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**Firm Size Distribution of Indian Medium, Small and Micro
Enterprises**

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Abstract

This paper analyzes the firm size distribution of Micro, Small and Medium Enterprises (MSME) using a nationally representative survey of unregistered firms in India that were collected as a part of the 3rd MSME Census in 2002. We find that the firm size distribution for younger firms is skewed to the right and the estimated density becomes log normal with age when we measure size using value of gross output. However, when we measure size using employment, the firm size is not log normal. We close with potential hypothesis as to why this may be so.

Keywords: Kernel Density Estimation, MSME, unregistered firms, India

Introduction

The size distribution of firms in an industry is an important element of the market structure. This affects the industry concentration, which in turn is an important determinant of the level of competition in the industry. Thus, knowledge about an industry's firm size distribution is relevant for any industry policy that attempts to encourage growth, improve competition, and provide a healthier environment for technology and productivity improvements. Such policies include many types of regulation, taxation, subsidies, measures designed to influence job creation, and affect trade barriers like tariffs and quotas. We investigate the firm size distribution of the unregistered Micro, Small and Medium Enterprises (MSMEs) in India.

Robert Gilbrat's *Inègalitès Èconomiques*, 1931 pioneered research on firm market structure where he postulates the *Law of Proportional Effects* to describe the plant size distributions. He finds that the firm size distribution is log normal and relatively stable over time. Gibrat's Law states that the firm size and its growth rate are independent. A number of empirical studies have found support for the Gibrat's law (Hymer and Pashigian (1962), Mansfield (1962), etc). Others have constructed more sophisticated models of firm size distribution to explain industry level behavior (Ijiri and Simon (1977) and Lucas (1978)).

However, empirical investigations have also thrown doubt on the Gibrat's law. Work by Evans (1987) and Hall (1987) suggests that firm size and growth rate have an inverse relationship rather than being constant or independent of each other. Secondly, evidence also suggests that there cannot be any single form of size distribution that can be regarded as 'usual' for all industries. In fact, there is enough evidence that documents wide differences in the size distribution between industries (Schmalensee 1989). More recently, Cabral and Mata (2003) document two important stylized facts about the firm size distribution using a sample of Portuguese manufacturing firms; first, the distribution of firms is skewed to the right and not log-normal and secondly, this skewness reduces with firm age, i.e. the distribution of older firms is more symmetric than the younger firms.

A failure to find empirical evidence supporting the Gibrat's law has led to the search for reasons why these sorts of relations exist in an attempt to understand firm growth and firm competitiveness better. The literature focuses on financial constraints as the biggest factor influencing the skewness in firm size distribution (Cooley and Quadrini (2001) and Desai, Gompes and Lerner (2003)). Angelini and Genrale (2008) compare nonparametric distributions of firms that are financially constrained with those that are not and present evidence to suggest that small firms are more likely to be subject to financial constraints and also that their size distribution is more skewed to the right. Other factors like constrained resources (Lawrence and Marks (2008)), and technology (Marsili (2005)) have also been attributed to explain the skewed firm size distribution. With a firm's age influencing firm size distribution there is research on the determinants of the size of start-up firms. This literature on firm startup size finds that industry characteristics, such as the extent of scale economies (Mata and Machado (1996) and Mata (1996)), and firm specific characteristics, such as the degree of human capital of the founding entrepreneurs (Astebro and Bernhardt (2005) Colombo et al. (2004); and Colombo and Grilli (2005)), influence the start-up size of new firms.

Much of this research investigates firm size distribution for firms that function in relatively smoothly functioning economies with institutional norms on start-up, closure, bankruptcy as well as in accessing institutional sources of finance. Relatively little is known about the size distribution of firms in developing economies, largely due to the paucity of the kind of data that one would need to estimate firm size distribution. An exception is Tamvada and Audretsch

(2008) who look at the role of geographic location in determining the firm size distribution of registered firms in India using the 3rd Census data for registered MSME firms. First, they show that registered firms in India also tend to have a right skewed distribution and then explain this using variation in access to finance and economic development within India.

In this paper we look at data from the 3rd Census of the MSME in India, however, we focus on the non-registered MSME firm sample that was drawn to form estimates about the unregistered sector. We specifically document two aspects of this sector - a) firm size distribution as measured by gross value of output and employment and b) the distribution changes over a span of three years that we observe within firms for in our dataset. We find that firms are approximately log normal in distribution when we look at firms in terms of their gross value of output. However, when we look at employment as a measure of firm size we find that the firm size distribution is skewed. We close with the hypothesis that this may have to do with labor laws that are an additional dimension of firm compliance that would not affect firm sales.

Data

The 3rd Census of the Small and Medium Enterprises (SME) was carried out during the year 2000-01 and its main objectives was to update the census frame for registered SMEs. In the processes key attributes of firms were also collected to help public policy makers understand key features of the SME industry. The second objective was towards building an Index of Industrial Production for SSI and finally, to collect information on the level of firm failure as well as self-identified reasons for such failure in the dataset. Prior to this initiative there was no data on the unregistered SMEs that consist of firms that are eligible for registration but have not registered since it has always been voluntary. This sector is a key omission from all calculations in the Economic Censuses and all other policy documents on the SME domain.

While the 3rd Census is a census in the true spirit for registered firms, for the unregistered firms, this is a sample of approximately 2,16,000 units has been fixed for the survey on unregistered SSI sector at all India level, which is expected to estimate the population parameters with a permissible margin of error of 2-3 % with 95 % probability. A two-stage stratified sampling design was used where the first stage units (FSUs) were census villages in the rural sector and Urban Frame Survey (UFS) blocks in urban sector. The UFS are compact areal units with

distinct boundaries with a mean population of 600-800 individuals based on the National Sample Survey Organisation norms that it uses for its samples. The second stage units (SSUs) are enterprises falling in the unregistered SSI sector. Stratification was also done across non-agricultural sectors and establishments along the NIC 1987 codes during the first stage selection. At the second stage public sector units and units without fixed premises were left out.¹

Methods

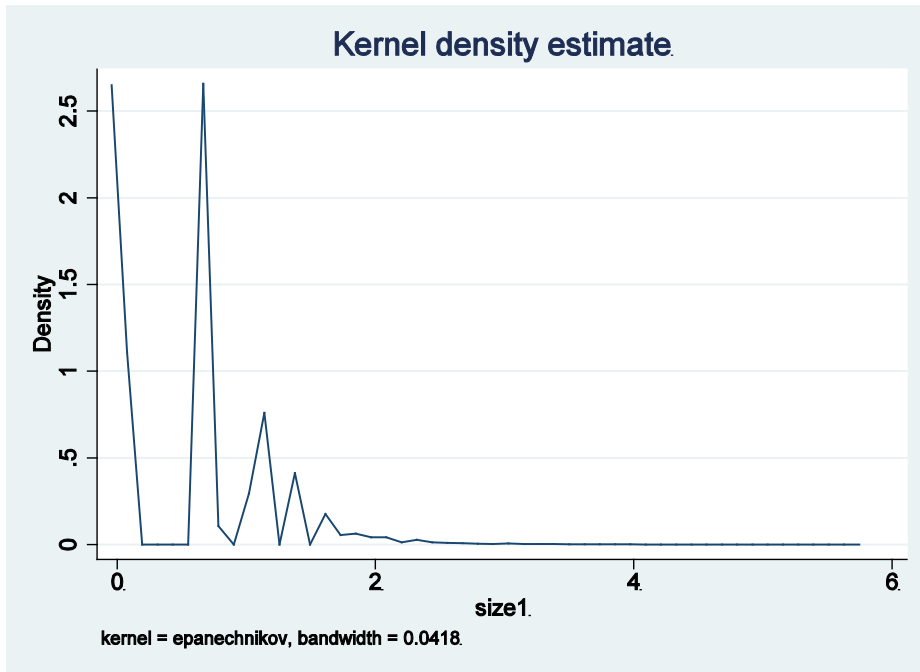
We are interested in the firm size distribution of unregistered SME firms. Our data provides with estimates on firms gross value of output and employment – our two measures of firms size. For each measure of firm size we estimate firm size density based on the observed data that gives us a full description of the distribution of the firm size distribution. One may estimate the firm size density function making an assumption about the nature of the distribution (such as normal or otherwise) or be non-parametric and not impose in distribution on the data and have the functional form be estimated. To do this we need to specify two things the nature of local function or Kernel that is used to calculate the mean for the distribution at that point. There are various competing means that can be calculated – we use an Epanechnikov Kernel. The second item that needs to be specified is how large is the window within which the Kernel is calculated – i.e. precisely what is local. This is usually resolve data adaptively with more data density allowing for small window sizes over which the density is estimated. For all our calculations we use Stata version 10 and its kernel density estimation function.

Results

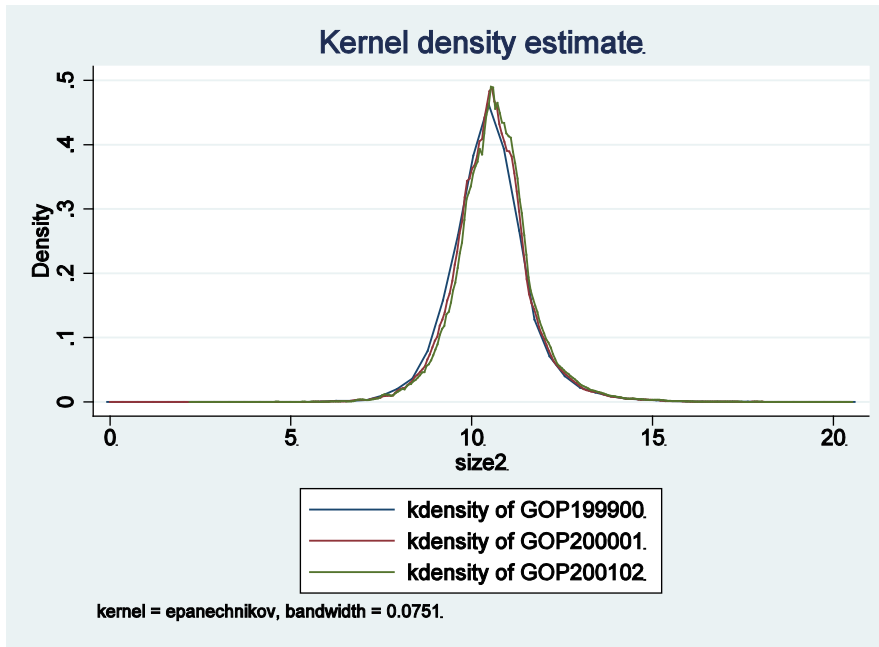
In this section we describe the preliminary investigative results. The dataset gives us three different instruments of size of a firm. We have information about the total employment of the firm, value of gross output for three financial years 1999, 2000, 2001. We also have information about the year the firm began operating. The number of years since the firm first started its operation is used as an indicator of its age.

The figure below shows the distribution of log of employment of the firm.

¹ <http://www.dcmsme.gov.in/ssiindia/census/concept.htm>

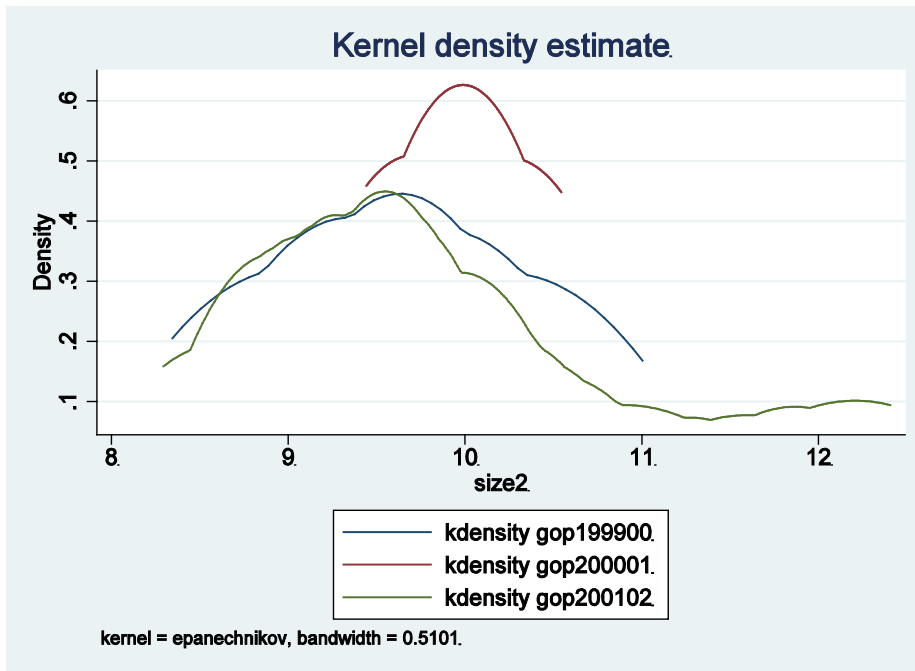


This shows that the firm size distribution (when the size of the firm is measured according to the total employment) is not log normal but is skewed to the right. The following three figures show the firm size distribution when the size of the firm is measured as the gross output of firms in years 1999, 2000, and 2001. All these figures indicate that when the size of the firm is measured by its gross output the firm size distribution is log normal in contrast to when it is measured in total employment.

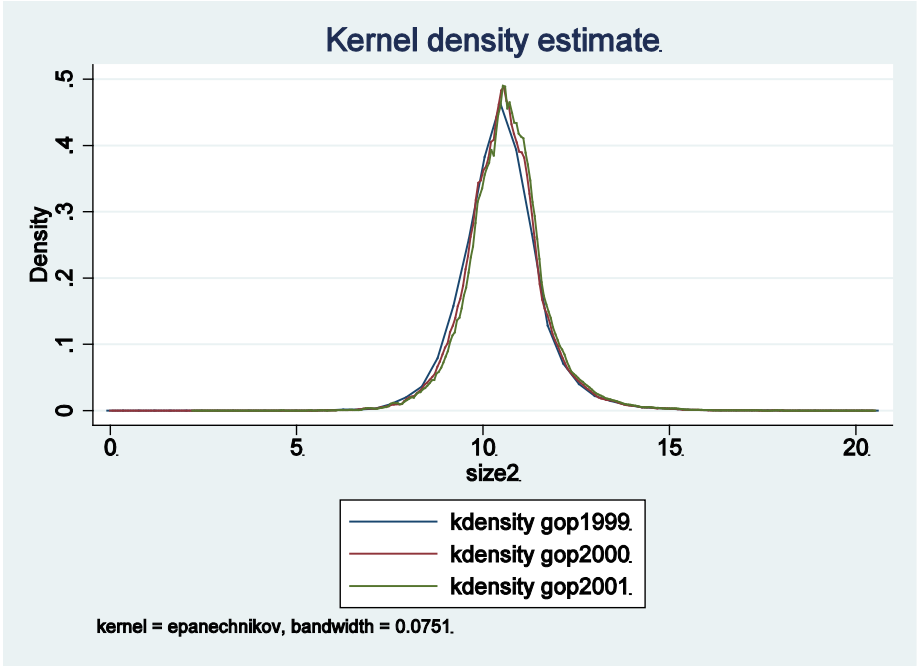
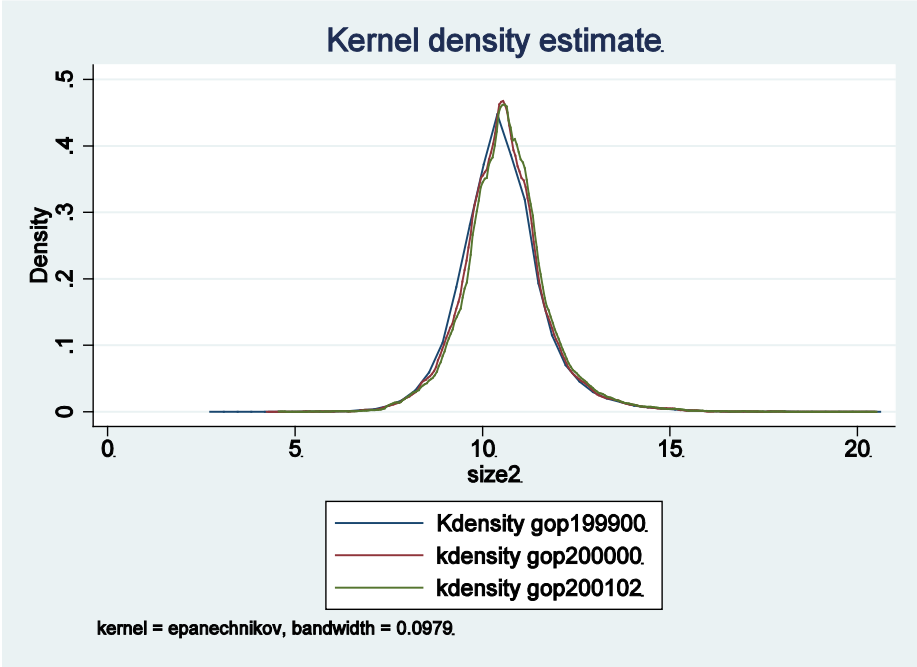


Size Distribution and Age

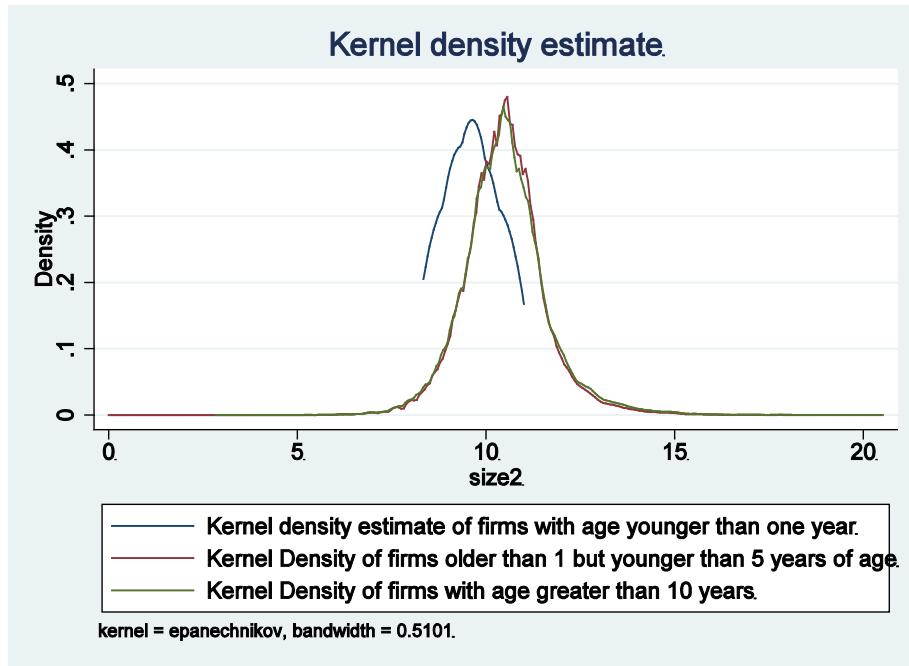
The following figure shows the distribution of firm size for firms with age less than 1 year. The firm size is measured in three different ways- Gross Output in year 1999, Gross Output in year 2000, Gross Output in year 2001.



The figure indicates that the firm size distribution is skewed to the right for measures of size as gross output 1999 and 2001. However, for the year 2000, the firm size distribution is almost log normal. The next two figures indicate the Kernel Density Estimate for firms with age greater than 10 years and the Kernel Density Estimate for firms with age between 1 and 5 years.

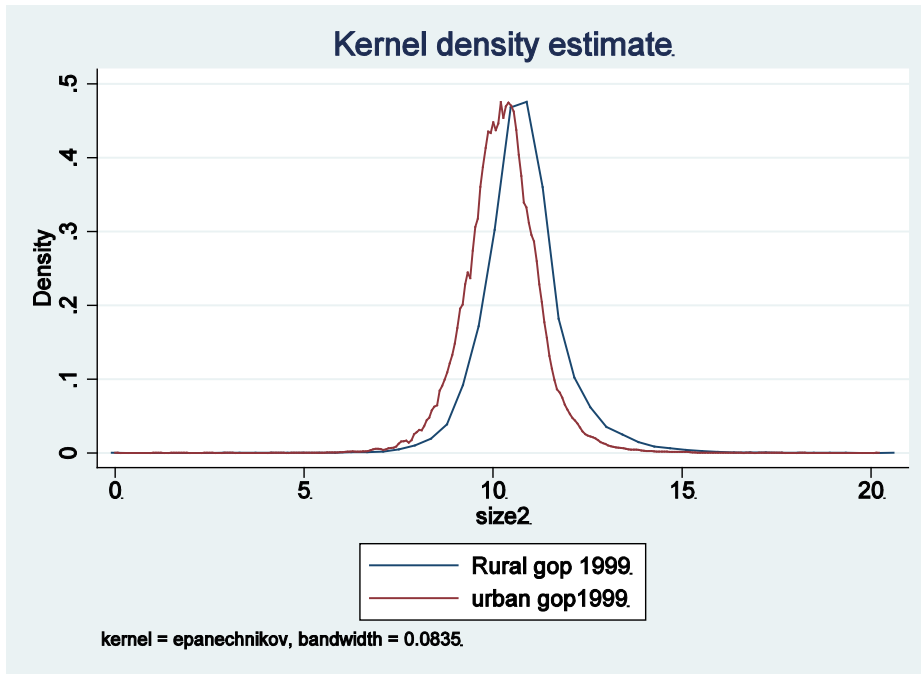


The next figure indicates how the estimated density changes with age. For younger firms the kernel density is skewed to the right but it becomes lognormal with an increase in age.



Rural Versus Urban

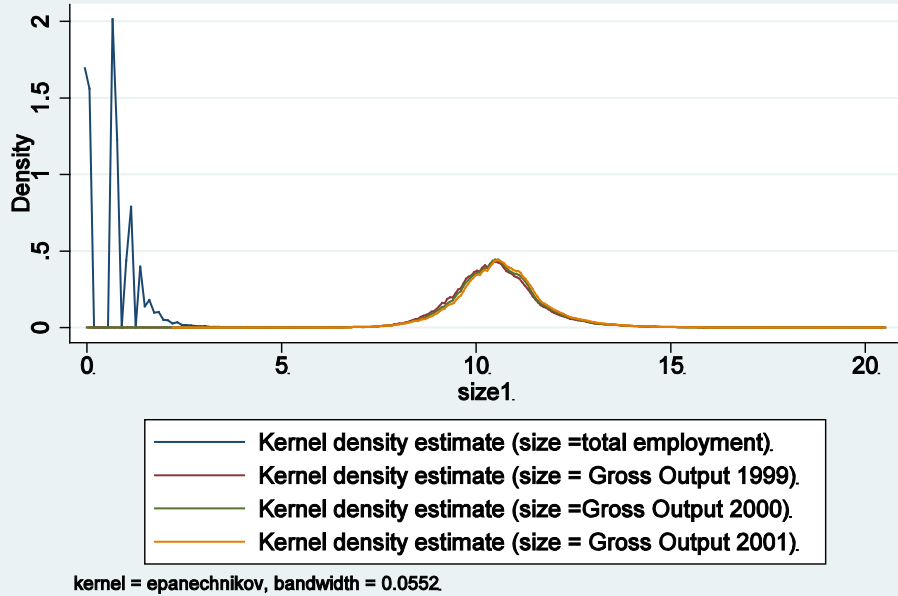
The following figure indicates the firm size distribution for firms in rural and urban sectors of the society. It can be observed that the firms which belong to the urban sector are skewed to the right more than those in the rural sector.



Sector Wise analysis

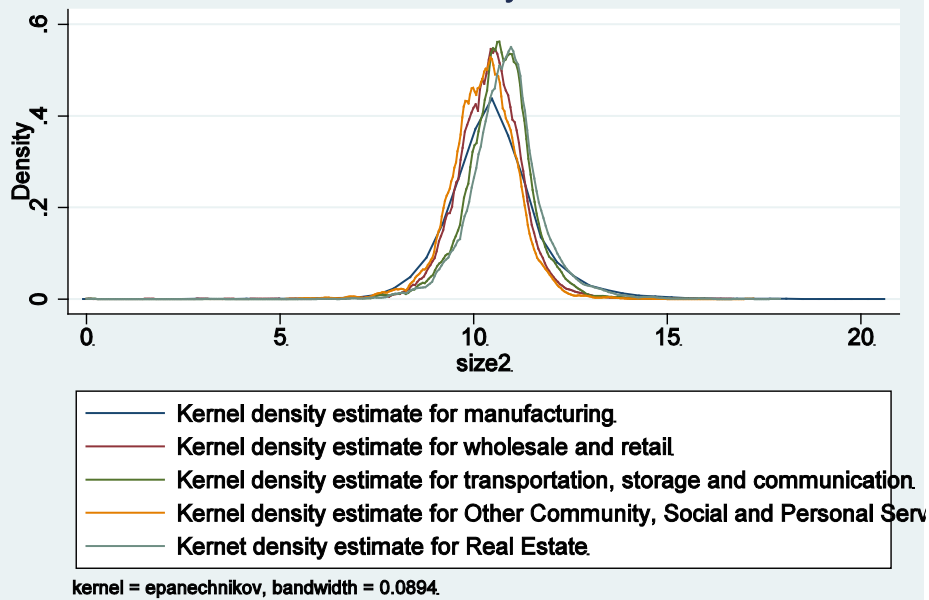
The first five sectors according to the numbers is Manufacturing; Wholesale retail and repair; Transportation, Storage and Communication; Other Community, Social and Personal Service Activities; Real Estate and Renting. The following figure indicates the kernel density estimate of firms in the manufacturing sector for different measures of size.

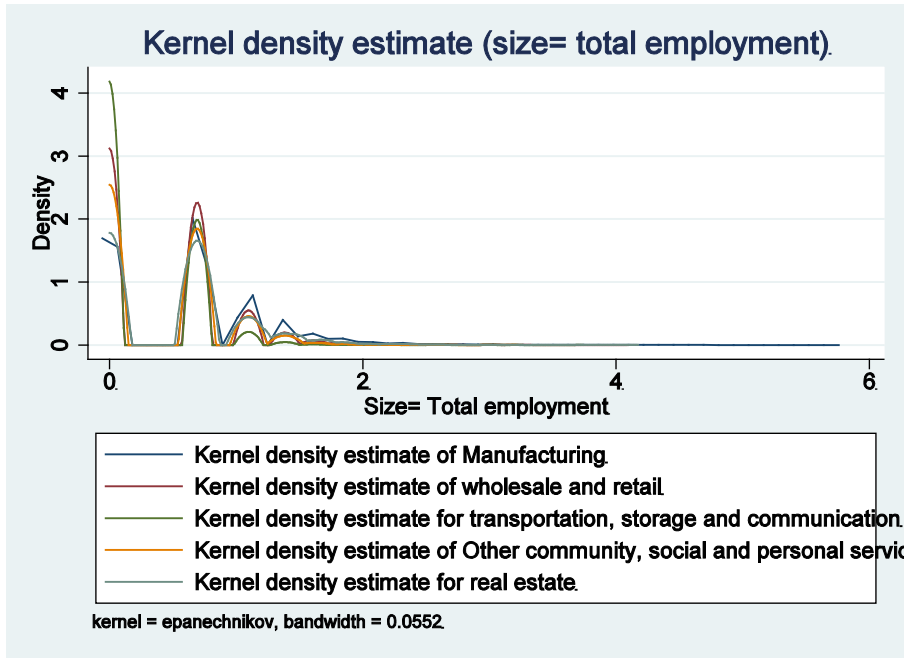
Kernel density estimate for firms in the manufacturing sector



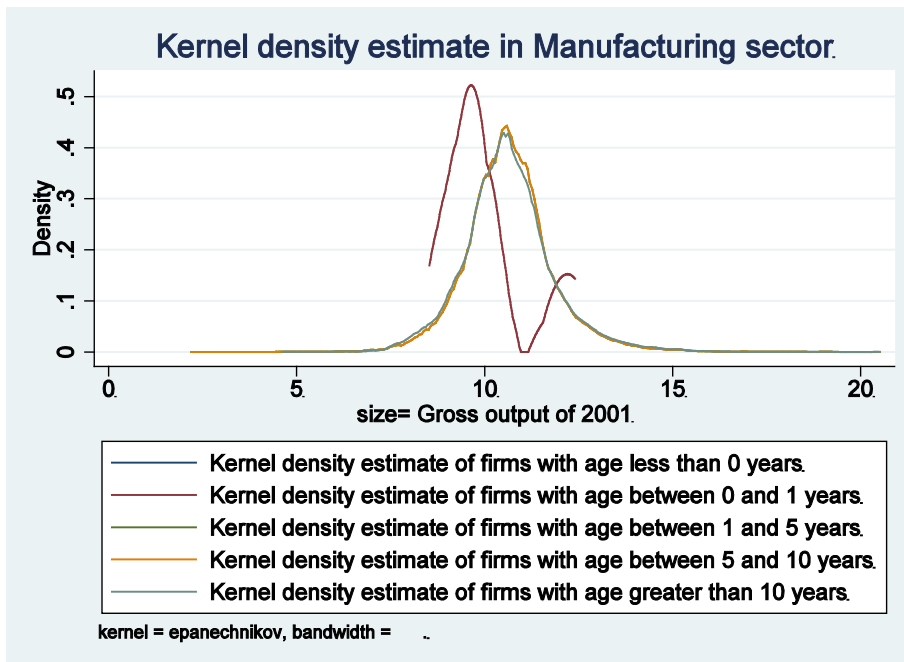
The next figure indicates the kernel density estimate for these five most popular sectors, when the size is measured as the gross output in year 1999.

Kernel density estimate.

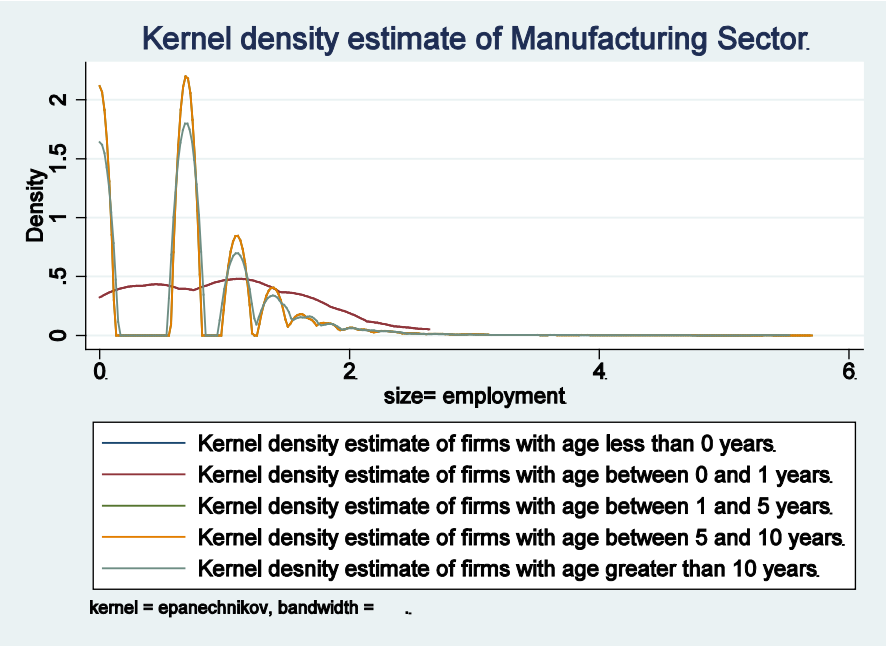




The next figure indicates the change in kernel density estimate of firms in the manufacturing sector with varying ages. We find that the kernel density estimate of younger firms is skewed to the right but it becomes almost log normal as the age increases. Here the size is measured as the gross output in year 2001. A similar trend is also observed when the size of a firm is measured as the gross output 1999 and gross output 2000. Age is measured as the number of years since the first year of production.

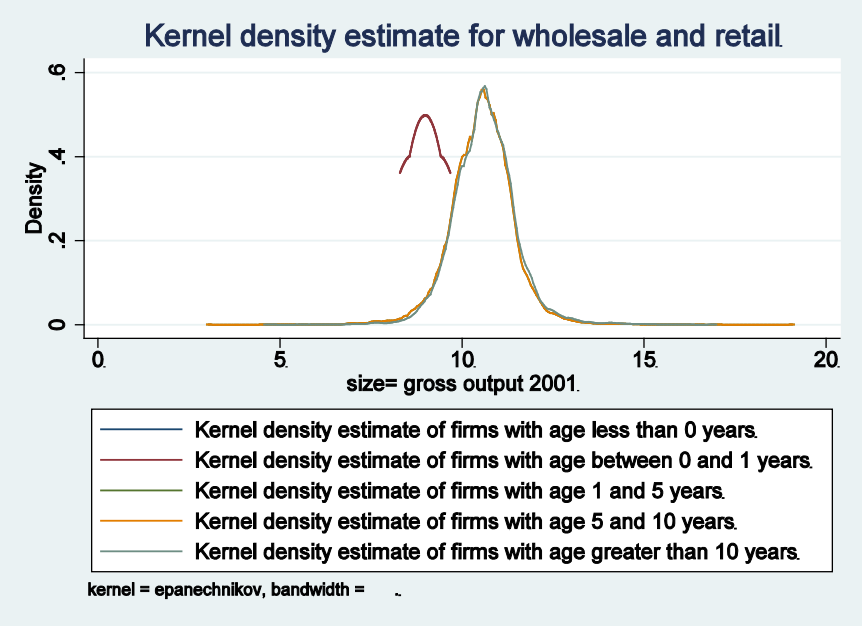


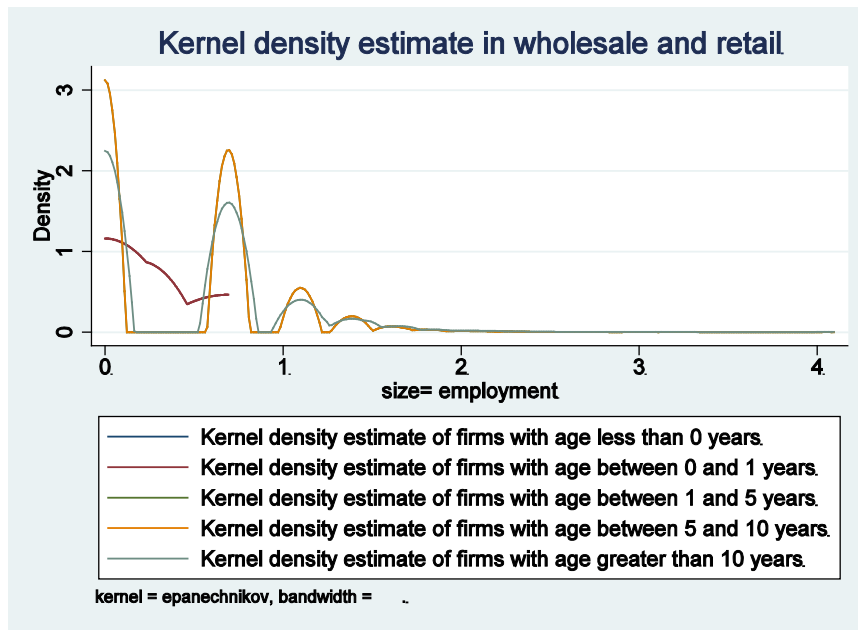
The following figure measures the same thing except the measurement of size is changed to total employment. Here the density estimate becomes skewed with the increase in age.



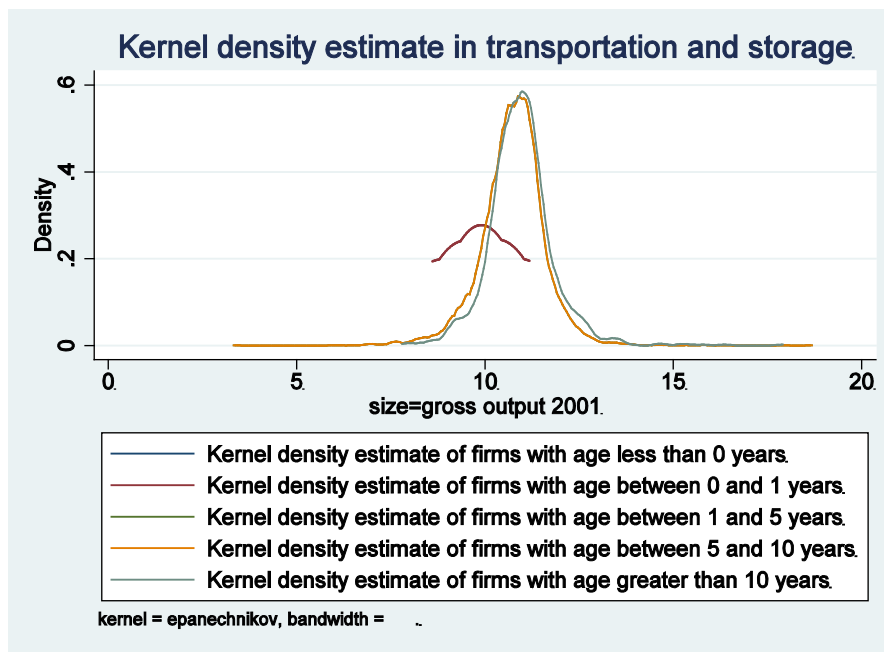
A similar trend is also observed in the other sectors

(B) Wholesale and Retail Sector





(C) Transportation and Storage



Conclusion and Future Work

Much research in empirical Industrial Organisation focuses on the validating *Gilbrat's Law*. Gibrat's Law states that the firm size and its growth rate are independent and the firm size distribution is log normal and stable over time. We contribute to this literature by understanding

the firm size distribution and its determinants in a developing country like India, which has not been the focus of the literature so far.

Unlike previous work, we look at the firm size distribution using two different measures of firm size- gross value of output and employment. The firm size distribution is log normal when the firm size is measured in gross value of output. However, this distribution is highly skewed when measured in terms of employment. We hope to find theoretical and empirical evidence for the differences in these two distributions. The hypothesis is that differences in labor laws within the country could explain the differences in firm size distribution. For this, we will investigate the firm size distribution in different regions of the country and contrast the ones which have different labor laws like minimum wage, existence or absence of trade union etc.

Next, the paper also looks at the change in firm size distribution over time. Looking at the same set of firms over three consecutive years we find that with age the firm size distribution becomes more log normal. This evidence for MSMEs, corroborates that of Cabral and Mata. Our next step would be to investigate factors, specific to developing countries that contribute to this.

We also analyze the firm size distribution of firms with varying age at any point in time. We find that the firm size distribution becomes less skewed with age. We will look into different factors like finance, economies of scale, regulation that contribute to the found change in firm size distribution with age.

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