

Examining the Spatial Pattern of Industrial Activities in Tehran Metropolitan Region

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Extended Abstract

1. Introduction

Various studies have been conducted to analyze the spatial structure of metropolitan regions over the past few decades. These studies can be classified mainly into two population and activity domains. The former explains the settlement system, and the latter explains the activity system. Majority of the studies on the spatial structure were activity-oriented. Spatial structure of activity, in fact, indicates employment and firm's distribution in the spatial domain of metropolitan regions. In other words, it is the degree of spatial concentration of activity. To explain the spatial distribution of economic activities and understanding spatial-activity structure of the regions, employment density or a kind of economic agglomeration in the geographic domain is seen as an important and indispensable part of the activities distribution in the region. Thus, we can analyze the pattern of activity structure and also understand the influenced and independent points in the spatial-activity structure of the metropolitan regions. The main aim of this research is to examine industrial activities in Tehran metropolitan region and analyze the quality of these changes in relation to geographic characteristics of the principal city, which can be studied using influential variables and indexes. Based on previous studies, the way of dispersion of firms and industrial activities in the metropolitan region and the degree of units' interrelations are influential variables on the activity-spatial structure through which the understanding of the activity-spatial structure of Tehran metropolitan region and its appropriate arrangement can be achieved.

2. Review of literature

The results of studies carried out in recent decades indicate that the spatial structure of the metropolitan areas is moving from a monocentric to a polycentric structure. In general, from the nineteenth century, the classic monocentric city model gradually became evolving. During this period, cities were expanded by the processes of industrialization. Hence, the suburbanization of the population accelerated with increasing levels of income combined with the invention and

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increase of ownership of cars and other transport systems and the construction of an extensive road infrastructure, making it possible for sites with lower densities, higher housing affordability, lack of disadvantages such as congestion, crime, and so on. During the twentieth century, these processes were more accelerated.

Suburban centers were developed over central business districts, while suburban areas developed over the city. Hence, in line with the growth of metropolises populations, their peripheral lands are developed, and the problem of sprawl and polycentric structures emerged. These dimensions represent the concentration of activity in the main city or the extent of the distribution of activity in one or more suburbs of the metropolitan area. In this situation, the spatial structure of the metropolitan area is largely defined in terms of features such as monocentric, polycentric, and dispersed patterns.

3. Method

The methodology adopted for the present study is quantitative and practical, and the approach is descriptive-analytical. The required data, including distribution and concentration of activities, number, and density of employment, are obtained from the Ministry of Industry and Trade (data of 2014). GIS layers, including the administrative-political divisions and the area and distance of each to rural districts and counties, are obtained from SCI in 2011. The most important tool for software analysis is ArcGIS, GEODA, and SPSS. To understand the spatial-activity pattern with regard to the distribution variable and the concentration of industrial activities, there are indicators and methods that show the distribution and concentration of industrial activities in the region and also in different districts. In this research, the method of distribution of industrial activities in the metropolitan area of Tehran is used by the Herfindahl index, the Gini coefficient, and the global Moran, whereas the recognition of the industrial activity concentration patterns is achieved by the local Moran method.

4. Results and Discussion

The main objective of this paper is to analyze the spatial distribution of industrial activities in the Tehran metropolitan region and to analyze the quality of these changes in relation to the geographic features of the Tehran metropolitan region. The findings obtained based on the Gini coefficient show that the distribution of industrial activities in the eight industrial subdivisions has been randomly distributed, and the distribution in different parts of the metropolitan region have been dispersed. Furthermore, the results for the 28 subdivisions of the industry indicate that most of the sectors are still unbalanced. In contrast, the sub-sectors of basic metals, non-metallic mineral products, fabricated metal products, chemicals, and chemical production, and machine manufacturing Machinery and equipment have a more balanced distribution than other sectors.

Calculating the Hierpindal Index also shows that among the 8 sub-sections, the manufacturing sub-sections and materials have a more dispersed distribution than other sub-sections. Moreover, the service and financial sector with the highest index of Hierpindal indicates the accumulation and density of this sector in the Tehran metropolitan region. Based on the 28 industrial subdivisions, the Harpindal

Index in the computer, energy generation, and tobacco products is at its maximum. This suggests that there is a complete concentration in these three sub-sections. But the production of metal and non-metallic products, wood products, machinery and food products, and the most balanced distribution are seen in other parts, indicating the distribution and agglomeration in the Tehran metropolitan region.

The results of the Moran Global Index for 8 industrial subdivisions show that all industrial sub-sectors of Tehran metropolitan region have a dispersed spatial pattern. Cluster patterns are not visible in the industrial area of the suburbs in Tehran. According to this method, in the raw materials sector, the most dispersion belongs to the region, while the least degree of dispersion belongs to the service and financial sector. There is a significant dispersion of 28 sub-sectors in the sub-sectors of paper, wood, rubber and plastics and also the production of basic metals and petroleum products, which shows that the production of these products is dispersed in Tehran metropolitan region.

5. Conclusion

From the above results, it can be concluded that spatial-patterns of the Tehran metropolitan region follows a concentrated pattern if the distribution of activities in the industrial sub-sectors is randomly observed. These random patterns are indicative of the fluctuation of programs and policies in the field of locating industrial activities. In addition, the spatial distribution of industrial activities is unbalanced and tends to disperse. Nevertheless, the concentrated pattern is trickled down; therefore, signs of the decentralization of industrial activities can be seen in the suburbs of Tehran such as Quds, Chardanje, Ray, Malard, Sharifabad, and Ahmad Abad.

In general, industrial subdivisions have different patterns that have shaped the industrial structure of the metropolitan area. However, two main eastern and western corridors can be generally seen in the region. In this context, various measures can be taken to strengthen these industrial centers and other centers in the region in order to strengthen the polycentric and network model, which requires identifying sub-centers with the capability and capacity of industrial activities in the industrial sector. For this reason, the program is considered to be necessary to form a poly-centric structure in the planning and management system.

Keywords: Spatial structure, Spatial pattern, Industrial activity, Distribution, Density, Tehran Metropolitan Region

References (In Persian):

1. Dadashpoor, H. (2011). تحلیل بر عوامل تعیین کننده مزیت های مکانی در منطقه کلان شهری [Analyzing the determinants of locational advantages in Tehran metropolitan region: Empirical evidence of the four industrial sectors]. *Environmentally Based Territorial Planning*, 4(14), 91-116.

2. Dadashpoor, H., & Alidadi, M. (2018). تحلیل ریخت شناسانه ساختار فضایی توزیع جمعیت [Tehran Morphological analysis of population spatial structure of Tehran metropolitan region]. *Human Geography Research Quarterly*, 50(1), 109-125.
3. Dadashpoor, H., & Tadayon, S. (2015a). تحلیل نقش الگوهای سفر در ساختاریابی فضایی. مناطق کلان شهری: مورد مطالعاتی منطقه کلان شهری تهران [Analysis of the role of trip patterns on the spatial structure of Tehran metropolitan region]. *Quarterly Journal of Geographical Planning of Space*, 5(18), 64-86.
4. Dadashpoor, H., & Tadayon, S. (2015b). شناسایی پهنه های همگن جریانی بر اساس جابه جایی های فضایی و الگوهای سفر- مطالعه موردی: منطقه کلانشهری تهران [Identification of the homogeneous flow zones based on spatial motilities and trip patterns in Tehran metropolitan region]. *Journal of Urban Studies*, 5(14), 61-76.
5. Dadashpoor, H., & Velshi, M. (2017). تحلیل ساختار فضایی جمعیت در شهر-منطقه مرکزی. مازندران در دوره زمانی ۱۳۶۵-۱۳۹۰ [Analysis of the structure and spatial organization of the city-region of Mazandaran during the period 1365-1390]. *Geography and Urban Planning Research*, 5(2), 199-222.
6. Dadashpoor, H., FathLalai, A. (2013). تحلیلی بر الگوهای تخصصی شدن منطقه ای و تمرکز [Analyzing Regional Specialization and Spatial Concentration Patterns of Industries in Iran], *Regional Planning*, 3 (11), 1-18.
7. Dadashpoor, H., Jahanzad N., (2015). شبیه سازی تغییرات آتی کاربری زمین بر اساس الگوی [Simulation of future land use changes based on an ecological optimal pattern in Mashhad metropolitan area]. *Geographical Urban Planning Research*, 3(3), 343-359.
8. Dadashpoor, H., Mamdoohi, A. R., & Afaghpoor, A. (2014). سازمان فضایی در نظام شهری ایران با استفاده از تحلیل جریان هوایی افراد [Analysis of spatial organization in the urban network based on air flows of people: Empirical evidence for Iran]. *Human Geography Research Quarterly*, 46(1), 125-150.
9. Khazaiy Nejhada, F., & Gharakhlou, M. (2011). مطالعه روند تغییرات سکونت جمعیت در [The study of Changing trend of population settlement in the Tehran metropolitan region]. *Geography and Urban and Regional Planning*, 2(3), 47-60.
10. Lalehpoor, M., Sarvar, H., Sarvar, R., (2011). مدیریت و برنامه ریزی فضایی مناطق کلان- [Management and spatial planning in metropolitan areas in the era of economic globalization with emphasis on Tehran metropolitan region]. *Geographical Quarterly of Territorial Planning*, 4(13), 68-79.

11. Ministry of Industry and Mining. (2014). سرشماری کارگاه های صنعتی یک نفره و بیشتر در [Census Industrial Workshops of One Person and more in Tehran and Alborz]. Tehran, Iran.
12. Planning and Management Organization of Tehran Province, برنامه آمایش استان [Spatial Planning of Tehran Province], Tehran: Tehran Provincial Government.
13. Rajaei, S. (2014). تحلیل فضایی فرآیندهای شهرنشینی در منطقه کلان شهری تهران. [Spatial analysis of urbanization processes in Tehran metropolitan region]. *Urban and Regional Studies and Research*, 7(25), 83-102.
14. Statistical Center of Iran. (2011). سرشماری عمومی نفوس و مسکن [Public Census of Population and Housing], Tehran, Iran

References (In English)

1. Anas, A., Richard A., & Kenneth, A. S. (1998). Urban spatial structure. *Journal of Economic Literature*, 36(3), 1426-1464.
2. Angel, S., & Alejandro, M. B. (2015). The spatial structure of American cities: The great majority of workplaces are no longer in CBDs, employment sub-centers, or live-work communities. *Cities*, 51, 21-35.
3. Anselin, L., (1995). Local indicators of spatial association—LISA, *Geographical analysis*, 27 (2), 93-115
4. Arbia, D. (2007). Spatial distribution of economic activities in local labor market areas: The case of Italy. *Journal of Political Economy*, 105(5), 899-927.
5. Asikhia, M., & Nkeki, M. (2013). Polycentric employment growth and the commuting behavior in Benin metropolitan region, Nigeria. *Journal of Geography and Geology*, 5(2), 1-17.
6. Arribas-Bel, D., Ramos, A., & Sanz-Gracia, F. (2015). The size distribution of employment centers within the US metropolitan areas. *Environment and Planning B: Planning and Design*, 42(1), 23-39.
7. Bigotte, J. F., Antunes, A. P., Krass, D., & Berman, O. (2014). The relationship between population dynamics and urban hierarchy evidence from Portugal. *International Regional Science Review*, 37(2), 149-171.
8. Baumont, C., Ertur, C., & Le Gallo, J. (2004). Spatial analysis of employment and population density: The case of the agglomeration of Dijon. *Journal of Political Economy*, 36(2), 146-176.
9. Bertaud, A. (2003). *Tehran spatial structure: Constraints and opportunities for future development*. Tehran: Ministry of Housing and Urban Development.
10. Brezzi, M., & Veneri, P. (2014). Assessing polycentric urban systems in the OECD: Country, regional and metropolitan perspectives. *European Planning Studies*, 23(6), 1-21.
11. Brueckner, J. K. (2011). *Lectures on urban economics*.: MIT Press Books.
12. Burger, M., & Evert M. (2012). Form follows function? Linking morphological and functional polycentricity. *Urban Studies*, 49(5), 1127-1149.

13. Burger, M. (2009). Spatial structure and productivity in U.S. Metropolitan Areas. *Environment and Planning*, 24(6), 231-246.
14. Camagni, R. P., & Carlo, S. (1993). Network urban structures in northern Italy: Elements for a theoretical framework. *Urban Studies*, 30(6), 1053-1064.
15. Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. *Transportation Research Part D: Transport and Environment*, 2(3), 199-219.
16. Dadashpoor, H., Nateghi, M. (2017). Simulating spatial patterns of urban growth using GIS-based Sleuth model: A case study of Eastern corridor of Tehran metropolitan region, Iran. *Environment, Development, and Sustainability*, 19(2), 527-547.
17. Dadashpoor, H., Jalili, H., (2019). Exploring the dynamics of spatial Structure in metropolitan regions: The case of Mashhad metropolitan region, Iran. *International Journal of Architecture and Urban Planning*, 29 (1), 99-111.
18. Dear, M., & Flusty, S. (1998). Postmodern urbanism. *Annals of the Association of American Geographers*, 88(1), 50-72.
19. Gámez, D. (2012). Spatial distribution of employment in Hermosillo. *Urban Studies Journal*, 49(16), 3663-3678.
20. Giuliano, R. (2012). Network accessibility and employment centers. *Urban Studies*, 49(1), 77-95.
21. Garcia-López, M. A. . (2012). Urban spatial structure, suburbanization and transportation in Barcelona. *Journal of Urban Economics*, 72(2), 176-190.
22. Garcia-L., Miquel-À., & Ivan M.. (2010). Employment decentralisation: Polycentricity or scatteration? The case of Barcelona. *Urban Studies*, 47(14), 3035-3056.
23. Garcia-L., & Miquel, À. (2010). Population suburbanization in Barcelona, 1991–2005: Is its spatial structure changing? *Journal of Housing Economics*, 19(2), 119-132.
24. Garcia-López, M. À., Holl, A., & Viladecans-Marsal, E. (2015). Suburbanization and highways in Spain when the Romans and the Bourbons still shape its cities. *Journal of Urban Economics*, 85, 52-67.
25. Giuliano, G., Redfean, C., Agarwal, A., & Sylvia H. (2012). Network accessibility and employment centers. *Urban Studies*, 49(1), 77-95.
26. Glaeser, E.L., & Kahn, M. E. (2004). Sprawl and urban growth. In J. V. Henderson & J. F. Thisse (Eds.), *Handbook of Urban and Regional Economics* (p. 2481-2527). The Netherlands: North-Holland.
27. González, E., & Soledad, N. (2016). Regional polycentricity: An indicator framework for assessing cohesion impacts of railway infrastructures. *European Planning Studies*, 24(5), 950-973.
28. Grove, A. (2012). Emerging polycentric city-regions in Germany. *Regionalization of Economic Activities in Metropolitan Regions, Erdkunde*, 66(4), 295-311.
29. Guillain, R., Julie L. G., & Celine B. O. (2006). Changes in spatial and sectoral patterns of employment in Ile-de-France, 1978-97. *Urban Studies*, 43(11), 2075-2098.

30. Hall, P. (2010). The polycentric metropolis: A western European perspective on mega-city regions. In *Governance and Planning of Mega-City Regions* (pp. 45-66). London, England: Routledge.
31. Hou, H., Liu, Y., Liu, Y., Wei, X., He, Q., & He, Q. (2015). Using inter-town network analysis in city system planning: A case study of Hubei Province in China. *Habitat International*, 49, 454-465.
32. Junliang, D., Kaiyong, W., & Xiaolu, G. (2010). Spatial structure and land use control in the extended metropolitan region of Zhejiang River Delta, China. *Chines Geographical Science*, 20(4), 298-308.
33. Kim, J., Chang-Hwan, Y., & Jin-Hwi, K. (2014). Spatial change in urban employment distribution in Seoul metropolitan city: Clustering, dispersion and general dispersion. *International Journal of Urban Sciences*, 18(3), 355-372.
34. Klapka, P., Bohumil, F., Marián H., & Josef K. (2010). Spatial organization: Development, structure, and approximation of geographical systems. *Moravian Geographical Reports*. 18(3), 53-66.
35. Krunić, M. (2012). Spatial-functional organization of settlements in Vojvodina. *Spatial International Review*, 28(6), 23-29.
36. Lambregts, K. (2001). Clustering of economic activities in polycentric urban regions: The case of the Randstad. *Journal of Urban and Regional Planning*, 15(5), 725-730.
37. McMillen, D., & William L. (2003). Evolving subcenters: Employment and population densities in Chicago, 1970–2020. *Journal of Housing Economics*, 12(1), 60-81.
38. Meijers, E. J., & Burger, M. J. (2010). Spatial structure and productivity in US metropolitan areas. *Environment and Planning A*, 42(6), 1383-1402.
39. O'Sullivan, A. (2010). Urban Economics. In: Hutchison, R. (ed.) *Encyclopedia of Urban Studies*. Los Angeles: SAGE Publications Ltd.
40. Otterstrom, S. M. (2003). Population concentration in the United States city-systems from 1790 to 2000: historical trends and current phases. *Tijdschrift Voor Economische en Sociale Geografie*, 94(4), 477-495.
41. Parr, J. (2004). The polycentric urban region: A closer inspection. *Regional Studies*, 38(3), 231-240.
42. Polèse, M. Fernando R., & Shearmur, R. (2007). Observing regularities in location patterns analysis of the spatial distribution of economic activity in Spain. *European Urban, and Regional Studies*, 14(2), 157-180.
43. Redfearn, M. (2007). The topography of metropolitan employment: Identifying centers of employment in a polycentric urban area. *Journal of Urban Economics*, 61(3), 519-541.
44. Alves, L. R., & Costa, E. S. M. da. (2013). The spatial distribution of economic activities in southern Brazil in the first decade of the XXI century: new dynamics, old geographies in a globalized paradigm. *Geosul*, 28 (56), 111-130. DOI: 10.5007/29920
45. Salahi Moghadam, A. (2013). *A Multidimensional and Dynamic Analysis of Urban Spatial Structure A Case-study of the Sydney Metropolitan Area (1981 – 2006)*. Unpublished Doctoral Dissertation, Faculty of Built Environment, UNSW Sydney.

46. Salvati, L., & Carlucci, M. (2016). Patterns of sprawl: The socioeconomic and territorial profile of dispersed urban areas in Italy. *Regional Studies*, 50(8), 1346-1359.
47. Shearmur, R., Coffey, W., Dube, C., & Barbonne, R. (2007). Intrametropolitan employment structure: Polycentricity, scatteration, dispersal, and chaos in Toronto, Montreal, and Vancouver, 1996-2001. *Urban Studies*, 44(9), 1713-1738.
48. Sofianou, P. (2016). Cultural heritage as a tool of polycentricity, synergy, and territorial cohesion: A Case study from Northern Greece. *Procedia - Social and Behavioral Sciences*, 223, 687-692.
49. Sun, T., Zhenhai, H., Lanlan, W., & Gouping, L. (2012). Suburbanization and sub centering of the population in Beijing metropolitan area: A nonparametric analysis. *Chinese Geographical Science*, 22(4), 472-482.
50. Takahashi, T. (2014). Location competition in an Alonso–Mills–Muth city. *Regional Science and Urban Economics*, 48, 82-93.
51. Van Oort, F., Burger, M., & Raspe, O. (2010). On the economic foundation of the urban network paradigm: Spatial integration, functional integration and economic complementarities within the Dutch Randstad. *Urban Studies*, 47(4), 725-748.
52. Vasanen, A. (2012) Functional polycentricity: examining metropolitan spatial structure through the connectivity of urban sub-centers. *Urban Studies*, 49(16), 3627-3644.
53. Veneri, P. (2013). The identification of sub-centers in two Italian metropolitan areas: A functional approach. *Cities*, 31, 177-185.
54. Zhao, M., Wu, K., Liu, X., & Ben, D. (2015). A novel method for approximating intercity networks: An empirical comparison for validating the city networks in two Chinese city-regions. *Journal of Geographical Sciences*, 25(3), 337-354.

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