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Advanced Producer Services and Core–Periphery Trajectories in German Metropolitan Regions

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Abstract

This paper examines how the growth and decline of agglomerations and peripheries in metropolitan regions can be understood in the context of Advanced Producer Service (APS) firm decisions, regional conditions and institutional policies. Focusing on Germany, it responds to divergent quantitative findings for Munich and Dresden and to outcome-oriented studies documenting spatial patterns, leaving underlying mechanisms under-specified. This study adopts an embedded qualitative case study design, analysing Munich and Dresden as contrasting metropolitan subunits within a shared national framework. Drawing on documentation, archival records and expert interviews with economic development and regional governance actors, it uses explanation building and template analysis to link empirical material to an analytical framework integrating firm, location and public authority perspectives. The results identify four recurrent configurations in the firm–location–policy nexus: reinforcing agglomeration, emerging limits to agglomeration, balancing peripheral growth and reinforced peripheral decline. These configurations show how the same metropolitan region can simultaneously exhibit core growth, constraints on further concentration, selective peripheral upgrading and cumulative peripheral disadvantage. Conceptually, this paper develops a mechanism-based account of APS-driven metropolitan development and proposes refined propositions that help reinterpret outcome-based studies on Munich and Dresden. More broadly, the configurations offer an analytical lens for analysing APS location dynamics and metropolitan governance challenges in other polycentric and federal contexts.

Keywords: advanced producer services; metropolitan regions; agglomeration; diffusion; core–periphery relations; firm–location–policy nexus; peripheralisation; Germany; Munich; Dresden



Academic Editor: Jesús
Manuel González Pérez

Received: 24 March 2026

Revised: 23 April 2026

Accepted: 12 May 2026

Published: 18 May 2026

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1. Introduction

Advanced Producer Services (APSs) are widely regarded as a central pillar of the knowledge economy and an important driver of metropolitan development [1,2]. APSs are firms providing specialised activities that generate, analyse, exchange, and trade information and expertise on behalf of other firms [3]. Over recent decades, APSs have internationalised alongside their client firms and have become embedded in transnational flows of capital, knowledge, and corporate control. This has reshaped traditional regional core–periphery relations and contributed to the emergence of transnational urban networks and a “geography of centrality” that selectively concentrates high-level functions while

connecting them across space [1,4]. In this context, APSs, including finance, legal services, consulting, and specialised information and communication technologies, have been characterised as among the most dynamic segments of the economy and as an important engine of growth [5].

A key implication of these developments is that APS location dynamics cannot be reduced to a single spatial tendency. On the one hand, APSs often display strong metropolitan concentration, as firms seek proximity to dense pools of high-skilled labour, knowledge institutions, clients, and complementary services typically found in large urban cores [4]. On the other hand, APS activities may also extend selectively beyond core cities into surrounding municipalities through multilocation networks, subsidiary offices, and functional differentiation within city–regional systems [6]. Such spatial reconfigurations are highly relevant for regional development and urban governance because they affect tax bases, labour market integration, infrastructure demand, and the distribution of economic opportunities within metropolitan regions [7,8]. Analytically, these tensions can be captured through the coexistence of the metropolitan concentration and metropolitan diffusion of APS activities, where diffusion denotes selective functional spread into surrounding municipalities.

Despite substantial research on APSs and metropolitan development, the mechanisms, i.e., the context-dependent processes through which outcomes are generated, linking APS firms' location strategies to spatial outcomes remain insufficiently specified. Much of the literature is outcome-oriented: it documents spatial patterns such as centralisation, reurbanisation, or deconcentration based on aggregate indicators (e.g., [9]), but it remains unclear how these outcomes are produced through the interaction of corporate strategies, place-based assets, and public steering [10,11]. Quantitative indicators such as APS employment counts, sectoral specialisation, or network connectivity are valuable for identifying patterns, yet they reveal little about how corporate decision making, regional structures, and institutional interventions co-evolve and shape one another over time. As a result, the existing literature provides limited explanations as to why similar outcome patterns can reflect different underlying processes, and why comparable regions may exhibit divergent development trajectories. Therefore, recent contributions call for more qualitative, mechanism-oriented inquiry to contextualise observed spatial patterns and to examine institutional practices and firm strategies more directly [8,12].

Germany constitutes a particularly insightful context for addressing this gap because it combines a polycentric urban system with pronounced regional disparities and ongoing debates about balanced territorial development. Within Germany, recent empirical studies report differentiated, and partly divergent, APS trajectories across metropolitan regions, with especially mixed readings for Munich and Dresden, e.g., [13–17]. While some analyses suggest strong core-led growth and persistent concentration, others point to spillover-driven expansion into smaller surrounding municipalities, shifting network roles, or selective peripheral gains. These inconsistencies indicate that outcome measures are insufficient to capture different elements of a more complex process in which firm strategies, locational conditions, and public authority interventions interact in context-specific ways. Therefore, a qualitative design can add explanatory depth by unpacking how and why APS location networks and metropolitan development co-evolve under a shared national institutional framework.

This paper responds to this challenge through an embedded case study design within Germany, using the metropolitan regions of Munich and Dresden as analytically contrasting subunits under otherwise comparable institutional conditions. Drawing on documentary material and expert interviews, this study identifies the mechanisms through which APS-related development becomes concentrated in metropolitan cores or diffuses into surrounding areas. The central research question is: How can the growth and/or decline

of agglomerations and peripheries be understood in the context of APS firm decisions, institutional actor policy, and regional factors?

This paper's contribution is the development of a mechanism-based account of APS-driven metropolitan development by integrating firm strategies, locational assets, and public steering into a coherent explanatory perspective. Building on this integrated view, the analysis derives a sharpened set of propositions that specify the configurations under which core advantages are reinforced, constraints to core growth emerge, and peripheral growth or decline is amplified. These propositions aim to clarify why metropolitan concentration and metropolitan diffusion may coexist within the same regional system and why they may appear differently across empirical indicators, thereby informing debates on metropolitan governance and spatially balanced development.

The remainder of this paper is structured as follows: Section 2 develops the analytical framework for understanding metropolitan concentration and diffusion through APSs. Section 3 outlines the methodological approach and case study design. Section 4 presents the empirical findings. Section 5 discusses the contribution, implications and limitations of these findings, and Section 6 indicates the implications for research and practice.

2. Literature Review

2.1. Theoretical Framework

Analysing APSs in space requires distinguishing three interrelated perspectives: firm, location, and public authority. Treating these as analytically separate sharpens conceptual clarity by recognising distinct agencies and logics while still allowing for their mutual entanglement. The interplay among these perspectives is interpreted here through agglomeration and network economies, which together provide the analytical lens for understanding metropolitan spatial outcomes.

The firm perspective foregrounds agency, explaining why and how firms take location decisions based on their strategic objectives and operational constraints [18]. Location choice is conceptualised as an internal decision process in which the perceived value of specific places is evaluated against wider market, organisational and competitive considerations [19]. Classical distinctions between hard location factors, like transport accessibility, land and office costs, or regulatory conditions, and soft location factors, like image, amenity and quality-of-life attributes, capture complementary dimensions of this evaluation [19]. Strategic considerations further shape these choices: firms conduct systematic market assessments, analyse sales potential, follow formal decision-making procedures, and consider their relational ties to clients and strategic partners [18]. Some location patterns have also developed historically [8]. For APSs in particular, empirical work highlights the importance of proximity to research institutions [20], access to a specialised and skilled labour pool, an information-rich and prestigious environment, and high-quality office, transport and telecommunication infrastructure [21]. At the same time, APS location patterns are dynamic, evolving over time as firms adapt their site networks to changing markets and technologies [8].

The location perspective shifts the focus from corporate agency to the structural conditions of place [22]. Spatial structures are treated as the contextual environment in which firms act, i.e., what a location objectively offers, independent of whether individual firms recognise or utilise these assets. Locations provide resource bases composed of both material and institutional features: physical infrastructure, labour market structure, knowledge institutions and forms of spatial embeddedness. As Hsu [23] emphasises, rather than a "passive container", a region is a dynamic setting whose development depends on its capacity to mobilise resources in spatial competition. Yet the delineation of such regions is complex. Administrative boundaries are widely used [24] but often misalign with the

functional geographies of firm networks or territorial economies [10,17]. This mismatch is particularly pronounced for APSs, which operate through multi-scalar networks that cut across jurisdictional borders. Importantly, APS firms do not merely locate within given regional structures; they actively shape them. Hanssens et al. [21] show that the geographies of APSs are defined by their presence in particular places and by the ways in which they reorganise spatial structures at multiple scales. Likewise, Waiengnier et al. [8] argue that inherited spatial core–periphery structures are continuously reconfigured through corporate locational strategies. The spatial perspective thus highlights how territorial attributes both structure and are structured by APS activities, contributing to the evolving geography of regions.

The public authority perspective conceptualises spatial development as a policy goal pursued through institutional steering. Public actors, like municipal planning departments, regional development agencies and investment promotion organisations, possess a steering capacity aimed at shaping regional attractiveness and guiding economic trajectories [25]. Their interventions are normatively oriented and include land use regulation, infrastructure provision, fiscal incentives and targeted support for specific sectors or clusters. In doing so, public authorities operate at the interface between location conditions and firm decisions: they modify place-based assets to enhance competitiveness while simultaneously attempting to influence corporate site selection. As Wei et al. [5] emphasise, APS settlements depend largely on local conditions, including local politics. Cluster initiatives, for example, can strengthen local innovative capacity and stimulate business start-ups [26].

In sum, firms follow a demand logic when making strategic location decisions, locations follow a supply logic by offering material and immaterial assets, and public authorities follow a steering logic by providing institutional frameworks. The interplay of these three logics, the firm–location–policy nexus, becomes manifest in spatial outcomes that, in the context of metropolitan regions, can be ideal-typically characterised by two contrasting dynamics: the metropolitan concentration and metropolitan spread of APS activities. These dynamics are interpreted through agglomeration and network economies.

Agglomeration is widely understood as a spatial phenomenon in which economic activity concentrates in clusters [27]. Agglomeration economies denote the external benefits that firms derive from geographic co-location, such as reduced transaction costs, access to specialised labour markets and facilitated knowledge spillovers [28]. Duranton and Puga [29] synthesise these mechanisms as sharing, matching and learning. Larger cities thus tend to offer more opportunities for APSs in terms of knowledge intensity and market size [30]. These benefits generate place-based agglomeration externalities, for instance rising wages or improved infrastructure, but they can be accompanied by agglomeration diseconomies, such as congestion or high rents [30]. The geographic scale at which agglomeration economies operate remains debated and empirically imprecise [28]. For APSs, agglomeration economies remain crucial because knowledge-intensive activities often involve high transaction costs and rely on face-to-face interaction [31,32]. When the temporal evolution is emphasised, the literature frequently speaks of centralisation, i.e., a strengthening of core locations over time [12].

Conceptually, there is no strict antonym to agglomeration, but opposite tendencies are framed as decentralisation or dispersion [33], de- or disagglomeration [34] or deconcentration [13]. Empirically, these processes often take the form of a spatial spread of firms into smaller cities surrounding an urban core [17]. Over longer periods, such shifts may lead to peripheralisation, whereby areas lose central functions and become structurally peripheral [35,36]. For APSs, this rarely means relocation to remote greenfield sites [32]. Rather, it typically involves a redistribution of functions within metropolitan regions driven by network economies, often considered the relational counterpart to agglomeration

economies [37]. Network economies arise from inter-urban functional integration: firms located in secondary centres benefit from the agglomeration advantages of nearby cores and from shared infrastructure such as airports, universities and major customer bases [38]. In this sense, a smaller city can “borrow size” [38,39], hosting specific functions or achieving performance levels usually found in larger cities, while remaining embedded in intra- and inter-firm networks. Therefore, network economies can be treated as relational externalities operating across the region, and being part of a network brings network externalities for a location. However, not all peripheral areas benefit equally: the notion of agglomeration shadows highlights that proximity to dominant cores may also suppress local growth [40].

Overall, both agglomeration and network externalities are “fuzzy concepts” that are used differently across contexts and scales [30]. At the regional scale, Wei et al. [5] speak of centring and suburbanisation to capture simultaneous tendencies of concentration and spread. To avoid terminological confusion, this study adopts a uniform labelling of the two ideal-typical spatial processes:

- Metropolitan concentration denotes the agglomeration- and centralisation-driven reinforcement of the metropolitan core (including processes labelled reurbanisation or recentring).
- Metropolitan diffusion denotes network-based decentralisation, deconcentration, suburbanisation and peripheralisation, where APS activities spread into surrounding municipalities while remaining functionally linked to the core.

At the level of empirical analysis, these two processes are operationalised as agglomeration growth/decline (developments in the metropolitan core) and peripheral growth/decline (developments in the surrounding areas).

A conditioning factor is digitalisation and hybrid work, which can potentially have an impact on both spatial processes: Digital tools can loosen the link between work and fixed office locations by allowing APS firms to distribute some tasks across multiple sites, reduce office footprints, and use peripheral or satellite locations [41]. At the same time, many APS activities continue to depend on dense urban environments for client contact, tacit knowledge exchange, recruitment, and trust-based coordination [42]. The spatial implications of digitalisation are therefore not yet fully understood: it may both relax pressures for concentration and support new forms of functional integration [43]. Metropolitan regions provide the key spatial frame within which these processes unfold [44].

Metropolitan regions are widely understood as large, functionally integrated systems of production and consumption, based on intensive information processing and knowledge creation [45], and they are characterised by dense clusters of economic activity and efficient transport infrastructure, enabling high volumes of commuting and goods flows [45]. A central feature is the integrated labour market, where commuting within the region exceeds commuting across its boundary [46,47]. In other cases, metropolitan regions are politically constructed and defined territories [48,49]. Although Fricke [48] notes an inconsistency in the literature based on different understandings of the term, in either case, metropolitan regions relate closely to the notion of polycentricity and intra-regional core–periphery relations [50], whereby one or more urban cores and their semi-urban and rural hinterlands play a salient role in the national urban system [48,51]. In the context of the knowledge economy, metropolitan regions host APSs and other knowledge-intensive industries because of their superior infrastructure, dense networks of research institutions and proximity to key political and economic actors [52]. They generate agglomeration economies and function as strategic nodes linking regional actors to national and global markets [53]. As such, metropolitan regions have a variety of knowledge-based assets and, hence, high innovation potential [54,55].

Figure 1 summarises this analytical framework. Firms, locations and public authorities are depicted as distinct but interconnected elements whose respective demand, supply and steering logics jointly shape the metropolitan concentration and diffusion of APS activities. Agglomeration and network economies provide the mechanisms through which these interactions translate into spatial outcomes in core and peripheral parts of metropolitan regions.

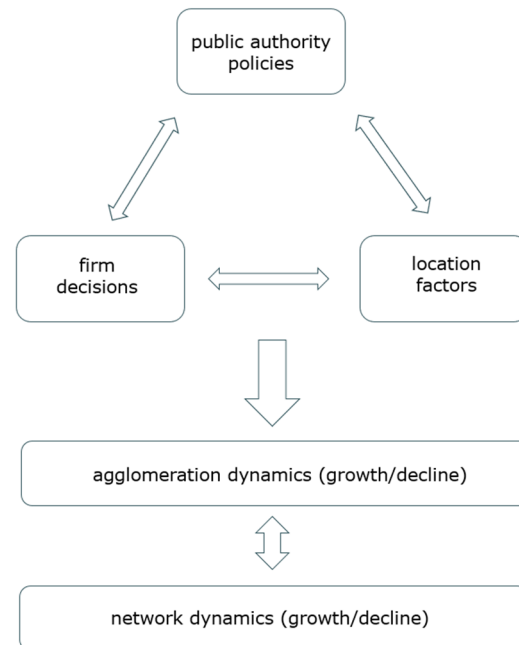


Figure 1. Analytical framework: interactions at city–firm nexus leading to spatial outcomes.

Firms are the primary agents of economic systems, but their strategies cannot be understood apart from the territorial contexts in which they are embedded [10]. They simultaneously adapt to regional conditions and transform them, a duality captured by Hsu’s [23] notion of “firming place” and “placing firm”. Multilocal firms in particular use territory as part of their competitive strategy, leveraging and reorganising local resources across their networks [5,10]. From this perspective, metropolitan concentration and diffusion are not merely spatial patterns; they are manifestations of strategic corporate decisions and institutional interventions as they interact with locational assets. To render these mechanisms empirically tractable, the analytical framework is translated into two sets of propositions that differentiate between developments in the metropolitan core (“agglomeration growth/decline”) and those in the surrounding areas (“peripheral growth/decline”).

Building on these insights, the following propositions guide the empirical analysis of APS dynamics in metropolitan regions:

- I. Agglomeration growth (or decline) is reflected in:
 - (a) Firms’ decisions to either move or not move into the agglomeration;
 - (b) Either favourable or disfavourable developments in the location factors;
 - (c) Institutional actors’ policies to either attract firms to or relocate firms from the agglomeration.
- II. Peripheral growth (or decline) is reflected in:
 - (a) Firms’ decisions to either move or not move into the periphery;
 - (b) Either favourable or disfavourable developments in the location factors;
 - (c) Institutional actors’ policies to either attract firms to or relocate firms from the periphery.

2.2. Empirical Contextualisation

Germany combines a polycentric and decentralised-federal urban system with pronounced regional disparities, making it a useful context for examining how APS location dynamics unfold across metropolitan cores and surrounding areas. The German urban hierarchy is characterised by multiple large city regions embedded in dense networks of medium-sized cities and small towns rather than a single dominant primate city, which limits the direct transferability of urbanisation theories developed for more monocentric contexts [40]. At the same time, a persistent East–West divide remains visible: Eastern Germany continues to exhibit lower densities of demographic and economic assets, and many rural regions are structurally weak [56,57]. Against the backdrop of stagnating macroeconomic performance, with only marginal real GDP growth and modest prospects compared to other advanced economies [58], understanding the mechanisms that underpin spatially uneven development becomes analytically and politically salient.

Within this setting, APSs constitute a core component of the knowledge economy. For the German context, Gehrke et al. [59] translated the EU's NACE-based definition of knowledge-intensive activities [60] into national economic codes, thereby delineating APSs as highly human capital-intensive services, such as accounting, advertising and media, banking and finance, law, management and IT consulting, information and communication services, logistics (third and fourth parties), as well as design, architecture and engineering. These activities are deeply involved in knowledge generation and transfer and are therefore well suited to trace how APS firm strategies and territorial structures co-evolve.

Several studies analyse the German urban system through the lens of APSs and their knowledge-intensive activities, e.g., [7,61]. Heider [62] argues that the dynamics of knowledge exchange in APSs have contributed to rising regional economic inequality in Germany, as growth impulses increasingly concentrate in a limited number of metropolitan regions. Knowledge-based service employment continues to expand [63], and many large urban centres have strengthened their specialised knowledge bases [62]. By contrast, numerous rural peripheral regions—particularly in Eastern Germany, but also in parts of Western Germany—face demographic decline and employment losses [64]. Kronenberg and Volkmann [65] further show that changes in knowledge-intensive employment are closely related to local characteristics, and that these relationships differ systematically between growing and declining regions, with regional conditions such as land and office costs playing a central role.

Digitalisation and post-COVID-19 work practices add another layer to these spatial processes. The diffusion of home office and virtual collaboration has increased locational flexibility for firms and employees [40]. On the one hand, this can relax traditional constraints tied to central workplaces and open up new options in more peripheral locations. On the other hand, digital tools only partly substitute face-to-face interaction, and key knowledge-based processes remain anchored in central urban locations [40]. Recent work suggests that expanded working-from-home arrangements may even extend urban areas and commuting fields, contributing to an outward expansion of city boundaries rather than a simple deconcentration [66]. These developments resonate with the theoretical emphasis on the coexistence of agglomeration and network economies.

Recent empirical work on APSs in Germany provides a more differentiated picture of how these processes play out in space. Longitudinal network analyses of the German knowledge economy between 2009 and 2019 show that core–periphery structures in APS networks are relatively stable at the national scale, yet they also reveal connectivity gains in selected secondary and tertiary cities when firms relocate or add functions outside traditional cores [16,17]. Complementary studies of knowledge-intensive employment patterns indicate that small and medium-sized towns can assume active roles in regional knowledge

economies rather than acting solely as passive spillover zones [9], and that functional interdependencies between metropolitan cores and their hinterlands are common [13,15]. Taken together, these findings point to simultaneous processes of concentration and diffusion: some metropolitan regions combine strong core growth with dynamic hinterlands, whereas others remain more centralised with only selective gains in surrounding areas.

Taken together, the German APS context is marked by a polycentric urban structure, persistent core–periphery disparities, and simultaneous tendencies towards concentration and selective diffusion. These characteristics form the empirical backdrop against which the propositions developed in Section 2.1 are examined. The following section turns to Munich and Dresden as contrasting embedded subunits within this national setting.

3. Methods

Case Selection and Regional Profiles: Munich and Dresden

Within the overarching single-case design for Germany, the metropolitan regions of Munich and Dresden are selected as embedded subunits that allow for a differentiated examination of APS dynamics under otherwise comparable national institutional conditions [67,68]. Both operate within the same federal and macroeconomic framework, yet they differ markedly in their metropolitan structures: Munich is widely depicted as a polycentric region with strong hinterland integration, whereas Dresden is described as more core-centred [13,14]. This embedded design seeks literal replication in the sense that similar mechanisms are expected under a shared national framework, while the metropolitan contrasts offer variance in how agglomeration and network processes manifest [67]. Short profiles of both metropolitan regions can be found in Appendix B.

For Munich, several studies portray a pattern of decentralised concentration in the knowledge economy. Wagner [13] shows that APS employment is not only clustered in the core city but has also dynamically expanded into surrounding small towns, which exhibit above-average specialisation in analytical fields such as research, technology and IT and strong growth in knowledge economy jobs. Wagner and Growe [15] further classify medium-sized towns in the Munich region as residential towns with a work function or as “accessibility winners”, absorbing commuting flows while gradually strengthening their own knowledge functions; this reinforces the interpretation of Munich as a polycentric region in which hinterland municipalities actively contribute to the regional knowledge economy. Network analyses by Zöllner et al. [16,17] add that Munich remains highly attractive for APSs because of its large, specialised labour pool, and that its core has maintained its position in the national urban hierarchy while several hinterland regions have registered pronounced connectivity gains, indicating a widening of the regional APS network rather than a further strengthening of the core alone. However, these findings only partly align with Wagner and Growe [14], who document a pattern of relative economic reurbanisation, with exceptionally strong growth of knowledge-intensive employees in the core and only slightly above-average growth in surrounding municipal associations, suggesting core-led development. Taken together, the literature thus sends mixed signals: APS development in the metropolitan region of Munich can be read either as polycentric spillover-driven growth or as reurbanisation led by a dominant core. This inconsistency directly reflects the tension between agglomeration-driven metropolitan concentration and network-based metropolitan diffusion in the terms of the propositions.

In Dresden, the dominant picture is that of a more monocentric metropolitan region. Wagner [13] identifies strong specialisation in analytical knowledge in the core city, underpinned by dense research and technology infrastructures, while surrounding small towns show no significant specialisation and only limited spillovers of knowledge-intensive activities. Wagner and Growe [15] classify all medium-sized towns in the Dresden region as

“average”, meaning they do not stand out in terms of their knowledge base, tax revenue, or residential and commuter functions, which reinforces the view of a core city concentrating knowledge-intensive employment with subordinate surrounding municipalities. At the same time, Wagner and Growe [14] describe Dresden as a case of core-centred absolute economic reurbanisation, where city cores grow strongly across all knowledge bases while surrounding areas lose relative importance in national comparison. Yet this pattern is not fully confirmed by relational analyses: Zöllner et al. [17] find a decline in Dresden’s national connectivity alongside gains in nearby secondary cities (notably Chemnitz and Zwickau) and some rural regions, as well as improved global connectivity, suggesting a redistribution of APS functions within the broader region and a changing network role rather than a simple reinforcement of the core. Earlier work by Zöllner et al. [16] also points to co-location tendencies and strengthening network effects involving Dresden. Thus, for Dresden, while some studies show persistent metropolitan concentration and limited peripheral upgrading, others hint at emerging diffusion and role shifts, again pointing to inconsistencies between agglomeration-driven metropolitan concentration and network-based metropolitan diffusion.

Therefore, Munich and Dresden provide a compelling contrast for this study. Munich is frequently characterised as relatively polycentric with dynamic core–hinterland relations, whereas Dresden is more often portrayed as core-centred with weaker surrounding municipalities. The existing quantitative studies nonetheless yield mixed indications as to whether APS change is predominantly driven by core agglomeration or by network-based diffusion into selected peripheral locations (Table 1), motivating a closer examination of the mechanisms behind these divergent readings.

Table 1. Overview of quantitative studies and observation windows prior to qualitative fieldwork.

Authors	Time Frame	Findings	Proposition(s) Addressed	Perspective(s)
Wagner (2024) [13]	2012–2019	Munich: decentralised concentration—small towns contribute actively to growth: high growth in population and knowledge economy jobs. Dresden: knowledge activities remain concentrated in core, with weak spillovers.	Agglomeration growth (I)	Location
Wagner & Growe (2023) [15]	2012–2021	Munich: surrounding towns function as commuter hubs or accessibility winners, gradually strengthening knowledge roles. Dresden: periphery remains commuter-oriented, with limited functional upgrading; core city concentrates knowledge-intensive employment.	Peripheral growth (II)	Location
Zöllner et al. (2023) [17]	2009–2019	Munich: stable core and but hinterland gains, showing spillover effects and widening of regional network. Dresden: national connectivity declines but global connectivity improves; growth in nearby smaller towns.	Peripheral growth (II)	Firm & location

Table 1. *Cont.*

Authors	Time Frame	Findings	Proposition(s) Addressed	Perspective(s)
Wagner & Growe (2022) [14]	2012–2019	Munich: relative economic reurbanisation, with both core and hinterland growing in knowledge-intensive employees, led by core. Dresden: core-centred absolute economic reurbanisation with strong growth in knowledge base; surrounding areas lose relative importance.	Peripheral decline (II)	Location
Zöllner et al. (2020) [16]	2009–2019	Munich: remains attractive for APSs due to firm concentration and labour pool. Dresden: shows strong co-location tendencies, reinforcing network effects.	Agglomeration decline (I)	Firm & location

Table 1 makes explicit how the existing quantitative studies relate to the analytical framework developed in Section 2.1. The column Proposition(s) addressed indicates whether a study primarily speaks to Proposition I (agglomeration growth/decline in the metropolitan core), Proposition II (peripheral growth/decline in surroundings), or both, depending on whether core dynamics, peripheral dynamics, or core–periphery contrasts are analysed. The column Perspective(s) assigns each study to one or more of the three perspectives of the framework: firm for analyses centred on APS networks and co-location patterns; location for work focusing on regional structures, employment and specialisation; and policy for studies that explicitly address public authority strategies and interventions. Notably, the reviewed studies mainly operate from the location perspective, sometimes complemented by a firm-network view, and address both propositions, while the policy perspective remains absent. This underscores the need for the present qualitative case study, which systematically incorporates institutional actors into the firm–location–policy nexus and examines how their practices condition the observed combinations of agglomeration and peripheral growth or decline.

Data collection

This study draws on three types of complementary data sources: documentation, archival records, and semi-structured interviews [68]. Triangulation across sources through joint coding strengthened the construct validity and contextual depth [69].

Documentation: Desk research was conducted to identify relevant textual sources on APS-related development trajectories, firm location dynamics, and institutional strategies in Munich and Dresden. The selection followed criteria of relevance, source reliability, and timeliness. To ensure reliability, government publications and reports from established research institutions were prioritised; peer-reviewed academic outputs were excluded from the document corpus and treated as part of the literature base. To ensure contemporary relevance, firm-related press releases and corporate statements were prioritised when published within six years preceding data collection. Additionally, two publicly available, high-profile interviews were incorporated because of their direct relevance to regional development narratives and policy rationales: an interview with the Prime Minister of Saxony and an interview with the Managing Director of the Munich Metropolitan Region. These materials were classified as secondary documentation because they were not generated through this study’s own fieldwork but represent analytically relevant public statements.

However, the two interviews were coded and analysed together with the anonymised primary interviews.

Archival Records: Archival data consisted of publicly available administrative reports and regional development policy documents that provide institutional and historical context for spatial planning, infrastructure development, and economic development strategies. Together with the documentation sources, these materials supported the process-oriented contextualisation of firm decisions and institutional interventions. Across documentation and archival records, 36 secondary documents were selected and coded.

Primary Interviews: Six semi-structured expert interviews were conducted between July 2024 and January 2025 with key informants in Munich and Dresden. Informants were selected based on two criteria: (i) their professional roles involve economic development, firm settlement and relocation, or collaboration between research institutions and businesses, and (ii) they hold leading positions in these domains within one of the two regions. The underlying rationale was that such actors regularly advise and support multiple firms and therefore possess aggregated, longitudinal insights into regional firm dynamics that would be difficult to obtain through single-firm interviews. This means that the interviews were not intended to capture only the immediate moment of fieldwork but to also obtain cumulative assessments of the firm location dynamics observed over several years. At the same time, some topics, e.g., digitalisation, hybrid work, and post-COVID-19 office practices, were explicitly discussed as more recent developments.

The interview strategy was therefore purposive and role-based rather than intended to achieve numerical representativeness within each metropolitan region. It sought variation across territorially and institutionally distinct interfaces relevant to APS development, including city-level and state-level economic development, county-level representation of surrounding municipalities, innovation support, and business–university cluster organisation. Direct interviews with APS firms were not used as the primary sampling route because the objective was not to reconstruct single-firm decision processes but to identify recurring patterns across multiple settlement, relocation, and expansion cases. Firm-related reasoning was instead triangulated through documentary material, including corporate statements and press releases, and through the cumulative information of actors who regularly advise and support multiple firms.

After obtaining university ethical approval (Appendix A), all interviews were conducted online to accommodate geographical dispersion [70], recorded with consent, transcribed, and prepared for analysis. Interviews averaged 30 min and followed a semi-structured guide (Appendix D), enabling adaptation to participants' expertise while maintaining thematic consistency [71,72]. Snowball sampling was used to identify additional informants [73].

In total, the empirical corpus comprises 44 documents (23 documentation sources, 13 archival records, and 8 interview transcripts), yielding 433 coded segments. The interview transcripts include six primary interviews and the two public interview materials described above. A detailed list of sources is provided in Appendix C. Table 2 provides an overview of the six anonymised interview partners, indicating their broad sectoral backgrounds, organisational roles and main areas of responsibility.

Table 2. Interview material included in analysis: six anonymised primary expert interviews and two publicly available high-profile interviews.

Interview Nr.	Territorial Scope	Sector	Broad Category	Organisational Role	Main Tasks/Expertise
1	Dresden, urban core	Public authority	Local economic development	Head of unit for business relocation and start-up support	Management of services for attracting and supporting firms and start-ups; advising investors and entrepreneurs; coordinating with other municipal departments and business support organisations.
2	Dresden, metropolitan region	Public authority	State government	Head of strategic investment projects unit	Planning and coordination of large-scale investment projects; negotiation with corporate investors and different levels of government; managing approval procedures and incentive packages.
3	Secondary data: see documentation				
4	Dresden, metropolitan region	Business (semi-public)	Development organisation and innovation agency	Head of project management	Design and implementation of programmes to support start-ups and innovation; coordination of publicly funded projects; networking between government, firms and research institutions.
5	Munich, surrounding municipalities	Public authority	County-level economic development	Head of economic development	Advising firms on local conditions and support instruments; facilitating business expansion and settlement; networking with municipalities, business associations and other regional actors.
6	Munich, urban core	Public authority	Municipal economic development	Head of firm services and site development	Strategic firm account management; support for site search, relocation and expansion projects; coordination with spatial planning and infrastructure departments; location marketing.
7	Secondary data: see documentation				
8	Munich, urban core	Business and university	Cluster organisation: university-affiliated institute	Head of cluster initiative	Strategic communication and stakeholder engagement for business cluster; organisation of events and networking activities; acting as interface between firms, researchers and policy actors.

Note: Interviews 1, 2, 4, 5, 6, and 8 were conducted for this study and are reported in anonymised form. Interviews 3 and 7 refer to publicly available interviews (see Appendix C for full details and links) and are treated as secondary data rather than primary interviews. However, they are coded and analysed together with the primary interviews. The numbering is retained to maintain consistency with the coded corpus of eight interview transcripts.

Data analysis

The goal of the analysis was to refine the initial theoretical propositions derived from the literature review. Therefore, this study followed an explanation-building strategy as the principal analytical technique [68]. The analytical process was operationalised through template analysis [74], a form of thematic content analysis that begins with an a priori coding template derived from theory and is subsequently refined through iterative engagement with the empirical material [70].

Coding was organised across four levels based on the propositions outlined in Section 2.1. First, segments were assigned to agglomeration versus network dynamics. Second, references were coded as indicating growth or decline. Third, codes captured the three perspectives of the analytical framework: firm decisions (demand logic), location factors (supply logic), and public policies (steering logic). Fourth, context-specific themes were developed inductively from the material. In this way, the coding scheme combined deductive categories anchored in the propositions with inductive refinement as empirical patterns emerged [75]. The fourth-level codes were iteratively revised during analysis across interviews, documentation, and archival sources. The final coding structure underpinning the analysis, including code definitions, is reported in Appendix E.

All materials were imported into the research software MAXQDA for analysis (Version MAXQDA Analytics Pro, Release 26.2.1, Build 260410, x64). Interviews were analysed in German to minimise translation bias [76]; only selected quotations were translated into English for reporting.

Although the number of primary interviews is modest, this study targets a narrow and specialised expert population (actors formally responsible for firm settlement/relocation and regional development interfaces). Convergence across the six primary interviews, the two public interviews, and the 36 secondary documents meant that no additional themes relevant to the coding template emerged after coding the full corpus. More specifically, no new fourth-level, context-specific themes emerged during the inductive refinement of the coding scheme. Following Moore et al.'s (2026) notion of inductive thematic saturation [77], this indicates that further coding no longer yielded new themes or meaningful refinements within the inductively developed part of the analysis. Saturation is therefore claimed at the level of the focal constructs and the triangulated corpus and not as exhaustive coverage of all relevant actor groups or all APS subsectors in each metropolitan region. The three perspectives of the framework could be addressed with different degrees of directness: location and policy primarily through expert interviews and archival records, and the firm perspective primarily through documentary traces and expert interviews rather than through single corporate interviews.

Based on the coded material, the initial propositions were revised. These revised propositions are derived from the results and presented in the Discussion.

4. Results

4.1. Agglomeration Growth or Decline

I. (a) Agglomeration growth (or decline) is reflected in firms' decisions to either move or not move into the agglomeration

The empirical evidence points toward agglomeration growth rather than decline. Firms' strategic location choices tend to be driven by intertwined cluster benefits, talent accessibility, infrastructural efficiency, workplace attractiveness, and market proximity. This results in a continuing and sometimes renewed inward migration of firms from suburban and extra-regional sites to the metropolitan core. There are no references in the empirical evidence for agglomeration decline from the firms' perspectives.

The empirical material shows that firms deliberately seem to select central urban areas that offer direct cluster advantages, including mature ecosystems characterised by dense supplier networks, inter-firm collaboration, and proximity to customers and markets. As one interviewee explains, *“What we see, which is still important for investors, is that there is already something to dock onto. That there are clusters. It’s more noticeable that companies are looking at this. Can I get into an environment where there is a starting point?”* (Interview 2). These clusters facilitate cumulative learning and technological progress through embedded, reliable connections among firms, service providers, and institutions. A key component of these clusters is perceived to be the availability of high-quality knowledge resources. The empirical material suggests that firms directly benefit from proximity to leading academic and research institutions, which enable joint research initiatives, innovation through spinoffs, and regular knowledge exchange.

This proximity also secures a continuous inflow of highly qualified graduates, directly addressing firms’ demands for specialised talent. As a regional developer explains, *“(…) the inquiries that have been coming in over the last few years are already pretty qualified. They have already made a conscious decision for this location. So they know why they want to come to Dresden.”* (Interview 1). Companies like Apple and Meta cite Munich’s unique talent pool—closely linked to the Technical University—as a decisive locational factor (Documentation 6, 8). Similarly, Bosch and Zeiss have expanded operations in Dresden to capitalise on partnerships with TU Dresden and Fraunhofer institutes (Documentation 17, 22). Some respondents felt that firms also explicitly seek central urban locations because of their advantageous proximity to markets. Munich, for example, was highlighted by one respondent as a strategic European hub, centrally positioned within easy reach of European capitals and international markets, facilitating direct customer engagement and logistical efficiency (Documentation 5). Similar reasoning underlies location decisions in Dresden, as a firm explains it chose the location explicitly to enhance customer interactions and market penetration within Eastern Germany (Documentation 15).

Furthermore, the documents reveal that some firms value accessibility highly, prioritising central locations with effective public transportation infrastructure. Improved cycling infrastructure is also recognised as supportive of low-carbon commuting and enables firms to provide fewer parking spaces for cars (Documentation 7).

Finally, interviewed experts explain that from their experience, the strategic choice of core urban locations is also driven by the quality of the working environment (Interviews 5, 6). Companies prefer prestigious and architecturally distinctive office spaces in vibrant urban areas for representing the firm’s image to clients and attracting scarce, highly skilled talent. An interviewee explains that post-COVID-19, *“(…) you really noticed (..) this countermovement. Everyone wants to go back to the office; everyone wants to be back on site and no longer cramped up at home.”* (Interview 8). For this reason, several respondents said that firms increasingly emphasise the irreplaceable value of physical proximity for informal yet essential interactions such as informal “coffee corner” exchanges, spontaneous brainstorming or rapid prototyping (Interview 4). Consequently, firms actively promote returns to central office environments by investing in flexible, high-quality office designs and prestigious locations that appeal strongly to their workforces. Inside the offices, there are mostly desk-sharing concepts. This leads to firms needing less space in total and space that is used more intensively and can therefore also be more expensive (Interview 6). However, as an experienced economic developer puts into perspective, *“I have already experienced many waves that go in one direction or another. And I don’t think you can make that absolute. These are simply certain trends that are now set. (..) I think that’s also working at the moment.”* (Interview 6). Taken together, these accounts do not point to a uniform return to

pre-pandemic office geographies but rather to a tension between a renewed demand for centrality and a more selective, space-efficient use of core offices.

I. (b) Agglomeration growth (or decline) is reflected in either favourable or disfavourable developments in the location factors

From the location perspective, the empirical material shows that agglomeration growth is supported by a bundle of favourable metropolitan location factors, while at the same time, signs of agglomeration decline emerge through growing scarcity, cost pressure, and labour market constraints. Research institutions, the labour market depth, mobility, attractive real estate, and the broader urban living environment reinforce the attractiveness of metropolitan cores. Yet the same success also generates mounting diseconomies that increasingly constrain further concentration.

In the documentary evidence, Munich and Dresden are characterised as leading European agglomerations, whose distinctive advantages drive sustained growth and attractiveness (Documentation 1, 18). Several sources indicate that a key locational benefit is the variety of research institutions provided by a tight network of universities, research institutes, and innovative start-ups, leading to superior productivity and heightened innovation capacity (Documentation 23; Interviews 1, 4, 8). Metropolitan regions continuously draw young, educated individuals seeking proximity to educational and professional opportunities, resulting in an increased density of skilled labour (Documentation 1, 2).

The respondents view the urban cores as exhibiting particularly dynamic labour markets, characterised by continuous employment growth and a rising share of academic professionals. One interviewee references a “*sticking effect*” that emerges as graduates settle permanently after their studies, adding stability and depth to the local talent pools (Interview 2). Still, attracting additional international talent is essential because of the growing labour demand, as a politician succinctly summarises, “*We have enough jobs. We are looking for people.*” (Interview 3, secondary data). This also points to a possible boundary condition of agglomeration growth: metropolitan labour market depth depends not only on local education and amenities but also on institutional conditions that enable the recruitment and retention of skilled international labour.

Mobility is seen by two interviewees to play a crucial role in enhancing urban locations (Interview 3, secondary data; Interview 6). Highly developed and integrated transportation networks ensure short commuting times, making centrally located workplaces attractive: “*If I’m traveling within Dresden for an hour, it’s never really interesting. Anything less than half an hour would help us a lot in attracting people to this location.*” (Interview 3, secondary data). Additionally, providing effective multimodal transport, including cycling infrastructure and efficient public transport, facilitates accessibility, which is considered essential for attracting talent and maintaining competitive urban cores.

The attractiveness of centrally located real estate offers significantly contributes to agglomeration growth according to a senior head of site development (Interview 6). High demand and scarce availability lead to strong competition for centrally situated office spaces, compelling cities to repurpose retail spaces vacated because of shifts toward e-commerce into premium office properties. Based on many years of experience, the interviewee explains that the pressure to maximise value encourages investments predominantly in knowledge-intensive sectors such as ICT, healthcare, and robotics, while manufacturing and logistics sectors face spatial pressures (Interview 6).

Finally, the broader urban living environment is judged to substantially enhance locational attractiveness (Interview 8). Vibrant urban amenities, including cultural offerings, restaurants, walkable distances and high-quality childcare, alongside green spaces, create a compelling living and working environment, as explained by a person responsible for economic development (Interview 6): “*But you notice that the city as a place to meet and*

experience things, you still have the opportunity to meet up and go out after work. So the whole leisure character still plays a role. Going out in the evening and then shopping from time to time, the city is somehow unbeatable in that respect, i.e., the city centre". These combined factors effectively position cities like Munich and Dresden competitively on an international scale, attracting talent that might otherwise opt for global metropolitan alternatives such as Singapore or Paris (Interview 1).

At the same time, the material also points to emerging signs of agglomeration decline, driven by specific unfavourable developments in location factors. As the head of a unit for business relocation explains, a significant issue is the escalating scarcity of space, as buildable land and suitable office spaces within the urban core become increasingly limited (Interview 1). This scarcity forces municipal authorities to prioritise space allocations toward high-value activities, consequently pushing larger-footprint projects like logistics or extensive manufacturing facilities toward peripheral or suburban areas (Interview 6). The issue has worsened by a pandemic-induced pause in the construction sector, followed by a slowdown due to rising material costs and difficult financing conditions, creating severe shortages in new office and residential developments (Interview 1).

These spatial constraints result in substantial cost pressure, marked by escalating commercial rents, rising residential costs, and elevated local taxes (Archival record 9, Documentation 2). This cost burden is a place-based disadvantage for both employees and firms. According to Interview 5, high living expenses increasingly price out families and new labour market entrants from core urban areas. This fuels labour market effects: the availability of skilled labour tightens as fewer qualified individuals are able or willing to live near central workplaces, which leads to shrinking pools of talent and increasing competition (Archival record 9): *"It is difficult to find new employees at the main location, as rents and the cost of living are very high in Munich, which means that wages are also very high. Switching to new locations where the wage level is lower."* (Documentation 23).

I. (c) Agglomeration growth (or decline) is reflected in institutional actors' policies to either attract firms to or relocate firms from the agglomeration

The empirical evidence underscores a clear institutional orientation toward agglomeration growth in Munich and Dresden. Policy is directed towards attracting, retaining, and functionally concentrating firms and high-value activities in the metropolitan core through economic promotion, spatial planning strategies, infrastructure policy, and strategic cooperation. The empirical material reveals no policy measures designed to relocate firms from the core.

This institutional orientation is visible first in economic promotion. Authorities actively pursue economic promotion by channelling substantial investments into sectors identified as pivotal for regional competitiveness, such as microelectronics, ICT, biotechnology, and advanced materials (Archival record 8). As the head of a unit for business relocation explains, they do acquisition to make firms curious about Dresden, but only for specific branches with high R&D and low space requirements (Interview 1). Dresden alone recently benefited from over 30 billion Euros of combined federal, state, and corporate funding aimed explicitly at a settlement policy to enhance high-tech industries (Interview 4) and reinforcing research collaboration between companies and local universities (Interview 3, secondary data).

Institutional actors implement rigorous spatial planning strategies centred on concentration and centralisation principles, effectively guiding large-scale commercial, residential, and retail developments strictly into existing settlement cores (Archival record 7). Policies mandate inner development over outer development, promoting mixed-use districts and integrating production spaces within city limits through cross-subsidised development models. This strategic spatial planning not only boosts urban density but enhances city

cores as vibrant hubs attractive to talent and high-value economic activities: *“As a result of a consistent urban development strategy that prioritises inner-city over outer-city development, the attractiveness of inner cities and their appeal as residential, commercial and cultural centres, especially for young people and skilled workers, has increased in recent years.”* (Archival record 5). The political goal is to strengthen the metropolitan function and supraregional significance as an economic centre (Archival record 7).

Complementary infrastructure policies support agglomeration growth by prioritising expansions aligned closely with demonstrable corporate demand. Dresden, lacking significant rail hub connections, strategically compensates by strengthening its airport facilities, crucially enhancing international accessibility (Archival record 7). Infrastructure extensions, such as childcare facilities and transit improvements, are executed responsively, driven by immediate economic needs rather than speculative anticipation, thereby ensuring resource efficiency (Interview 1).

Additionally, authorities foster strategic cooperation through structured interactions between public entities, private firms, and research institutions (Archival record 5). Institutional support facilitates clusters and promotes spillover effects mandated by subsidy conditions, explicitly obligating beneficiary firms to engage deeply with universities and local suppliers (Interview 2). Regular investor conferences and collaborative governance frameworks further solidify this cooperation, reinforcing regional economic ecosystems and deepening local embeddedness. Politics is well aware that this strategic cooperation is a long-term task: *“... (it) takes years to grow an ecosystem, you need to continuously work on it and set the right incentives”* (Interview 2).

Overall, the empirical material shows that policy in both regions is designed to reinforce rather than weaken agglomeration. Economic promotion, spatial planning, infrastructure provision, and strategic cooperation all work in the direction of continued concentration in the metropolitan core.

4.2. Peripheral Growth or Decline

II. (a) Peripheral growth (or decline) is reflected in firms' decisions to either move or not move into the periphery

The empirical material points to a mixed pattern of peripheral growth and decline. Firms increasingly establish locations in areas immediately surrounding Munich and Dresden in order to benefit from spillover effects and, in some cases, from the greater locational flexibility enabled by digitalisation and hybrid work. At the same time, labour shortages and bureaucratic hurdles limit the attractiveness of peripheral locations and can even trigger recentralisation into the metropolitan core.

Empirical evidence suggests peripheral growth as firms increasingly establish locations in areas immediately surrounding Munich and Dresden (Interviews 1, 5). Firms actively leverage spillover effects from urban cores, capitalising on core-city infrastructure advantages such as transportation connectivity and urban amenities while benefiting from lower land prices and less restrictive zoning regulations beyond city limits. Notably, businesses frequently situate themselves precisely at municipal boundaries, allowing them to utilise these benefits and market themselves with prestigious urban addresses (Interview 1). However, this is not always a conscious decision: *“And some firms are basically not even aware that they are located in the district of Munich if they are now located in a municipality. How can I put it? By and large, it is Munich's affluent suburbs from which the companies benefit. And the further away the companies come from, the less they realise what the district of Munich actually is. For them, it is the city of Munich.”* (Interview 5).

Additionally, digitalisation further facilitates peripheral expansion, as an interviewee notes, particularly benefiting technology-oriented sectors such as software and IT

services (Interview 5). The adoption of hybrid work models significantly reduces the necessity for extensive central office spaces, enabling businesses to effectively operate from decentralised locations (Interview 2). This shift is particularly observable among younger, digitally proficient companies whose employees primarily work remotely, emphasising flexibility and reducing reliance on traditional office setups (Interview 5). Consequently, as the head of a strategic investment projects unit explains, digital infrastructure enhancements enable peripheral growth without sacrificing the benefits derived from proximity to metropolitan hubs (Interview 2). This suggests that peripheral growth is often not fully autonomous but remains dependent on continued functional and symbolic attachment to the metropolitan core.

Despite these signs of peripheral growth, the material also indicates vulnerabilities that can contribute to peripheral decline. Firms are directly and negatively impacted by a shortage of skilled workers. Companies located in peripheral areas struggle to attract and retain skilled labour, facing challenges in recruiting successors for retiring executives and appealing to younger professionals who generally prefer the amenities and conveniences of urban life (Documentation 21). One firm reports that it will cut down locations because of the shortage of skilled workers (Archival record 13). According to a head of firm services and site development, several firms report negative workforce impacts following peripheral relocation, as employees are frequently unwilling to compromise on central-city accessibility and urban lifestyle benefits: *“I was surprised myself that firms from the surrounding areas or from the periphery are moving back into the city. That was a surprising realisation for me, because I always thought that firms which moved to the suburbs would perhaps have thought carefully beforehand and actually arrived there quite happily. But they say it has mostly led to a loss of jobs, in other words also to an outflow of workers, because the workers obviously prefer to work centrally.”* (Interview 6).

Additionally, firms emphasise that increasing bureaucracy and regulatory hurdles substantially hinders their business operations in peripheral regions (Archival records 10, 11, 12, 13). One firm mentions too many authorities, requirements and regulations that hinder the implementation of projects (Archival record 12). Challenges further include protracted processes for acquiring commercial property, as another firm claims that *“(. . .) it takes half a century for everything to be approved.”* (Archival record 10). Further, firms criticise high administrative costs and a perceived stagnation in essential digital infrastructure developments, notably broadband expansion (Archival record 11). Consequently, such persistent bureaucratic obstacles have compelled some businesses to consider downsizing or relocating entirely back to urban cores, highlighting a critical area of fragility in peripheral growth dynamics (Archival record 13).

II. (b) Peripheral growth (or decline) is reflected in either favourable or disfavorable developments in the location factors

From the location perspective, the empirical material shows that peripheral areas combine single advantages that can support growth with structural disadvantages that can support decline. Hard location factors such as cheaper and more available land, lower real estate costs, and quality-of-life advantages can make peripheral regions attractive. At the same time, demographic change, infrastructure deficits, and fragmented settlement structures limit their capacity to sustain broader and more stable growth.

The empirical material shows signs of peripheral growth, supported by favourable developments in several locational aspects. Peripheral regions become attractive through hard location factors such as more affordable and available land, competitive real estate prices, and supportive local infrastructure, including municipal innovation hubs and start-up centres (Documentation 1, 23; Interviews 2, 3, 7). These advantages are particularly appealing in contrast to the saturated and expensive urban cores (Documentation 1): *“While*

the housing markets and infrastructure in metropolitan areas are reaching their limits in some cases, there is still plenty of room for growth here”.

Further, peripheral regions increasingly capitalise on improved quality of life, attracting middle-class families and young professionals seeking spacious living environments with gardens, lower housing costs, and closer proximity to nature (Documentation 23). The recent socio-demographic shift towards suburban and rural areas has been further accelerated by changes in work practices resulting from digitalisation and amplified by the lifestyle adjustments prompted by the COVID-19 pandemic (Documentation 2). *“Even in rural areas, there are still attractive and productive communities that utilise and maintain their specific locational advantages, which include a vibrant social structure, a strong sense of tradition and natural resources.”* (Archival record 5). Thus, there are individual indications that peripheral areas could offer attractive environments for both residential and professional purposes, reinforcing sustained growth and integration with metropolitan dynamics.

Despite this, structural challenges indicate decline within peripheral regions, shaped by unfavourable developments in location-specific conditions. A critical factor is demographic change, particularly characterised by shrinking populations and rapid ageing, disproportionately affecting rural areas compared to urban cores (Archival record 5). Youth and graduate out-migration toward urban centres exacerbate local skill shortages, further straining the workforce and limiting economic vitality. However, this is not black and white, as Archival record 5 states: *“(. . .) population growth and shrinkage are taking place to varying degrees, often in close proximity, both in densely populated areas and in rural areas and their sub-regions”.*

Moreover, peripheral regions struggle with pronounced infrastructure deficits. This demographic trend severely undermines the sustainability of essential public services, such as childcare facilities, public transportation, and even basic utilities (Interview 3, secondary data). Other essential services, like broadband internet and road infrastructure, frequently lag behind urban standards, impeding access to educational institutions, training centres, and workplaces (Archival record 5). This situation adversely affects apprentices and trainees who often cannot reach their training locations reliably, intensifying workforce challenges and diminishing the attractiveness of peripheral regions (Interview 3, secondary data).

Compounding these issues is the problematic settlement structure found particularly in Eastern Germany, where fragmented, dispersed settlements hinder the formation of productive spillover effects between universities, research facilities, and businesses (Documentation 19). Such spatial configurations reduce opportunities for innovation-driven economic growth that typically flourish in denser, urbanised cores. Consequently, these combined challenges of demographic shifts, inadequate infrastructure, and fragmented settlement patterns underscore systemic vulnerabilities that could lead to peripheral decline.

II. (c) Peripheral growth (or decline) is reflected in institutional actors’ policies to either attract firms to or relocate firms from the periphery

The empirical material shows that public policy can actively support peripheral growth, particularly through social infrastructure, strategic cooperation, mobility measures, and incentives linked to land use and taxation. At the same time, these efforts remain constrained by financial limitations and unresolved mobility gaps, which can undermine the longer-term effectiveness of peripheral development strategies. Policy therefore appears both as a potential enabler and inhibitor of peripheral upgrading.

Some institutional actors across the federal states of Saxony and Munich actively promote peripheral growth through deliberate policy decisions and strategic interventions. A central element of this strategy is the proactive development of social infrastructure, ensuring the availability of affordable housing, childcare facilities, schools, healthcare,

and cultural amenities (Interview 5, Archival record 7). Policies such as the state price for building culture highlight efforts to foster inclusive, high-quality regional growth and alleviate fears of becoming mere overflow areas for urban centres (Interview 7, secondary data). This emphasis on comprehensive social infrastructure seeks to retain young families, attract diverse demographics, and enhance overall living conditions also in the areas of culture and leisure (Archival record 5).

Moreover, regional authorities prioritise strategic cooperation between urban cores and peripheral areas, exemplified by initiatives such as the Dresden Adventure Region and targeted collaborations among municipalities and counties (Archival record 7). Through a decentralised concentration approach, authorities aim to create robust networks of basic, medium and upper centres, facilitating economic integration and balanced spatial development (Archival records 5, 7). Regular interactions, joint planning activities, and unified regional marketing reinforce a cooperative framework, significantly enhancing regional resilience and attractiveness (Interviews 1, 3).

In the area of mobility, substantial policy efforts focus on expanding and integrating transport infrastructure. Initiatives include unified regional transit tariffs, enhancements of public transport links, and strategic road and rail developments to ensure seamless connectivity between urban cores and peripheral regions (Interview 3, secondary data; Interviews 6 and 7): *“There must be a flat rate for this region. It is unacceptable that we need three tickets to travel from Munich to Augsburg. And we have been working hard for a long time to push this forward.”* (Interview 7, secondary data). These mobility investments not only support daily commuting but also expand the functional metropolitan area, making peripheral regions more accessible and attractive to businesses and residents alike (Archival record 7).

Finally, policies related to incentives and land use policy can constitute levers for stimulating peripheral growth. Municipalities outside the core deliberately use lower commercial tax rates to attract firms, alongside targeted land use planning that designates and fast-tracks zoning for commercial and industrial developments (Interviews 5, 7). Anchor projects, such as the TSMC’s semiconductor facility near Dresden, are strategically coupled with supplier location requirements within a defined geographical radius, ensuring distributed economic benefits (Interview 1). Additionally, statewide initiatives actively channel substantial funds into research and development, firmly embedding innovation-driven growth within peripheral settings (Interview 4). As a head of project management explains, *“...being a place for research and innovation does not happen by itself and over 3% of Saxony’s GDP is spent on R&D, one of the highest levels in Germany”* (Interview 4). Substantial regional funding programs further enhance attractiveness by targeting specific industries and technological fields, fostering new clusters, such as the large-scale research centre, which was explicitly established in a rural area of Lusatia (Interview 4). As there are no more areas available within the city of Dresden, land use planning aims for an approximately equal distribution of the potential areas to be designated across the districts (Archival records 5, 7).

At the same time, the empirical material highlights individual key policy-related constraints contributing to peripheral decline, particularly in finances. Strained municipal budgets limit the capacity of local governments to co-finance critical infrastructure projects, such as business parks or public services (Interview 3, secondary data; Documentation 23). Financial constraints also affect the ability to sustain transportation systems over time. As costs rise and subsidies shrink, some municipalities are unable to maintain their existing service levels, placing additional pressure on already limited development opportunities in peripheral areas (Archival records 5, 7). Mobility gaps, in turn, reflect institutional difficulties in providing consistent and regionally coordinated transportation coverage. In sparsely populated areas, inadequate transit options reduce accessibility to workplaces,

education, and services, further deterring firms and residents (Interview 3; secondary data; Archival record 7). Although some policy responses aim to engage local communities in developing context-specific mobility solutions, these efforts often lack the structural support and long-term funding needed for effective implementation. As a result, peripheral regions remain underserved, with fragmented infrastructure undermining broader economic integration (Archival record 5). The policy material therefore reveals an internal tension between the goal of balanced territorial development and the limited fiscal and infrastructural capacity available to realise it in weaker peripheral areas. Together, these financial constraints and unresolved mobility gaps reveal how institutional limitations can undermine peripheral development, turning policy from a potential enabler into a structural barrier to regional integration.

5. Discussion

Mechanisms of metropolitan concentration and diffusion

The results can be synthesised into four configurations summarising how different combinations of firm, location and policy mechanisms reinforce agglomeration, generate internal limits to agglomeration, enable balancing peripheral growth, or contribute to reinforced peripheral decline.

The findings reaffirm the continued significance of agglomeration economies for APS location strategies. Several firms in both regions prioritise clustered environments that provide access to specialised suppliers, research institutions and highly skilled labour, corresponding to Duranton and Puga's [29] "sharing, matching, and learning" mechanisms. At the same time, respondents emphasise symbolic and lifestyle dimensions of central locations: high-quality urban amenities, prestigious office environments and reputational advantages are seen as important assets for attracting clients and talent, echoing Hanssens et al.'s [21] argument that APS competitiveness depends on infrastructural and reputational advantages alike. These elements come together in the configuration of reinforcing agglomeration (Proposition 1), in which firms' deliberate moves into the core, dense knowledge and labour markets and policy priorities favouring inner-city development and core clusters jointly sustain cumulative growth in metropolitan centres.

Yet the findings also suggest that agglomeration may not be uniformly beneficial. The post-COVID-19 return to office environments highlights the continued importance of informal, face-to-face interaction for complex coordination and trust-based relations [8,32]. At the same time, core locations, particularly Munich, experience rising real estate prices, congestion, scarcity of developable space and tightening labour markets. These pressures exemplify van Meeteren et al.'s [30] argument that agglomeration effects are "fuzzy", context-dependent and potentially self-limiting. In the configuration of emerging limits to agglomeration (Proposition 2), such diseconomies arise endogenously from successful core growth: firms do not systematically withdraw from the core, and public authorities do not pursue explicit deconcentration strategies, but locational conditions become increasingly constraining. This pattern suggests that initial rounds of reinforcing agglomeration can, over time, generate internal tensions that make further concentration more difficult, even without deliberate decentralisation policies.

Peripheral development presents an equally nuanced picture. In line with Meijers and Burger's [38] concept of "borrowed size", firms at the metropolitan edge exploit cost advantages and infrastructural spillovers from the core: they benefit from access to large labour markets, research institutions and transport infrastructures while locating in places with lower land prices and attractive residential environments. In Munich, several smaller municipalities benefit from such dynamics, contributing to a polycentric pattern of balancing peripheral growth (Proposition 3) in which core and periphery are functionally

complementary. Here, firm strategies, favourable peripheral location factors and selective policy support (for example, investments in social infrastructure and cooperation arrangements) jointly underpin peripheral upgrading, even though mobility gaps and tight municipal finances make this growth fragile.

Dresden's periphery, by contrast, exhibits only selective gains, mainly in Chemnitz, Zwickau and a few rural areas, and more closely resembles a monocentric structure. Peripheral municipalities are affected by demographic ageing, thin settlement structures and underfunded infrastructures, conditions consistent with Kühn's [35] concept of peripheralisation. Firms outside the core often struggle to attract skilled workers, as younger professionals favour urban amenities, while bureaucratic delays and insufficient broadband provision further weaken their competitiveness. In some cases, these constraints trigger recentralisation into core areas, echoing Volgmann et al.'s [40] notion of an "agglomeration shadow". In the configuration of reinforced peripheral decline (Proposition 4), firms' reluctance to locate in the periphery, adverse locational conditions and fiscally constrained policies mutually amplify one another, resulting in cumulative disadvantage.

Taken together, the refined propositions condense the detailed empirical findings into a limited set of recurrent configurations in the firm–location–policy nexus (Table 3). Collectively, they indicate that metropolitan development is best understood as a shifting equilibrium in which concentration and diffusion can coexist, and in which peripheral trajectories depend on whether complementary firm strategies, locational assets and institutional capacities align.

Table 3. Configurations in firm–location–policy nexus underlying metropolitan outcomes.

	Core/Agglomeration	Periphery/Network
Growth-dominated	Reinforcing agglomeration (Proposition 1) firm: ↑	Balancing peripheral growth (Proposition 3) firm: ↑
	Deliberate moves into core, cluster advantages, proximity to research and clients location: ↑	Selective peripheral siting, hybrid work enabling decentralised offices location: ↑
	Dense knowledge, labour market depth, accessibility, urban amenities policy: ↑	Cheaper and available land, quality-of-life advantages, emerging clusters policy: +/–
	Spatial planning and promotion favour inner-city development and core clusters	Targeted social infrastructure and incentives, but mobility gaps and tight finances
Decline-dominated	Emerging limits to agglomeration (Proposition 2) firm: 0	Reinforced peripheral decline (Proposition 4) firm: ↓
	No systematic withdrawal from core location: ↓	Reluctance to move to periphery; recentralisation due to recruitment problems location: ↓
	Scarcity of space, cost pressure, congestion, tight labour markets policy: 0	Demographic ageing, infrastructure deficits, thin settlement structures policy: ↓
	Continued pro-core investments, no explicit deconcentration strategy	Fiscal constraints and mobility cuts limit compensatory investments

Note: arrows indicate whether respective mechanisms predominantly support growth (↑), reinforce decline (↓), have mixed effects (+/–), or have no effect (0).

Across these configurations, digitalisation and hybrid work emerge as a cross-cutting mechanism that may reconfigure the firm–location–policy nexus. Hybrid arrangements loosen the need to anchor all APS activities in a single central office and enable smaller, more differentiated location portfolios, including satellite and peripheral sites. Yet this does not eliminate the importance of metropolitan cores, since client contact, recruitment,

tacit knowledge exchange and informal coordination continue to benefit from dense urban environments. Digitalisation may therefore ease some pressures in the core, support selective peripheral growth in accessible and digitally connected locations, and extend policy challenges to the wider metropolitan region. In the medium to long term, the likely effect is less a simple displacement of agglomeration than a reorganisation of how agglomeration and network economies are combined across metropolitan space.

Re-reading outcome-based studies on Munich and Dresden

The four configurations provide a lens for revisiting the outcome-based studies summarised in Table 1 and for clarifying why prior quantitative findings for Munich and Dresden appear partly divergent.

The temporal relation between the quantitative studies that motivated the case selection and the qualitative corpus requires clarification. The primary interviews were conducted between 2024 and 2025, and much of the documentary and archival material was also assembled later, so the qualitative material cannot be treated as a direct reconstruction of the mainly pre-2021 observation windows covered by the quantitative studies. At the same time, the interviews were designed to capture aggregated professional observations over several years, while the documentary and archival material captures both longer-running institutional orientations and more recent developments. On this basis, several mechanisms identified qualitatively are likely to have been operative already in the earlier period, including cluster advantages, proximity to research institutions, labour market depth, accessibility, core–periphery cost differentials, and pro-core planning orientations. By contrast, hybrid work, reduced office footprints, return-to-office dynamics, and the construction and real estate slowdown are more plausibly interpreted as later modifiers. The qualitative analysis is therefore used primarily to unpack the mechanisms that may underlie the earlier quantitative patterns while also signalling that some elements of the empirical material are more plausibly related to recent post-2019 developments.

For Munich, Wagner [13] identifies decentralised concentration in which small towns contribute to regional growth, while Wagner and Growe [14] emphasise core-led relative reurbanisation, with exceptionally strong core growth and only slightly above-average growth in surrounding municipalities. Network analyses [16,17] similarly show Munich's persistent core centrality alongside connectivity gains in hinterland areas, suggesting a widening regional APS network rather than a further strengthening of the core alone. Read through the configurations, these results are complementary: strong and persistent core performance corresponds to reinforcing agglomeration, whereas hinterland expansion corresponds to balancing peripheral growth. Munich therefore exhibits both processes simultaneously: a reinforcing core and selective peripheral upgrading that borrows size from that core.

For Dresden, the quantitative literature largely depicts a more monocentric structure. Wagner [13] reports strong core specialisation in analytical knowledge and weak spillovers, and Wagner and Growe [14,15] similarly portray medium-sized towns as “average”, consistent with limited functional upgrading beyond the core. At the same time, Zöllner et al. [17] observe declining national connectivity for Dresden alongside gains in nearby secondary cities and some rural areas, plus improved global connectivity, indicating selective redistribution and role shifts; earlier work also highlights co-location tendencies and strengthening network effects [16]. The qualitative evidence suggests that these patterns reflect a combination of reinforcing agglomeration in the core, reinforced peripheral decline across much of the hinterland, and localised instances of balancing peripheral growth around a few smaller centres and rural areas. The mechanisms identified in the case study, labour shortages, bureaucratic hurdles and uneven infrastructure provision, help explain why such peripheral gains remain partial and fragile.

In this perspective, the present case study does not contradict the outcome-based literature but re-contextualises it. The four configurations clarify why the same regional system can simultaneously exhibit indicators of decentralised concentration and core-led reurbanisation (Munich), or core-centred growth alongside selective but fragile peripheral gains (Dresden). Apparent inconsistencies between studies thus largely reflect different slices through the underlying firm–location–policy configurations: some analyses primarily capture reinforcing agglomeration; others capture elements of balancing peripheral growth or reinforced peripheral decline. By specifying the mechanisms through which APS strategies, locational assets and institutional interventions interact, the qualitative configurations extend the existing quantitative work and provide a framework for interpreting seemingly divergent findings.

Contributions and boundary conditions

Conceptually, this paper advances a mechanism-based account of APS-driven metropolitan development that foregrounds the interaction of firms, locations, and public authorities. Instead of treating metropolitan concentration and diffusion as descriptive outcomes of employment or connectivity, it specifies how configurations of corporate strategies, place-based assets, and institutional steering co-produce trajectories of core growth, endogenous constraints, selective peripheral upgrading, and cumulative peripheral disadvantage.

A first contribution is to recast concentration and diffusion as recurrent configurations rather than a binary opposition. The four refined propositions translate abstract notions of agglomeration and network economies into empirically tractable bundles. They show that similar outcome patterns can reflect different underlying processes, and that apparently divergent indicators may capture different facets of the same metropolitan system. This configurational view helps explain why studies focusing on different indicators or spatial scales can arrive at seemingly inconsistent conclusions about the same region.

Second, the findings refine relational views of the firm–territory nexus. APS firms are not simply adjusting to pre-given spatial structures; their multilocation strategies, client-following behaviour and responses to infrastructural and regulatory frameworks actively reshape metropolitan space. At the same time, the analysis underscores that the firm perspective represents a selective reading of the broader location perspective, as firms privilege certain assets (e.g., proximity to research, labour market depth, prestige) while other locational features become relevant only when activated by policy. Conceptually, this supports treating the firm, location and policy logics as distinct but interdependent dimensions, rather than collapsing territorial development into either corporate decision making or structural endowments alone.

Third, this study nuances debates on polycentricity, borrowed size and peripheralisation. The analysis of Munich and Dresden illustrates that peripheral development is not uniformly expansive or uniformly declining. Instead, metropolitan regions exhibit shifting balances between compensating and reinforcing tendencies at the edge: selected municipalities can borrow size from strong cores, while others fall into trajectories of cumulative disadvantage. The same national framework can thus support different constellations of peripheral upgrading and peripheral decline, depending on regional structure and institutional capacity. This suggests that empirical assessments of polycentricity and peripheralisation need to attend to underlying sets of mechanisms rather than infer processes directly from outcome indicators.

These contributions are qualified by several boundary conditions. Empirically, this study is confined to Germany as a federal, polycentric country, which supports the analytical generalisation of mechanisms but restricts statements about broader prevalence across national institutional frameworks. The qualitative design foregrounds explanatory depth rather than causal identification, and the evidence base, while triangulated

across documents, archival records, and expert interviews, captures APS dynamics as one segment of the knowledge economy, primarily from the perspective of institutional and intermediary actors rather than from internal corporate decision-making processes. The firm perspective within the firm–location–policy nexus is therefore reconstructed indirectly, through actors who advise and support multiple firms and through documentary traces of firm behaviour, rather than observed directly at the level of corporate strategy. This strengthens this study's ability to identify recurring patterns across multiple location cases, but it limits the completeness with which internal firm logics can be captured.

A further limitation concerns the temporal relation between the motivating quantitative studies and the qualitative corpus. While several mechanisms identified in the qualitative material are likely to be more temporally durable, others, especially those linked to hybrid work, office restructuring, and post-pandemic real estate adjustment, are more plausibly interpreted as later developments.

These limitations determine where the configurations can be most plausibly applied: as an interpretative framework for mechanism diagnosis and not as a substitute for longitudinal measurements or for firm-level causal inference.

While the empirical analysis is Germany-based, the mechanisms are unlikely to be uniquely German. Their transferability is, however, conditional. The configurations are most plausibly applicable in polycentric settings in which subnational actors retain meaningful planning, fiscal, and coordination capacity over land use, infrastructure, and economic development, and in which APS growth can draw on dense knowledge institutions, strong metropolitan accessibility, and sufficiently deep labour markets. One additional boundary condition concerns migration and labour policy. In the German case, metropolitan labour pools are supported not only by local universities and research institutes but also by the capacity of firms and regions to recruit internationally within a supportive national institutional framework. In more restrictive immigration regimes, in labour markets with weaker matching capacities, or in more centralised national settings with more limited subnational steering capacities, reinforcing agglomeration may be harder to sustain because metropolitan cores cannot gain specialised labour as easily. Where agglomeration does occur, labour market constraints may become binding earlier, even if other diseconomies such as congestion or land scarcity are less pronounced. Selective peripheral upgrading may also remain weaker because peripheral locations depend on spillovers from strong cores while often facing even greater recruitment difficulties of their own.

6. Conclusions

This paper examines how the growth and decline of agglomerations and peripheries in metropolitan regions can be understood through APS firm decisions, locational conditions, and institutional policy. Using an embedded qualitative case study design, it shows that APS-driven metropolitan development cannot be captured adequately by dichotomies of concentration versus diffusion or by outcome indicators alone. Instead, metropolitan trajectories are configuration-specific: depending on how firm strategies, place-based assets, and public steering interact, APSs can reinforce core dominance, generate endogenous limits to agglomeration, enable selective peripheral upgrading, or reproduce cumulative peripheral decline.

Future research can extend this approach in four directions. First, comparative studies across national institutional settings could test how far the configurations travel beyond Germany's polycentric context and whether additional configurations emerge in more monocentric systems. Second, designs that combine qualitative mechanism tracing with longitudinal quantitative analysis could assess when regions shift between configurations and how strongly particular mechanisms predict subsequent spatial outcomes. Third,

research could incorporate additional relational data, such as digital collaboration ties, to move beyond headcounts and office locations when locating APS knowledge creation under hybrid work models. Fourth, extending the framework to adjacent sectors, including high-tech manufacturing, would clarify whether similar configurations govern broader knowledge economy restructuring.

For policy and practice, the findings underline that balanced territorial development is unlikely to arise from market dynamics alone. Where reinforcing agglomeration dominates, continued core-oriented policies without attention to emerging limits risks locking metropolitan regions into high-cost, congested equilibria. In such cases, policy needs to move from simply promoting the core towards managing agglomeration diseconomies, for example, through land use strategies and housing and transport policies that alleviate bottlenecks. Under conditions of hybrid work, APS development can no longer be governed through core-city policies alone but increasingly requires the metropolitan-scale coordination of broadband, mobility, and land use, within supportive state and national frameworks. At the metropolitan edge, the analysis highlights a persistent “chicken and egg” dynamic: firms tend to avoid locations lacking adequate mobility, childcare and digital infrastructure, yet such investments are often postponed until business demand is visible. This self-reinforcing dynamic suggests the need for more anticipatory planning, particularly in fiscally constrained regions. Where balancing peripheral growth is plausible, the evidence suggests prioritising those municipalities that already possess minimum thresholds of connectivity and labour market depth, and that stabilising upgrading through reliable social and transport infrastructure may offer greater leverage than diffuse support to structurally weak areas characterised by reinforced peripheral decline. Where reinforced peripheral decline prevails, interventions face harder constraints: without addressing structural mobility, digital infrastructure, and fiscal capacity, peripheral disadvantage is likely to remain cumulative, implying a need for explicit, politically negotiated choices about long-term service provision and the selective concentration of functions.

More broadly, the results point to the importance of configuration-sensitive metropolitan governance. In both case regions, institutional interventions predominantly strengthened cores, while peripheral policies remained fragmented and project-based. Strengthening governance arrangements that coordinate tax bases, mobility, land use and economic development across municipal boundaries could help align strategies for cores and surrounding areas, reduce zero-sum competition and stabilise fragile forms of peripheral upgrading. The appropriate mix of instruments will vary by configuration: managing growth where agglomeration is reinforcing; consolidating and supporting complementarities where peripheral growth is emerging; and, where decline is reinforced, engaging in more fundamental debates about long-term service provision and the selective concentration of functions.

Overall, the central conclusion is that APS location dynamics and metropolitan spatial outcomes are co-produced by firms, places, and policies, and that their interplay can be captured through a limited set of recurrent configurations. Diagnosing which configuration dominates in specific sub-areas and aligning policy mixes accordingly offers a more robust basis for analysis and intervention than generic narratives or approaches that focus on aggregate outcomes or single actors in isolation.

Author Contributions: Conceptualisation, S.Z.; methodology, S.Z.; formal analysis, S.Z.; investigation, S.Z.; writing—original draft preparation, S.Z.; writing—review and editing, U.J. and A.A.; supervision, U.J. and A.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Cranfield University Research Ethical Approval, Reference CURES/24066/2024, Project ID: 27390, on 14 December 2024.

Informed Consent Statement: Verbal informed consent was obtained from all participants before the interviews commenced. Written consent was not obtained because the consent process was integrated into the interview procedure and documented orally prior to participation.

Data Availability Statement: The data for the documentation and archival records can be accessed via the links provided in Appendix C. The raw interview data are not publicly available due to privacy restrictions. Anonymised transcripts in German are available from the authors upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Cranfield University Research Ethical Approval



14 December 2024

Dear Mrs. Zöllner,

Reference: CURES/24066/2024

Project ID: 27390

Title: The local and global structure of the knowledge economy in Germany: Dynamics and differences at the city-firm nexus

Thank you for your application to the Cranfield University Research Ethics System (CURES).

We are pleased to inform you your CURES application, reference CURES/24066/2024 has been reviewed. You may now proceed with the research activities you have sought approval for.

If you have any queries, please contact CURES Support.

We wish you every success with your project.

Regards,

CURES Team

Appendix B

Short profiles of metropolitan regions Munich and Dresden

In terms of the demographic development, the populations of the largest cities, such as Berlin, Hamburg, Munich, Cologne and Frankfurt, were growing until the outbreak of the COVID-19 pandemic. In contrast, small and medium-sized cities lost inhabitants from 2005 to 2019 [78] but seem to have regained them [79]. The more centrally located ones are growing again.

Dresden, located in the east of Germany, has around 500,000 inhabitants and is recognised for its strong IT cluster. Unlike many other metropolitan areas, it lacks an industrialised hinterland. The wider metropolitan region, situated in the federal state of Saxony, covers roughly 1200 km² and is home to about 900,000 people. It encompasses smaller cities such as Meissen, Pirna, and Radebeul as well as surrounding rural areas. The region is known for its research infrastructure: the Fraunhofer Society maintains six institutes and sub-institutes here—more than in any other German region—making it a significant location for micro-technical production.

Munich, in Southern Germany, has a population of about 1.5 million and forms the core of a larger metropolitan region. Known for its traditional strength in the automotive industry, it is also one of Germany's three largest cities, alongside Berlin and

Hamburg. The metropolitan region of Munich, located in the federal state of Bavaria, has 6.2 million inhabitants spread over 26,000 km² and benefits from a strong economic base in its surrounding areas. Munich is also Germany's second-largest higher education location, hosting 22 universities, colleges, and academies, which further underpins its role as a leading centre of innovation and knowledge production.

Appendix C

Data sources

Documentation

Document Name	Document Title	Subunit	Year	Link
Documentation 1	Prognos Zukunftsatlas	Munich	2022	https://www.prognos.com/de/zukunftsatlas , accessed on 11 December 2024
Documentation 2	Landlust neu vermessen	Munich	2022	https://www.berlin-institut.org/fileadmin/Redaktion/Publikationen/Berlin-Institut___Wuestenrot_Stiftung_Landlust_neu_vermessen.pdf , accessed on 19 February 2025
Documentation 3	Bedeutung unternehmensnaher Dienstleistungen für den Industriestandort Deutschland	Munich	2021	https://www.bmwk.de/Redaktion/DE/Publikationen/Studien/Studie-Industrie-und-Dienstleistungen.pdf?__blob=publicationFile , accessed on 19 February 2025
Documentation 4	OpenAI kommt nach München	Munich	2025	https://www.br.de/nachrichten/wirtschaft/hightech-standort-wird-noch-staerker-openai-kommt-nach-muenchen,Uc6rZem and https://www.br.de/nachrichten/netzwelt/chatgpt-firma-openai-eroeffnet-erstes-deutsches-buero-in-muenchen,Uc1wmmC , accessed on 19 February 2025
Documentation 5	neues europäisches HQ in München	Munich	2024	https://www.merkur.de/wirtschaft/deutschland-headquarter-neue-zentrale-dmg-mori-muenchen-irene-bader-standort-zr-93023938.html , accessed on 11 December 2024
Documentation 6	Meta eröffnet Büro	Munich	2023	https://www.abendzeitung-muenchen.de/muenchen/nach-google-und-apple-naechster-internet-riese-zieht-nach-muenchen-buero-eroeffnung-im-oktober-art-921539 and https://about.fb.com/de/news/2023/08/meta-eroeffnet-buero-in-muenchen/ , accessed on 2 May 2025
Documentation 7	Google	Munich	2020	https://www.sueddeutsche.de/muenchen/muenchen-google-postpalast-entwicklungszentrum-1.5032823 , accessed on 2 May 2025
Documentation 8	Apple	Munich	2020	https://www.sueddeutsche.de/muenchen/apple-muenchen-neuer-standort-1.4761133 , accessed on 2 May 2025
Documentation 9	Amazon	Munich	2021	https://www.aboutamazon.de/news/arbeiten-bei-amazon/amazon-and-the-city-in-muenchen-daheim and https://www.sueddeutsche.de/muenchen/muenchen-parkstadt-schwabing-immobilien-argenta-1.4659068 , accessed on 19 February 2025

Document Name	Document Title	Subunit	Year	Link
Documentation 10	Ifo Bericht	Dresden	2016	https://www.ifo.de/DocDL/ifoDD_16-04_34-44_Kluge.pdf , accessed on 11 December 2024
Documentation 11	Prognos Zukunftsatlas	Dresden	2022	https://www.prognos.com/de/zukunftsatlas , accessed on 11 December 2024
Documentation 12	Landlust neu vermessen	Dresden	2022	https://www.berlin-institut.org/fileadmin/Redaktion/Publikationen/Berlin-Institut_Wuestenrot_Stiftung_Landlust_neu_vermessen.pdf , accessed on 19 February 2025
Documentation 13	Bedeutung unternehmensnaher Dienstleistungen für den Industriestandort Deutschland	Dresden	2021	https://www.bmwk.de/Redaktion/DE/Publikationen/Studien/Studie-Industrie-und-Dienstleistungen.pdf?__blob=publicationFile , accessed on 24 February 2025
Documentation 14	Bundesinstitut für Bau-, Stadt- und Raumforschung BBSR	Dresden	2023	https://www.bbsr.bund.de/BBSR/DE/forschung/programme/exwost/Studien/2020/wirtschafts-kleinstaedte/01-start.html?pos=3 , accessed on 24 February 2025
Documentation 15	Neuer Standort in Dresden	Dresden	2021	https://www.opus-marketing.de/opus-marketing-eroeffnet-neuen-standort-in-dresden/#:~:text=Endlich%20k%C3%B6nnen%20wir%20verk%C3%BCnden,%20dass,aus%20den%20%C3%B6stlichen%20Bundesl%C3%A4ndern%20erreichbar , accessed on 19 September 2024
Documentation 16	Fraunhofer holt koreanische Forschungs- förderung nach Dresden	Dresden	2024	https://www.ikts.fraunhofer.de/de/presse/pressemitteilungen/2024_2_21_p_fraunhofer_ikts_holt_koreanische_forschungsfoerderung_nach_dresden.html#:~:text=Fraunhofer%20IKTS%20holt%20koreanische%20Forschungs%C3%B6rderung%20nach%20Dresden,-21.&text=Das%20Fraunhofer%20IKTS%20und%20das,Dresden%20unter%20einem%20Dach%20zusammen , accessed on 19 September 2024
Documentation 17	Erste AIoT Fabrik von Bosch, mit KI gesteuert	Dresden	2024	https://www.bosch-presse.de/pressportal/de/de/bosch-eroeffnet-chipfabrik-der-zukunft-in-dresden-230080.html , accessed on 11 December 2024
Documentation 18	Messestandort Dresden	Dresden	2021	https://www.messe-dresden.de/veranstalter/messestandort-dresden , accessed on 19 September 2024
Documentation 19	ifo Institut—Leibniz- Institut für Wirtschaftsforschung an der Universität München e.V	Dresden	2018	https://www.ifo.de/publikationen/2018/aufsatz-zeitschrift/mit-gazellen-gegen-arbeitsplatzverluste-eine-analyse-schnell , accessed on 11 December 2024
Documentation 20	Kompetenzzentrum «Green ICT»	Dresden	2022	https://www.forschungsfabrik-mikroelektronik.de/de/presse-und-medien/Presse/PI_Start_GreenICT.html , accessed on 2 October 2024
Documentation 21	Bericht über Geschäftsstelle der Allianz in Meissen	Dresden	2022	https://www.wachstumsregion-dresden.de/erfolgsgeschichten/unternehmen/allianz-beratungs-und-vertriebs-ag , accessed on 2 May 2025
Documentation 22	Zeiss baut Standort in Dresden aus	Dresden	2024	https://www.saechsische.de/lokales/dresden/vorstandschef-reist-persoendlich-an-zeiss-baut-standort-in-dresden-aus-DJG7R3ZZRVEAX65IBVG7RKGXLU.html , accessed on 19 September 2024
Documentation 23	Fläche, Fachkräfte, Ökostrom—das zieht Firmen an	Dresden	2024	https://www.iwd.de/artikel/interview-flaeche-fachkraefte-oekostrom-das-zieht-firmen-an-622792/ , accessed on 2 May 2025

Archival Records

Document Name	Document Title	Subunit	Year	Link
Archival record 1	IHK-Standortumfrage: Ergebnisse für Oberbayern	Munich	2023	https://www.ihk-muenchen.de/de/Wirtschaftsstandort/standortentwicklung/zahlen-daten-fakten-wirtschaftsstandort-muenchen-oberbayern/standortumfrage/ , accessed on 1 May 2025
Archival record 2	IHK Positionen	Munich	2025	https://www.ihk-muenchen.de/politik/positionen/ , accessed on 2 May 2025
Archival record 3	Bundesinstitut für Bau-, Stadt- und Raumforschung BBSR	Munich	2023	https://www.bbsr.bund.de/BBSR/DE/forschung/programme/exwost/Studien/2020/wirtschaft-kleinstaedte/01-start.html?pos=3 , accessed on 24 February 2025
Archival record 4	Standortzufriedenheitsanalyse	Dresden	2014	https://www.hwk-dresden.de/fileadmin/user_upload/mb/HWK-Allgemein/Dokumente/Standortbefragung_LH-Dresden_24-06-2014.pdf , accessed on 7 March 2025
Archival record 5	Landesentwicklungsplan	Dresden	2013	https://www.landesentwicklung.sachsen.de/landesentwicklungsplan-2013-4794.html , accessed on 7 March 2025
Archival record 6	Regionalpläne	Dresden	n.d.	https://www.landesentwicklung.sachsen.de/regionalplaene-4880.html , accessed on 7 March 2025
Archival record 7	Regionalplan Dresden	Dresden	2019	https://rpv-elbtalosterz.de/wp-content/uploads/rpl/Regionalplan_2024.pdf , accessed on 7 March 2025
Archival record 8	Regionale Wirtschaft in Bayern	Munich	2025	https://www.stmwi.bayern.de/wirtschaft/wirtschaftspolitik/regionale-wirtschaft/ , accessed on 1 May 2025
Archival record 9	IHK-Standortumfrage: Ergebnisse für die Stadt München	Munich	2023	https://www.ihk-muenchen.de/ihk/pictures/Standort/Stadt-M%C3%BCnchen_2023.pdf , accessed on 1 May 2025
Archival record 10	IHK-Standortumfrage: Ergebnisse für den Landkreis Neuburg-Schrobenhausen	Munich	2023	https://www.ihk-muenchen.de/ihk/pictures/Standort/Landkreis-Neuburg-Schrobenhausen_2023.pdf , accessed on 1 May 2025
Archival record 11	IHK-Standortumfrage: Ergebnisse für den Landkreis Traunstein	Munich	2023	https://www.ihk-muenchen.de/ihk/pictures/Standort/Landkreis-Traunstein_2023.pdf , accessed on 1 May 2025
Archival record 12	IHK-Standortumfrage: Ergebnisse für den Landkreis Garmisch-Partenkirchen	Munich	2023	https://www.ihk-muenchen.de/ihk/pictures/Standort/Landkreis-Garmisch-Partenkirchen_2023.pdf , accessed on 1 May 2025
Archival record 13	IHK-Standortumfrage: Ergebnisse für den Landkreis Altötting	Munich	2023	https://www.ihk-muenchen.de/ihk/pictures/Standort/Landkreis-Alt%C3%B6tting_2023.pdf , accessed on 1 May 2025

Interviews

Document Name	Type	Function, Organisation	Subunit	Date	Link
Interview 1	Primary interview	Anonymous, see broad description in Table 2	Dresden	12 July 2024	
Interview 2	Primary interview	Anonymous, see broad description in Table 2	Dresden	23 July 2024	
Interview 3	Secondary data	Prime Minister of Saxony	Dresden		https://www.smwa.sachsen.de/blog/2024/04/07/martin-dulig-konkret-wie-die-grossansiedlungen-sachsens-mittelstand-fordern-und-fordern/ , accessed on 19 July 2024
Interview 4	Primary interview	Anonymous, see broad description in Table 2	Dresden	19 November 2024	
Interview 5	Primary interview	Anonymous, see broad description in Table 2	Munich	11 July 2024	
Interview 6	Primary interview	Anonymous, see broad description in Table 2	Munich	15 July 2024	
Interview 7	Secondary data	Managing Director of Munich Metropolitan Region	Munich	7 October 2024	https://www.youtube.com/watch?v=9hudmSPwn9Q , accessed on 10 December 2024
Interview 8	Primary interview	Anonymous, see broad description in Table 2	Munich	7 January 2025	

Appendix D

Interview Guide

Introduction

- Brief introduction to the research project
- Explanation that the study examines structural change towards a knowledge economy, the globalisation of value chains, and their implications for the spatial development of APS
- Explanation that the interview seeks expert perspectives on the development of the metropolitan regions of Munich and Dresden, including changes in firm locations, drivers of relocation, and broader regional trends
- Request for permission to audio-record the interview

Questions

- How would the interviewee describe the economic development of the region in recent years?
- What are the interviewee's main responsibilities in their current role?
- What kinds of firms typically seek support from the organisation, and what are the main reasons for locating in the region?
- To what extent have processes of concentration in the metropolitan core and relocation to surrounding areas been observed?
- What are the main reasons why firms remain in, move to, or relocate within the region?

- How important is the specific location within the metropolitan region for firms' location decisions?
- What role does the regional location play within firms' wider national or multilocation office networks?
- How have digitalisation and post-COVID developments affected firm location patterns in the region?
- How important are factors such as land availability, real estate costs, and access to skilled labour?
- How is the relevant regional perimeter understood: mainly in administrative terms or in functional terms?
- How would the interviewee assess the future development of the region?

Closing

- Are there other actors or organisations with whom the researcher should speak?
- Is there anything else the interviewee would like to add?
- Thank the interviewee for their time

Appendix E

Coding scheme

First-Level Code	Second-Level Code	Third-Level Code	Fourth-Level Code	Definition
Agglomeration	Growth	Firm	Cluster advantages	Firms profit from a spatial concentration of suppliers, customers, knowledge and cooperation partners.
			Accessibility	Firms find a supply of public transportation and transportation infrastructure, like roads and airports.
			Working environment	Firms find attractive buildings in attractive locations.
		Location	Research institutions	Metropolitan regions offer a variety of research institutions.
			Labour market	Urban centres provide a large, qualified—often international—skilled labour base.
			Mobility	Urban centres provide a dense public transport network, rail/airport connections, and cycling and micromobility options.
			Real estate offers	Buildings in metropolitan regions offer high quality at a central location.
			Urban living environment	Centres offer urban amenities like social infrastructure, gastronomy, leisure, cultural offerings and green spaces.
		Policy	Economic promotion	Proactive relocation and policy programs that specifically attract key industries to metropolitan regions.
			Spatial planning strategies	Measures of concentration and integration that protect inner cities.
			Infrastructure policy	Measures of infrastructure expansion to increase accessibility and competitiveness of centres.
			Strategic cooperation	Cooperation with the purpose of facilitating cluster building.
		Firm	-	-
	Decline	Location	Scarcity of space	The demand for commercial and residential space in centres is higher than the supply.
			Cost pressure	Costs for construction, rent, living or location in the centre are high or rising.
			Labour market effects	The labour market in metropolitan regions is facing increasing challenges.
		Policy	-	-

First-Level Code	Second-Level Code	Third-Level Code	Fourth-Level Code	Definition
Network/periphery	Growth	Firm	Spillover effects	Firms profit from the centre without being located in the centre.
			Digitalisation	A decoupling of location and work allows firms to have smaller spaces and in more remote locations.
		Location	Hard location factors	The periphery offers tangible location advantages, like more or cheaper commercial and residential space or lower taxes.
			Quality of life	Peripheral regions offer open space, nature, family friendliness and lively social structures.
		Policy	Social infrastructure	Politically flanked expansion of housing, daycare, schools, health, culture & leisure; building culture initiatives; programs to retain families and skilled workers.
			Strategic cooperation	Urban–rural coordination, joint area and acquisition management, “decentralised concentration” in the network of central locations.
			Mobility	Public transport/rail/road expansion, umbrella tariffs.
			Incentives & land use policy	Lower trade tax rates and support programs for, e.g., industry-specific relocations.
	Decline	Firm	Shortage of skilled workers	Firms do not find employees, as they prefer the centre.
			Bureaucracy	High regulations, tax burdens, approval times and a lack of expansion areas block firms’ investments.
		Location	Demographic change	An ageing population together with a lack of young people is causing peripheral regions to thin out.
			Infrastructure deficits	Gaps in the infrastructure undermine the attractiveness and economic viability of peripheral regions.
			Settlement structure	Low density of universities, research and complementary companies prevent productive spillovers that drive growth in metropolitan areas.
		Policy	Mobility gaps	Decreasing capacity utilisation forces policy to cut services; full-coverage accessibility is not available.
			Finances	Tight financial situation at federal, state and local level limits investment in transport, infrastructure and location development.

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2026-05

MDPI

<https://doi.org/10.3390/urbansci10050284>

Zöllner S, Jüttner U, Angus A. (2026) Advanced producer services and core–periphery trajectories in German metropolitan regions. Urban Science, Volume 10, Issue 5, May 2026, Article number 284