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Agglomeration of population and employment in the urbanization - industrialization interaction: The case of Izmir

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Abstract

As production and economic activities shaped the growth of cities during the pre-industrial era, they are still the most important factors explaining modern urbanization. Economic restructuring is being reshaped with agglomeration economies, bringing spatial restructuring with it. Regional economic growth, emergence of new centers and production foci are formed in the equilibria of positive and negative externalities of agglomeration. Positive externalities do not arise solely from internal economies of scale related to factors of production such as easy accessibility in the region. It also results from external economies of scale, including economies of localization and urbanization. On the other hand, as cities grow the attractiveness of large agglomeration and advantages of economies of scale decrease. Negative externalities in the larger agglomerations may eventually lead to decreasing returns to scale in cities. Economic view of regional science and geography considers cities maintaining equilibrium between two competing forces, i.e., centripetal forces (agglomeration) and centrifugal forces (dispersion). This study examines recent agglomeration and dispersion processes in the settlement pattern from the relationship between urbanization and economic growth. To do so, we take Izmir as a case and use general explanatory variables such as population and employment. Specifically, we investigate spatial agglomeration in the Izmir city region and metropolitan area by using population and employment data of 2009 and 2019. Based on empirical results, we discuss new sub-regions, urban centers, and clustering that emerged due to economies of scale as well as positive and negative externalities of agglomeration.

Keywords: agglomeration economies, clustering, population and employment change, settlement pattern

1. Introduction

The world population is increasingly living in cities. The proportion of the population living in urban areas in 2010 increased from 52% to 56.2% by 2020, and it is expected a reach 68% in 2050 (UN, 2022). Economy is the most crucial factor in explaining this accelerated urbanization and rapid growth of cities. Production and trade in the pre-industrial era also shaped the growth of cities. However, regional or urban centers mainly developed for political, administrative, or symbolic (including religious) reasons. Although these reasons remain essential, their influence has decreased relatively following structural changes in the spatial pattern of production and trade. Especially Post-Fordist and post-industrial economies have changed the structure and scale of production and trade. Both the scale of production and international trade has reached an unprecedented level, as was the scale of urban growth (Paddison, 2001). Within this framework, regions and cities have been restructuring. The long-championed dichotomy between urban and rural has disappeared, and the urbanization-industrialization pair has become the primary determinant of growth. The balance between urban and rural areas has gradually distorted and

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evolved towards urbanization while city regions, polycentric metropolitan areas and metropoles have been formed.[1]

The current phase of economic and spatial restructuring has brought into question those aspects of cities that had been taken for granted. Even if these aspects are still vital as the primary loci of accumulation, we know that economies of scale come out as a new concept when older concepts are reviewed (Marshall, 1890). From the size distribution of cities to their hierarchical rank in the settlement system or from a city's growth rate to unbalanced development between cities, economies of scale are critical in many issues (Henderson, 2001). Positive externalities do not arise solely from natural advantages such as availability of raw materials, or from internal economies of scale related to factors of production such as easy accessibility in the region. It also results from external economies of scale, including economies of localization and urbanization (Hoover, 1948; Ohlin, 1933; Isard, 1956). Labor market externalities, knowledge spillovers, social capital accumulation, and diversity are also key drivers of agglomeration. Yet cities do not only provide environments to create positive externalities. Increasing scale of a region or city can also lead to negative externalities. Along with the increasing costs of agglomeration, the advancement of technology can change the spatial division of labor, causing the emergence of new centers and poles in a settlement system. Thereby, economic restructuring is being reshaped with agglomeration economies while bringing spatial restructuring.

We already know that the settlement system in Turkey is changing with similar economic and spatial restructuring processes (Tübitak Project Report, 2021). In this article, the İzmir region and its metropolitan area are examined to interpret recent changes experienced in several regions and cities of Turkey. To do so, we resort to general explanatory variables such as population and employment. Regional characteristics and agglomeration trends in the İzmir region are investigated by analyzing the population and employment of İzmir province in the decade between 2009 and 2019. Relevant data on population and economy, such as gross domestic product (GDP), was obtained from the TURKSTAT, Central Dissemination System database. Employment data, on the other hand, was obtained from the Directorate General for Insurance Premiums, Social Security Institution. Employment data has been spatialized using address information and NACE codes (Statistical Classification of Economic Activities) of businesses and workplaces. When these two datasets brought together, we could see spatial patterns of population and employment changes at the district and neighborhood scale as well as their agglomerations in maps.

How the population and employment interactively change in İzmir, and clustering shapes the spatial pattern in the decade after 2009 are investigated with GIS-based analyses. Regional economic growth, the emergence of new centers, and foci are formed in the equilibria of positive and negative externalities of agglomeration. Economies of scale, localization, and urbanization economies are discussed within this framework. Mapping on district and neighborhood scales is employed to depict the metropolitan area's natural boundaries and indicate regional centers. The agglomeration of population and employment changes is captured by neighborhood scale hot spot analysis using the Getis Ord Gi* method. Hotspot analysis is a spatial statistical analysis and mapping technique developed to reveal the clustering of spatial events (see Getis & Ord, 1992 for detailed information). Cluster density is measured for high or low values. High-value regions/neighborhoods are classified as hot (red) spots, while low-value regions/neighborhoods are as cold (blue) ones. In this article, in which we will exemplify the change in the settlement pattern through İzmir, the relationship between urbanization and economic growth is examined with population and employment data between 2009 and 2019.

2. Agglomeration, Localization and Urbanization Economies

From the late 19th century to the 1960s, significant developments in regional economics and economic geography were all explained by agglomeration economies, although scholars were

[1] For more details, see the web page of İzmir City Tübitak Project, *IKTP*

driven by different thoughts and traditions. Weber (1909), Lösch (1954 [1939]), Isard (1956), and Christaller (1966 [1933]) provided major insights into the hierarchy of a settlement system and regional agglomerations while analyzing the location choices of economic activities and defining the structure of basic economic relations (For more details, see Yetişkul, 2012). At the same time, related work on the causes of spatial clustering of economic activities and their effects on regional growth was also undertaken by Lichtenberg (1960) and Vernon (1960). Their research, which emphasized the different characteristics of agglomeration economies, was generally based on the insights of Marshall (1890). Historically, agglomeration is explained as a strategic characteristic of a place or settlement that increases productivity (De Groot et al., 2009). Ease of access to natural resources or trade routes is one of these locational advantages. Prominent thoughts have emerged in recent years to model the structure of agglomeration and its effect on economic growth through trade (e.g., Fujita & Thisse, 2002). Although the origin of these approaches is based on traditional models and explanations, agglomeration economies still draw considerable attention as a result of the ongoing urbanization around the world, which is an agglomeration itself.

Quigley (1998) described four main factors of agglomeration economies (McCann & van Oort, 2009). The first one is economies of scale, which is central to all productivity and growth discussions (Isard, 1956). The existence of economies of scale in production can clearly be observed when we consider the relationship between location choices and transportation costs. If we think the other way around, firms or economic activities would be spatially dispersed to save transportation costs if there were no economies of scale (Fujita & Thisse, 2002). Increasing returns to scale may occur to a single firm due to production cost efficiencies caused by serving a large market, or large numbers of local firms, reduced average cost of producing outputs in that locality. Output increase at a greater rate than input which means an increase in productivity causes agglomeration. Other than internal scale economies, Hoover (1948), Ohlin (1933), and Isard (1956) allocated sources of agglomeration advantages to external scale economies and, more specifically, categorized agglomeration economies by distinguishing localization and urbanization. While localization economies are the geographical concentration of one industry, urbanization economies are the concentration of a variety of industries. The former involves benefits to a firm from expansion in its own industry and clustering. The latter occurs from the intensity of various economic activities and involves benefits to a firm from proximity to other firms (Nakamura and Morrison Paul, 2009). Therefore, specialization and diversity can be directly linked to economic productivity.

Input sharing, the first of three sources of agglomeration economies in Marshall's classic text (1890), is the relatively inexpensive purchase of various intermediate inputs from downstream and/or other firms nearby.[2] Quigley (1998) identifies economies of the localized industry as the second factor of agglomeration economies, which is related to localization economies as well as urbanization. Economies of localized industry arise from the use of shared inputs to produce a variety of differentiated consumption goods demanded by modern culture, fashion, and lifestyle (Katz & Shapiro, 1985). Quigley's third factor in agglomeration economies is efficiency growth and economic productivity that arises from potential reductions in transaction costs. Transaction cost is the sum of the time spent to reach any product and/or service and the expenses related to search and information, bargaining, and enforcement (Cheung, 1987). Agglomeration causes transaction costs to decrease. Similarly, Kim (1987) and Acemoğlu (1996) demonstrate returns to human capital accumulation in a matching context between workers and firms as a result of a decrease in transaction costs, which results in labor market pooling, identified by Marshall as the second source of agglomeration economies. When human capital accumulation takes place, the risks and costs of searching for workers or jobs reduce. Again similar to production, better matching may occur in consumption.

A high level of production caused, whether due to firm size or togetherness of a large number of local firms, supports local employment and produces external economies in that locality. However, the strength of these local externalities varies. Stronger externalities occur in some

[2] Marshall identifies three sources of agglomeration economies: input sharing, labor market pooling, and knowledge spillovers.

industries, while in others, weaker externalities occur (Duranton & Puga, 2000). In any case, economies of scale cause a decrease in the average cost of producing outputs in that locality. There are also externalities characterized by the diffusion of knowledge between firms in a spatially agglomerated industry. These externalities, commonly known as Marshall-Arrow-Romer (MAR) externalities, corresponds to knowledge spillovers, which is Marshall's third source in agglomeration economies (Marshall, 1890). Knowledge spillovers are generated from the interactions among people working in close proximity and the turnover of skilled workers. Even though researchers such as Schumpeter (1934) assert that local monopoly is better for growth than the local competition because it allows for innovator-internalization, Jacobs (1969) argues that diversified urban spaces encourage complementary information exchange among firms, thereby generating new ideas and technologies. Porter (1998) agrees with the localization economies, also adding the competition externalities to MAR's specialization externalities and Jacobs' diversity externalities. He explained why certain regions are able to maintain and even strengthen their growth advantages compared to other regions with their competitive advantage. Once any firm or location assumes a lead in a particular activity, it maintains its competitive advantage over others. This reveals a different type of externality regarding a locality or city (Krugman, 1991).

Even if all production in a city takes place with constant returns to scale and no technological externalities, urbanization economies emerge due to a better match between production and consumption activities or easy exchange. Quigley's (1998) fourth factor concerns the applicability of this matching context against fluctuations in the economy. Although purchases of inputs, and production or sales of outputs are often not stable and in equilibrium, firms, employees, or buyers reduce risks. This necessitates keeping less inventory holding or stockpiling. On the other hand, urbanization economies also offer other externalities to firms and production. Since a city as a large-scale agglomeration operates as a whole on its own, it houses various institutions and organizations, too (McCann & van Ortt, 2009). Universities, research and development centers, trade associations, and professional chambers are located in relatively more populous localities or cities with easy access to metropolitan areas or metropolises. These institutions and organizations, which are not only economic in character but also social, cultural, and political in nature, cause urbanization economies and create varied externalities from the production of knowledge and absorption of know-how to know-how diffusion (Harrison et al., 1997). This stimulates innovation and regional growth as well.

All of these positive externalities, which originated from internal economies of scale, then localization and urbanization economies, explain the sizes of cities, their position in a hierarchical system as well as their growth potentials too. On the other hand, as cities grow the attractiveness of large agglomeration and advantages of economies of scale decrease. Location choices of firms shift to peripheral areas away from the center, providing local advantages outside the agglomeration due to higher transportation costs. Besides, increased crowding, congestion, pollution, and high land prices support this choice (Quigley, 1998). Negative externalities in the larger agglomerations may eventually lead to decreasing returns to scale in cities (Glaeser et al., 1995). In short, the economic view of regional science and geography considers cities maintaining equilibrium between two competing forces, i.e., centripetal forces (agglomeration) and centrifugal forces (dispersion).

3. Agglomerations in İzmir Region and Metropolitan Area

This study examines recent agglomeration and dispersion processes in the settlement pattern from the viewpoint of the relationship between urbanization and economic growth. To do so, we take the İzmir region as a case. Historically, always keeping its central feature, İzmir has come to the fore with its different geographical, economic, historical, and socio-cultural features, such as one of the main port cities of the Eastern Mediterranean (see Yetişkul, 2019 for more details). İzmir, the westernmost settlement of Anatolia and an Aegean city, is the third largest city in Turkey. It is known that regions and cities characterized by agglomeration generally grow faster and at a higher

rate than others. When the economic size and growth potential of İzmir are evaluated together with socio-economic indicators such as income per capita, livability, higher education, and health facilities per capita, it is clearly seen that İzmir is one of the leading localities in Turkey. However, İzmir, characterized as a 'city without excuses' by Keyman and Koyuncu Lorasdağlı (2010), could not benefit from its resources and potentials effectively as well as locational advantages to achieve a leap forward in economic growth in the 2000s (Genç et al., 2021). The question of whether the economy of İzmir is in a period of growth or recession leads us to analyze a polycentric settlement structure or city region formation of İzmir.

Özatağan and Eraydın (2014) analyzed the population and employment data between the years 1990–2000 and found that the clustering of firms and employment spread towards the peripheries of the İzmir metropolitan area while forming new centers in their vicinity. According to their research findings, İzmir has been reorganizing and forming a city region by including peripheral settlements specialized in a particular economic activity. While urban growth moves from the center to the periphery, the historical center of İzmir has transformed into a regional center by functionally integrating with several settlements and various economic activities around it (Eraydın et al., 2008). As the economic geography of İzmir creates new foci, the center of the metropolitan area is shrinking. Tekeli (2018) explained İzmir, where the formation of city regions can be best observed on the basis of İzmir-Manisa linkages. He emphasized that relationships which operated mainly through agricultural production and trade in the past have been reinforced with relocations of various industries from İzmir to Manisa today. Thereby, a new spatial division of population and employment has emerged. In fact, the economic growth in the 2000s mainly took place in the İzmir-centered city region, which surpassed the provincial borders. Özatağan and Güvenç (2013) pointed out that this trend continues in their research.

In this article, we discuss regional development characteristics and agglomeration trends of İzmir, whose economic and spatial structure has been reshaped since the 2000s, using population and employment data for the years 2009 and 2019. In the face of findings, we also make interpretations and derive analogies for the settlement pattern of Turkey. As a matter of fact, the province of İzmir covers industrial clusters such as Aliağa and Torbalı, agricultural production regions around Bergama, Tire and Ödemiş, tourism centers such as Çeşme and Seferihisar, coastal stripes on the shores of the Aegean Sea and inland settlements with a relatively lower contribution to the regional economy, which is a perfect representation of settlement pattern in Turkey. Besides, the urbanization and growth period of İzmir caused the emergence of new city centers. In addition to Konak, which has traditionally been the central business district of İzmir, Karşıyaka has served as a sub-center along the northern and eastern coastline of İzmir Gulf. Lately, Bayraklı on the northeastern coastline has emerged as a new financial center. This economic and spatial diversity is an additional feature that contributes to the growth potential of a region other than agglomeration economies in terms of the regional economy. Urban diversity, when considered in a manner analogous to corporate diversification in a firm's product range, is a strategy that protects regional income from industry-specific crises in demand (Mills, 1972; Dissart, 2003). This mainly protects the labor market. Even if labor mobility within the region is high, economic crises reduce growth as a result of agglomeration economies (Krugman, 1993). Industrial variety at the regional scale is a feature that reduces regional unemployment and supports economic growth.

3.1. Agglomeration of population: 2009–2019

The population of İzmir increased 3.5 times in a 55-year period from 1,234,667 to 4,367,251 people between 2009 and 2019. In the meantime, its settlement structure has transformed from a monocentric city to a polycentric metropolitan area along with numerous spatial agglomerations on its wide provincial spread over 11,891 km². To search the population and employment agglomerations between 2009 and 2019, we group this provincial spread into six sub-regions according to different social and economic characteristics. The metropolitan sub-region covering eleven districts around the inner gulf, and Gediz and Küçük Menderes sub-regions, formed by the basins in the north and south, is the densest and highly productive region of İzmir in terms of both

population and employment numbers. Metropolitan sub-region was 2,972,900 people in 2019. Buca, Karabağlar, and Bornova, central districts in the metropolitan sub-region, have reached population levels of more than 450,000, followed by Konak, Karşıyaka, and Bayraklı, with populations over 300,000 (Figure 1).

Gediz sub-region in the north and Küçük Menderes sub-region in the south define peripheries of the metropolitan sub-region, with populations of 319,701 and 360,269, respectively. A continuation of the Küçük Menderes basin, the Peninsula sub-region, which includes the coastal districts in the west, had a population of 166,987 in 2019. The Bakırçay sub-region, with a population of 273,449 in the far north, and the Bozdağlar sub-region, with a population of 273,945 in the southeastern parts of the province, differ from the metropolitan sub-region in terms of social and economic structure. Proportionally, the increase in both population and employment in these sub-regions is lower. All six sub-regions of İzmir are experiencing socio-spatial processes such as expansion, sprawl, shrinkage and coastalization, similar to the changes observed in Turkey's settlement system.

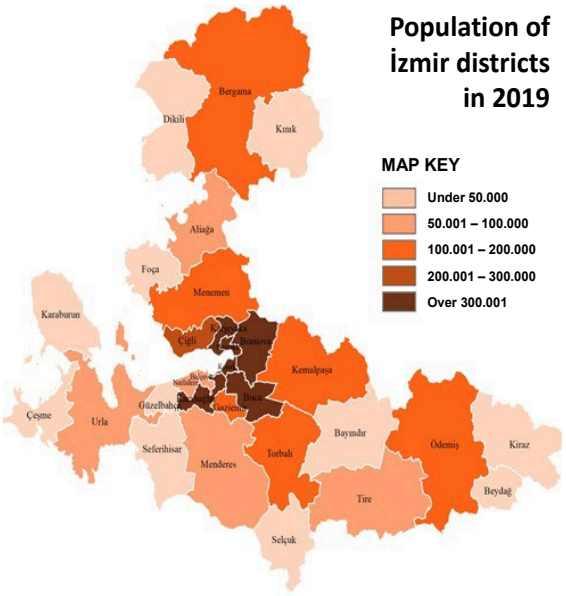


Figure 1 Population of İzmir districts in 2019

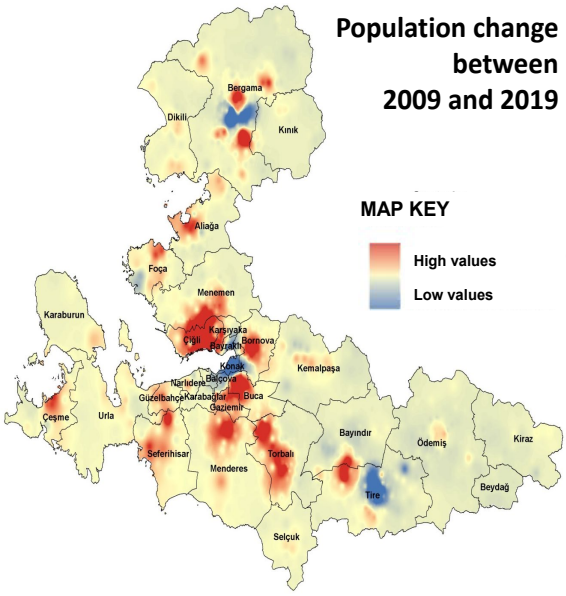


Figure 2 Agglomeration of population change between 2009 and 2019

Hotspot analysis of the population change between 2009 and 2019 reveals that İzmir is spreading from the inner gulf to the outer, and the city center (i.e., Konak district) is shrinking. Population changes represented by color contrast from high (red) —Population Increase— to low (blue) values —Population Decrease— in Figure 2 forms an outer ring of population decentralization around the metropolitan sub-region. Therefore, we may conclude that the shrinkage trend continues, as raised by Özatağan and Eraydın (2014) based on the data for the years 1990 and 2000. Besides, one can easily detect that the metropolitan area has expanded towards the periphery and enlarged its geography reach and hinterland by covering the districts of Menemen, Kemalpaşa, Torbalı, and Menderes –and even Aliağa in the North and Seferihisar in the southwest. From 2009 to 2019, 47% of the population growth of İzmir occurred in the metropolitan sub-region, 14% in the Gediz, and 18% in the Küçük Menderes sub-region. Although Bergama in the north and Ödemiş in the southeast maintain their historical positions as regional sub-centers, population growth remained at a relatively low level between 2009 and 2019. Similarly, the population growth of Bayraklı, Konak, and Balçova districts in the inner gulf slowed down and took low values, even negative values, as cold spots —shades of blue— in the agglomeration map (Figure 2). Bayraklı and Balçova grew only by 1.9% and 2.3%, respectively. In the same period, Konak shrank by 14.5%, and its population decreased from 411,112 to 351,572.

3.2. The economy of İzmir: 2009–2019

In addition to being the third largest city in Turkey, İzmir also stands out as the province with the third highest income level, producing 6.1% of the gross domestic product (GDP) in 2019. According to the chained volume index calculation (of GDP), adjusted for the price effects between 2009 and 2019, İzmir GDP increased from 100 units to 172 units, reaching a total value of 106,349,166 thousand TL (Table 1). The per capita GDP value was calculated as 10,655 $ in 2019. Economic activities are generally divided into three main groups as agriculture (primary), industry (secondary), and services (tertiary) sectors.[3] While the goods produced directly from natural resources are considered as agricultural sector activities, the production of new products from the produced goods is classified industrial sector activities. Activities not producing goods but services, other than the aforementioned sectors, are classified under the service sector. When we calculated shares of production in three main sectors in 2019, agricultural production took 4.3% of the total production, while industry accounts for 29.2% of the total production in İzmir. The remaining 66.5% is produced by the service sector. Accordingly, the distribution of total employment, 1,620,000 in 2019, reveals a similar ranking among primary (agriculture), secondary (industry), and tertiary (services) sectors are 9.3%, 31.0%, and 59.7%, respectively.

Table 1 Contemporary tapered supertall buildings

	2009	2014	2019	2009	2009-2014	2009-2019
	Population*			Population, growth rate (%)		
Population	3.868.308	4.113.072	4.367.251	-	6,3	12,9
Sectors	GDP at chain linked volume index (Thousand TL)**			GSYH, volume index**		
Agriculture (A)	3.164.307	4.274.076	4.543.838	100	135	144
Industry (B, C, D, E, F)	16.350.450	26.021.610	31.084.573	100	159	190
Consumer services (G, H, I, R, S, T)	15.789.162	21.929.141	28.408.002	100	139	180
Producer services (J, K, L, M, N)	13.325.844	16.851.516	20.546.629	100	126	154
Public services (O, P, Q)	6.435.779	7.924.042	9.924.577	100	123	154
Total GDP	61.692.893	86.956.660	106.349.166	100	141	172
	GDP per capita (TL)**			GDP per capita ($)**		
GDP per capita at current prices	16.099	30.235	60.505	10.423	13.830	10.655
	Employment rate (%)***			Labor force participation rate (%)		
Employment – Labor force	-	46,1	47,2	-	53,5	56,1

*TURKSTAT (Central Dissemination System), Address-based population registration system results
**TURKSTAT (Central Dissemination System), Regional accounts
*** TURKSTAT (Central Dissemination System), Regional labor force statistics

Nowadays, business and consumer services account for the majority of urban employment as cities have generally transformed into service-based economies, most of which are characterized by the knowledge-based information society. The interaction between urban economies and knowledge-based service industries explains the increase in economic productivity related to flows and transactions carried out through networks (Castells, 1989). Developments in information and communication technologies have caused the emergence of many new economic activities, and main sectors like industry and service have been divided into sub-sections by specializing in themselves. Depending on the output, the service sector is generally grouped into three further sub-sections, which are consumer, producer, and public services (Table 2) that provide direct services to the consumers, activities targeting business and industry production, and activities that provide service for specific needs to all socio-economic groups of the society without profit, respectively (Hayter & Patchell, 2011). Consumer services include retail, accommodation and food service, and primarily individual services, while producer services include marketing, advertising, research and development, finance, insurance and real estate, leasing, and so forth. When we look at the distribution of these three main service sectors in İzmir, it is seen that consumer services

[3] For the discussion and suggestion, see Şahin et al. (2018).

value the highest, with a rate of 26.7% in 2019. Technology and knowledge-intensive producer services contribute 19.3%, while public services are 9.3%.

Table 2 Distribution of economic activities by sectors

Main sectors	NACE code	Economic activities
Agriculture	A	Agriculture, forestry and fishing
Industry	B, C, D, E	Mining and quarrying, manufacturing and other industries
	F	Construction
Consumer services	G, H, I	Wholesale and retail trade, transportation and storage, accommodation and food service activities
	R, S, T	Arts, entertainment and recreation, other services activities
Producer services	J	Information and communication
	K	Financial and insurance activities
	L	Real estate activities
	M, N	Professional, scientific and technical activities, administrative and support service activities
Public services	O, P, Q	Public administration and defense, education, human health and social work activities
NACE Rev.2 (A10), Statistical classification of economic activities for 10 sectors in the European Community, Revision 2		

3.3. Agglomeration of employment: 2009–2019

The regional and spatial characteristics of employment at the district level are analyzed based on the employment data in 2009 and 2019. The findings in Figure 3 indicate with shades of green color that employment agglomerated in the metropolitan sub-region and its surrounding vicinity. Unlike the population agglomeration, employment disperses a broad region from Aliağa in the north to Torbalı in the south, in addition to the central districts of İzmir. Metropolitan sub-region accounted for 68.5% of total employment in 2016, while Gediz (Menemen and Kemalpaşa districts) and Küçük Menderes sub-regions have 8.4% and 9.2% of total employment, respectively. Altogether, 86.1% of total employment is concentrated in the metropolitan sub-region and its nearby vicinity. However, the economic growth in İzmir was not limited to the inner gulf, which defines the natural borders of the metropolitan area surrounded by a wide belt from north to south. In the hot spot analyses of the employment change at the neighborhood level between 2009 and 2019, economic agglomeration can be followed by Figure 4, with the transition of colors from high (shades of red) to medium (shades of yellow) values and the formation of belts from the inner to the outer.

Having said this, we should also note that regional (agricultural) sub-centers, Bergama and Ödemiş, are remarkable in terms of their population sizes. In addition to the hot spot analyses regarding the spatial agglomeration of population and employment change between 2009 and 2019, we investigate the percentage changes too. As seen in Figure 5, neighborhoods with high population growth are concentrated in the periphery of the İzmir metropolitan area, especially in the Aegean coastal zone. The high values (shades of red) in the coastal settlements reveal the recent coastalization trend in İzmir. Among the thirty districts of İzmir, the districts with the highest population change rates in the ten-year period are Seferihisar, Aliağa, and Torbalı districts, with 55.7%, 52.7%, and 49.2% growth, respectively. Seferihisar in the Peninsula sub-region in the west, Aliağa in the Bakırçay sub-region in the north,and Torbalı in the Küçük Menderes sub-region in the south show clear trends of growth in terms of population. These foci are the points where the red color is darkest, as seen in Figure 5. These districts are followed by Menemen, Menderes, and Güzelbahçe, with population growth rates of 40.4%, 39.7%, and 38.8%, respectively. The Peninsula sub-region, which includes the coastal districts of Karaburun, Çeşme, Seferihisar, and Urla, grew 38.5% between 2009 and 2019, reaching 166,987 people in 2019. This tendency exposes the positive impact of the coastal factor on population dynamics and economic activities in İzmir. In the same period, employment in the Peninsula sub-region also increased from 37,966 to 82,086. This rapid change was observed mainly on the coastal loci of Çeşme, Seferihisar, and Urla (Figure 6).

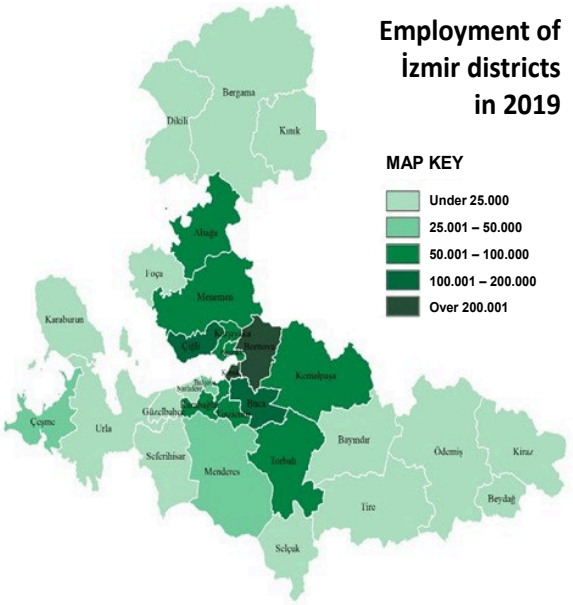


Figure 3 Employment of İzmir districts in 2019

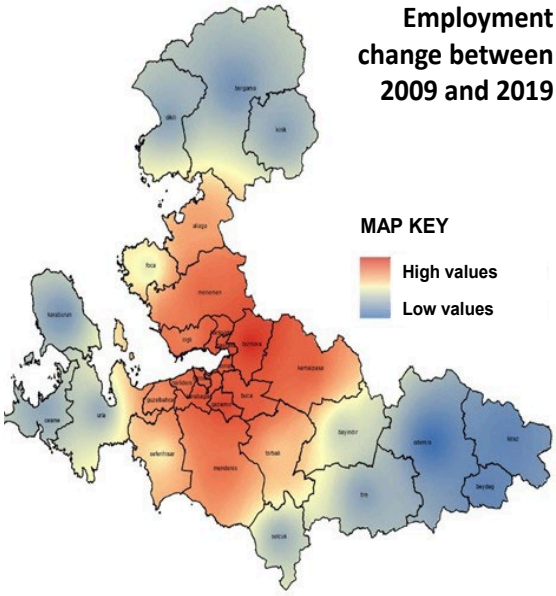


Figure 4 Agglomeration of employment change between 2009 and 2019

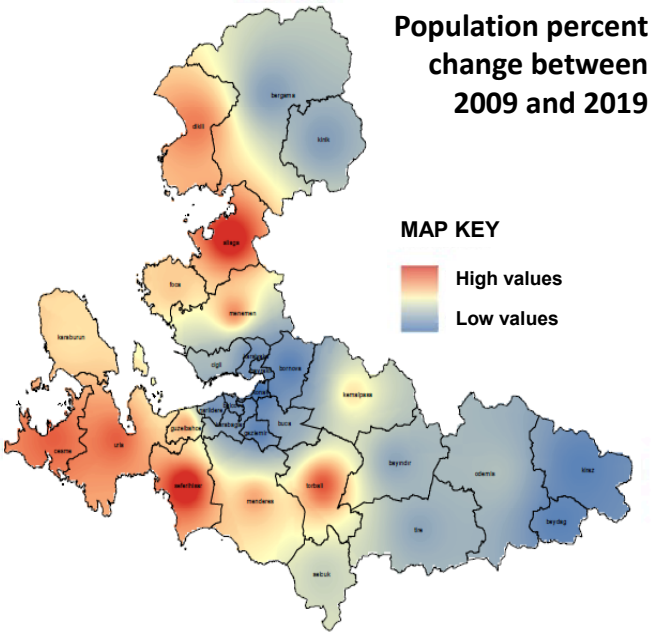


Figure 5 Population percent change between 2009 and 2019

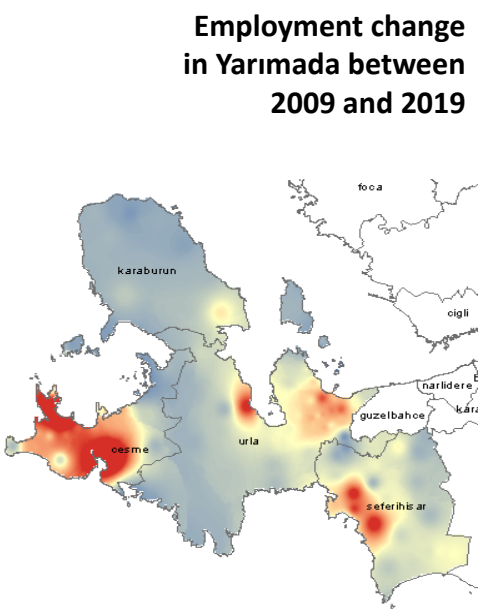


Figure 6 Agglomeration of employment change in the Peninsula sub-region between 2009 and 2019

Having said this, we should also note that regional (agricultural) sub-centers, Bergama and Ödemiş, are remarkable in terms of their population sizes. In addition to the hot spot analyses regarding the spatial agglomeration of population and employment change between 2009 and 2019, we investigate the percentage changes too. As seen in Figure 5, neighborhoods with high population growth are concentrated in the periphery of the İzmir metropolitan area, especially in the Aegean coastal zone. The high values (shades of red) in the coastal settlements reveal the recent coastalization trend in İzmir. Among the thirty districts of İzmir, the districts with the highest population change rates in the ten-year period are Seferihisar, Aliağa, and Torbalı districts, with 55.7%, 52.7%, and 49.2% growth, respectively. Seferihisar in the Peninsula sub-region in the west, Aliağa in the Bakırçay sub-region in the north, and Torbalı in the Küçük Menderes sub-region in the south show clear trends of growth in terms of population. These foci are the points where the red

color is darkest, as seen in Figure 5. These districts are followed by Menemen, Menderes, and Güzelbahçe, with population growth rates of 40.4%, 39.7%, and 38.8%, respectively. The Peninsula sub-region, which includes the coastal districts of Karaburun, Çeşme, Seferihisar, and Urla, grew 38.5% between 2009 and 2019, reaching 166,987 people in 2019. This tendency exposes the positive impact of the coastal factor on population dynamics and economic activities in İzmir. In the same period, employment in the Peninsula sub-region also increased from 37,966 to 82,086. This rapid change was observed mainly on the coastal loci of Çeşme, Seferihisar, and Urla (Figure 6).

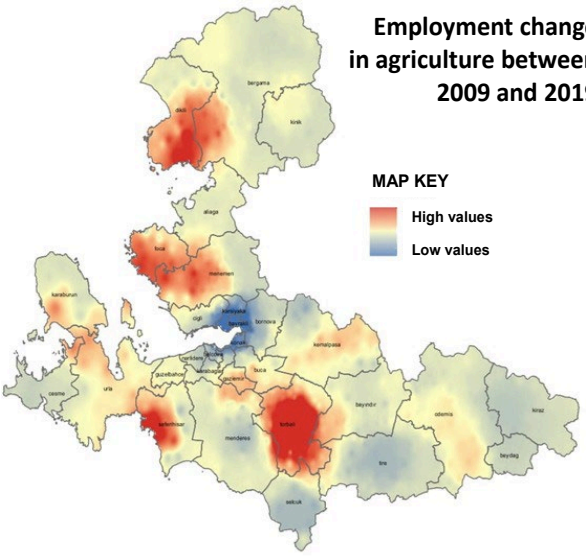


Figure 7 Agglomeration of employment change in the agriculture sector between 2009 and 2019

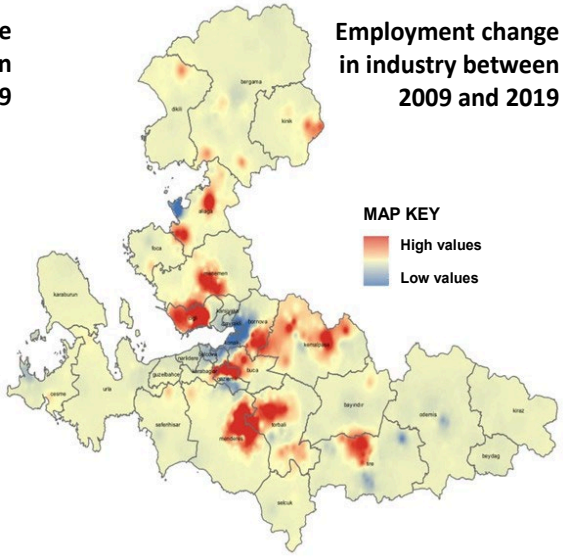


Figure 8 Agglomeration of employment change in the industry sector between 2009 and 2019

Between 2009 and 2019, total employment increased by 63.2% in İzmir—the employment size, which was 1,078,666 in 2009, increased to 1,760,308 in 2019. Concentrated in the metropolitan area and its surrounding vicinity, employment spreads over a wide area, including Aliağa, Kemalpaşa, and Torbalı. Resembling the change in the Peninsula sub-region, employment numbers in the Gediz and Küçük Menderes sub-regions almost doubled. Although employment in the metropolitan sub-region has increased, its share in the province has decreased by nearly 4% in the decade between 2009 and 2019. Hot and cold spots of employment change in terms of agriculture, industry, and services sectors between 2009 and 2019 are also analyzed to find sector-specific spatial characteristics and agglomerations in the region. The agricultural sector, which does not show a significant increase in absolute numbers, grew 102% in this period. While agricultural employment primarily has concentrated around Torbalı and Seferihisar in the south, it has also increased on the northern coast of Foça and Dikili (Figure 7). In the metropolitan sub-region, both agricultural employment and its change rate are observed at low levels.

Between 2009 and 2019, industrial sector employment grew by 33%. In the analysis of the spatial distribution of this change at the neighborhood scale, industrial employment is found condensed with high (shades of red) values around the periphery of the metropolitan sub-region, especially in the organized industrial zones (Figure 8). The increase in industrial employment can be clearly seen from Menemen and Çiğli to Aliağa in the north and from Bornova and Buca to Kemalpaşa in the east. Menderes and Torbalı in the south became a growth focus, and a gradual increase took place in Tire. As expected, industrial employment growth in the inner gulf and rural neighborhoods creates cold spots lower than their surroundings (Figure 8). When we examine agglomeration in service sector, the metropolitan sub-region predominates service employment, and growth between 2009 and 2019 attains its highest level throughout İzmir. The spatial distribution of the 75.8% growth in the service sector employment between 2009 and 2019 presents similar pattern with total employment change, as shown in Figure 4. As employment in

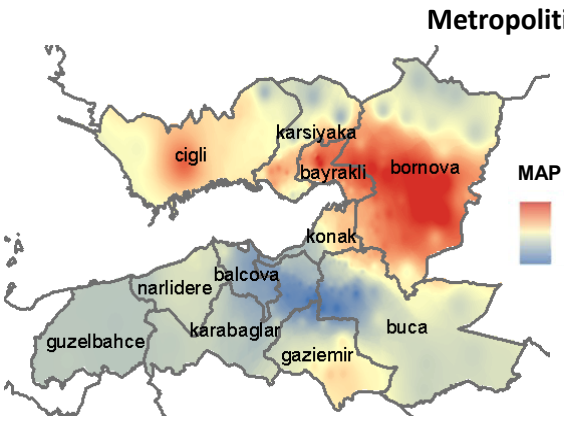
the metropolitan sub-region is concentrated in the service sector both absolute and ratio change (increase) of service employment follows urban bias strikingly. Increase of the service sector in the metropolitan sub-region concentrates in Çiğli and Bornova districts, while the Konak district (traditional city center) enjoys a relatively lower share.

When we focus on settlements in the outer periphery, it is observed that employment in the Bozdağlar sub-region is concentrated in the city centers of the Tire and Ödemiş districts. The agricultural sector has increased, especially in the south of Ödemiş. The most significant change in employment in the Küçük Menderes sub-region was realized with a growth-focused on Torbalı. It can be obviously observed that employment has increased to a certain extent in the south of the Selçuk district. While Kemalpaşa and Menemen districts at the periphery of the metropolitan sub-region stand out in the Gediz sub-region, the agglomeration in the Aliağa district of the Bakırçay sub-region differs from other districts. In the decade between 2009 and 2019, the agricultural sector in the Bakırçay sub-region grew by more than 280%. Although the employment growth rates in agriculture and industry sectors in the sub-region of the metropolitan area were lower than the rates of the province in general, the service sector grew by approximately 70%. This change in the service sector concentrated in Çiğli and Bornova districts and remained at a low level in Konak, the historical city center.

4. Discussion and conclusions

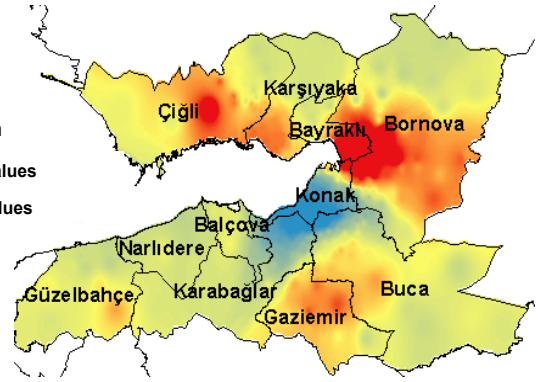
Urbanization has often been seen as synonymous with economic growth, and the population size of cities or urbanization rates have also been used to predict economic growth and even sometimes economic development rather than income level and distribution. Even though Jedwab and Vollrath (2014) showed that urbanization has increased in not only richer countries but also in poorer countries over time and that megacities disproportionately emerged in underdeveloped countries without economic productivity, they also found that urbanization and income were highly correlated for any given year between 1500 and 2010. This strong link between urbanization and economic productivity, which is explained by agglomeration economies, is indisputable. Greater agglomeration means higher local demand and higher local demand enables firms to benefit more from internal economies of scale, thereby allowing them to make more profit and afford higher nominal wages. This increases local demand, attracting new firms to that locality or city, creating a new workforce, and increasing the variety of goods and services produced. Therefore, the increase in the real income of the employees leads to more consumption, expanding the market, and attracting more economic activities (Gianmarco et al., 2001). There exist many interrelated backward and forward linkages that affect the size of cities and economic growth.

İzmir, a city where the population and employment were concentrated around the inner gulf in 2009, has transformed into a city-region that spreads over a vast geography in 2019, mainly involving the surrounding districts such as Menemen, Kemalpaşa, Torbalı, and Menderes. Based on the data from the years 1990 and 2000, Özatağan and Eraydın (2014) found that the metropolitan area of İzmir spread by forming belts from its core to its periphery and that a city region has been formed with new centers in the vicinity. In this paper, we use data at both the district and neighborhood levels for the years 2009 and 2019 and present that the trend of expansion continues up to a certain point. The gravitation of agglomeration has enlarged the metropolitan area from the core to the outer areas, attracting new economic activities and population. On the other hand, with the effect of negative externalities, the city center has shrunk. Growth from the center to the periphery occurs within a regionally wide belt, which emerged as development corridors, including the centers of Menemen, Kemalpaşa, Torbalı, and Menderes. In addition, the Seferihisar corridor and the center of Urla join this “fringed structure” of the metropolitan area, with the significant effect of the coastal trend in the period covering the years 2009-2019.



Employment change (2009 – 2019)

Figure 9 Agglomeration of employment change in Metropolitan sub-region between 2009 and 2019



Employment change in service sector (2009 – 2019)

Figure 10 Agglomeration of service employment change in Metropolitan sub-region between 2009 and 2019

In this context, we can define the natural boundaries of the metropolitan area with Menemen in the north, Kemalpaşa in the east, Torbalı and Menderes in the south, and finally, Seferihisar and Urla development corridors in the southwest. In these main corridors, uninterruptedly integrated with eleven central districts in the inner gulf, population and employment growth have been high in the last ten years. Coastalization has also emerged with rapid population and employment increases from Dikili to Aliağa and from Karaburun and Çeşme to Seferihisar. However, Bozdağ and Bakırçay sub-regions in the outer periphery have been areas where both population and employment have decreased. In these sub-regions, the population and employment are concentrated mainly in the central districts, and both decrease in the rural districts. On the other hand, the population of Konak, which is traditionally the central business area of İzmir, shrank by 14.5%. In the surrounding Bayraklı and Balçova districts, the population growth rate has decreased considerably. However, the shrinking of this city center, which is determined by the population data, cannot be fully supported by the employment data.

Although the employment growth rate of the metropolitan area sub-region is lower than other sub-regions, in absolute numbers, main bulk of service sector increase takes place in this region, especially around Bayraklı and Bornova in the northeast of the inner gulf (Figure 9 & Figure 10). These service sector concentrations merge with Karşıyaka and Çiğli in the northwest and extend to Gaziemir in the south. Athough losing its base, traditional central business district in Konak still serves as the main center of the city region as a whole. Agglomerations in agriculture, industry, and service sectors and the diversity of products and services show the economic level and growth potential of İzmir. As discussed in the sections above, regional or urban diversity is also affecting regional economic growth and development in addition to localization and urbanization economies. Diversified and specialized sub-regions and settlements expanding from the center of the metropolitan core sub-region to the periphery in İzmir have developed thanks to these positive externalities. The growth pole concept of knowledge diffusion and innovation in the economic geography literature, introduced by Perroux (1950) many years ago, assumes that economic growth is achieved in the region by spreading knowledge and innovation to nearby lower-level settlements throughout the hinterland of a growth focus. In line with this assumption, İzmir hosts various institutions and non-governmental organizations such as universities, research and development centers, trade unions, and professional chambers with the potential to spread knowledge to the city region. Yetişkul and Şenbil (2020) emphasize the administrative and organizational strategies and policies of İzmir Metropolitan Municipality, focusing on the quality of life and entertaining participatory, actor-based, entrepreneurial, innovative, and process-involved governance model, supporting a collective economic growth in this backdrop.

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