufacturing plants in

[22] The ratio represents the increase in mean size of the establishments in the 40+ age bin compared to that of establishments in the <5 age bin. It is not the mean annual growth rate of the establishments in the 40+ age bin.

Figure 3, we again find that the average size of a plant that is 40+ years old is 5.7 times larger than the average size of plants that are less than 5 years old.

In Figure 4, we undertake additional robustness tests. We exclude countries with Socialist legal tradition because Ayyagari, Demirguc-Kunt, and Maksimovic (2008, 2013a) argue that these countries are fundamentally different from others in their perceptions of property rights protection. One of the other concerns with the former Socialist economies might be that the data on establishment year is noisy because of mass privatizations though the establishments were queried on when the establishment first started operations even if it was under state ownership. However in Figure 4 we find consistent results with our main finding when we drop former Socialist economies. We then explore if our results are being driven by the really old large State firms or firms that were established many years before countries' independence. We find our results to be robust to dropping firms with any government ownership and dropping firms that were established before the countries' independence.

Firms in our survey were also asked to report the number of employees at the time the firm began operations (size at birth). So in Figure 5, we normalize the average size of each age cohort by the average size of that cohort at birth. We find that firms that are over 40 years old are 4 times larger than their size at birth. This is consistent with our main finding that older plants in developing countries are larger than their younger counterparts.

In unreported figures, we examine if there are differences in plant size-age gap across different country income groups. Using the sampling weights, we find that in all cases, the average size of 40 year old plants is much larger than plants under 5 years of age and the size-age gap ranges from 4.75 times in the case of high income countries to 5.3 times in the case of

low income countries. Across regions, we find that the size-age gap for firms 40 years and older ranges from 3.32 in East Asia Pacific to 6.03 in Africa.

The evidence thus far provides only suggestive evidence of plant life cycle because it provides a snapshot of firm size-age relationship for surviving establishments. One possible explanation for the pattern we find may be selection, that is, our results may be being driven by firm exits rather than firm growth. For instance, each year if we had the smallest 5% of firms exiting, we would still find an upward sloping relationship between establishment size and age. To improve on the cross-sectional evidence, we next look at the data at two snapshots in time from the same surveys. Firms in our survey were asked to report their employment last year and three years ago. In Figure 6, we plot the average employment at the two different snapshots in time. So for instance if we look at the firms in the 15-16 age cohort (bold line), their size at the previous snapshot will be the dashed line of the 13-14 age cohort. The figure shows that the two distributions are comparable so it is not the case that the surviving firms are from the top end of the size distribution. This provides some suggestive evidence that our results are not entirely driven by exit.

B. Multivariate Analysis

In Table 4, in col. 1, we regress Establishment Size on age dummies and find all the age coefficients to be positive and significant suggesting that older firms are larger than younger firms. For ease of comparison with youngest firms, we add the constant (which presents the average mean size for firms younger than 5 years old) to each of the age coefficients and divide the sum by the constant. These ratios are reported in bold in square brackets below the coefficient and standard errors. Thus we see that the average 40+ year old firm is 4.783 times the

size of the average firm that is younger than five years old. In col. 2, we repeat the analysis in Col. 1 using industry dummies and country dummies to control for any time-invariant unobserved heterogeneity across countries and industries. Once again we find that all the age coefficients are positive and significant. Cols. 3 and 4 present results for manufacturing and non-manufacturing sub-samples where we find a similar increase in establishment size with age.

In cols. 1-4, we are comparing the mean size of firms that are 40+ years old with the mean size of firms that are younger than 5 years old. However, young firms could be varying in size across years due to different macroeconomic factors, entry regulations, capital market openness, etc as well as across countries. In order to see if firms indeed grow as they age over their lifecycle, we would want to compare the size of older firms at any given point in time with their size when they were born. The Enterprise Surveys ask firms to report the number of full-time employees when the firm started operations which allows us to construct Establishment Size Ratio, which is the ratio of each firm's current employment level to the number of employees when it started operations. Col. 5 presents a regression of Establishment Size Ratio on age dummies and shows that older firms are much larger compared to their size when they first started operations. The constant shows that the average firm that is less than 5 years old is 3.05 times its size when it first started operations whereas the coefficient of the 40+ age bin shows that the average 40+ year old establishment is 11 times its size when it first started operations.

Overall Table 4 shows that firms in developing countries grow as they age and we find no evidence of a declining life-cycle in our sample of firms.

IV Establishment Size and Age in India

A. Firm Lifecycle in the Formal Manufacturing Sector

To examine the relationship between firm size and age, we pool repeated cross-section data from the Indian census. We begin with some descriptive statistics of our data, following Hsieh and Klenow (2013). For each census year separately, we first compute the mean employment in each age bin reported by that census. We then compute an index for each year of data where the index takes the value 1 for establishments less than five years old. For all other age bins, the index is the ratio of the mean employment in that age bin to the mean employment for firms under five years of age reported in the same census. Figure 7 plots the mean index for each age bin using data for five repeated cross-sections – 1983/84, 1989/90, 1994/95, 2000/01, and 2004/05. The figure shows that the average 40 year old plant is 3 to 5 times the size of the plants under five years of age. Figure 8 presents data using weighted employment and shows that for the average 40+ year old plant, the ratio varies from 4.8 times in 1983 to 2.2 in 1994. We also see that in recent years, the average 30 year old plant is not that much larger than plants younger than five years old but after that, older plants are larger than the young plants. To mitigate concerns about sampling issues we present data only using the census sector in Figure 9 and find that even the 20 year old plant in most years is twice as large as plants younger than five years of age. Figure 9 also shows that over time the size-age gap for the 40+ year old plant has shrunk starting from 4.91 in 1983/84 to 2.62 in 2004/05. In unreported figures we find similar results when we use a weighted average across all industries in each age bin with the weights being the value added shares of each industry.

The graphs show a much faster growth rate for Indian plants than found by Hsieh and Klenow (2013) who document a flat plant lifecycle in Indian manufacturing, including in just the

formal sector, using only data form the 1994/95 Census. The differences are particularly stark later in the lifecycle where we find older plants to be much larger while they find older plants to be declining in size. We discuss the reasons for the discrepancy below in section IV.E.

Insert Table 5 here

In Table 5, we use pooled OLS regressions to explore the age effects in detail. In col. 1, we regress Establishment Size on age dummies and find all the age coefficients to be positive and significant suggesting that older firms are larger than younger firms. For ease of comparison with youngest firms, we add the constant (which presents the average mean size for firms younger than 5 years old) to each of the age coefficients and divide the sum by the constant. These ratios are reported in bold in square brackets below the coefficient and standard errors. Thus we see that the average 40+ year old firm is 3.775 times the size of the average firm that is younger than five years old. In col. 2, we repeat the analysis in Col. 1 using 3-digit NIC industry dummies and state dummies. While we are not allowing for time varying changes across states and industries, the dummies help us control for any time-invariant unobserved heterogeneity across states and industries. Once again we find that all the age coefficients are positive and significant. Figure 10 plots the coefficients for the age dummies and the 95% confidence bands and shows that even after controlling for period effects, location, and industry, older firms are larger than firms younger than five years old (reference sample).

In columns 1 and 2, we are comparing the mean size of firms that are 40+ years old in the pooled sample with the mean size of firms that are younger than 5 years old. However, young firms could be varying in size across years due to different macroeconomic factors, entry regulations, capital market openness, etc. Figure 11 plots the mean employment and the

confidence intervals for firms younger than five years old in each census year and shows that the average size of the youngest firms almost doubles between 1983 and 1995[23] and then reduces.

In order to obtain true lifecycle effects and to see if firms indeed grow as they age over their lifecycle, we would want to compare the size of older firms at any given point in time with their size when they were born. In the absence of panel data we are unable to look at the employment of the exact firm when it was born and hence rely on the mean employment in its birth cohort. Thus we construct Establishment Size Ratio, which is the size of firms in a particular age bin scaled by the mean size of the firms in their birth cohort. Since our sample period extends from 1983 to 2005, the oldest firms in our sample for which we can obtain this comparison are firms that are 20-24 years old in 2005 with their birth cohort being firms that were <5 years old in 1983. Columns 3 and 4 in Table 5 present regressions with the Establishment Size Ratio. Col. 3 shows that firms that are 20-24 years old are 1.419 times the size of average firms in their birth cohort. The constant in col. 3 is again the reference category of firms younger than five years old and since we are scaling each firms employment by the mean employment of their birth cohort (firms younger than 5 years old when the firms was born) and using OLS we would expect it to be 1 as it is. Col. 4 shows that after controlling for industry, location, and year dummies, firms that are 20-24 years old are 1.86 times the size when they were born. Col. 4 also shows that there must be heterogeneity across industries (e.g. labor vs. capital intensive), states (e.g. regulation), and firm types (e.g. organization structure) in the size of the firms younger than 5 years old since the constant is no longer 1.

Overall Table 5 shows that manufacturing plants in India grow as they age.

[23] Hsieh and Klenow (2013) use data from 1995 for their main analysis thus scaling the employment of all firms with that of the youngest firms in 1995, which is also the year when the youngest firms were the largest in our sample period.

B. Heterogeneity across Industries in Firm Lifecycle

In this section we explore if there are technological differences across industries that must be taken into account when considering lifecycle effects. In the regression tables in this section and the following section, we first show the regression results and then show the corresponding margin plots of the interaction coefficients for ease of interpretation. While these margin plots give an idea of the initial starting points of plants in different industries and give an idea of relative size across different age groups, we also present results taking the ratio of the predicted margin of each age group with that of the youngest firms to give an estimate of growth rates.

In column 1 of Table 6 we interact Age Dummies with Small Firm Industry dummy. The main age effects are positive and significant suggesting that the average older firm is larger and the main effect of Small Firm Industry is negative and significant suggesting that average firm size in small firm dominated industries is smaller than that in large firm dominated industries. The interaction coefficients are all negative and significant. To better interpret the interaction effects, we plot the predictive margins of the interaction coefficients in col. 1 along with the 95% confidence intervals in Figure 12. The first panel in figure 12 shows that the average size of firms in large firm dominated industries is higher than that in small firm dominated industries across all age groups. Large firm dominated industries are also growing faster than small firm dominated industries. In Panel B of Table 6 we present the ratio of the predictive margins of each age bin to that of the reference group to obtain an estimate of growth rates. Cols 1 and 2 of Panel B show that the average 40+ year old firm is 5.11 times the size of firms that are younger than five years old in large firm dominated industries while that ratio is only 2.74 in small firm dominated industries.

Insert Table 6 here

In col. 2 of panel A we look at the interaction of labor intensive industry and age. The age effects are again positive and significant while the labor intensive industry dummy is positive and significant suggesting that on average employment levels are higher in labor intensive industries. The second panel in Figure 12 plots the margin plots of the interaction coefficients and shows that while firms in capital intensive industries start out smaller than those in labor intensive industries they grow faster and are larger than firms in labor intensive industries as they age. Cols. 3 and 4 of Panel B show that the average 40+ year old firm is 4.08 times the size of firms that are younger than five years old in capital intensive industries while that ratio is only 2.38 in labor intensive industries.

The correlation coefficient of the Small Firm Industry dummy and Labor Intensity Dummy is only 6.3% (see panel B of Table 2). However to investigate if the difference in age effects in Small firm versus Large firm dominated industries varies by labor intensity in col. 3 of panel A of Table 6, we explore the triple interaction of age dummies with Small Firm Industry dummy and Labor Intensity dummy. The interaction of labor intensity and small firm dominated industry is positive and significant. Figure 13 plots the predictive margins of the triple interaction coefficients and shows that the average size is the biggest in Capital Intensive and Large Firm dominated industries while in the Small Firm dominated Labor Intensive industries growth over the firm's life-cycle is the lowest. The figure also shows that older firms in Capital Intensive and Large Firm Dominated industries are particularly large while the differences between the other industry classifications are not as stark.

In cols. 5-8 of panel B, we take the ratio of the predictive margins in each age group in each industry category with the predictive margin of the youngest firms in that industry category.

We find that the average 40+ year old firm is 5.69 times larger than firms younger than 5 years old in large firm dominated and capital intensive industries where as that ratio is 2.71, 3.02, and 2.12 in large firm and labor intensive industries, small firm dominated and capital intensive industries, and small firm dominated and labor intensive industries respectively.

To explore the role of external financing in the establishment lifecycle and firm growth we divide the sample into industries that are dependent on external finance and those that are not dependent on external finance using the index of external finance dependence (EFD). In col.4 of Table 6 we interact the age dummies with EFD. The age dummy coefficients are all positive and significant suggesting that on average older firms are larger. The EFD dummy is positive but not significant whereas the interaction of EFD with age dummies is positive and significant. To better interpret the interaction terms we plot the predictive margins along with the 95% confidence intervals in Figure 14. The figure shows that while firms in industries that are dependent on external finance start out the same size as firms in industries that are not highly dependent on external finance, they grow faster and are larger as they age. Cols. 9 and 10 of Panel B show that the average 40+ year old firms in industries that are not highly dependent on external finance is 2.93 times the size of firms younger than five years old in those industries whereas that number is 4.89 times in industries that are highly dependent on external finance.

Overall, Table 6 and figures 12-14 show that the initial starting point of firms and their growth rates are different depending on their industries' technological size, production technology, and dependence on external finance. Firms grow more over their life-cycles in industries predicted to be large-firm-dominated based on US data and in capital-intensive industries and in industries more dependent on external finance.

C. Financial Development and Firm Life-cycle

In this section, we examine variations in firm lifecycle across different levels of financial development of the states they are located in and across different industry characteristics. In these regressions, we don't include state fixed effects but instead control for net State Domestic Product (SDP)/capita (in logs). In col.1 of Table 7, we investigate the role of financial development on firm life-cycle by interacting age dummies with FD, a dummy variable that takes the value 1 for financially developed states and 0 for financially under-developed states. The financial development dummy is by itself positive and significant suggesting that plants in more financially developed states are larger and so are plants in states with higher SDP/capita. Most of the interaction terms are insignificant. This can also be seen in Figure 15 where we plot the predictive margins of the interaction coefficients and find that financial development does not make a material difference to plant lifecycles in India. In col. 1 of Panel B, we take the ratios of the predicted margins in each age bin to that of the youngest firms(<5), and find that plants in developed versus under-developed states are growing at very similar rates. In unreported tests we find similar results when we look at just the top 3 and bottom 3 states in terms of financial development. We also do not find evidence supporting the role of financial development for firm lifecycle when we use a continuous measure of financial development, Credit/SDP, interacted with age dummies either.

Insert Table 7 here

In cols. 2-7 we investigate if the financial development of the state is more critical for firm lifecycle in some industries versus others. We look at large-firm dominated and labor intensive industries in col.2, large-firm dominated capital intensive industries in col. 3, small-firm dominated and labor intensive industries in col.4, small-firm dominated capital intensive

industries in col. 5, industries not dependent on external finance in col.6 and industries dependent on external finance in col. 7.

The financial development dummy is positive and significant in all specifications except in the case of small firm dominated, capital intensive industries. The predictive margins of the interaction coefficients in all the 6 columns are shown in Figure 16 where we see that firms in large-firm dominated labor intensive industries are larger at all ages in financially developed states versus underdeveloped states. In small-firm dominated labor intensive industries, plants start out larger in the financially developed states but for older plants we find that those in financially under-developed states are larger. In all other industry samples, we do not find striking differences between the financially developed and under-developed states. In cols. 2 -7 of panel B we show the ratio of the predictive margins in each age bin to that of the youngest firms (<5 years old). We find that plants are growing fastest in large firm dominated capital intensive industries and slowest in small-firm dominated labor intensive industries. Plants in industries that are dependent on external finance grow faster compared to plants in industries less dependent on external finance. However when we look at the differences across financial development, surprisingly we find that the older plants in financially under-developed states are larger than youngest firms in those states compared to the size difference between old and young plants in financially developed states.

Together Table 7 and figures 15-16 show that there are no significant differences in the lifecycle of Indian firms across financially developed and under-developed states and any key differences in size and growth rates that exist are at the industry level.

C.1. Robustness

In this section we undertake a number of robustness tests to see if there is a differential effect of financial development on firm lifecycle. First, in col. 1 of Table 8, we explore whether the effect of financial development is larger for firms in the right tail of the size distribution by looking at firms at or above the 90th percentile in terms of size distribution. Most of the interaction terms are insignificant suggesting only marginal differences in growth rates of these plants in financially developed versus under-developed states.

Insert Table 8 here

In cols. 2 and 3 we use alternate measures of our financial development indicator – in col. 2 we use Commercial Bank Deposits/SDP as an alternate measure of financial depth and in col. 3 we use Total number of bank branches/1000 persons as a measure of financial outreach. We once again split states each year into financially developed versus under-developed depending on the median value of these indicators across states. Cols. 2 and 3 show that the main effect of financial development is negative while the interaction effects with age are mostly insignificant. This is also seen in Figure 18 where we don't find material differences between developed and under-developed states using these alternate indicators.

India has been known to have one of the most stringent formal labor laws in the world, and substantially more protective than the British labor laws along which it was originally modeled as discussed by Dougherty, Robles, and Krishna (2011). Several studies have shown that stringent labor regulations have been associated with lower levels of manufacturing output, employment, and labor productivity (e.g. Besley and Burgess, 2004; Aghion et al., 2008; Ahsan and Pages, 2009). In cols. 4 and 5 of Table 8, we examine if the effect of financial development on plant lifecycle is different in states with flexible labor regulations versus states with stringent labor regulations following the classification in Gupta, Hasan, and Kumar (2008). While the

main effect of financial development is positive and significant in flexible states it is negative and significant in the inflexible states. However, all the interaction coefficients of age with financial development are positive and significant in states with rigid labor regulations. To better interpret the interaction coefficients, we look at the predictive margins with the 95% confidence bands for the interaction coefficients in Figure 18. We find that among the plants in states with rigid labor regulations, those in financially developed states are larger than those in financially under-developed states. The differences across financial development are less stark in states with flexible labor regulations.

In cols. 6 and 7 we next investigate if the role of financial development differs across differing periods of industrial policy. Following India's independence in 1947, the 1951 Industries Development and Regulation Act introduced a system of industrial licensing that came to be known as the "license raj", which regulated and restricted the entry of new firms and expansion of existing firms. With the Indian economy being stagnant over several decades, a series of liberalization reforms were introduced by the Government starting in the 80s which included de-licensing of industries. A third of the industries were de-licensed during the period 1985-1987 and most of the others in 1991. Aghion et al. (2008) provide information on each three-digit industry that was de-licensed over the period 1980-1997. We extend their data to the end of our sample period till 2005 to identify firms that were born after their industry was de-licensed. In col. 6 of Table 8 we look at the interaction of FD and age for firms born after the period of de-licensing. Since the earliest de-licensing year in our sample starts in 1985, we only have the first19 years of firm life-cycle and hence use interactions of FD with each year of age. The predictive margins of the interaction coefficients are in Figure 19. We find that while the age coefficients are mostly positive and significant, the FD dummy is not significant and neither are

the interaction terms. Figure 19 also shows that there does not seem to be much difference in the early lifecycle of firms born after de-licensing in financially developed versus under-developed states. While firms in financially developed states seem to be born larger, the difference is not maintained over time.

In col. 7 of Table 8 we examine if there is a differential effect of state-level financial development on plants born after India's financial liberalization in 1991. Since the last year of data in our sample is 2005, we have 14 years of firms' lifecycle for the firms born after liberalization. Once again most of the interaction terms are not significant. Figure 20 plots the predictive margins of the interaction coefficients along with the 95% confidence intervals. We find that while firms in financially developed states start out larger than firms in financially under-developed states in the period before liberalization, these differences do not persist over time. We do not find any material difference in the lifecycle of plants born after liberalization in financially developed versus under-developed states.

In unreported tests we do not find significant differences in early plant lifecycle between states with high versus low levels of financial development even before industry de-licensing or liberalization.

C.2. Intensive vs. Extensive Margins

The above section shows that despite great variation within the country, financial institutions have limited explanatory power for plant lifecycle in India. In this section we examine if the financial institutions have a differential effect on the *extensive margin* (Number of Plants) versus *intensive margin* (Avg Employment/Plant).

In Fig 21, we plot the proportion of employment in financially developed states in each bin (EM-developed) and the proportion of employment in financially under-developed states in each bin (EM-Underdeveloped). We find marginal differences between financially developed versus under-developed states. Across both categories of states, the 5-9 aged firms have the highest proportion of employment after which it declines. So older plants have smaller employment shares though the oldest age group of 40+ have higher employment shares than middle-aged plants between 20-39 years of age Next, for each age bin in financially developed states we take the ratio of total number of employees to total number of establishments to give us the intensive margin (IM-developed) and repeat the same for the under-developed states to obtain IM-Underdeveloped. While older firms have higher employment/ establishment ratio, we don't find significant differences across financially developed versus under-developed states. All our results hold if we were to take sampling weights into account and examine the intensive and extensive margin in the population.

D. Informal Manufacturing Sector

In this section we study the size-age gap in the informal manufacturing sector in India. In a recent paper using World Bank Enterprise survey data for the informal sector, La Porta and Shleifer (2008) show that informal firms look very different from formal firms in terms of size, productivity, and education level of managers and find little evidence that growth occurs by informal firms eventually becoming large formal establishments. They interpret their findings as being consistent with the *dual economy* view (e.g. Harris and Todaro, 1970) which predicts that in developing countries, in addition to the formal sector, there is an informal sector that employs a large section of the labor force.

Figure 22 presents the sample statistics for establishment size across different age bins, combining the data for both the rural and urban sectors. We see that older firms in the unorganized manufacturing sector employ fewer people than firms younger than 5 years old. Thus firms in the informal manufacturing sector in India have a very different lifecycle than the firms in the formal manufacturing sector. The downward sloping age size profile in the informal sector is consistent with the description of the informal sector in La Porta and Shleifer (2008).

E. Reconciling our results with Hsieh and Klenow (2013).

The analysis above shows that firms in the formal manufacturing sector in India grow as they age in contrast to Hsieh and Klenow (2013)'s findings for the formal manufacturing sector for the same year – 1994/95.[24] In this section, we try to understand if the different results we obtain from those in Hsieh and Klenow (2013) are data driven by taking a closer look at the different types of workers. The Indian census data provides detailed information on the types of workers in an establishment as shown in Appendix D. In all the figures presented thus far, we use total number of workers (line 13 in ASI data and line 22 in NSS data). In this section, we focus our attention on contract workers in the ASI 1994/95 dataset. In Figure 23, we present the size-age relationship using total employment and just contract workers. We find the size-age gap is declining only in the case of contract workers with older firms employing fewer workers than firms under five years of age.

Overall, we find evidence of a flat or declining life cycle in India found by Hsieh and Kloenow only when we look at the informal sector or a particular category of workforce,

[24] Hseih and Klenow (2013) state "..we see flat size with respect to age in the formal plants of the Indian ASI alone, just as in the pooled NSS-ASI data"

contract labor. However, there is no compelling economic rationale for measuring firm size or labor input in the formal sector in this way, and clear reasons not to do so.

IV Conclusion

The role of size and age in influencing plant dynamics is crucial to understanding productivity differences across firms and countries. In this paper, we use unique survey data across 120 developing countries to examine the relationship between establishment size and age in the formal sector. We find that the average 40 year old plant in developing countries is about 5 times larger than the average plant less than 5 years of age. Our results are robust to a number of checks in smaller samples including looking at just the manufacturing sector, dropping former Socialist economies, dropping firms with any government ownership and dropping firms that started operations before the countries' year of independence.

We then undertake an in-depth analysis of plant lifecycle in one developing country, India. Based on 5 repeated cross-sections of census data in India spanning 23 years, this study shows that there are significant age effects in determination of firm size. While the average 20 year old plant in India is not that much larger than plants younger than five years, by age 40, the average plant in India in the formal sector is 2 to 4 times larger than the average plant five years or younger. We find evidence of a flat life-cycle only in the informal sector in India.

We also find that the differences in financial development across Indian states, while substantial, only modestly affect the life-cycles of established firms in most industries. The one exception is firms in large-firm dominated labor intensive industries, which are larger in financially developed states versus underdeveloped states. We also find that plants in financially developed states that have rigid labor market regulations are larger than plants in financially

under-developed states with rigid labor market regulations. We do not find the institutions to have a big impact on either the intensive (employment/establishment) or extensive margin (number of plants). Our results are consistent with the hypothesis that majority government-owned banking systems like the one India has, is not an effective way of employing the financial system to support economic growth.

Our findings have important policy implications. We show that on average, across the world, formal new establishments start small and grow as they age. We find no evidence of declining life-cycles in the formal sector suggesting that older firms are important contributors to economies in developing countries in terms of employment. However, we also find that the size-age ratio may not be as large as that in developed countries such as the United States, suggesting that other institutional factors or firm idiosyncratic factors such as organizational structures may play a role in establishment life-cycle.

References

Aghion, Philippe, Robin Burgess, Stephen J. Redding, and Fabrizio Zilibotti (2008), "The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India", American Economic Review, 98(4): 1397-1412.

Ahsan, Ahmad and Carmen Pages (2009), "Are all labor Regulations Equal? Evidence from Indian Manufacturing", *Journal of Comparative Economics*, 37(1): 62-75.

Ahluwahlia, M. (2002) State Level Performance under Economic Reforms in India. In "*Economic Policy Reforms and the Indian Economy"* Ed: Anne O. Krueger, University of Chicago Press, 1 edition, Chicago, USA.

Ayyagari, Demirguc-Kunt, and Maksimovic, 2008, How well do Institutional Theories Explain Firms Perception of Property Rights, *Review of Financial Studies 21(4), 1833-1871.*

Ayyagari, Demirguc-Kunt, and Maksimovic, 2010 "Formal versus Informal Finance: Evidence from China." Review of Financial Studies, 23(8).

Ayyagari, Demirguc-Kunt, and Maksimovic, 2012, Who creates jobs in developing countries? *SSRN Working Paper Series.*

Ayyagari, M., Demirguc-Kunt, A., and V. Maksimovic, 2013a, What determines protection of property rights? An Analysis of Direct and Indirect Effects, *Journal of Financial Econometrics forthcoming.*

Bajpai, N. and J. D. Sachs, 1999, The Progress of Policy Reform and Variations in Performance at the Sub-National Level in India. *Harvard Institute of International Development Discussion Paper No. 730*

Banerjee, A., S. Cole, and E. Duflo, 2004, "Banking Reform in India" in Bery, S. B. Bosworth and A. Panagariya, India Policy Forum, 2004, Volume 1. New Delhi; Washington, DC: National Council of Applied Economic Research; Brookings Institution, 277-332.

Barth, James, Gerard Caprio and Ross Levine, 2001. "Banking Systems Around the Globe: Do Regulation and Ownership Affect Performance and Stability?" in Financial Supervision and Regulation: What Works and What Doesn't? Ed. Frederick Mishkin, NBER, 31-88.

Beck, Thorsten, Asli Demirguc-Kunt, Luc Laeven and Ross Levine, 2008. "Finance, Firm Size, and Growth," Journal of Money, Credit and Banking, vol. 40(7), 1379-1405.

Beck, Thorsten, Asli Demirguc-Kunt, and Vojislav Maksimovic, 2005, Financial and Legal Constraints to Firm Growth: Does Firm Size Matter? *Journal of Finance, 137-177*

Besley, T. and R. Burgess, 2004, Can Labor Regulation Hinder Economic Performance? Evidence from India," The Quarterly Journal of Economics, vol. 119(1), 91-134.

Bhattacharjea, Aditya. 2006. “Labour market regulation and industrial performance in India: A critical review of the empirical evidence.” *The Indian Journal of Labour Economics*, 49(2): 211-32.

Boyreau-Debray, G., 2003, Financial Intermediation and Growth: Chinese Style. *World Bank Policy Research Working Paper No. 3027.*

Boyreau-Debray, G. and S. J. Wei 2005, “Pitfalls of a State-Dominated Financial System: The Case of China.” *NBER Working Paper 11214*

Burgess, R. and R. Pande, 2005. "Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment," *American Economic Review*, 95(3), 780-795.

Brav, A., John R. Graham, Campbell Harvey, Roni Michaely, 2005, Payout Policy in the 21st Century, *Journal of Financial Economics* 77(3), 483-527.

Bruhn, M., 2011, License to Sell: The Effect of Business Registration Reform on Entrepreneurial Activity in Mexico, *The Review of Economics and Statistics* 93(1), 382-386.

Cabral, Luis and Jose Mata (2003), "On the Evolution of the Firm Size Distribution: Facts and Theory," American Economic Review 93(4): 1075-90.

Campello, M., Erasmo Giambona, John R. Graham, and Campbell R. Harvey, 2011, Liquidity Management and Corporate Investment During a Financial Crisis, *Review of Financial Studies* 24(6): 1944-1979.

Caves, Richard E. (1998). “Industrial Organization and New Findings on the Turnover and Mobility of Firms,” Journal of Economic Literature, December 1998, 1947-1982.

Cole, S. (2009). “Financial Development, Bank Ownership, and Growth: Or, Does Quantity Imply Quality?” *Review of Economics and Statistics* 91, 33-51.

Davis, Steven, John Haltiwanger, and Scott Schuh (1996), Job Creation and Destruction. Cambridge, MA: MIT Press.

Dehejia, R. and A. Lleras-Muney, 2007. "Financial Development and Pathways of Growth: State Branching and Deposit Insurance Laws in the United States, 1900-1940," Journal of Law and Economics, 50, 239-272

Dougherty, Sean (2009), “Labor Regulation and Employment Dynamics at the State Level in India”, Review of Market Integration, 1(3): 295-337.

Dougherty, Sean, Robles, V. C. F. and Krishna, K., 2011. "Employment Protection Legislation and Plant-Level Productivity in India," NBER Working Papers 17693, National Bureau of Economic Research, Inc.

Dunne, Timothy, Mark Roberts, and Larry Samuelson (1989), "The Growth and Failure of U.S. Manufacturing Plants," Quarterly Journal of Economics 104(4), 671-98.

Evans, David S, 1987, The Relationship between Firm Growth, Size, and Age: Estimates for 100 Manufacturing Industries, *Journal of Industrial Economics* 35(4), 567-581.

Foster, L., Haltiwanger, J. C., and Syverson, C., 2012, The Slow Growth of New Plants: Learning about Demand? *National Bureau of Economic Research Working Papers No. 17853.*

Graham, John R., and Campbell Harvey, 2001, The Theory and Practice of Corporate Finance: Evidence from the Field, *Journal of Financial Economics* 60, 187-243

Gupta, P., Hasan, R., and Kumar, U., 2008, What constrains Indian manufacturing? *Macroeconomics Working Papers* 22162, East Asian Bureau of Economic Research.

Guiso, L., P. Sapienza, and L. Zingales, 2004. The Role of Social Capital in Financial Development. *American Economic Review* 94 (3), 526-556.

Harris, John R., and Michael P. Todaro. 1970. "Migration, Unemployment and Development: A Two- Sector Analysis." *American Economic Review* 60, no. 1: 126-42.

Hanson, James A., 2001. Indian Banking: Market Liberalization and the Pressures for Institutional and Market Framework Reform. Center for Research on Economic Development and Policy Reform Working Paper No. 104, Stanford University.

Hasan, R. and Jandoc, K. R. L., 2012, Labor Regulations and the Firm Size Distribution in Indian Manufacturing. *Columbia Program on Indian Economic Policies Working Paper No. 2012-3.*

Hasan, R., Mitra, D., and Ramaswamy, K. V., 2007. Trade Reforms, Labor Regulations, and Labor-Demand Elasticities: Empirical Evidence from India. *Review of Economics and Statistics* 89 (3), 466-481.

Hsieh, Chang-Tai and Peter J. Klenow (2013), "The Lifecycle of plants in India and Mexico," *Quarterly Journal of Economics forthcoming.*

Jayaratne, J. and Strahan, P. 1996. The Finance-Growth Nexus: Evidence from Bank Branch Deregulation. *Quarterly Journal of Economics* 111 (3), 639-670.

La Porta, R., F. Lopez de Silanes, and A. Shleifer (2002) "Government ownership of banks," Journal of Finance 57, 265-301.

La Porta, Rafael and Andrei Shleifer (2008), "The Unofficial Economy and Economic Development," Brookings Papers in Economic Activity, 275-352.

Lins, Karl V. & Servaes, Henri & Tufano, Peter, 2010, What drives corporate liquidity? An international survey of cash holdings and lines of credit, *Journal of Financial Economics* 98(1), 160-176.

Rajan, R. and Zingales, L., 1998, Financial Dependence and Growth. *American Economic Review 88 (3), 559-586.*

Figure 1: Establishment Employment by Age – Sample Estimates in 120 Developing Countries

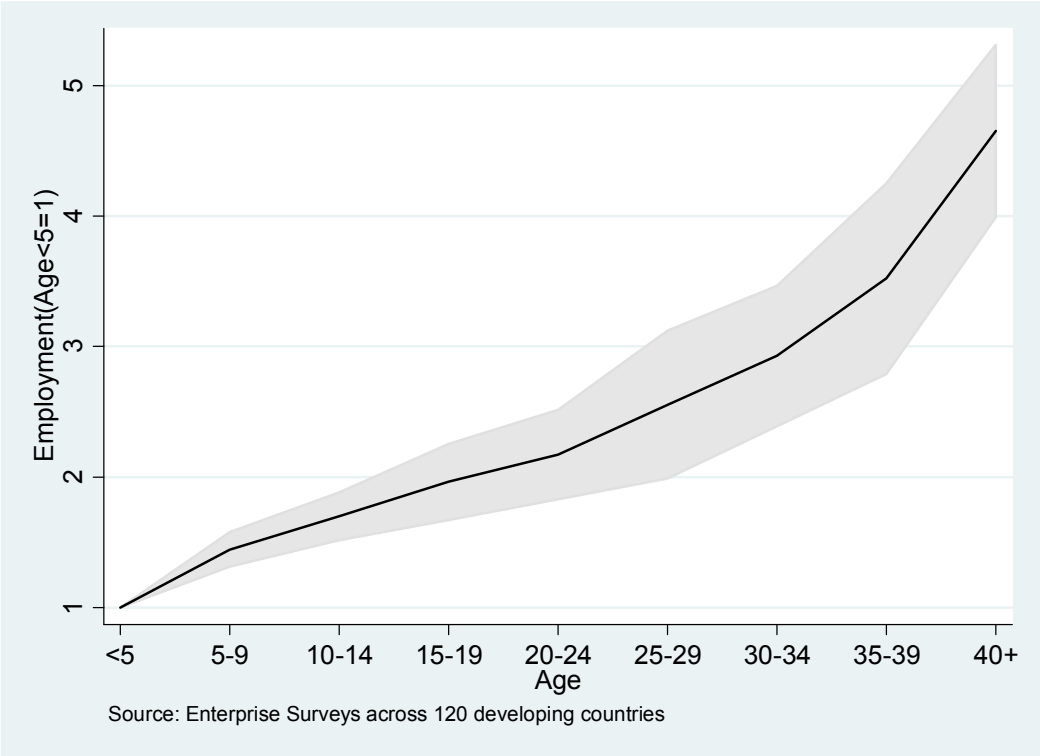


Figure 2: Establishment Employment by Age - Population Estimates in 120 Developing Countries

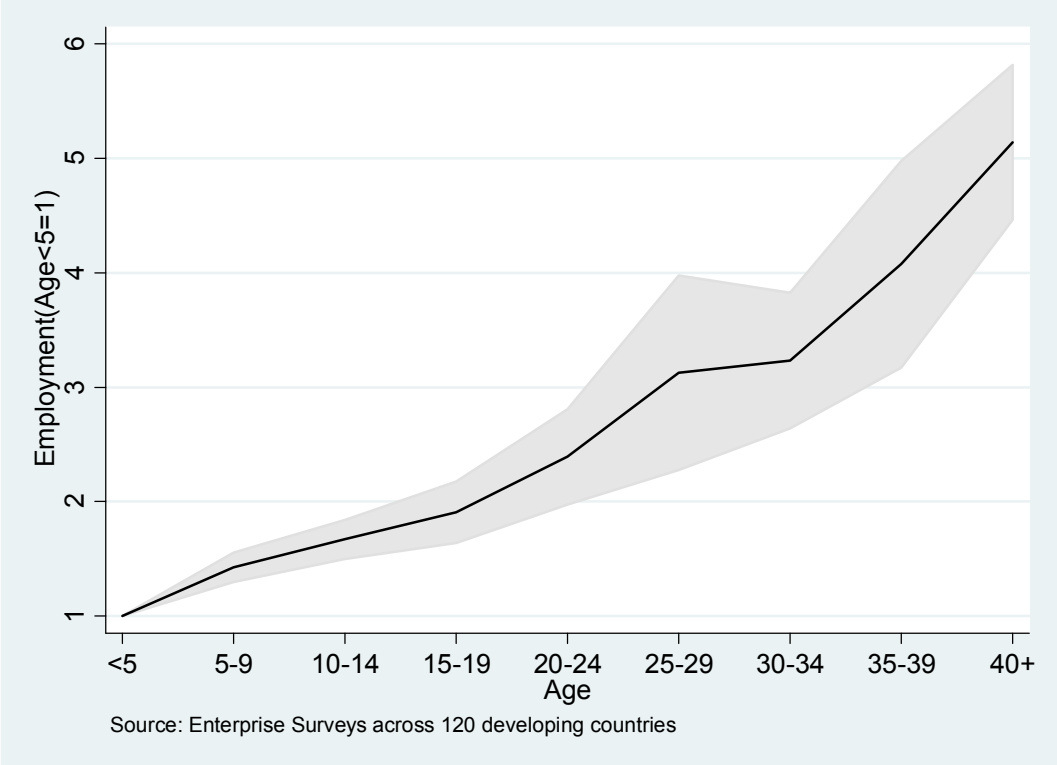


Figure 3: Establishment Employment by Age – Manufacturing in 120 developing countries

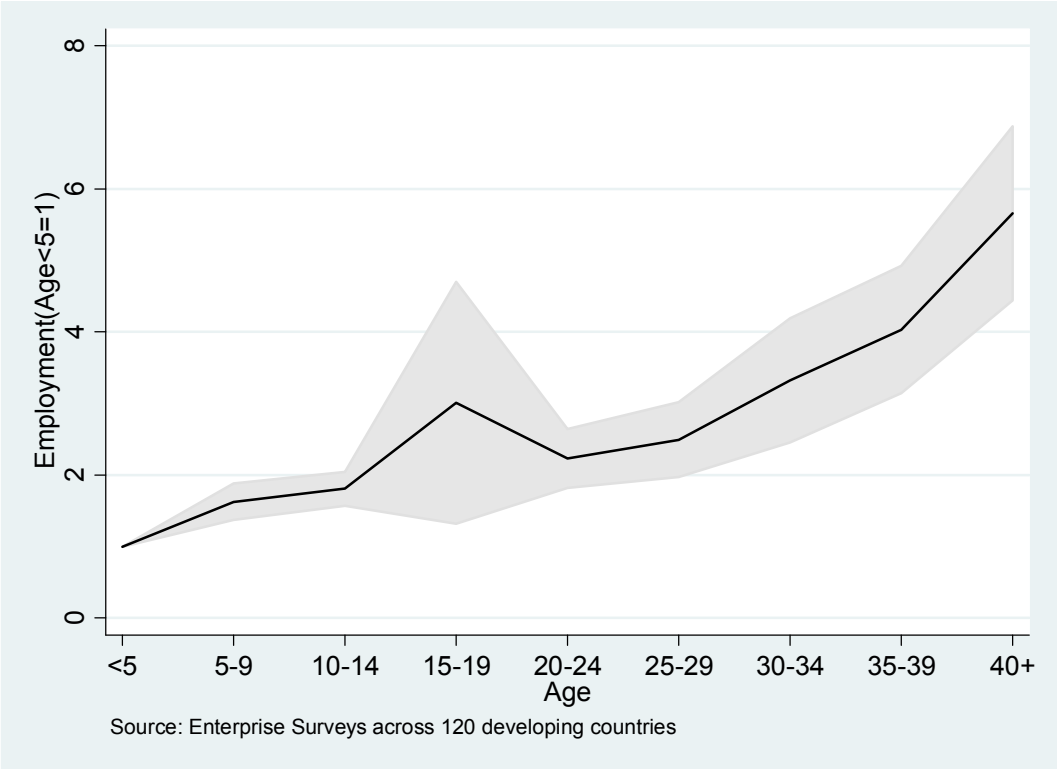


Figure 4: Establishment Employment by Age – Robustness Tests

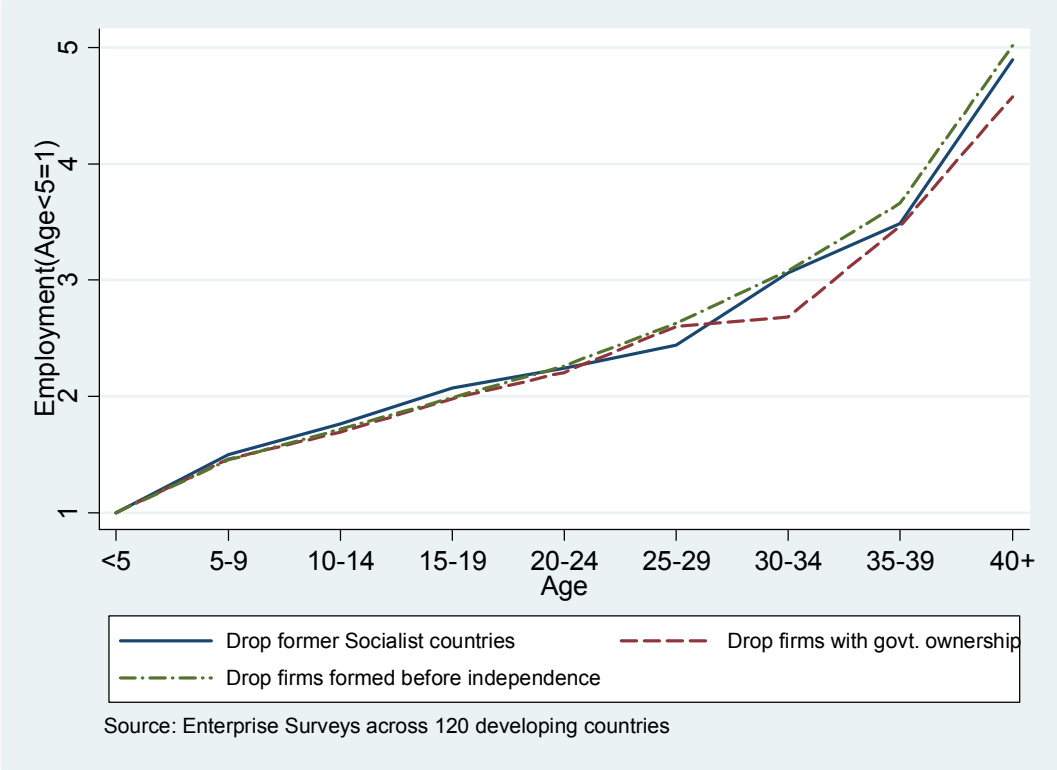


Figure 5: Establishment Employment by Age - Normalize by Average Employment at Birth

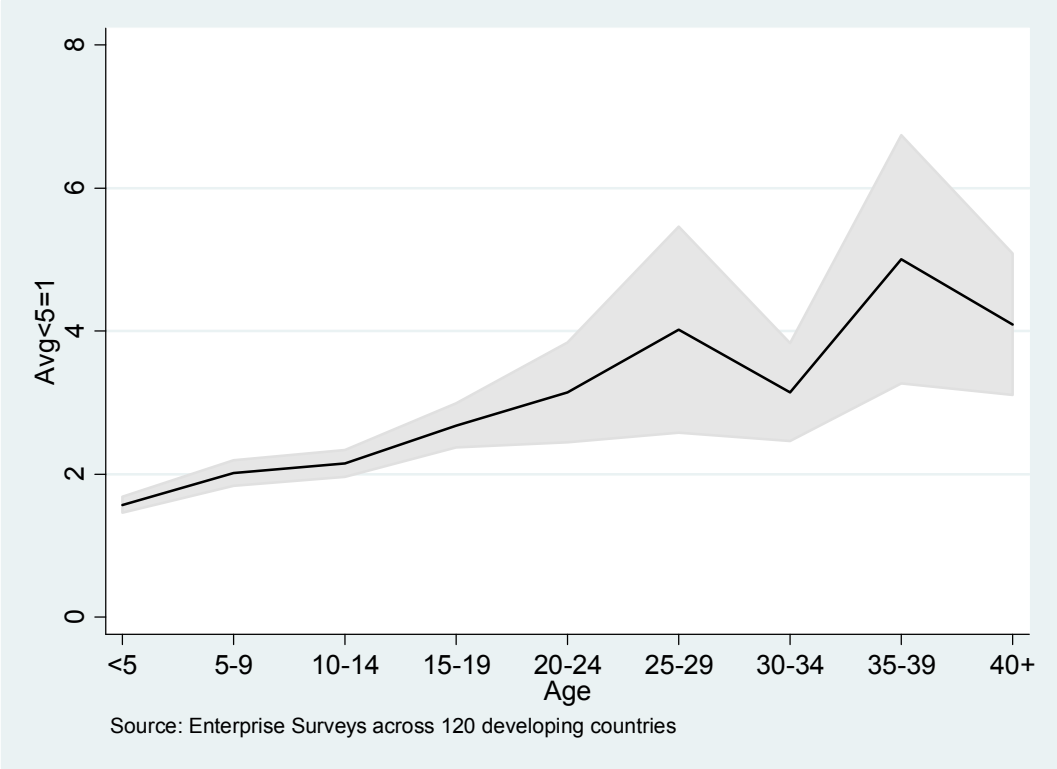
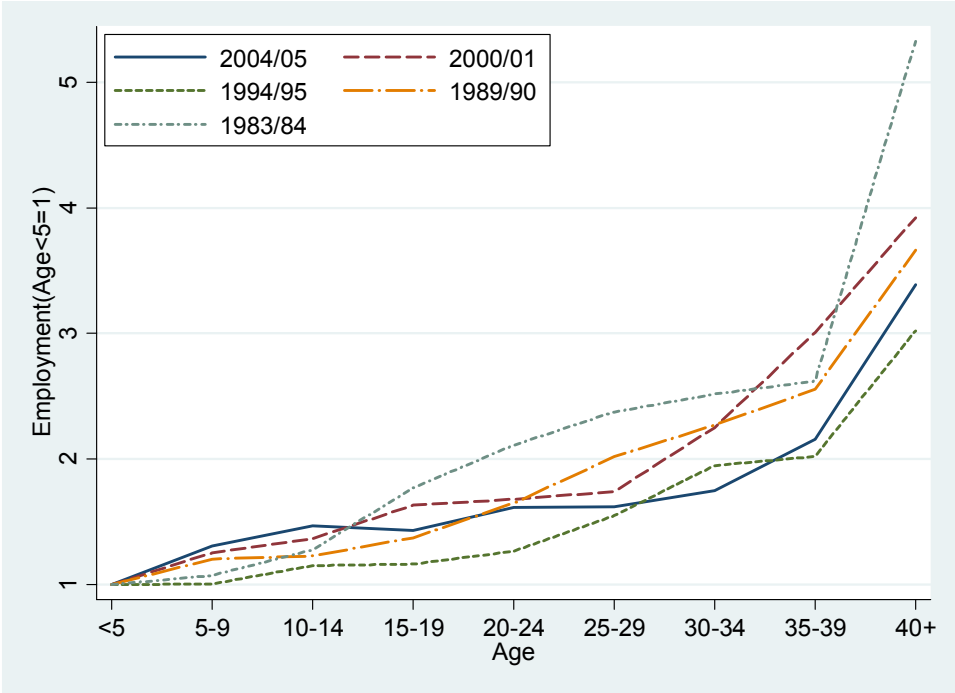


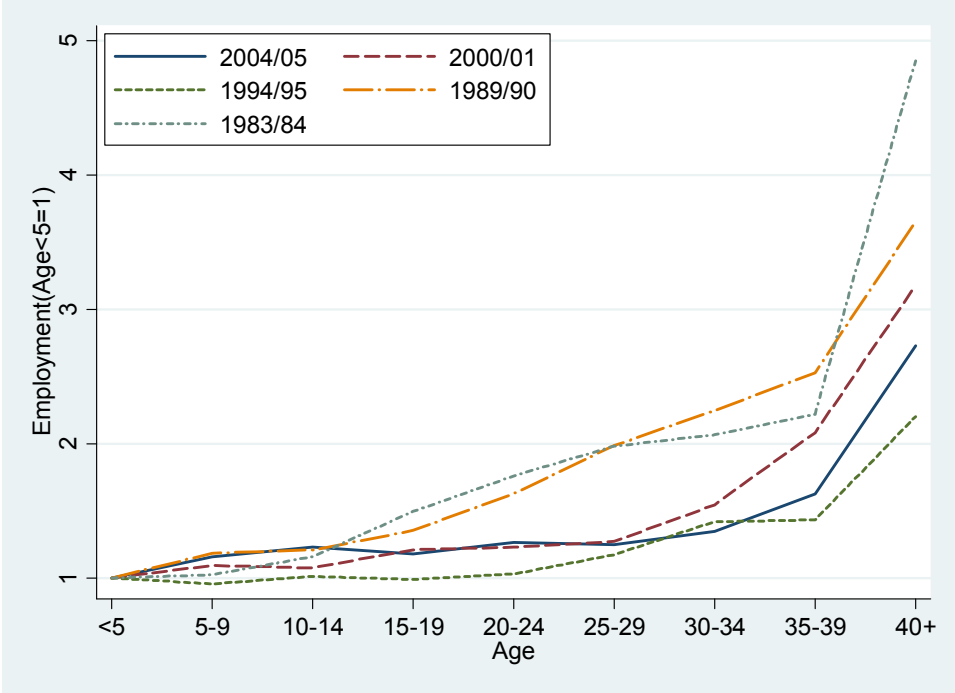
Figure 6: Establishment Employment by Age – Two Snapshots

Figure 7: Firm Size and Age – Sample Estimates



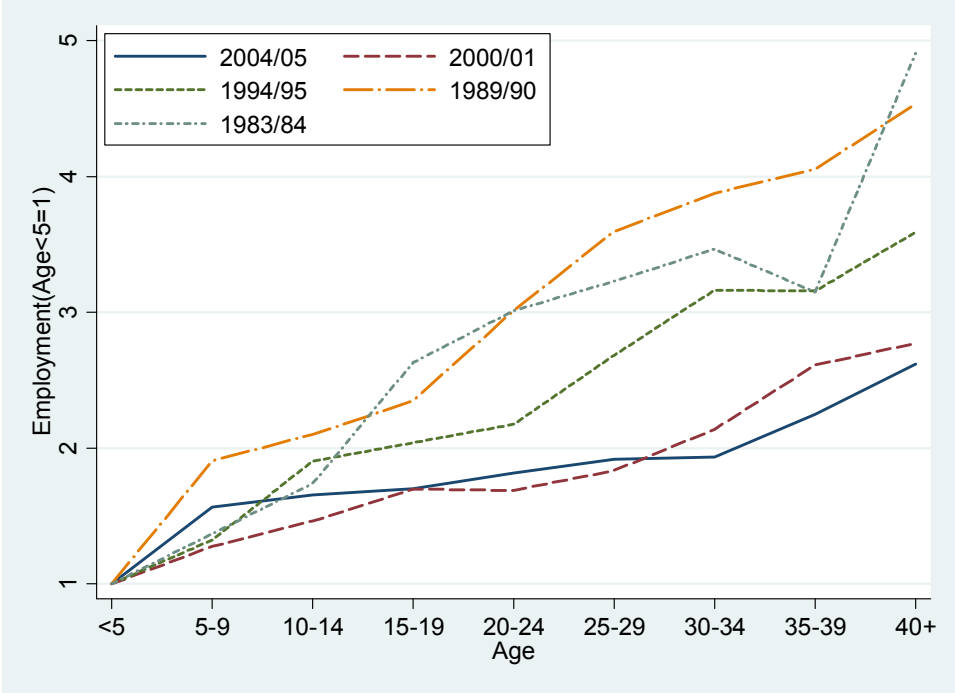
Source: ASI Data for following individual census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 8: Firm Size and Age – Population Estimates



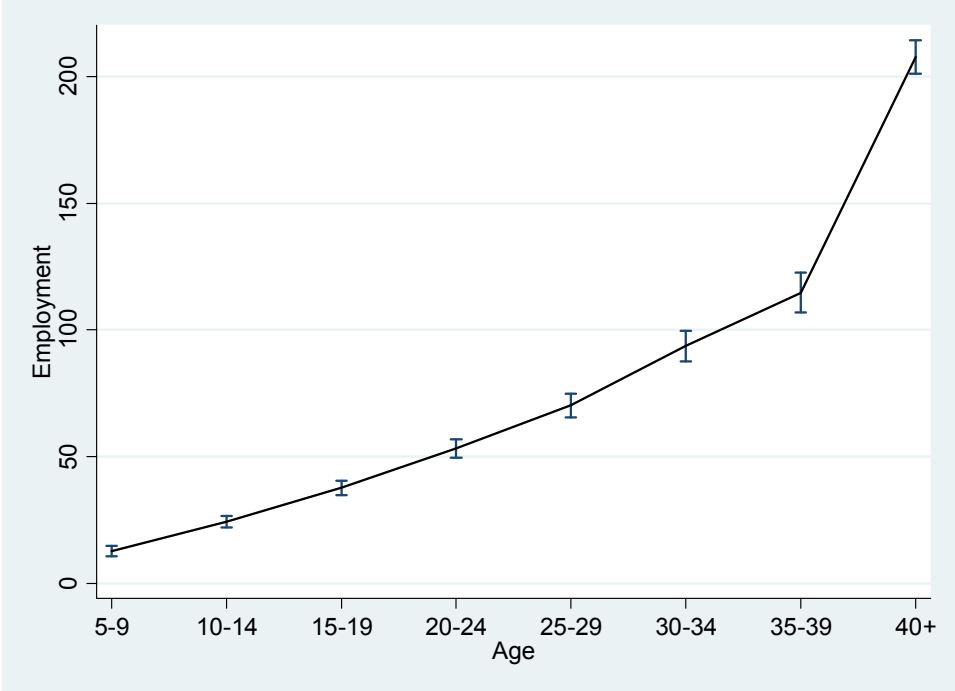
Source: ASI Data for following individual census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 9: Firm Size and Age – Census Sample



Source: ASI Data for following individual census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 10: Firm Size and Age – Pooled Regression Sample

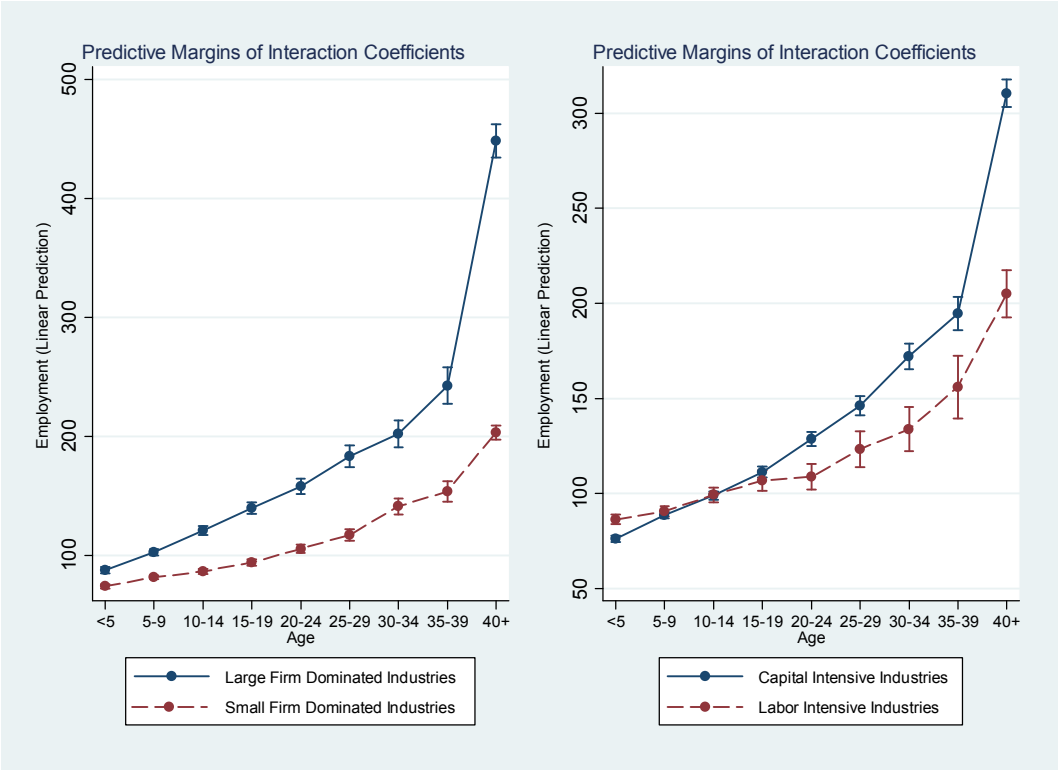


Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 11: Size of young firms over the years

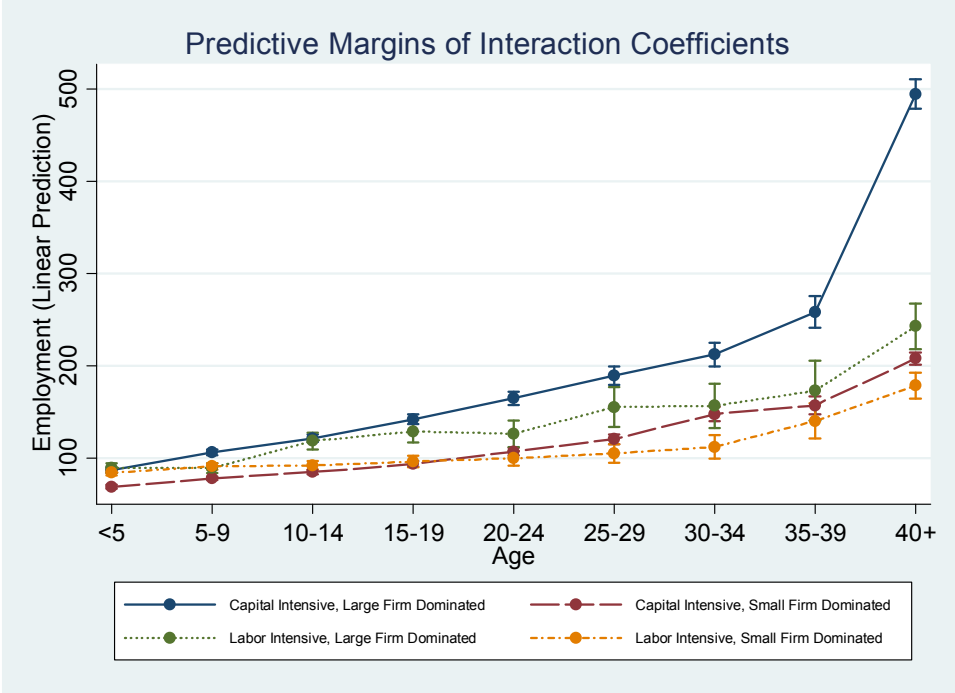
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 12: Firm Size and Age: Industry Heterogeneity



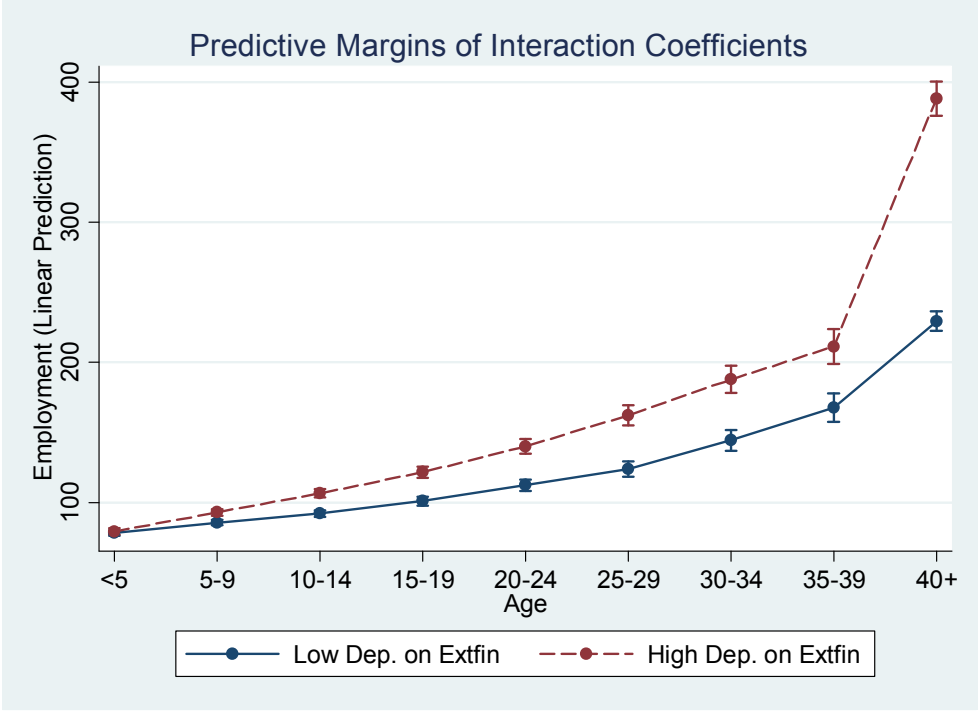
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 13: Firm Size and Age: Small/Large Firm and Labor/Capital Intensive



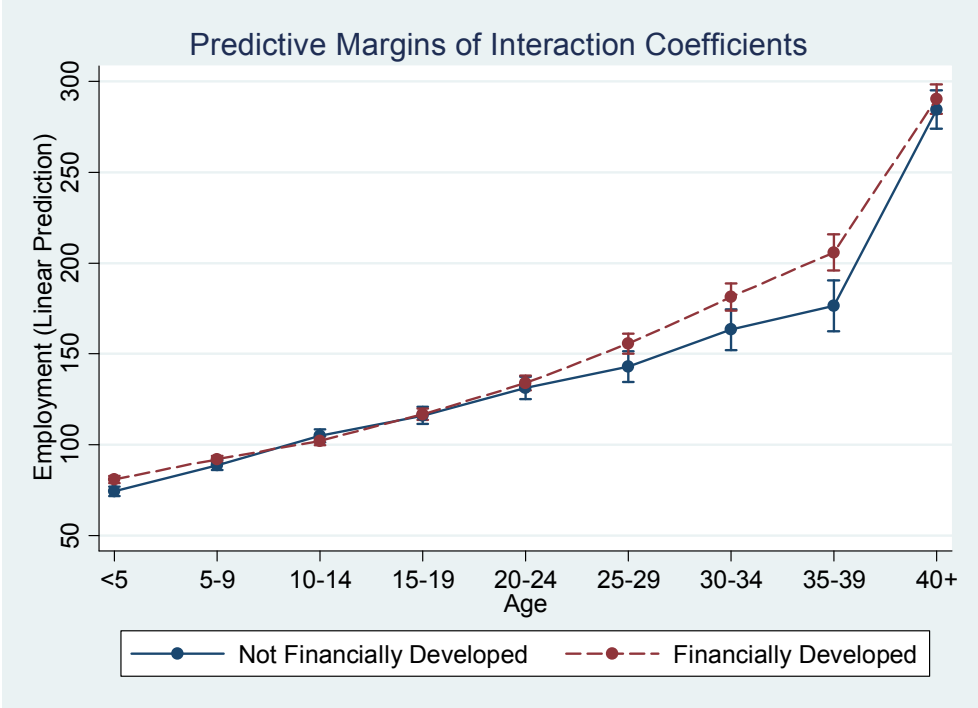
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 14: Firm Size and Age: External Finance Dependence



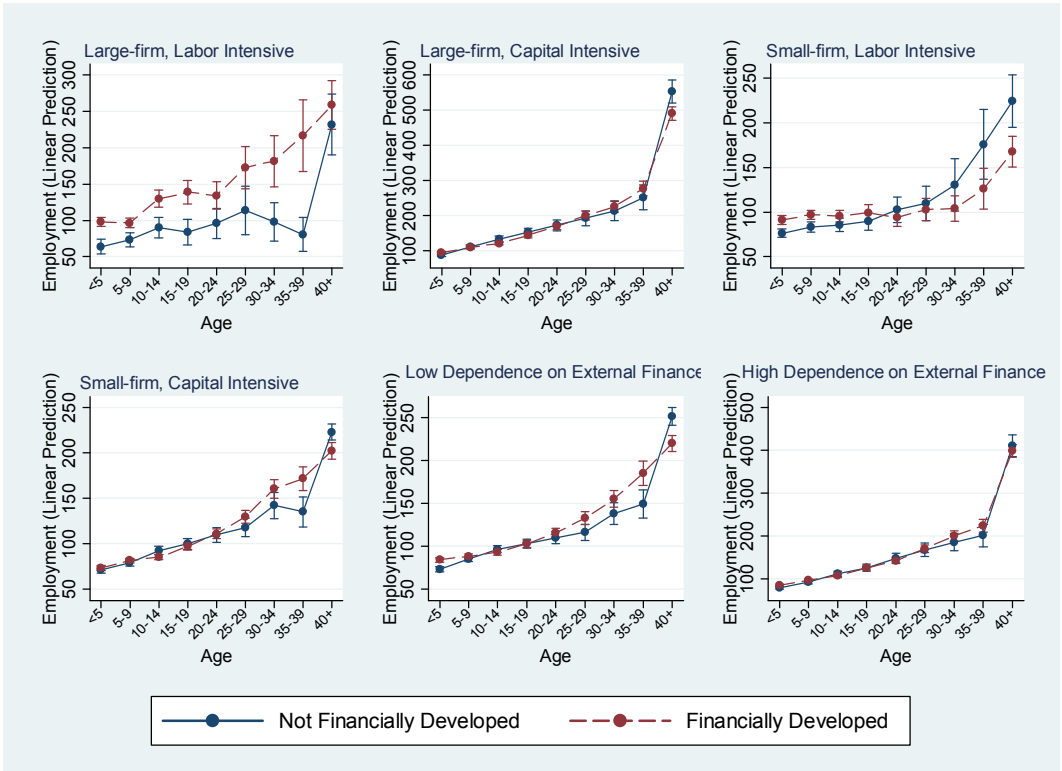
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 15: Firm Size and Age: Role of Financial Development



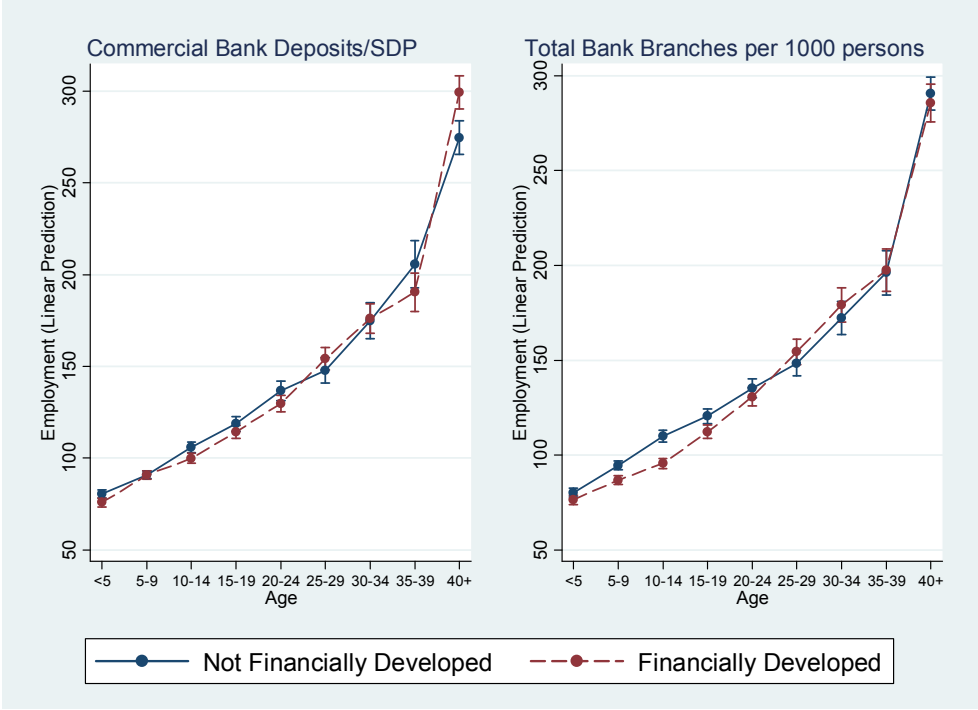
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 16: Firm Size and Age: Role of Financial Development across Industries



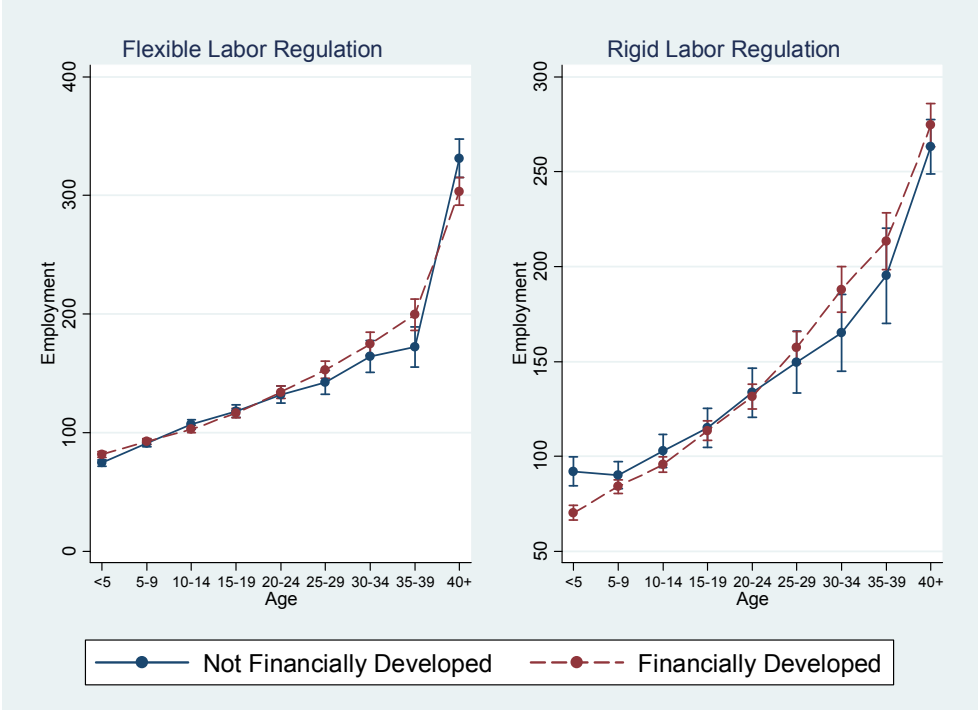
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 17: Firm Size and Age: Alternate Indicators of Financial Development



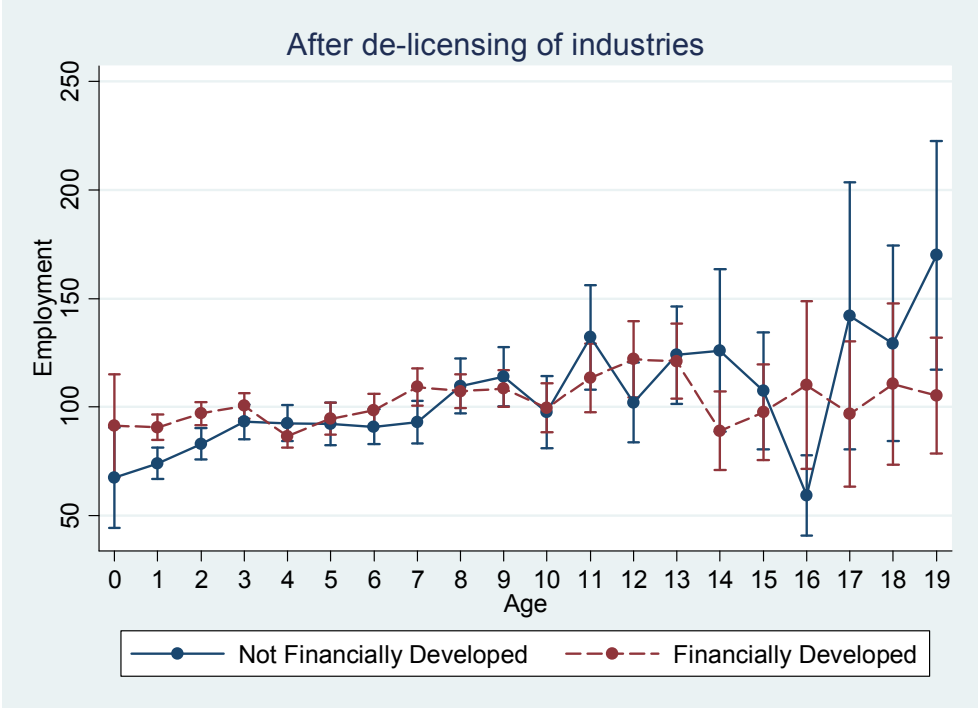
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 18: Firm Size and Age: Role of Financial Development in Flexible vs Inflexible States



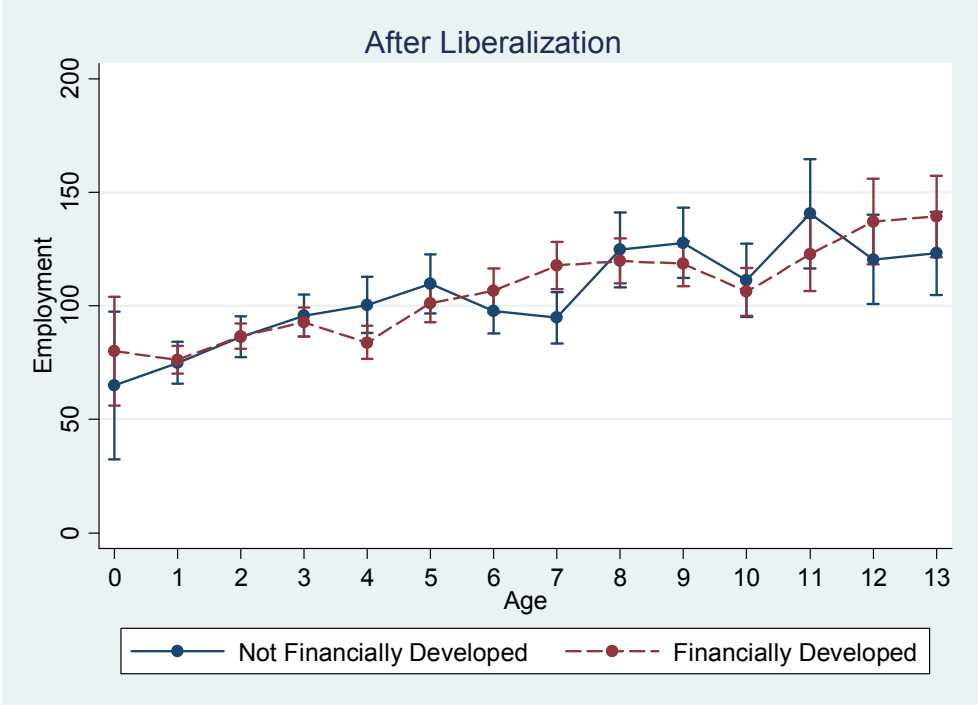
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 19: Firm Size and Age: Role of Financial Development after De-licensing



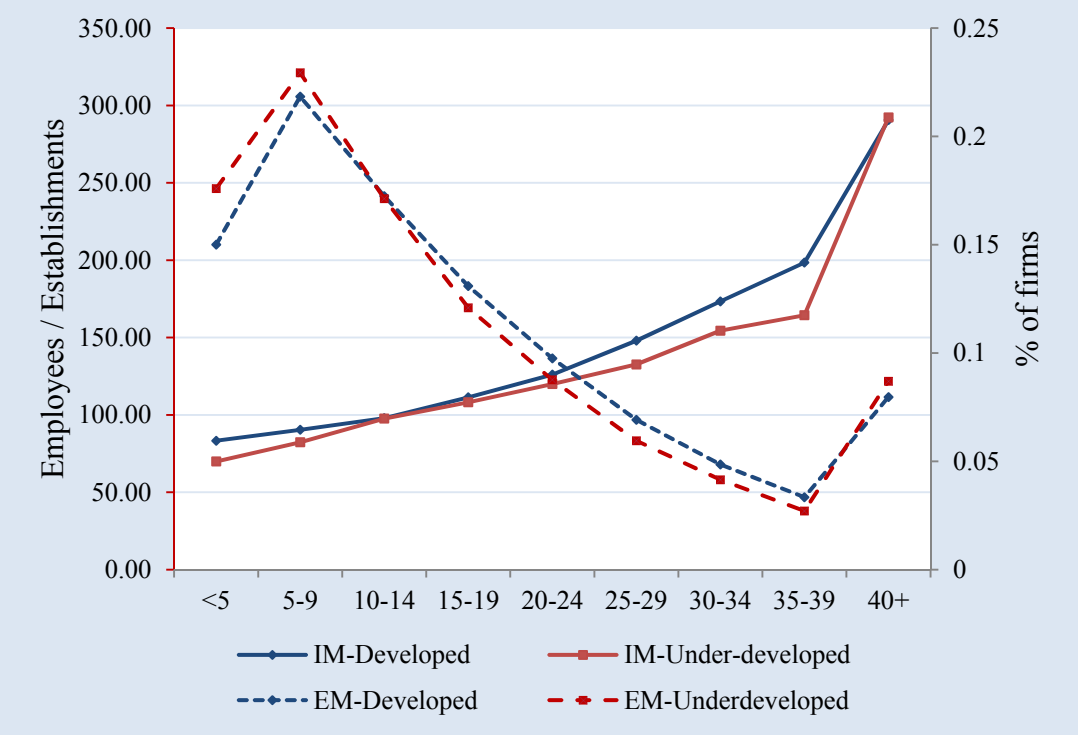
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 20: Firm Size and Age: Role of Financial Development after Liberalization



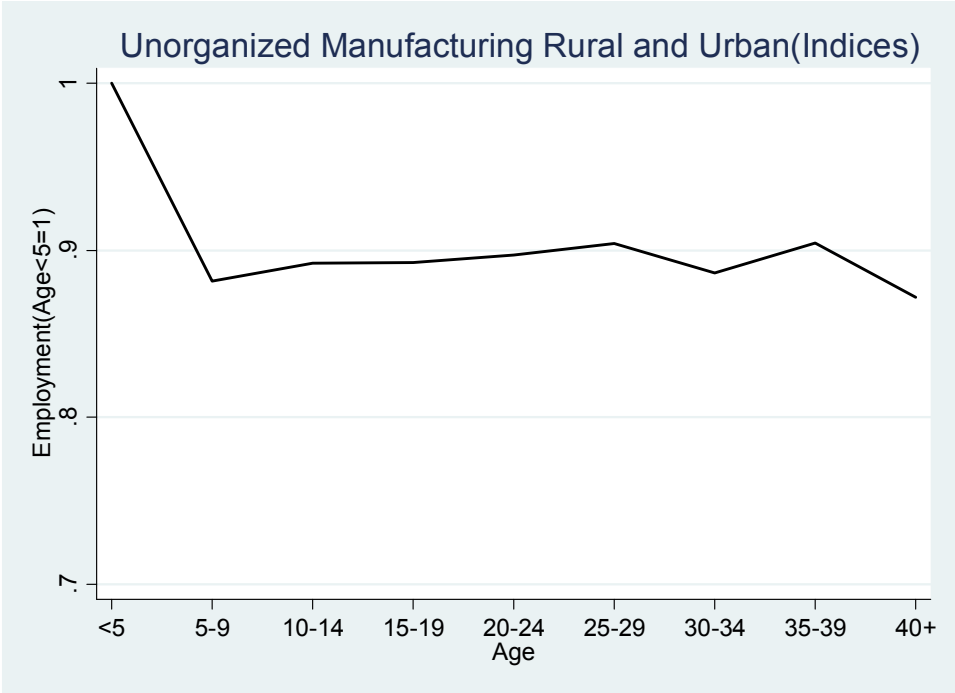
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/05

Figure 21: Financial Institutions and Intensive (IM) versus Extensive Margin (EM)



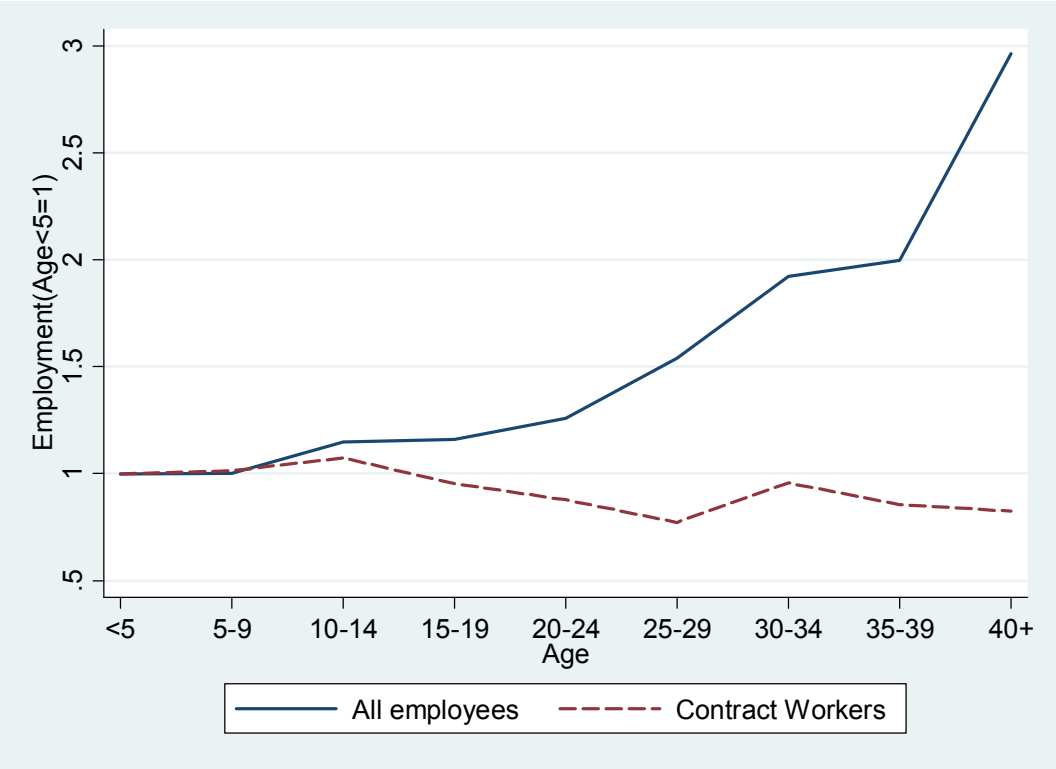
Source: ASI Data pooled from the following census years: 1983/84, 1989/90, 1994/95, 2000/01, 2004/0

Figure 22: Establishment Employment by Age – Informal Sector in India



Source: NSS 1994/95

Figure 23: Establishment Employment by Age – Contract Workers in India



Source: ASI 1994/95

Table 1: Summary Statistics and Correlations – Cross-country Sample

The variables are defined as follows: Establishment Size is the number of permanent, full-time employees in the establishment where permanent, full-time employees are defined as all paid employees that are contracted for a term of one or more fiscal years and/or have a guaranteed renewal of their employment contract and that work 8 or more hours per day. Establishment Size Ratio is the establishment size of each firm scaled by the number of full-time employees when it started operations. Establishment Age is defined as the number of years since the establishment began operations in the country and consist of 9 age dummies for the following age bins: <5, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. Manufacturing is a dummy variable that takes the value 1 for firms in the manufacturing sector and 0 otherwise.

Panel A: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Establishment Size	53821	69.728	143.899	3	1300
Establishment Size Ratio	45314	6.078	22.054	5.00E-06	1250
Establishment Age	53821	3.590	2.358	1	9
Manufacturing	53797	0.550	0.497	0	1

Panel B: Correlations

	Establishment Size	Establishment Size Ratio	Establishment Age
Establishment Size Ratio	0.337***		
Establishment Age	0.227***	0.125***	
Manufacturing	0.118***	-0.000	0.151***

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively

Table 2: Institutional Variation across Indian States

Panel A presents data on financial development across different states of India for each of the census years in our sample. Credit/SDP is the ratio of Total Bank Credit to Net State Domestic Product. FD is a dummy variable that takes the value 1 for state-years that are at or higher than the median value of Credit/SDP across states in a given census year. Panel B classifies states based on the stringency of labor regulations and is from Gupta, Hasan, and Kumar (2008). Flexible is a dummy variable that takes 1 for states with flexible labor regulations and 0 for states with rigid labor market regulations.

Panel A: Financial Development across States

Year	1983		1989		1994		2000		2004	
State	**Credit/SDP**	**FD**	**Credit/SDP**	**FD**	**Credit/SDP**	**FD**	**Credit/SDP**	**FD**	**Credit/SDP**	**FD**
Assam	0.073	0	0.118	0	0.102	0	0.119	0	0.171	0
Bihar	0.120	0	0.145	0	0.144	0	0.166	0	0.259	0
Uttar Pradesh	0.149	0	0.169	0	0.156	0	0.172	0	0.267	0
Haryana	0.187	0	0.184	0	0.155	0	0.181	0	0.273	0
Gujarat	0.190	1	0.245	1	0.210	1	0.296	1	0.322	0
West Bengal	0.273	1	0.287	1	0.283	1	0.238	1	0.342	0
Orissa	0.115	0	0.168	0	0.155	0	0.172	0	0.357	0
Punjab	0.229	1	0.221	1	0.231	1	0.286	1	0.364	1
Rajasthan	0.150	0	0.176	0	0.145	0	0.206	0	0.374	1
Madhya Pradesh	0.122	0	0.180	0	0.166	0	0.197	0	0.418	1
Andhra Pradesh	0.222	1	0.272	1	0.262	1	0.316	1	0.438	1
Kerala	0.293	1	0.345	1	0.330	1	0.366	1	0.555	1
Karnataka	0.291	1	0.385	1	0.330	1	0.383	1	0.666	1
Tamil Nadu	0.351	1	0.396	1	0.424	1	0.522	1	0.733	1
Maharashtra	0.477	1	0.417	1	0.497	1	0.659	1	1.148	1

Panel B: Stringency of Labor Regulations across States

State name	Flexible State
Andhra Pradesh	1
Delhi	1
Gujarat	1
Haryana	1
Himachal Pradesh	1
Karnataka	1
Madhya Pradesh	1
Maharashtra	1
Punjab	1
Rajasthan	1
Uttar Pradesh	1
Assam	0
Bihar	0
Chhattisgarh	0
Goa	0
Jharkhand	0
Kerala	0
Orissa	0
Tamil Nadu	0
Uttaranchal	0
West Bengal	0

Table 3: Summary Statistics and Correlations –India Sample

The variables are defined as follows: Establishment Size is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. Establishment Size Ratio is the ratio of each firm's establishment size scaled by the average establishment size of all firms in its birth cohort year. Age Dummies consists of dummy variables for the following 9 age bins - <5, 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+ - and is defined as the year of the survey - year of initial production reported by the firms. Small Firm Industry takes the value 1 if industry's share of employment in firms with less than 20 employees is ≥ median value of the Index of small firm domination from Beck, Demirguc-Kunt, Laeven, and Levine (2008) and takes the value 0 if it is < the median index value. EFD is a dummy variable that takes the value 1 if industry's dependence on external finance is ≥ median value of the Index of External Finance Dependence and takes the value 0 if it is < the median of the Index of External Finance Dependence. The Index of External Finance Dependence is computed for US industries over the period 1980-2005following the procedure in Rajan and Zingales (1998). Labor Intensive Industries is a dummy variable that takes the value 1 for labor intensive industries and 0 for capital intensive industries and is from Hasan and Jandoc (2012). FD is dummy variable that takes value 1 for financially developed states and 0 otherwise. Flexible state is a dummy variable that takes the value 1 for states with flexible labor regulations and 0 for states with stringent labor regulations and is from Gupta, Hasan, and Kumar (2008).

Panel A: Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
Establishment Size	221029	121.51	238.36	1	1616
Establishment Size Ratio	106362	1.38	2.64	0.01	30.44
Age Dummies	228904	3.78	2.40	1	9
Small Firm Industry	217596	0.62	0.48	0	1
Labor Intensive	228904	0.23	0.42	0	1
EFD	227123	0.42	0.49	0	1
FD	208963	0.73	0.44	0	1
Flexible State	220811	0.69	0.46	0	1

[a] and [b] represent significance at 1% and 5% levels respectively.

Panel B: Correlation Matrix

	Establishment Size	Establishment Size Ratio	Age Dummies	Small Firm Industry	Labor Intensive	EFD	FD
Establishment Size Ratio	0.962***						
Age Dummies	0.221***	0.132***					
Small Firm Industry	-0.101***	-0.085***	0.025***				
Labor Intensive	-0.04***	-0.004	-0.085***	0.063***			
EFD	-0.066***	-0.053***	-0.007***	-0.019***	-0.163***		
FD	0.024***	0.012***	-0.022***	-0.01***	-0.050***	0.001	
Flexible State	-0.021***	0.014***	-0.107***	-0.054***	-0.051***	0.073***	0.073***

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively.

Table 4: Establishment Size and Age – Cross-Country Sample

This table shows results from the following regression: Establishment Size /Size Ratio = $\alpha + \beta_1$ Age Dummies + β_2 Ownership Dummies + β_3 Age x Ownership Dummies + β_4Year Dummies + β_5Country Dummies + e. Establishment Size is the number of permanent, full-time employees in the establishment where permanent, full-time employees are defined as all paid employees that are contracted for a term of one or more fiscal years and/or have a guaranteed renewal of their employment contract and that work 8 or more hours per day. Establishment Size Ratio is the establishment size of each firm scaled by the number of full-time employees when it started operations. Age Dummies consist of 9 age dummies for the following age bins: <5(reference category), 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40. Manufacturing is a dummy variable that takes the value 1 for firms in the manufacturing sector and 0 otherwise. Year Dummies consist of dummies for each of the years in which the Enterprise Survey is conducted. All regressions are estimated by ordinary least squares. Robust standard errors are reported in parentheses. The square brackets in col. 1 containa a ratio of the mean size of the particular age bin to the mean size in the age bin with youngest (<5) firms.

	1	2	3	4	5	6	7	8
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size Ratio	Establishment Size Ratio	Establishment Size Ratio	Establishment Size Ratio
			Manufacturing	Non-Manufacturing			Manufacturing	Non-Manufacturing
5-9	13.424***	9.849***	12.382***	7.047***	0.812***	0.609***	0.421*	0.664*
	(1.388)	(1.376)	(2.361)	(1.517)	(0.191)	(0.211)	(0.234)	(0.347)
	1.375							
10-14	30.411***	21.077***	28.663***	12.834***	2.942***	2.127***	1.496***	2.663***
	(1.618)	(1.638)	(2.682)	(1.901)	(0.279)	(0.301)	(0.262)	(0.549)
	1.849							
15-19	36.483***	26.157***	29.525***	23.267***	4.615***	3.696***	2.700***	4.701***
	(1.916)	(1.976)	(3.067)	(2.482)	(0.345)	(0.359)	(0.362)	(0.643)
	2.018							
20-24	41.206***	30.670***	35.970***	25.650***	5.024***	4.161***	3.589***	4.940***
	(2.634)	(2.691)	(3.700)	(4.000)	(0.598)	(0.596)	(0.550)	(1.340)
	2.150							
25-29	44.286***	35.494***	39.902***	31.548***	4.791***	4.173***	4.099***	3.943***
	(2.947)	(3.043)	(4.175)	(4.372)	(0.488)	(0.514)	(0.678)	(0.678)
	2.236							
30-34	58.577***	46.687***	51.136***	43.465***	5.318***	4.398***	4.223***	4.463***
	(3.863)	(3.915)	(5.263)	(5.674)	(0.507)	(0.511)	(0.630)	(0.846)
	2.635							
35-39	69.747***	59.877***	70.089***	43.997***	7.078***	6.276***	6.830***	5.260***

	1	2	3	4	5	6	7	8
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size Ratio	Establishment Size Ratio	Establishment Size Ratio	Establishment Size Ratio
			Manufacturing	Non-Manufacturing			Manufacturing	Non-Manufacturing
	(4.851)	(4.871)	(6.674)	(6.661)	(0.993)	(0.994)	(1.395)	(1.092)
	2.947							
40+	135.520***	122.361***	142.259***	87.720***	11.134***	9.767***	10.345***	8.623***
	(3.754)	(3.790)	(5.131)	(5.523)	(0.819)	(0.812)	(1.018)	(1.402)
	4.783							
Constant	35.828***	52.000***	9.907**	2.473	3.050***	-0.212	1.219***	0.943***
	(0.973)	(5.221)	(4.734)	(2.964)	(0.163)	(0.593)	(0.248)	(0.221)
N	53821	53797	29614	24183	45314	45292	24491	20801
Adjusted R-square	0.058	0.110	0.103	0.085	0.017	0.034	0.040	0.029

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively.

Table 5: Establishment Size and Age – India Sample

This table shows results from the following regression: Establishment Size/Size Ratio = $\alpha + \beta_1$ Age Dummies + β_2 State Dummies + β_3Year Dummies + β_4Industry Dummies + e. Establishment Size is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. Establishment Size Ratio is the ratio of each firm's establishment size scaled by the average establishment size of all firms in its birth cohort year. Age Dummies consist of 9 age dummies for the following age bins: <5(reference category), 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. Year Dummies consist of dummies for each of the years in which the census is conducted. State Dummies are 32 dummies for states in which the establishments are located. Industry dummies are 3 digit NIC dummies for manufacturing industries. All regressions are estimated by ordinary least squares. Robust standard errors are reported in parentheses. The square brackets in cols. 1 and 2 contain a ratio of the mean size of the particular age bin to the mean size in the age bin with youngest (<5) firms.

	(1)	(2)	(3)	(4)
	Establishment Size	Establishment Size	Establishment Size Ratio	Establishment Size Ratio
5-9	11.531***	12.777***	0.377***	0.421***
	(1.026)	(1.026)	(0.016)	(0.016)
	[1.149]	**[1.258]**		
10-14	21.942***	24.367***	0.636***	0.833***
	(1.189)	(1.195)	(0.023)	(0.024)
	[1.284]	**[1.493]**		
15-19	34.544***	37.649***	0.884***	1.200***
	(1.452)	(1.465)	(0.040)	(0.042)
	[1.447]	**[1.762]**		
20-24	48.060***	53.217***	1.419***	1.862***
	(1.816)	(1.814)	(0.075)	(0.076)
	[1.622]	**[2.076]**		
25-29	66.018***	70.194***		
	(2.370)	(2.351)		
	[1.855]	**[2.420]**		
30-34	89.781***	93.613***		
	(3.142)	(3.101)		
	[2.163]	**[2.894]**		
35-39	110.703***	114.692***		
	(4.068)	(3.985)		
	[2.434]	**[3.320]**		
40+	214.261***	207.637***		
	(3.335)	(3.349)		
	[3.775]	**[5.200]**		
Constant	77.205***	49.436**	1.000***	0.282
	(0.717)	(25.092)	(0.009)	(0.385)
State Fixed Effects	NO	YES	NO	YES
Year Fixed Effects	NO	YES	NO	YES
Industry Fixed Effects	NO	YES	NO	YES
N	221029	221020	106362	106362
Adjusted R-square	0.057	0.107	0.018	0.063

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively.

Table 6: Technological differences across industries – India Sample

Panel A shows results from the following regression: Establishment Size = $\alpha + \beta_1$ Age Dummies + β_2 Labor Intensive Dummy+ β_3 Small Firm Dominated Dummy + β_4 EFD + β_5 Age Dummies x Labor Intensive Dummy + β_6 Age Dummies x Small Firm Dominated + β_7 Age Dummies x EFD + β_8 Age Dummies x Labor Intensive Dummy x Small Firm Dominated Dummy + β_9Year Dummies + β_{10} State Dummies + e. In Panel B, we present ratios of the predicted margins of the interaction coefficients (from the regressions in panel A) of each age bin with that of the youngest firms (<5) as an estimate of growth rates. Establishment Size is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. Age Dummies consist of 9 age dummies for the following age bins: <5(reference category), 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. Year Dummies consist of dummies for each of the years in which the census is conducted. Labor Intensive Dummy takes the value 1 for labor intensive industries and 0 for capital intensive industries and is from Hasan and Jandoc (2012). Small Firm Dominated Industry is from Beck et al. (2008) and takes the value 1 for small firm (≤20 employees) dominated industries and 0 otherwise. EFD takes the value 1 for industries that are highly dependent on external finance and 0 for industries that are not highly dependent on external finance. State Dummies are 32 dummies for states in which the establishments are located. All regressions are estimated by ordinary least squares. Robust standard errors are reported in parentheses.

Panel A:

	(1)	(2)	(3)	(4)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size
5-9	15.213***	12.532***	19.265***	7.398***
	(1.884)	(1.216)	(2.177)	(1.322)
10-14	33.317***	22.839***	34.450***	13.887***
	(2.281)	(1.385)	(2.539)	(1.510)
15-19	52.117***	35.269***	55.066***	22.635***
	(2.877)	(1.681)	(3.173)	(1.814)
20-24	70.595***	52.684***	77.838***	34.073***
	(3.573)	(2.107)	(3.993)	(2.291)
25-29	95.773***	70.069***	102.336***	45.453***
	(4.803)	(2.713)	(5.282)	(2.921)
30-34	114.397***	95.959***	125.371***	66.157***
	(5.997)	(3.610)	(6.751)	(3.880)
35-39	154.768***	118.498***	171.340***	89.405***
	(7.919)	(4.590)	(8.886)	(5.231)
40+	360.350***	234.465***	407.587***	151.009***
	(7.258)	(3.885)	(8.273)	(3.710)
Small Firm Industry	-13.650***		-18.131***	
	(1.572)		(1.840)	
5-9 x Small Firm Industry	-7.588***		-10.143***	
	(2.252)		(2.615)	
10-14 x Small Firm Industry	-20.697***		-18.396***	
	(2.664)		(2.993)	
15-19 x Small Firm Industry	-32.065***		-30.378***	
	(3.308)		(3.684)	
20-24 x Small Firm Industry	-38.986***		-39.601***	
	(4.110)		(4.625)	
25-29 x Small Firm Industry	-52.444***		-50.693***	
	(5.448)		(6.050)	
30-34 x Small Firm Industry	-47.235***		-46.413***	
	(6.997)		(7.928)	
35-39 x Small Firm Industry	-74.887***		-83.104***	
	(9.099)		(10.212)	
40+ x Small Firm Industry	-231.268***		-268.560***	
	(7.958)		(9.032)	
Labor Intensive Industry		10.239***	2.527	
		(1.555)	(2.995)	

	(1)	(2)	(3)	(4)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size
5-9 x Labor Intensive Industry		-8.146***	-19.618***	
		(2.244)	(4.245)	
10-14 x Labor Intensive Industry		-9.875***	-5.310	
		(2.743)	(5.853)	
15-19 x Labor Intensive Industry		-14.820***	-15.620**	
		(3.440)	(7.523)	
20-24 x Labor Intensive Industry		-30.227***	-40.982***	
		(4.178)	(8.740)	
25-29 x Labor Intensive Industry		-33.089***	-36.561***	
		(5.612)	(12.611)	
30-34 x Labor Intensive Industry		-48.415***	-58.239***	
		(7.096)	(14.313)	
35-39 x Labor Intensive Industry		-48.894***	-87.864***	
		(9.646)	(19.055)	
40+ x Labor Intensive Industry		-115.782***	-254.272***	
		(7.610)	(15.383)	
Labor Intensive Industry x Small Firm Industry			12.701***	
			(3.558)	
5-9 x Labor Intensive Industry x Small Firm Industry			17.484***	
			(5.070)	
10-14 x Labor Intensive Industry x Small Firm Industry			-2.761	
			(6.692)	
15-19 x Labor Intensive Industry x Small Firm Industry			3.060	
			(8.495)	
20-24 x Labor Intensive Industry x Small Firm Industry			18.496*	
			(9.999)	
25-29 x Labor Intensive Industry x Small Firm Industry			5.958	
			(14.001)	
30-34 x Labor Intensive Industry x Small Firm Industry			7.321	
			(16.370)	
35-39 x Labor Intensive Industry x Small Firm Industry			55.759**	
			(22.035)	
40+ x Labor Intensive Industry x Small Firm Industry			209.643***	
			(17.456)	
EFD				1.086
				(1.469)
5-9 x EFD				6.190***
				(2.067)
10-14 x EFD				13.199***
				(2.403)
15-19 x EFD				19.643***
				(2.954)
20-24 x EFD				26.549***
				(3.698)
25-29 x EFD				37.353***
				(4.822)
30-34 x EFD				42.218***
				(6.385)

	(1)	(2)	(3)	(4)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size
35-39 x EFD				42.497***
				(8.220)
40+ x EFD				157.612***
				(7.345)
Constant	67.859***	48.003*	68.821***	58.993**
	(24.826)	(24.729)	(25.189)	(24.353)
State Fixed Effects	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES
Industry Fixed Effects	NO	NO	NO	NO
N	210044	221020	210044	219282
Adjusted R-Square	0.093	0.070	0.099	0.077

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively.

Panel B: Ratio of Predictive Margins of each age bin to the reference group (<5 firms)

	1	2	3	4	5	6	7	8	9	10
Age	Large-Firm	Small Firm	Capital	Labor	Large-Firm, Capital Intensive	Small-Firm, Capital Intensive	Large-Firm, Labor Intensive	Small-Firm, Labor Intensive	Low Dependence on External Finance	High Dependence on External Finance
<5	1	1	1	1	1	1	1	1	1	1
5-9	1.17	1.10	1.16	1.05	1.22	1.13	1.00	1.08	1.09	1.17
10-14	1.38	1.17	1.30	1.15	1.40	1.23	1.33	1.09	1.18	1.34
15-19	1.59	1.27	1.46	1.24	1.63	1.36	1.44	1.14	1.29	1.53
20-24	1.80	1.43	1.69	1.26	1.89	1.56	1.41	1.19	1.43	1.76
25-29	2.09	1.59	1.92	1.43	2.18	1.75	1.73	1.25	1.58	2.04
30-34	2.30	1.91	2.26	1.55	2.44	2.15	1.75	1.33	1.84	2.36
35-39	2.76	2.08	2.56	1.81	2.97	2.28	1.93	1.67	2.14	2.66
40+	5.11	2.74	4.08	2.38	5.69	3.02	2.71	2.12	2.93	4.89

Table 7: Role of Financial Development – India Sample

The regression equation estimated in Panel A is Establishment Size $= \alpha + \beta_1$ Age Dummies $+ \beta_2$FD $+ \beta_3$ FD x Age Dummies $+ \beta_4$ Year Dummies $+ \beta_5$ Industry Dummies $+ \beta_6$ Log SDP/Capita + e. In Panel B, we present ratios of the predicted margins of the interaction coefficients (from the regressions in panel A) of each age bin with that of the youngest firms (<5) as an estimate of growth rates. Establishment Size is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. Age Dummies consist of 9 age dummies for the following age bins: <5(reference category), 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. FD is dummy variable that takes value 1 for financially developed states and 0 otherwise. Year Dummies consist of dummies for each of the years in which the census is conducted. Industry dummies are 3 digit NIC dummies for manufacturing industries. All regressions are estimated by ordinary least squares. Robust standard errors are reported in parentheses.

Panel A:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
		Large Firm Dominated, Labor Intensive	Small Firm Dominated, Labor Intensive	Large Firm Dominated, Capital Intensive	Small Firm Dominated, Capital Intensive	Not Dependent on External Finance	Dependent on External Finance
5-9	14.331***	15.889**	5.316	24.638***	8.513***	11.700***	14.200***
	(1.823)	(7.263)	(3.687)	(4.062)	(2.604)	(2.135)	(3.049)
10-14	30.379***	33.735***	8.990**	47.782***	21.930***	23.330***	34.817***
	(2.197)	(8.894)	(4.533)	(5.106)	(2.955)	(2.490)	(3.780)
15-19	41.611***	22.287**	12.440**	65.657***	28.207***	28.903***	47.337***
	(2.703)	(10.490)	(5.507)	(6.354)	(3.622)	(3.039)	(4.748)
20-24	56.823***	35.436***	26.174***	86.911***	39.571***	37.154***	70.568***
	(3.443)	(11.974)	(7.775)	(8.265)	(4.552)	(3.945)	(6.147)
25-29	68.594***	49.792***	30.665***	105.893***	46.905***	42.034***	88.580***
	(4.488)	(17.946)	(10.150)	(11.049)	(5.610)	(4.905)	(8.245)
30-34	88.962***	37.314***	52.918***	126.531***	71.326***	64.148***	107.396***
	(5.882)	(14.458)	(15.155)	(14.266)	(7.589)	(6.665)	(10.619)
35-39	102.120***	24.865*	96.669***	166.647***	65.038***	75.633***	123.904***
	(7.319)	(12.891)	(19.919)	(18.463)	(8.560)	(8.396)	(13.250)
40+	210.194***	166.776***	144.789***	467.598***	151.684***	176.468***	332.947***
	(5.565)	(21.469)	(15.116)	(17.174)	(5.028)	(5.398)	(12.991)
FD	6.439***	58.656***	18.656***	11.155***	3.492	13.047***	9.382***
	(1.694)	(6.378)	(3.594)	(3.533)	(2.533)	(2.049)	(2.750)
5-9 x FD	-3.168	-17.247**	0.249	-10.257**	-0.993	-7.743***	-2.620
	(2.286)	(8.463)	(5.140)	(4.968)	(3.287)	(2.844)	(3.706)
10-14 x FD	-9.143***	-3.477	-4.803	-20.888***	-10.945***	-15.101***	-12.742***
	(2.686)	(11.160)	(6.167)	(6.000)	(3.650)	(3.273)	(4.446)
15-19 x FD	-5.745*	16.050	-4.692	-16.293**	-5.709	-11.049***	-7.385
	(3.277)	(13.587)	(7.531)	(7.477)	(4.391)	(3.936)	(5.561)
20-24 x FD	-3.739	-3.805	-22.296**	-10.747	-1.917	-5.904	-11.727*
	(4.127)	(15.791)	(9.580)	(9.616)	(5.478)	(5.004)	(7.105)
25-29 x FD	6.109	24.540	-18.736	0.444	8.547	5.667	-3.214
	(5.375)	(23.588)	(12.286)	(12.834)	(6.815)	(6.308)	(9.493)
30-34 x FD	11.472	47.720**	-40.640**	4.708	14.481	5.865	6.771
	(7.079)	(23.270)	(17.018)	(16.453)	(9.375)	(8.478)	(12.315)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
		Large Firm Dominated, Labor Intensive	Small Firm Dominated, Labor Intensive	Large Firm Dominated, Capital Intensive	Small Firm Dominated, Capital Intensive	Not Dependent on External Finance	Dependent on External Finance
35-39 x FD	22.965**	97.683***	-61.149***	17.203	33.776***	25.683**	15.948
	(8.932)	(28.157)	(23.278)	(21.439)	(10.893)	(11.084)	(15.347)
40+ x FD	-0.685	-5.424	-69.092***	-70.629***	-23.561***	-41.980***	-19.764
	(6.974)	(27.594)	(17.674)	(19.779)	(7.005)	(7.358)	(15.090)
Log SDP/Capita	3.325*	-38.255***	-4.200	-6.697*	4.516**	6.395***	-7.087**
	(1.795)	(7.329)	(3.319)	(4.063)	(2.304)	(2.126)	(2.935)
Constant	-15.480	288.294***	78.652***	110.535***	10.728	-7.156	109.595***
	(13.822)	(55.267)	(25.320)	(31.338)	(17.561)	(16.116)	(22.576)
State Fixed Effects	NO	NO	NO	NO	NO	NO	NO
Industry Fixed Effects	YES	NO	NO	NO	NO	NO	NO
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES
N	201796	14121	27662	58965	90974	108303	91801
Adjusted R-square	0.105	0.067	0.026	0.131	0.045	0.049	0.091

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively.

Panel B: Ratio of Predictive Margins of each age bin to the reference group (<5 firms)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	FD	Full Sample	Large-Firm Dominated, Labor Intensive	Small-Firm Dominated, Labor Intensive	Large-Firm Dominated, Capital Intensive	Small-Firm Dominated, Capital Intensive	Low Dependence on External Finance	High Dependence on External Finance
<5	0	1	1	1	1	1	1	1
5-9	0	1.19	1.15	1.09	1.26	1.11	1.16	1.16
10-14	0	1.41	1.41	1.12	1.51	1.29	1.32	1.40
15-19	0	1.56	1.32	1.17	1.74	1.40	1.41	1.57
20-24	0	1.76	1.50	1.35	1.96	1.53	1.50	1.84
25-29	0	1.92	1.78	1.44	2.20	1.65	1.59	2.09
30-34	0	2.20	1.54	1.71	2.43	1.99	1.89	2.31
35-39	0	2.37	1.27	2.30	2.87	1.89	2.04	2.50
40+	0	3.83	3.64	2.94	6.32	3.11	3.43	5.10
<5	1	1	1	1	1	1	1	1
5-9	1	1.14	0.98	1.06	1.16	1.11	1.05	1.14
10-14	1	1.26	1.32	1.05	1.28	1.16	1.10	1.25
15-19	1	1.44	1.41	1.09	1.53	1.32	1.22	1.47
20-24	1	1.66	1.37	1.03	1.79	1.51	1.37	1.67
25-29	1	1.92	1.76	1.13	2.14	1.76	1.58	2.00
30-34	1	2.24	1.85	1.14	2.40	2.18	1.84	2.34
35-39	1	2.55	2.20	1.38	2.96	2.33	2.20	2.62
40+	1	3.59	2.63	1.83	5.25	2.75	2.61	4.65

Table 8: Role of Financial Development – India Sample - Robustness

The regression equation estimated in this table is Establishment Size $= \alpha + \beta_1$ Age Dummies $+ \beta_2$FD $+ \beta_3$ FD x Age Dummies $+ \beta_4$ Year Dummies $+ \beta_5$ Industry Dummies $+ \beta_6$ Log SDP/Capita + e. Establishment Size is the total number of workers which includes workers employed directly, workers employed through contractors, supervisory and managerial staff, other employees, working proprietors, unpaid family workers, and unpaid working members if cooperative factory. Age Dummies consist of 9 age dummies for the following age bins: <5(reference category), 5-9, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, and 40+. In cols. 6 and 7 we use dummies for each year of age. FD is dummy variable that takes value 1 for financially developed states and 0 otherwise and is defined by Total Bank Credit/SDP in cols. 1, 4-9. In Cols. 2 and 3 we use alternate measures of financial development namely Bank Deposits/SDP and Branches/1000 persons respectively. In cols. 4 and 5 we split the sample into states with states with flexible (pro-employer) labor regulation and states with rigid labor regulations respectively. In cols. 6 and 7 we focus on early life-cycle by looking at firms born after de-licensing of industries (col.6) and after liberalization in 1991 (col.7). The de-licensing of industries varies by industry-year. Year Dummies consist of dummies for each of the years in which the census is conducted. Industry dummies are 3 digit NIC dummies for manufacturing industries. All regressions are estimated by ordinary least squares. Robust standard errors are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
	Above 90th percentile of size distribution	*Alternate Measure of FD:* Deposits/ SDP	*Alternate Measure of FD:* Branches/ 1000 per	Flexible States	Inflexible States	Firms born after de-licensing	Firms born after Liberalization
5-9	44.421**	10.512***	14.297***	16.760***	-1.962		
	(18.046)	(1.502)	(1.575)	(2.020)	(4.232)		
10-14	78.741***	25.548***	29.738***	32.465***	10.783**		
	(18.952)	(1.785)	(1.872)	(2.454)	(5.017)		
15-19	112.084***	38.209***	40.179***	43.732***	22.989***		
	(19.963)	(2.244)	(2.266)	(3.059)	(5.846)		
20-24	143.166***	56.284***	54.926***	57.591***	41.469***		
	(21.191)	(2.885)	(2.767)	(3.943)	(7.175)		
25-29	213.063***	67.442***	68.158***	67.917***	57.572***		
	(24.056)	(3.732)	(3.530)	(5.223)	(8.902)		
30-34	245.911***	94.524***	92.119***	90.014***	73.105***		
	(26.879)	(5.096)	(4.547)	(6.995)	(10.953)		
35-39	199.345***	125.308***	115.839***	97.663***	103.137***		
	(29.328)	(6.655)	(6.078)	(8.782)	(13.270)		
40+	284.614***	194.276***	210.234***	256.951***	171.069***		
	(18.084)	(4.836)	(4.538)	(8.451)	(7.970)		
FD	-46.502***	-4.516***	-3.839**	7.049***	-21.824***	23.852	14.996
	(17.177)	(1.698)	(1.885)	(1.945)	(4.689)	(16.910)	(20.575)
5-9 x FD	-8.142	4.243*	-3.988*	-5.741**	15.755***		

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
	Above 90th percentile of size distribution	*Alternate Measure of FD:* Deposits/ SDP	*Alternate Measure of FD:* Branches/ 1000 per	Flexible States	Inflexible States	Firms born after de-licensing	Firms born after Liberalization
	(21.429)	(2.210)	(2.195)	(2.636)	(4.877)		
10-14 x FD	-24.319	-1.578	-10.588***	-11.090***	14.600**		
	(22.360)	(2.537)	(2.525)	(3.115)	(5.680)		
15-19 x FD	-21.482	0.226	-4.348	-8.680**	20.307***		
	(23.587)	(3.085)	(3.069)	(3.863)	(6.587)		
20-24 x FD	-16.547	-2.342	-0.729	-5.020	19.844**		
	(25.083)	(3.853)	(3.818)	(4.892)	(8.094)		
25-29 x FD	-60.795**	10.857**	9.780**	3.573	29.529***		
	(27.924)	(5.005)	(4.967)	(6.490)	(10.027)		
30-34 x FD	-30.693	5.584	10.499	3.347	44.583***		
	(31.155)	(6.663)	(6.573)	(8.630)	(12.660)		
35-39 x FD	25.928	-10.728	5.143	20.275*	40.031***		
	(34.000)	(8.584)	(8.426)	(11.099)	(15.380)		
40+ x FD	55.745**	29.195***	-1.033	-35.073***	33.266***		
	(22.028)	(6.744)	(6.919)	(10.420)	(9.637)		
1 year						6.585	9.971
						(12.186)	(17.144)
2 years						15.490	21.404
						(12.194)	(17.100)
3 years						25.653**	30.796*
						(12.359)	(17.154)
4 years						25.079**	35.437**
						(12.416)	(17.687)
5 years						24.661*	44.715**
						(12.736)	(17.843)
6 years						23.386*	32.721*

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
Above 90th percentile of size distribution	*Alternate Measure of FD:* Deposits/ SDP	*Alternate Measure of FD:* Branches/ 1000 per	Flexible States	Inflexible States	Firms born after de-licensing	Firms born after Liberalization
					(12.443)	(17.279)
7 years					25.538**	29.796*
					(12.768)	(17.520)
8 years					42.140***	59.748***
					(13.417)	(18.592)
9 years					46.552***	62.719***
					(13.632)	(18.317)
10 year					30.092**	46.310**
					(14.511)	(18.467)
11 years					64.580***	75.627***
					(16.976)	(20.585)
12 years					34.580**	55.468***
					(15.058)	(19.381)
13 years					56.401***	58.154***
					(16.476)	(19.060)
14 years					58.519***	
					(22.397)	
15 years					39.881**	
					(18.112)	
16 years					-8.188	
					(15.044)	
17 years					74.473**	
					(33.531)	
18 years					61.745**	
					(25.785)	
19 years					102.363***	

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
Above 90th percentile of size distribution	*Alternate Measure of FD:* Deposits/ SDP	*Alternate Measure of FD:* Branches/ 1000 per	Flexible States	Inflexible States	Firms born after de-licensing	Firms born after Liberalization
					(29.397)	
1 year x FD					-7.333	-13.751
					(17.455)	(21.238)
2 years x FD					-9.831	-14.822
					(17.405)	(21.158)
3 years x FD					-16.507	-17.973
					(17.548)	(21.242)
4 years x FD					-29.842*	-31.605
					(17.561)	(21.776)
5 years x FD					-21.415	-23.449
					(17.957)	(22.005)
6 years x FD					-16.269	-6.011
					(17.765)	(21.675)
7 years x FD					-7.698	8.038
					(18.130)	(21.967)
8 years x FD					-26.276	-19.989
					(18.480)	(22.742)
9 years x FD					-29.345	-24.090
					(18.730)	(22.541)
10 years x FD					-21.840	-20.060
					(19.715)	(22.728)
11 years x FD					-42.661*	-32.858
					(22.311)	(25.233)
12 years x FD					-3.930	1.660
					(21.283)	(24.820)
13 years x FD					-26.654	1.197

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size	Establishment Size
	Above 90th percentile of size distribution	*Alternate Measure of FD:* Deposits/ SDP	*Alternate Measure of FD:* Branches/ 1000 per	Flexible States	Inflexible States	Firms born after de-licensing	Firms born after Liberalization
						(22.208)	(24.327)
14 years x FD						-60.840**	
						(27.057)	
15 years x FD						-33.606	
						(24.493)	
16 years x FD						26.937	
						(27.568)	
17 years x FD						-69.032*	
						(39.521)	
18 years x FD						-42.525	
						(34.115)	
19 years x FD						-88.526**	
						(34.508)	
Log(SDP/Capita)	16.608*	6.812***	11.195***	6.795***	22.466***	13.529***	7.594**
	(9.555)	(1.841)	(2.051)	(2.092)	(5.530)	(2.897)	(3.144)
State Fixed Effects	NO	NO	NO	NO	NO	NO	NO
Industry Fixed Effects	YES	YES	YES	YES	YES	NO	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Constant	333.851***	-36.349**	-70.096***	-43.029***	-152.354***	-63.601**	-15.537
	(75.096)	(14.216)	(15.628)	(16.237)	(40.376)	(30.189)	(34.821)
N	21114	201796	201796	140100	61696	41055	30844
Adjusted R-square	0.137	0.105	0.105	0.103	0.127	0.007	0.077

*, **, and *** represent significance at 10%, 5%, and 1% levels respectively

Appendix A: ASI Sampling Design

Year	Census Sector	Sample Sector (Definition borrowed verbatim from the Ministry of Statistics)
1983-84	• All units with ≥ 50 workers and using power or ≥ 100 workers without using power • All electricity undertakings • All industrial units in 12 less industrially developed States/Union Territories*	The rest of the universe was covered on sampling design adopting *State x 3 digit industry group* as stratum so as to cover all the units in a span of two consecutive years (50% samples in alternate years).
1989-90	• All units with ≥ 100 workers with/without power • All electricity undertakings • All industrial units in 12 less industrially developed States/Union Territories*	The rest of the universe was covered on sampling design adopting *State X 3 digit industry group* as stratum so as to cover all the units in a span of three years. In any stratum, if the number of units was less than 20, then the entire stratum was enumerated completely along with census factories. In any stratum if no. of unit is between 21 & 60, a minimum sample of size 20 was selected by Circular Systematic Sampling. For all other units a uniform sampling fraction of 1/3 was adopted.
1994-95	• All units with ≥ 100 workers with/without power • All electricity undertakings • All industrial units in 12 less industrially developed States/Union Territories*	The rest of the universe was covered on sampling design adopting *State X 3 digit industry group* as stratum so as to cover all the units in a span of three years. In any stratum, if the number of units was less than 20, then the entire stratum was enumerated completely along with census factories. In any stratum if no. of unit is between 21 & 60, a minimum sample of size 20 was selected by Circular Systematic Sampling. For all other units a uniform sampling fraction of 1/3 was adopted.
1998-99	• All industrial units in 5 less industrially developed States/Union Territories ** • Units having ≥200 workers and all factories covered under Joint Returns	After identifying Census sector factories, rest of the factories were arranged in ascending order of States, NIC-98 (4 digit), number of workers and district and properly numbered. The Sampling was taken within each stratum (State X Sector X 4-digit NIC) with a minimum of 8 samples in each stratum in the form of 2 sub-samples. For the first time, all electricity undertakings other than captive units, Government Departmental undertakings such as Railway Workshops, P & T workshops etc. were kept out of coverage of ASI.
2000-01	• All industrial units in 5 less industrially developed States/Union Territories ** • Units having ≥100 workers and all factories covered under Joint Returns	After identifying Census sector factories, rest of the factories were arranged in ascending order of States, NIC-98 (4 digit), number of workers and district and properly numbered. The Sampling fraction was taken as 12% within each stratum (State X Sector X 4-digit NIC) with a minimum of 8 samples except for the State of Gujarat where 9.5% sampling fraction was used. For the States of Jammu & Kashmir, Himachal Pradesh, Daman & Diu, Dadra & Nagar Haveli, Goa and Pondicherry, a minimum of 4 samples per stratum was selected. For the States of Bihar and Jharkhand, a minimum of 6 samples per stratum was selected. The entire sample was selected in the form of two independent sub-sample using Circular Systematic Sampling method.
2004-05	• All industrial units in 6 less industrially developed States/Union Territories *** • Units having ≥100 workers and all factories covered under Joint Returns • All units belonging to the strata (*State x 4-digit of NIC-04*) having less than or equal to 4 units are also considered as Census Sector units.	Remaining units are arranged in order of their number of workers and samples are then drawn circular systematically considering sampling fraction of 20% within each stratum (*State x Sector x 4-digit NIC*) for all the states. An even number of units with a minimum of 4 are selected and evenly distributed in two sub-samples. The sectors considered here are Biri, Manufacturing and Electricity.

* Goa, Himachal Pradesh, Jammu & Kashmir, Chandigarh, Manipur, Meghalaya, Nagaland, Tripura, Daman & Diu, Pondicherry Dadra & Nagar Haveli, and Andaman & Nicobar Islands

** Manipur, Meghalaya, Nagaland, Tripura, and Andaman & Nicobar Islands.

*** Manipur, Meghalaya, Nagaland, Tripura, Sikkim, and Andaman & Nicobar Islands.

Appendix B: Sample and Population Sizes in the ASI/NSS

Survey	Sample	Population
ASI 1983/84	59000	95,133
ASI 1989/90	49485	49,485
ASI 1994/95	57933	117,290
ASI 1999/00	33515	174,263
ASI 2004/05	49340	164,265
NSS 1994/95 (Informal)	120609	10,497,371

Appendix C: Concordance between US-SIC and ISIC-Revision 2

ISIC Rev. 2	ISIC Industry Description	SIC
311-312	Food products	201,202,203,204,205,206, 207, 209
313	Beverages	208
314	Tobacco	21
321	Textiles	22
322	Wearing apparel, except footwear	23, 315
323	Leather products	311,316,317,319
324	Footwear, except rubber or plastic	313, 314
331	Wood products, except furniture	24
332	Furniture, except metal	25 except 2514
341	Paper and products	26
342	Printing and publishing	27
351	Industrial chemicals	281,286,287,282
352	Other chemicals	283,284,284, 285, 289
353	Petroleum refineries	291
354	Miscellaneous petroleum and coal products	295,299
355	Rubber products	301,302,305,306
356	Plastic products	308
361	Pottery, china, earthenware	326
362	Glass and products	321,322,323,
369	Other non-metallic mineral products	325,327,324,328,329
371	Iron and steel	331,332
372	Non-ferrous metals	333, 334, 335, 336
381	Fabricated metal products	34, 2514
382	Machinery, except electrical	35
383	Machinery, electric	36
384	Transport equipment	37
385	Professional and scientific equipment	38
390	Other manufactured products	39

Appendix D: Employment Categories in ASI 1994/95 and NSS 1994/95 Surveys

Panel A: ASI Data

Sl. No.	Item		Average number of persons worked
1	Workers Employed directly	Men	
2		Women	
3		Children	
4	Sub-total (1+2+3)		
5	Employed through contractors		
6	Total Workers (4+5)		
7	Supervisory & managerial staff		
8	Other employees		
9	Total (6 to 8)		
10	Working proprietors		
11	Unpaid family members		
12	If cooperative factory unpaid working members		
13	Total (9 to 12)		

Panel B: NSS Data

Sl. No.	Item				Average number (modal value) of persons per working day during the reference month
1	Hired workers (other than household workers)	Men			
2		Women			
3		Children	Boys		
4			Girls		
5	House-hold workers	Paid	Men		
6			Women		
7			Children	Boys	
8				Girls	
9		Unpaid	Men		
10			Women		
11			Children	Boys	
12				Girls	
13	All workers				
14	Supervisory & managerial staff	Men			
15		Women			
16	Other employees	Men			
17		Women			
18	Working proprietors	Men			
19		Women			
20	If co-operative society unpaid working members	Men			
21		Women			
22	All employees (13 to 21)				