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Geography of venture capital investments in India

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Abstract: *Venture capital industry has been efficacious in demonstrating itself as a form of sustenance to entrepreneurial development encouraging novice ideas across the globe. Nevertheless, Venture capital is found to be geographically concentrated in few regions across the globe. Analogous to the global trend, venture capital investments is found to be geographically concentrated in the few regions- tier 1 and tier 2 cities in India. The degree of geographical concentration is assessed empirically using Mixed Effects model, an econometric model. Four major regions and nine major cities are considered for the study. The variance of venture capital investments at multi-level that is regional and city level is gauged and compared. The results of the study connotes that the deviation of regional level mean is found to be lesser from the grand mean. However, at the city level venture capital investments unveils the deviation from the regional mean to the greater extent. Thereby, the study deliberates the higher degree of geographical concentration of venture capital investments in few top cities- Bangalore, Delhi and Mumbai. Captivatingly, these three cities are part three various regions and found plummeting region variance due concentration of venture capital investments.*

Introduction: Venture capital is a distinguished entrepreneurial finance which offers financial support partaking the risk and returns. Venture capital in India is in its transformation from nascent to growth stage. Venture capital industry has upheld the entrepreneurial talents of India globally. India now is the home for 8 ventures in unicorn club. The growth in the venture capital industry in the last decade has been tremendous. However, venture capital investments in India are also found to follow its global footsteps of geographical concentration/ clustering.

Clusters are formed as the results favorable environment factors resulting in increased economic activities. Eminent venture capital deals and its success pave way for the formation of cluster in those technological complexes. Spatial structure being well defined with network enhances the probability of clustering. Venture capital industry also operated through syndications and co-investments which depend on the geography. Knowledge spillover also extends its impact in clustering of related ventures. Clusters essentially help in strategic collaboration, sharing of information and rival observation.

Literature Review:

Barbara Pistoresi & Valeria Venturelli (2013) provided the empirical evidence for the strong association between regional growth and financial intermediaries. The positive effect of venture capital investments were found in economically backward areas. **Sampsa Samila and Olav Sorenson (2011)** confirmed that the supply of venture capital impacts the creation of newer firm in the regions. Venture capital drives entrepreneurship and growth of the nation.

Hector O. Rocha Rolf Sternberg (2005) avows that clusters drive the entrepreneurial development than in general market mechanism. The study validates the positive impact of cluster on regional level on entrepreneurship. **Rui Baptista (2000)** assess the role of clusters in diffusion of innovation. The study established that diffusion of innovation were faster in clusters. Clusters emphasize the spill over effect. The strong relationship endorsed between learning effect of the region and the diffusion.

Tayfun , Zafer Aykanat (2015) affirms that clustering is the appropriate model for the national development. Clustering helps in affecting the innovation perceptions in the constituents of the clusters. **Viorica Pușcaciu, Rose-Marie Pușcaciu, Iuliana Pop (2016)** stated that clusters are projections of potential of the regional competitveness.

Astrid Romain, Bruno van (2003) built the model projecting the factors influencing the demand and supply of venture capital and its intensity namely conditions of the state at its macro-economic level, entrepreneurial development and research and innovations. **Biao ZHANG et.al (2013)** inveterate empirical that venture capital significantly contribute the economic development of the nation.

Need for the Study: Venture capital industry is comparatively new-fangled; it indorses the potential research topic unexplored. There have been only very few studies found geographical concentration of venture capital investments in India. This research paper is first attempt is to bring in the empirical evidence using econometric model- Mixed Effects Model for the concentration of venture capital investments in India in IT & ITES sector.

Research Methodology and Modeling:

Venture capital investments only in IT & ITES sector is considered for the study. BPO, Enterprise Resources, IT Services, IT Products, Mobile VAS and Online Services are the subsectors of IT & ITES secor. Time frame is from the year 2008 to 2017.

The regions and their respective cities are classified as follows.

North	**South**	**East**	**West**
Delhi	Bangalore	Kolkata	Mumbai
Gurgaon	Chennai		Pune
Noida	Hyderabad		

A multilevel mixed effects model is advanced model which possess the features with combination of random effects and fixed effects model. Thereby, brings in greater efficiency and higher analysis points. Here in this paper, mixed effects model to assess the variability at the city level and regional level to gauge geographical concentration.

Mixed effects model is used for the study. Venture capital investments may be correlated within regions and city. However, venture capital investments with each city could attribute the variance around regional mean. Similarly regional mean vary around grand mean. Hierarchy level are considered for attaining means and then subjected for comparison. The deviation from the calculated mean can be observed and variability at each level city and regional level is estimated using variance component model using Mixed Effects model in Stata.

Results and Discussions:

Venture capital investments have undeniably supported the emergence of its extended subsectors like Mobile VAS, Entrepreneur Resources, and Online resources. Venture capital industry has unveiled the potential opportunities IT & ITES sector beyond its traditional benchmarked avenues like IT Service and BPO. Major share of Venture capital investments have been attracted by the major teir-1 cities since its inception of venture capital industry in India. However, the emergence of more number of potential startups in the extended subsectors of IT & ITES sector has led to the spread of venture capital investments to tier 2 cities.

Venture capital investments in Online Segment alone attribute to 51% share in the overall investments in IT & ITES sector during the study period. Online services segment is the highest receptor of venture capital investments followed by Mobile VAS segment with 18% share. Flipkart, Oyo, Swiggy , Zomato, Paytm are popular venture capital backed companies which has joined the unicorn club whose valuation being more than 1 Billion.

Region wise and subsector wise clustering of venture capital investments is exemplified in the following info-graphic pie charts – graph No. 2 and graph No. 3.

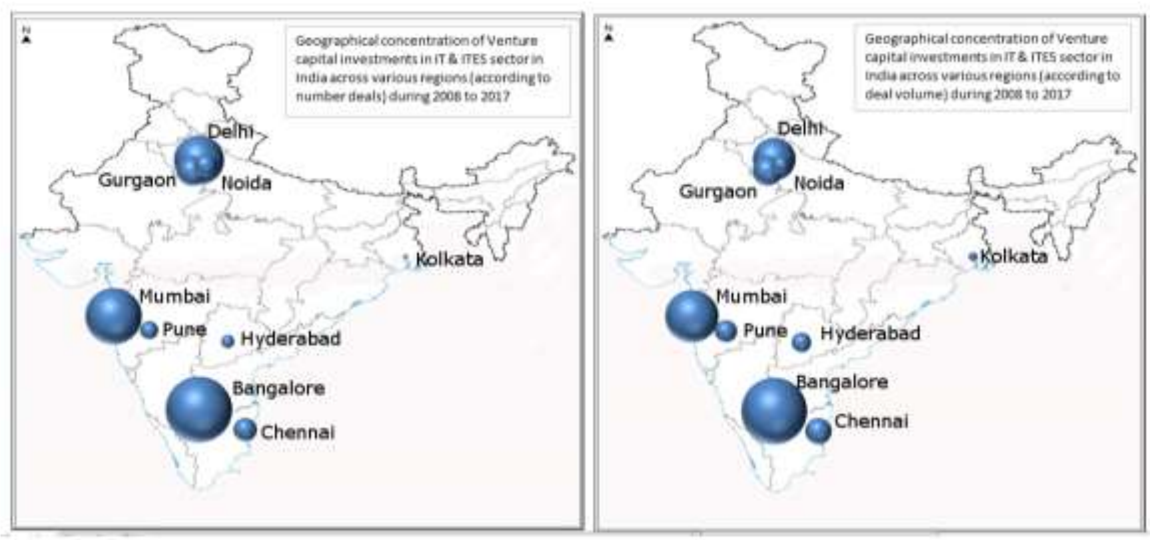
From the info-graphic pie chart it is evident that south region dominates in almost every sub sectors of IT & ITES sector. South region is the highest receptor of overall venture capital investments in Enterprise resource segment and online services segment. Second highest receptor in BPO, IT product and IT service sector. North region is the highest receptor in IT Products sector and Mobile value Added sector. Western region is the highest receptor is the BPO & IT services segment and second highest receptor in Enterprise resource segment and Mobile Value added Segment.

In terms of number of venture capital deals also south region has attracted a major share in overall deals which is validated in the above info graphic pie charts. South region is the highest receptor of venture capital deals in all subsectors. Bangalore is also called the startup hub of India. West region accounts as the second highest receptor of the venture capital deals in all subsectors except in online services segment. Henceforth, North region is third highest receptor of venture capital deals in all subsectors and second highest receptor in Online service segment.

The below graph No. 1 it is evident that venture capital is highly concentrated in the Bangalore, Mumbai and Delhi both in terms of deal volume of venture capital investments and number of venture capital deals. The emerging cities in attracting venture capital investments are Pune Noida, Gurgaon, Chennai and Hyderabad. Kolkata is the least receptor of venture capital investments. Though being a metropolitan city, Kolkata failed to attract venture capital investments and even the entire eastern part of India.

All the above discussions were accounting the overall venture capital investments made during the study period. The geographical concentration of venture capital investments in IT & ITES sector is further exposed to solid econometric test which considers the latitudinal and time aspects of the data.

Graph No. 1. The geographic concentration of venture capital investments in IT & ITES sector is portrayed using bubble graph.



Source: Compiled by the author.

Results of Mixed Effects Model

Geographical concentration/ clustering of venture capital investments at regional level and city level is assessed using Mixed Effects Model. Standard Deviation results of the Mixed effects model confers the regional deviation of venture capital investments from average grand mean and city deviation refers to the deviation from the regional mean. Higher the deviation higher would be geographical concentration at its level.

a. Venture capital deals of each subsector

Particular	BPO	Enterprise Resource	IT Products	IT services	Mobile VAS	Online Services
Region sd(_cons)	3.01e-11	7.51e-08	3.19e-11	5.36e-08	6.91e-07	1.69e-06
City sd(_cons)	0.57	3.37	2.07	1.46	4.277	11.42
Error e_i	1.00	3.06	1.46	1.23	4.37	9.46

Sd(Residual)						

b. Venture capital deal volume of each subsector

Particular	BPO	Enterprise Resource	IT Products	IT services	Mobile VAS	Online Services
Region sd(_cons)	5.98e-06	0.14	6.93e-07	0.000015	3.29e-07	0.00002
City sd(_cons)	19.94	20.07	4.19	38.07	105.67	253.47
Error e_i Sd(Residual)	181.13	31.46	28.93	157.59	239.36	514.86

The results of the Mixed Effects Model validate that the deviation of the regional mean from the grand mean is very low. This confers that there spread of venture capital investments across the regions do not vary to the greater extent. The reason behind that is could be attributed to the fact that each region possesses the major city grabbing the chunk of venture capital investments with close competitions like South – Bangalore, West- Mumbai and North – Delhi. Regions are also supported the emerging cities increasingly attracting the venture capital investments attributing to the overall regional share. The regional mean resumes being low and variance between grand mean and regional mean stands lower.

The variance or deviations of city mean from the regional stands higher and the same displayed in the results of Mixed Effects. This infers that venture capital investments few cities are relatively very high than those of the rest. This confirms the higher degree of concentration and clustering of venture capital investments in few cities.

Online services segment represents the highest deviation values in terms of number of deals and deal volume of investments with 11.42 and 253.47 units respectively followed by the Mobile VAS segment with 4.27 and 105.67 units. This also confers that online services segment and Mobile VAS segment is the prime drivers for the clustering of venture capital investments. The same pattern is evident with variance of regional level means. Cities like Bangalore, Mumbai and

Delhi have been grabbing huge share of venture capital investments and emerging cities fail to compete on par with these cities.

IT services segment attributes the third highest deviation. The rationale behind that is due the fact that the venture capital investments in IT Service segment had greater average deal volume with few deals. IT services segment received more of later stage deals being the traditional benchmarked segment of IT & ITES sector of India.

Enterprise resource segment is highly concentrated in Bangalore city and is emerging sector receiving early stage investments. Being in emerging stage it attributes to the disparity in the landscape of venture capital investments.

BPO segment similar to IT services segment received venture capital investments in its later stages with huge deal volume being a proven segment with global recognition. However the segment did not witness growth subsequently. IT products segment is accounts for the least deviation comparatively. Fewer deals with lower average deal volume could be attributed as the rationale for the least deviation as this segment does not make much impact on over all venture capital investments.

Conclusion and Suggestion:

The geographical clustering of venture capital investments in IT & ITES sector is therefore empirical proven. Bangalore, Mumbai and Delhi are the major cities attracting venture capital investments in India. Feature of these clusters could be observed to build the artificial building of cluster for venture capital industry. Online services segment and Mobile VAS segment are the major attributors for the clustering of major share of venture capital investments across few cities. Online services segment and Mobile VAS segment together holds the share of 69% share of overall venture capital investments during the period. The growth of these segments witnessed tremendous growth in the last five to six years and essentially backed by venture capital investors. This also endorses that venture capital investments look out for newer prospects and high growth avenues. The drift from the tradition avenues like IT services and BPO segment is evident. There is significant drop in venture capital investments in these segments across the nation. Enterprise resource segment and IT products are emerging segments which has the potential to attract more venture capital investments.

Government can ensure balanced geographical development through encouraging venture capital investments in tier 2 and tier 3 cities as the regional growth is also associated with the venture capital. Venture capital industry relies on entrepreneurial development. Government should encourage entrepreneurial development, ease of doing business and infrastructure. Policies supporting novice ideas and innovation also attract potential ventures. Online services segment and Mobile VAS segment are subjected to security issues. Thereby, government has to take measures to protect the customer's interest.

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