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OUTSOURCING AND URBAN DECENTRALIZATION: ¹

SPATIAL ANALYSIS OF ADVANCED PRODUCER SERVICES IN THE METROPOLITAN AREA OF GUADALAJARA

TERCERIZACIÓN Y DESCENTRALIZACIÓN URBANA: ANÁLISIS ESPACIAL DE LOS
SERVICIOS AVANZADOS AL PRODUCTOR EN EL ÁREA METROPOLITANA DE
GUADALAJARA

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Mediante la adecuación del índice tradicional de Gini en modelos de autocorrelación espacial y el análisis de cartografía temática, este documento tiene como objetivo evidenciar que en el proceso de tercerización de las ciudades latinoamericanas existe una incertidumbre respecto de los patrones espaciales que presentan, entendiendo que ciertas actividades económicas en este sector rompen los esquemas típicos de centro-periferia y aprovechan capacidades territoriales para constituir entornos productivos autónomos. Al analizar diversos sectores de Servicios Avanzados al Productor en el Área Metropolitana de Guadalajara, en México, se evidenció que existe una reducida presencia empresarial de mediano y gran tamaño, condición que interviene en la limitada construcción de aglomeraciones productivas distintas a la centralidad principal de la ciudad. No obstante, un análisis relacional del espacio lleva a considerar que, además de mostrar predilección por el poniente urbano, existen servicios que en su papel de estratégicos se podrían posicionar como de futuro desenvolvimiento de conglomerados en esta ciudad.

Palabras clave: medio urbano, terciarización económica, aglomeración productiva

Using an adaptation of the traditional Gini index in spatial autocorrelation models and the analysis of thematic cartography, this article aims to show that there is uncertainty about the spatial patterns found in the outsourcing process of Latin American cities, understanding that certain economic activities in this sector break with the typical center-periphery layouts and take advantage of territorial capacities to establish autonomous production environments. When analyzing different Advanced Producer Services sectors in the Metropolitan Area of Guadalajara, in Mexico, it was seen that there is a reduced presence of medium to large-sized businesses, which leads to the limited construction of production agglomerations outside the main city center. However, a relational analysis of the space leads one to consider that apart from showing a predilection for the urban west, there are services that in their strategic role could provide the basis for the future development of clusters in this city.

Keywords: urban environment, economic outsourcing, productive agglomerations

I. INTRODUCTION

As cities increase their dependence on global financial dynamics, it is evident that there will be a process of urban change as the tertiary sector positions itself throughout its surface area. In particular, the proportion and coverage that Advanced Producer Services or APS have, stands out, since, on being characterized for covering an intermediate demand before an end one (Waiengnier et al., 2020), these become representative of the level of specialization (Solo et al., 2022) and integration that a city has regarding everything related to the system of cities it belongs to. This contrasts to a greater extent if the secondary status of Latin American cities in this hierarchy is considered, since both their territorial extensions, as well as the inequality in their income distribution or historical processes of formation (Göbel, 2015), are presented as conditions for a representative development of these units.

This text aims to show that in the outsourcing process of these urban developments, there is an uncertainty of the APS services regarding their distribution and spatial behavior, a condition that is reflected in the unequal behaviors found, either through productive agglomerations in scenarios outside the main nodes, the concentration in the latter, or a total dispersion.

Taking the Guadalajara Metropolitan Area, hereinafter, GMA, as a case study, this work analyzes the spatial behavior and the distribution of the APSs by company size to determine whether they maintain trends not only towards urban decentralization but also towards the constitution of productive agglomerations capable of acquiring relevance as a strategic setting for territorial development. To do this, both the Gini traditional model and the econometric adaptation model, which refers to the autocorrelation demonstrated by each of the analyzed services, are used, together with a qualitative analysis focused on the relational vision of the space.

Among the main results, a relationship between the unequal proportion of company sizes and their behaviors in the city is demonstrated. This does not imply an increase in surface coverage, but rather a greater tendency towards centrality⁴ and spatial continuity under the center-periphery logic. On the other hand, it is also seen that, although there is a greater balance between some of the APS, this does not necessarily constitute productive agglomerations.

Based on the relational analysis of the space in the GMA and the coefficients from the proposed models, it is concluded that the APS categories such as legislative services and those for business support, given their strategic role in consolidating a city, could be suggested as elements of the future conformation of productive agglomerations that are an alternative to the main centrality, both for their dispersion around the constituent territories of the city and their conformation as basic needs elements in the production model focused on services and information.

II. THEORETICAL FRAMEWORK

Spatial inequality and agglomeration of Advanced Professional Services.

As cities have become the main focus of demographic, productive, and multicultural concentration, the speculations and modeling regarding their structure and internal distribution have been diverse and have been positioned as milestones. The truth is that, beyond the techniques that raise the ideal visions of the urban, the city has the particularity of becoming an element that finds the difference in its ontology, i.e., a social unit that in its constant struggle to consolidate itself as a setting of universal equality recreates landscapes differentiated from each other. This is mainly due to the processes of investment and restructuring of productive outlines as a result of both global structural changes and interurban dynamics (Torrado, Duque-Calvache & Palomares-Linares, 2020).

It is in the positioning of the tertiary sector where the current discussion is focused. This is mainly because the other components in cities become dependent on them (Harvey, 2021; Sassen, 2010). On one hand, the intensity and presence of this process depend on an urban role awarded by a new international division of labor (NIDL), and on the other, this dynamic is constituted as a limited element whose search for efficiency is recreated in advanced territorial environments.

The difference compared to the industrial sector in the city lies in that, tertiary services, essentially due to the ability information and communication technologies have to guarantee production without spatial continuity, rely on disruptive finite spaces of the center-periphery logic (Soja, 2008). This allows the city to be formed in a fragmented way through the use of strategic fixed capital - central communication routes, significant equipment - and territorial capacities⁵ (Harvey, 2012; Harvey, 2021). This leads one to consider that, beyond an urban centrality that

⁴ For the purposes of the text, this refers to the location given "the supply of higher tertiary services that attract demand, namely, companies and the population" (Beuf, 2020).

⁵ Defined as the action of "determining what the physical capacities of a territory are to solidify the supply of a destination and thereby influence demand" (Fresnada, 2019, p. 237).

concentrates the tertiary production groupings within itself, there is a determining historical outline of territorial capacities in the city that makes it possible, or not, to organize productive agglomerations capable of sustaining the service sector and, consequently, that is representative of a decentralization.

By understanding productive agglomeration as a set of economic units characterized by geographical proximity and typified considering the form and intensity of relationships between them (Ayala-Durán et al., 2020), it should be noted that the possibility of the tertiary sector creating such environments depends on a spatial framework whose shaping process has positioned it as part of what is developed, modernized, and is strategic in the investment (Smith, 2020). In this sense, there will be specific activities of the sector that, as they become indispensable for the urban function, increase their probability of occurring.

In the heterogeneity of the tertiary sector, the role that Intermediate Services or APS can have in Latin America stands out. These services not only represent a specialized economy but also make use of inputs that require highly specialized workers, mainly in roles related to the organization (Gutiérrez, 2011, p. 169). However, despite this specialization and diversity, Latin America still faces challenges due to structural backwardness and its secondary position in political and financial affairs on a global level (United Nations [UN], 2005; Smith, 2020; Vargas, 2005).

The current discussion emphasizes that the agglomerations of Advanced Professional Services (APS) are considered successful in the Global North, which allows describing the cities of this region as decentralized (Gutiérrez, 2011; Landriscini, 2011). In contrast, in Latin America, these APS agglomerations face uncertain scenarios, mainly due to the impact of neo-extractivism (Svampa, 2019), export-oriented manufacturing policies (Arisa & Oliveira, 2014), and the growth of job insecurity (Bonet, 2006). In short, while productive success and decentralization are observed in the Global North, uncertainty prevails in Latin America due to economic and political factors.

In this sense, it could be considered that, although some APSs in the region guarantee an urban presence given their relevance in the productive chain, these would not necessarily be formed as agglomerations, since, beyond the existence of static elements representative of territorial capacities, the probability of constituting themselves as such is focused on a historical outline, i.e., a relational perspective that will determine a dynamic advantage (Fernández-Satto et al., 2009).

III. CASE STUDY

The Guadalajara Metropolitan Area (GMA), which is the second-largest metropolitan area in the Mexican nation-state, was used as a case study (Figure 1). It comprises 10 municipalities — Guadalajara, Zapopan, San Pedro Tlaquepaque, Tonalá, El

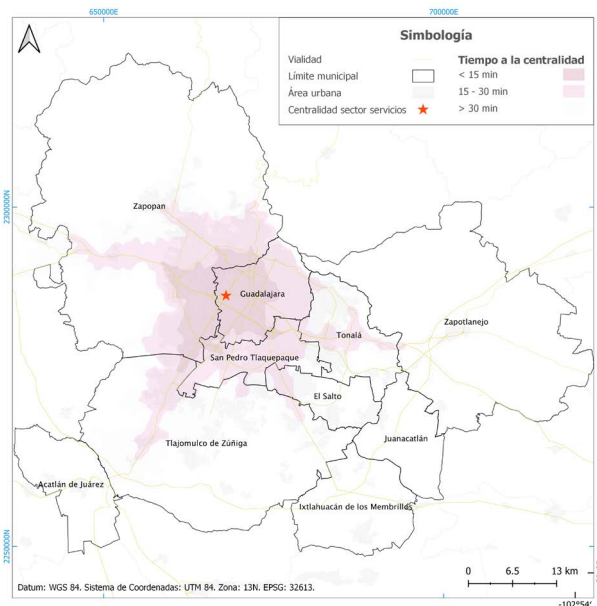


Figure 1. Guadalajara Metropolitan Area and its centrality in the service sector. Source: Preparation by the authors based on López-García and Gómez-Álvarez (2022) and INEGI (2021).

Salto, Juanacatlán, Tlajomulco de Zúñiga, Ixtlahuacán de los Membrillos, Zapotlanejo, and Acatlán de Juárez, in order of accession—. By 2020, the GMA had 7,069,000 km² of urban area and 5,117,370 inhabitants (National Institute of Statistics and Geography [INEGI], 2021).

What is sought to highlight in this analysis is that the position of the GMA as the second city gives it an important role regarding the financial dynamics of the federation and, consequently, the development of the APS sector infrastructure is also established as considerable (Table 2). However, typical of the marked structural inequality in Latin American cities, these develop based on the city's foundational ethnic-racial distinction processes and have been replicated in the residential or equipment's physical conditions. For the GMA, the largest companies, regardless of their economic line, are usually located in settings that have historically served as productive nodes, particularly in the municipalities of Guadalajara and Zapopan, contrary to the micro or small units positioned around them (Sevilla & Colmenares, 2022).

IV. METHODOLOGY

The methodological design focused on the APSs, as these show a true expression of urban outsourcing in Latin America

APS Category	SCIAN Code
Legislative activities	931
Corporate	551
Insurance	524
Business support services	5611, 5612, 5613, 5614, 5615, 5616, 5619
Financial services	5211, 5221, 5231, 5239
Real estate and rental services	5311, 5312, 53212, 53221, 5323, 53241, 53242, 53249

Table 1. Database codes considered for the design of the APS categories. Source: Preparation by the author.

(Bonet, 2006). Based on the categories created for case studies in the Global North (Gutiérrez, 2011; Taylor & Derudder, 2016; Waiengnier et al., 2020) and publicly accessible geostatistical data for the study area (INEGI, 2022), a database of six categories alluding to this economic sector was established⁶ (Table 1). The information created allowed analysis based on location and company size, in addition to the estimated number of employees in each of them.

The objective of this study was to statistically demonstrate the trend of the Advanced Producer Services (APS) categories to form productive agglomerations in areas other than the central core of the city. In addition, the authors sought to identify the diversity in which these units manifest themselves, considering the heterogeneity in company size. This exercise stimulated a discussion that, supported by cartographic tools, addressed the spatial distribution of productive units in these categories. The end goal was to understand the relational conditions that influenced the results obtained. For this, an analysis was made that compared the centrality and concentration of each APS category in the GMA, understanding that this allows deducing both the existence of concentrations that allow talking about agglomerations, as well as the intensity in the relations towards urban centrality.

For the centrality, the calculation of the Euclidean distances to the main productive node related to the branch was used, the latter detailed for 2019 (Figure 1) by López-García and Gómez-Álvarez (2022). From this, the optimal route of each business unit was established; so, the results show the average distances calculated for each of the categories.

The concentration was determined using the model proposed by Rey and Smith (2012) that seeks to integrate both the inequality of conditions of economic units — diversity in company sizes of a setting — and the tendency of the latter to create diverse groupings in a space. The model is based on the traditional Gini index (Equation 1), defined as:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n (x_i - x_j)}{2n^2 \bar{X}} \quad (\text{Equation 1})$$

Where:

x = value of the variable x observed at location $i = (1, 2, \dots, n)$
 $\bar{X} = (1/n) \sum x_i$

Integrating this function into a spatial autocorrelation model leads to the formation of the so-called *Spatial Gini Index*, which the same authors express (Equation 2):

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n w_{ij}(x_i - x_j)}{2n^2 \bar{X}} + \frac{\sum_{i=1}^n \sum_{j=1}^n (1 - w_{ij})(x_i - x_j)}{2n^2 \bar{X}} \quad (\text{Equation 2})$$

Where:

w_{ij} = Element of the matrix of spatial weights corresponding to the pair (i, j)
 x = value of variable x observed at location $i = (1, 2, \dots, n)$

According to Waiengnier, Van Hamme, Hendrikse, and Bassens (2020), the model needs to be presented in two components: the spatial Gini and the non-neighbor Gini (Table 3). The former is responsible for determining the degree of autocorrelation for each variable, while the latter allows the result to be interpreted in the same way as the traditional model, in that 0 would represent a total autocorrelation

⁶ The categorization was created from the *North American Industrial Classification System*, given the compatibility between the categories of external sources and existing geostatistical information.

APS Category	Estimated jobs	Companies > 250 employees (%)	Companies > 250 employees	Total companies	Companies < 5 employees	Companies < 5 employees in the sector (%)	Percentage of companies in the GMA
Legislative activities	69,025	19.61	145	1,410	525	37.23	0.63
Corporate	420	0	0	29	16	55.17	0.01
Insurance	5,685	0.57	4	340	187	55.00	0.15
Business support services	79,455	26.68	195	1,858	1,045	56.24	0.83
Financial services	35,375	2.36	18	3,835	3,051	79.56	1.71
Real estate and rental	10,925	0.39	3	902	611	67.74	0.40
Total	200,885	49.6	365	8,374	5,435	64.90	3.73

Table 2. Characteristics of APSs in the Guadalajara Metropolitan Area. Source: Preparation by the authors based on DENEUE (INEGI, 2022).

between the units presented, as well as a symmetrical distribution between company sizes, while 1 is presented as a total absence of any type of relationship.

In the results process, the calculation of the spatial weight matrix was adjusted using the 70 nearest neighbors. This choice is based on the consideration that this methodology would make it possible to achieve statistical significance levels of $p \leq 0.05$. However, an exception is highlighted in the corporate sector, where the high number of units affected the feasibility of assigning the coefficient under the same consideration, as this would have implied an inappropriate restriction.

Finally, the discussion focused on the relational analysis of the results, understanding the relevance of the qualitative approach and the specialized literature regarding the territorial constitution processes of the GMA.

V. RESULTS

As shown in Table 2, APSs represent 3.73% of the companies in the GMA, with an estimated 200,885 jobs. Of these, business support services and legislative activities have a presence of over 18% for companies with more than 250 employees, while the rest do not exceed 2.5%. On the other hand, except for legislative activities, settings that employ less than 5 people have percentages greater than 55%, which accounts for the unequal distribution in terms of size.

In addition, the analysis of the fastest route to the main centrality in the GMA demonstrates differentiated results among the APS. As shown in Figure 2, there is a direct relationship between the

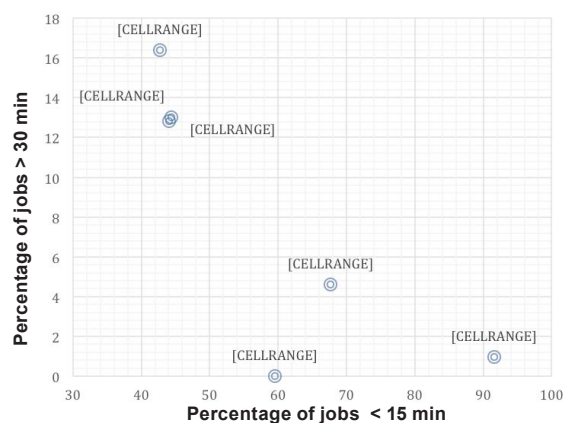


Figure 2. Percentages of APS jobs by time to the centrality. Source: Preparation by the authors based on DENEUE (INEGI, 2022).

growth of jobs more than 30 minutes from the center and a decrease in proportion for less than 15 minutes away. However, these proportions, for the former, do not exceed 17%, in contrast to what happens in the second case, in that these are always above 40%. It should be noted that the insurance, business support services, and corporate sectors show a significant concentration of jobs, exceeding 55%, at a distance of less than 15 minutes from the main node. In contrast, the proportion of jobs in the most remote peripheries is below 5% for these sectors. On the other hand, the other activities maintain a more equitable distribution, with percentages in the range of 40 to 45% for proximity and 12 to 17% for dispersed jobs.

APS Category	Gini	Spatial Gini	Non-neighbor Gini	Significance
Corporate	0.845	0.525	0.32	0.8
Real estate and rental	0.817	0.0377	0.7793	0.002
Financial services	0.804	0.00768	0.79632	0.00001
Insurance	0.694	0.122	0.572	0.05
Legislative activities	0.226	0.0316	0.1944	$2 \cdot 10^{-16}$
Business support services	0.169	0.0262	0.1428	$2 \cdot 10^{-16}$

Table 3. Index results for the APS. Source: Preparation by the authors based on DENU (INEGI, 2022).

The results obtained reaffirm that the centrality condition is only a strategic one for a limited group of APSs. This condition is corroborated by the autocorrelation coefficients (Table 3). On one hand, real estate, financial, and insurance services were those that showed greater inequality and spatial fragmentation by presenting a non-neighbor Gini above 0.5, contrary to legislative activities and business support services which show coefficients below 0.2. This is indicative of a relationship between the disproportion in company sizes and the absence of productive agglomerations in alternative city settings. In this way, as the non-neighbor Gini shows a similarity to the traditional index and, the latter, approaches total inequality - equal to 1 — there will be a tendency to concentrate in the main centrality of the city. Corporate services deserve special mention, as their presence in the city prevented making significance estimates below 0.05.

In addition, Table 3 shows that, although the spatial Gini results reject the null hypothesis and resemble one another when positioned between 0.03 and 0.02, their incidence in the non-neighbor Gini evidences a differentiated spatial behavior. In particular, it is interpreted that, although there are productive agglomerations throughout the city, these are usually created between companies mainly comprising less than 5 employees. The main factors of this are the limited or zero presence of medium or large companies and their concentration in the main centrality of the GMA (Table 2).

On the other hand, Figure 3 demonstrates a relationship between productive inequality and the tendency to position in the city's main centrality, since, as the presence of companies with more than 250 employees increases in locations more than 20 minutes away from the aforementioned node, there is a tendency to reduce the Gini coefficient for each of the sectors, with business support services and legislative activities having a greater presence.

Likewise, the existence of spatial conditions related to a dissimilar and strategic distribution of the APS that affect the

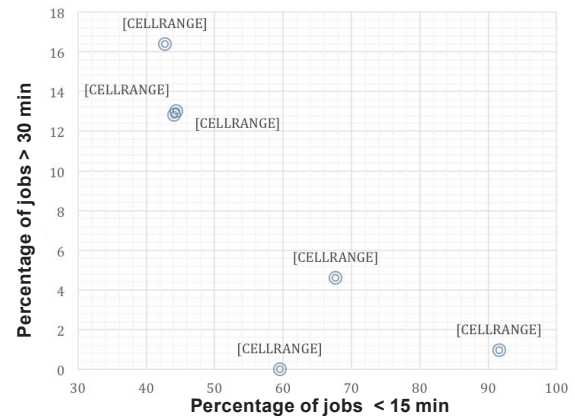


Figure 3. Relationship between the presence of companies with more than 250 employees and the Gini index. Source: Preparation by the authors based on DENU (INEGI, 2022).

inequality expressed by the Gini coefficients is demonstrated. This could be considered as the reason why the Gini Coefficient was affected by the degree of dispersion of its medium and large companies, considering smaller-sized ones remain throughout the GMA. Finally, it is important to confirm a difference in the spatial behavior of the analyzed APSs, in the sense that it is understood that this encourages a discussion focused on territorial skills that affect said spatial behavior, rather than a total dependence on the *free market*.

VI. DISCUSSION

There is a relationship between the hypotheses regarding the outsourcing processes of cities and the spatial behaviors of the APSs in the GMA. However, in consideration of the

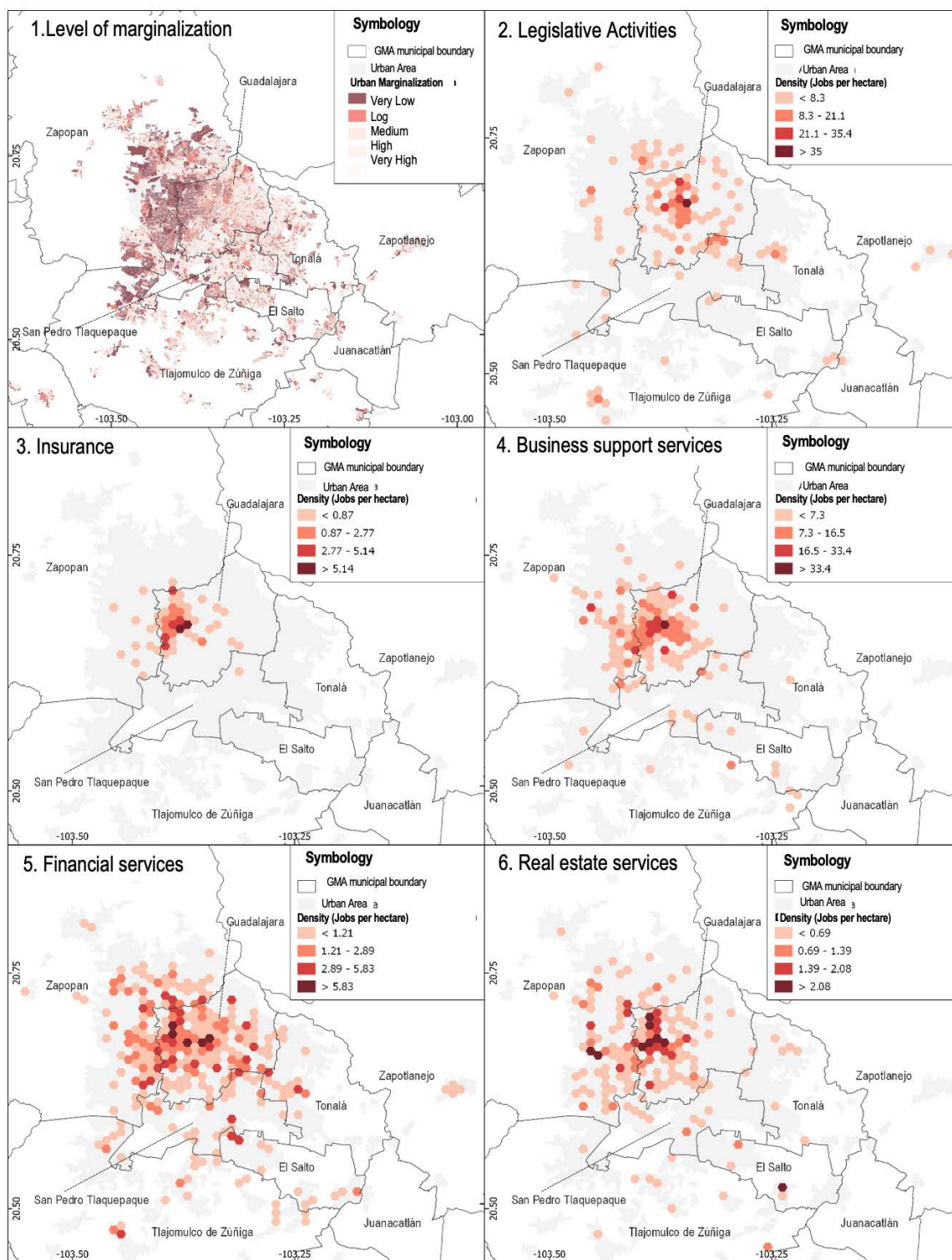


Figure 4. Level of marginalization and density of employees in the GMA for each APS. Source: Preparation by the authors based on DENUE (INEGI, 2022).

indices shown for each sector, significant agglomerations are not yet expressed. This is because, unlike cities of the Global North characterized by greater historical and economic development and greater surface compaction, the GMA is undergoing a development of the APS sector as a result of its relative and recent involvement in the free market and globalization outlines in the second half of the nineties (Borja & Castells, 2002; Núñez, 2014). It is these processes that would allow characterizing the phenomenon as one that is in development and uncertain.

It is imperative to highlight, through the specific models of each APS, the territorial affinities demonstrated that not only condition, but could also ground future development. Figure 4, as is evident, illustrates a clear preference for the location in the western part of the city, particularly in the municipalities of Zapopan and Guadalajara. This inclination matches the Partida (2014) and Seville (2020) approaches regarding these environments, identified by the NIDL as areas of constant investment in fixed capital and as generators and residents of skilled labor. This condition, theoretically expressed as a territorial capacity and symbolic element linked to urban centrality, confirms and supports the aforementioned territorial preference.

Similarly, it can also be highlighted that the uneven spatial development demonstrated by each sector is closely related to the city's hierarchical position regarding its participation in the global economy. This is due to the understanding that this is a link in the financial dynamics that originates in the large cities of the Global North. In this sense, sectors such as corporate or insurance have a limited dispersion and agglomerations compared to essential activities of the contemporary life model, such as financial services, legislative, and even real estate⁷ and rental, considered as basic needs for the population. Therefore, it would be possible to witness that, as the Gini spatial index grows, a sector will have a greater presence in areas of greater structural backwardness.

Finally, Figure 4 allows contrasting the spatial condition of the services, discriminating between those with Gini indices close to equality -in windows 2 and 4- and those that showed an inclination to inequality -in windows 3, 5, and 6-. Initially, the first group maintains the highest employment densities per hectare, which is directly related to the previously stated condition regarding a greater presence of units with more than 250 employees. In addition, these units are located in more restricted and distant locations from the city in contrast to the second

group, thus manifesting in lower densities and continuously starting from the main urban centrality.

However, the fundamental point is linked to the city's participation in global economic dynamics. Although financial and real estate services - windows 5 and 6 - have greater coverage in the GMA, their calculated indices reveal that these do not form particular agglomerations in themselves. Even the persistence of the highest densities in the vicinity of the primordial centrality of the city confirms its spatial coverage as a condition rooted in the positioning of these sectors as essential elements of everyday life.

In contrast, and according to what can be seen in windows 2 and 4, the group of legislative and business support services are presented in a more fragmented way in the territories, which may seem counterintuitive. However, by accepting the idea of Guadalajara as an entity recently incorporated into the inertia of neoliberal capitalism, it is understood that these areas find structural conditions that allow their full development in the locations where they are positioned. Therefore, regardless of the low spatial indices expressed, they are positioned as the main sectors for the formation of significant agglomerations, which is corroborated by the low coefficients recorded by the non-neighbor Gini (Table 3).

VII. CONCLUSIONS

From what has been presented in this work, it is possible to mention that the APSs in the GMA maintain differentiated spatial behaviors, either depending on the historical-territorial peculiarities or the level of demand required by a certain category. In this logic, it is observed that while the insurance or corporate sector is concentrated around the main node of the GMA, financial and real estate and rental services have a more extensive coverage, which manifests a preference for environments with the best structural conditions.

The discussion raised here emphasizes the need to integrate complementary models that delve into the territorial peculiarities that encourage the formation of these distributions, either through affinity with particular economic corridors or through land rental and urban complexity outlines. However, the Gini spatial coefficient and the proposed relational analysis allow it to function as an exploration of future scenarios in the city, applicable in other productive sectors. In addition, it is necessary to consider as a future line of research, an analysis of the changes caused by the health crisis due to SARS-Cov-2, particularly due to the productive disruption this represented and the reaffirmation of the APS as protagonists and the future of societies.

⁷ The latter understood as a fundamental part of neoliberal capitalism (Harvey, 2021)

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