Identification and Mapping of Fintech Clustering Using a Qualitative-dominant Mixed Method

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Abstract: This research delves into the complex landscape of the fintech ecosystem, specifically focusing on the Northwest City region of Ireland, employing a mixed-method approach. The study focused on the methodology used to identify and map the fintech clusters. Different methodologies have been used to map and identify clustering due to its evolving nature. In our case, due to the lack of fintech companies' records on publicly available databases, and fintech being an emerging phenomenon, our methodology relied on a combination of approaches like desk research, stakeholder engagement, geospatial analysis, and in-depth interviews which fall under the qualitative-dominant mixed method approach. Despite a diverse range of methodologies being used to identify clusters, some known studies have used mixed methods. This research aims to provide guidelines for identifying clusters by developing a database of the companies in the fintech sector and its validation in an evolving field like Fintech. It also highlights the importance of the use of geospatial analysis in clustering by mapping the fintech companies, however at the same time questions the simple agglomeration of the firms in the region. It's not only the physical proximity that develops the clusters but the local linkages, collaborations, and networks that play a pivotal role in reaping the benefits of clusters. The detailed interviews with the fintech companies in the region and their relationship with different components of the fintech ecosystem using the triple helix model highlighted the strengths and weaknesses of the fintech ecosystem in the region. The application of mixed methods in this research highlights the value gained in exploring fintech clustering and ecosystems. This study further enhances our understanding of the emerging phenomenon of fintech clusters and ecosystems in cluster-based economies, specifically how a combination of approaches could be used to map and identify fintech clusters. It also furthers the boundaries of knowledge in business and management methodological literature by introducing a comprehensive qualitative-dominant mixed method approach with a consolidating knowledge base on methodological approaches to clustering.

Keywords: Industrial clustering, Fintech, Cluster analysis, Visualization, Fintech clustering

1. Introduction

The landscape of the fintech ecosystem is complex, particularly in the Northwest City region of Ireland. This study delves into the methodology used to identify and map fintech clusters, employing a mixed-method approach. Fintech clusters are geographic areas with a concentration of fintech companies, startups, investors, and supporting institutions. Literature shows that it is not just a mere concentration of corporations in a geographic location (Ffowcs-Williams 2012; Ketels 2017). Clustering happens when companies from related industries interact with each other and create linkages and networks within and beyond the cluster boundaries (Byrne 2016; Walsh 2020). An in-depth analysis of the business linkages is required to understand the business environment and the level of interaction among corporations in the region. The level and type of analysis depend upon the availability of data, region, and the objective of the study.

Industrial clustering is not a new phenomenon. Literature shows different terms have been used for fintech clustering in academia and policy reports like fintech or digital or electronic finance clusters, hubs, agglomeration, ecosystem, cities, zones, or geographies (Wójcik *et al.* 2022). Despite the prominence of fintech clusters in global economic landscapes, identifying and mapping industrial clustering poses challenges (Porter, 2000a; Sölvell et al., 2006; Sölvell, Ketels and Lindqvist, 2008; Ketels and Protsiv, 2021). This study examined a border region of Ireland (Northwest City Region) where publicly available data on fintech companies is scarce. Literature shows that the major challenge in mapping industrial clustering is the availability of robust statistical data as well as the presence of data collection bodies in some geographic locations as well as sectors (Ketels 2017; O'Connor *et al.* 2017). Hence, the methodology adopted for this study integrates desk research, stakeholder engagement, geospatial analysis, and in-depth interviews within a qualitative-dominant mixed-method framework. Through a blend of quantitative and qualitative data insights, this study provides a comprehensive understanding of the industrial clustering phenomenon while enabling the researcher to identify and map the industrial clusters which contribute to both theory and practice.

The remaining study is organized in the following way. Section 2 provides the context highlighting the significance of the fintech clustering. Section 3 discusses the concepts central to the study based on the review of the literature. Section 4 discusses the application of mixed methods to the study in the context. Section 5 explains the value of the suggested approach and Section 6 concludes the study.

2. Context

Industrial clustering has become a significant drivers of economic growth and innovation as evidenced by the fourth industrial revolution and smart production processes (Jiao *et al.* 2021). Some of the famous Fintech clusters are Silicon Valley, London, Berlin, New York City, Singapore, Hong Kong and Shanghai. Fintech is a new phenomenon that has radically changed the traditional financial landscape (Abbasi *et al.* 2021). It has impacted important areas of the economy like banking systems, trading systems, and payment platforms which are leading countries to economic development and being a source of competitiveness (Jiao *et al.* 2021; Lai and Samers 2021; Guo *et al.* 2023). Today, cities are fighting to become fintech hubs rather than financial hubs, cities like London, New York, and Silicon Valley are well-known for being prominent FinTech hubs. However, other cities and nations are eager to become, if not global hubs of this rapidly expanding sector, then at least regional ones. Governments around the world are working with regulators and policymakers to support the development of fintech technologies by creating and testing environments known as regulatory sandboxes, fintech sandbox hubs, or innovation hubs (Parenti 2020). Fintech companies in the jurisdiction of the regulatory sandbox or innovation hub are given regulatory lenience, however, the regulators are working very closely with new technologies and are assessing the attached risks (Buckley *et al.* 2020). Since the 2008 financial crisis, the fintech industry has been growing, specifically in countries that faced severe repercussions because of the financial crisis (Laidroo and Avarmaa 2020a). Literature shows that there is a greater tendency for the fintech firms to operate in closer proximity and this phenomenon is defined as fintech clustering even though this sector operates online (Laidroo and Avarmaa 2020b; Gazel and Schwienbacher 2021; Jiao *et al.* 2021; Alaassar *et al.* 2022). Due to the technical infrastructure and the financial regulations in the region.

The Northwest City Region of Ireland consists of Donegal County, Derry City, and Strabane District Council. It's a part of the border region and is crucial for the economic development of Ireland as it provides direct access to the EU, UK, and Irish markets. The research conducted by the Western Development Commission declared County Donegal as the Atlantic Economic Corridor (AEC). The agglomeration of economic activities can be seen in this region. An initiative of the Irish government Investderrystrabane (2023) indicates the presence of different industrial clusters in this region including Medtech, Engineering, and a suspected Fintech cluster. In 2018 the North West Regional Skills Forum declared Information and Communication Technology and Financial Technologies (Fintech) as the fastest-growing sector in Ireland. There is an extensive occurrence of financial institutions, technology and communication companies, and fintech corporations in the region. The suspected fintech cluster and the related industries could be just an agglomeration of economic activities without knowledge sharing or linkages among themselves. The existing ecosystem of fintech and related industries in the Northwest City Region shows prominence of financial institutions and information technology (IT) corporations due to Ireland's stable financial regulatory system and internationally traded technologies. Fintech is given special attention because of the attached benefits for economic growth, productivity, and competitiveness which was highlighted during COVID-19. The strategic position of this region, welcoming tax policy, and a stable financial regulatory landscape without any restrictions for fintech companies, is encouraging fintech startups to grow a fintech cluster of its kind.

Industrial clustering has been used as a tool for regional development all over the world. Economies based on clustering are outperforming the rest of the market in the case of developing and developed countries (Sölvell *et al.* 2003; Ketels and Memedovic 2008; Ketels 2017). According to O'Connor et al. (2017), Ireland is lagging in the clustering of different sectors as compared to other European economies. Bryne (2016) and Walsh (2020) highlighted the lack of formal cluster policies and cluster organizations for the development of a micro-level business environment in Ireland, clusters are mentioned in policy plans to achieve policy goals. However, literature shows that clusters could lead to an improved business environment, resulting in locational competitiveness of the region which attracts more foreign investments, increases employment, and increases innovation in the related industries (Porter 2000a; Ffowcs-Williams 2012; Ketels 2017). Industrial clustering could be a game changer for the Irish economy after Brexit, being part of the European Union (EU) and having access to UK and EU markets, with a concentration of multinational companies (O'Connor *et al.* 2017). So, all the components of an industrial ecosystem to understand the opportunities and challenges related to the identification and mapping of industrial clustering in the environment.

3. Concepts Central to the Study (Review of the Literature)

The understanding of the evolution of industrial clustering and mixed method approach is crucial for the methodology opted for this study. The methodologies and models central to our study include the 4I linkage model introduced by Hobbs (2010) which measures the strength of the relationship based on the following four key aspects of the relationship: Intensity, Importance, Involvement, and Investment. The VLINC methodology (Visualization of linkages in networks and clusters) developed by Bryne (2016) introduced the visualization of companies within clusters on different levels and the triple helix model which emphasizes on integration of three components of any ecosystem, which are government bodies, educational institutions, and the industry.

The concept of industrial clustering has been introduced in the early works of Von Thunen (1842). Marshall (1890) and Weber (1909) highlighted the importance of location and agglomeration, which Hoover (1948) tested on different and similar types of industries. The terms industrial complexes and industrial cities were discussed referring to the concept of industrial clustering (Isard 1956; Warf 1995). It resulted in Porter's (1998) seminal work on national competitiveness and clusters. Literature shows that there is no standard approach used for cluster analysis (Feser and Bergman 2000). The integration of qualitative and quantitative techniques in cluster analysis has evolved, with mixed-method approaches gaining prominence due to their ability to overcome the limitations of individual techniques studies (den Hertog *et al.* 1999). However, the aim of the cluster analysis is important as it could vary from the identification of clusters, and mapping of clusters, to the functioning and operations of clusters. The aim of the cluster analysis depends on the level of cluster analysis.

Level of Analysis	Cluster Concepts	Aims
Micro (Local industry, cluster or firm level)	Examines a group of related firms, and their connections, in a locality.	Initiating or supporting specific firm level initiatives and supports.
Meso (Regional Level)	Examines the specialization and the inter and intra-industry linkages of a group of industries for a region.	Developing strategy for a region's clusters.
Macro (National or Supranational level	Examines specialization patterns at a national or supra-national level. Linkages between industry groups across the economy as a whole.	Identifies the cluster categories of a nation, for national and regional industrial and innovation policy-making.

Figure 1: According to Bryne (2016) there are three levels of analysis for industrial clustering

It could be a quantitative (top-down) or a qualitative (bottom-up) approach or a mix of both methods. Different techniques have been used under these methods location quotients, input-output tables, expert opinions and interviews, network analysis, 4I linkage model, and visualization of linkages in networks and clusters (VLINC) methodology based on network analysis. The relevance of these techniques depends on the level and type of analysis.

Characteristics	Top-Down	Bottom-Up
Research Question	How much?	How?
Approach	Quantitative	Qualitative
Principal Data	Secondary Data	Primary Data
Methodology	Statistical Modelling	Case Studies
Industrial Proximity	Classification System	Descriptive
Scope	Nationwide, Multi-Industry	Local, Single-Cluster
Dominant Logic	Deductive	Inductive
Measures	Employment, Patents, Wages, Output, Sales	Relationships, Institutions
Findings	Broadly Applicable	Narrowly Limited

Figure 2: Different cluster analysis techniques and their characteristics (Cortright 2006)

According to Brown (2000) most of the cluster studies use mixed methods. Some of the mixed method techniques are used to analyze predetermined clusters in a region. A location quotient shows the concentration of an industry in a region by comparing it to a benchmark (Porter 2012; De Propris 2005; Carroll *et al.* 2008; Cortright 2006.). Different economic measures have been used for the analysis of predetermined clusters using a quantitative technique which is further detailed with key stakeholder interviews of the ecosystem (Napier and

Bjerregaard 2013). Some scholars have used social network analysis to explain the network dynamics of clusters (Powell *et al.* 1996; Casper 2007; Giuliani and Pietrobelli 2011). These studies were focused on the understanding of the knowledge networks within clusters (Giuliani 2013). In 2010, Hobbs designed a framework for the understanding and analysis of industrial clusters. It is a mixed-method approach that is based on location quotients for the identification of a specialization of the region. However, qualitative methods are used for the identification of different linkages. In 2016, the VLINC methodology was developed for the identification and mapping of different industrial clusters (Byrne 2016). This methodology is based on the work of Hobbs (2010), who developed an industrial clustering framework with the addition of a visualization software based on Google Maps that shows the linkages on four different levels, namely the local, national, European, and international level for each participant firm in the study. There are macro-level industrial clustering studies also conducted on the US and EU levels for the development of region and business strategies for local businesses (Rosenfeld 2002; Sölvell *et al.* 2003).

The triple helix model, a concept introduced by Etzkowitz and Leydesdorff (1995), emphasizes the collaboration among academia, government, and industry in fostering innovation and economic development. In our study, the triple helix model guides the assessment of linkages within the fintech ecosystem, focusing on the roles of innovation centers, government agencies, industry associations, peers, customers, suppliers, and training services. Understanding these linkages is crucial for evaluating the innovation potential and competitiveness of a cluster.

4. Discussion: Integrating Mixed Methods in Understanding Fintech Clusters and Ecosystems

We employed a hybrid approach that combines qualitative and quantitative methods to explore the landscape of fintech clusters in the Northwest City region of Ireland. It is a micro-level fintech cluster analysis of the region of interest focused on the methodology of the study. The study began with desk research and stakeholder engagement to identify fintech companies and related industries in the region. This qualitative aspect helped us build a foundational understanding of the ecosystem's components. Quantitative methods were then employed to check the concentration and size of the fintech companies and map the dispersion of fintech companies using geospatial analysis. The visualization aided in identifying clusters within the region. It led us to in-depth interviews with stakeholders to further enrich the qualitative aspect which helped in understanding the dynamics of the fintech ecosystem, including linkages, collaborations, and networks. The 4I linkage model of Hobbs (2010) provided a structured framework for assessing these relationships.

The study started with desk research and stakeholder identification within the fintech ecosystem, for which we approached different components of the ecosystem. One of the primary challenges faced was the dynamic nature of the fintech sector, with new niches continually emerging. The firms, in the region, did not know whether they identify themselves as fintech or not. So, this study started from scratch by developing a database for fintech companies, related industries such as the financial industry and the IT industry, and other components of the fintech ecosystem. For this study, the following definition of fintech is used; the use of technology to provide new and improved financial services (Thakor 2020), which is further explained by (Lai and Samers 2021) via fintech framework which says that fintech unfolds at the intersection of technologies and institutions with advanced financial products and services.

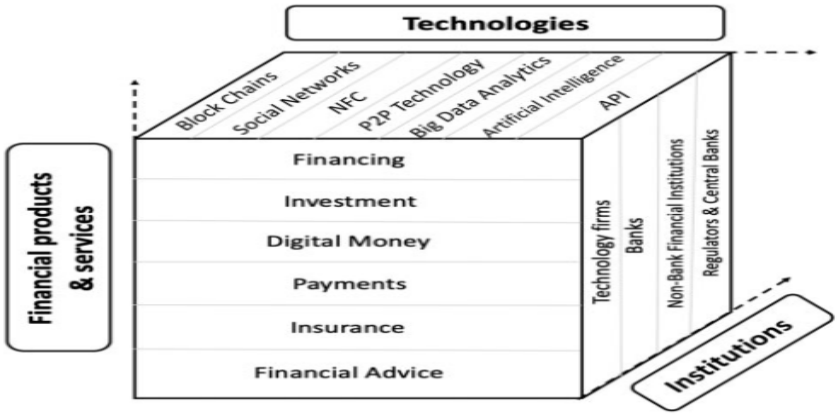

Figure 3: Lai and Samers (2021) fintech cubic framework

According to the literature, fintech and related industries resort under the traded clusters in Ireland and are crowded by multinational companies which increases the importance of this sector further (O'Connor *et al.* 2017). Traded clusters have spread all around the world and are an important source of exports (Porter 2000a; Snowdon and Stonehouse 2006; O'Connor *et al.* 2017). Fintech and related industries like financial services and IT industries are deeply embedded in the Irish economy as it is a valued contributor towards employment, gross domestic product (GDP), and exports. Consequently, this study is focused on the potential of industrial clustering to further the development of the fintech sector and regional development.

The search for fintech companies and firms from related industries leads us to the Chambers of Commerce. The study was presented to both Letterkenny and Derry chambers, along with some stakeholders. At the end of the meeting, chambers shared a list of the registered companies with us and assured us of complete support till the completion of the project. We updated all the data in a Microsoft Excel workbook and started looking for the companies of our interest in the region via the Google search engine. We also made a separate list of all the companies lying in the Fintech industry, Financial services industry, and IT industry in the region. The lists were sent to the Chambers of Commerce (Letterkenny and Londonderry), for cross-checking. Afterward, we shared those lists with government agencies and with companies that we interviewed later to ensure the validity of the study.

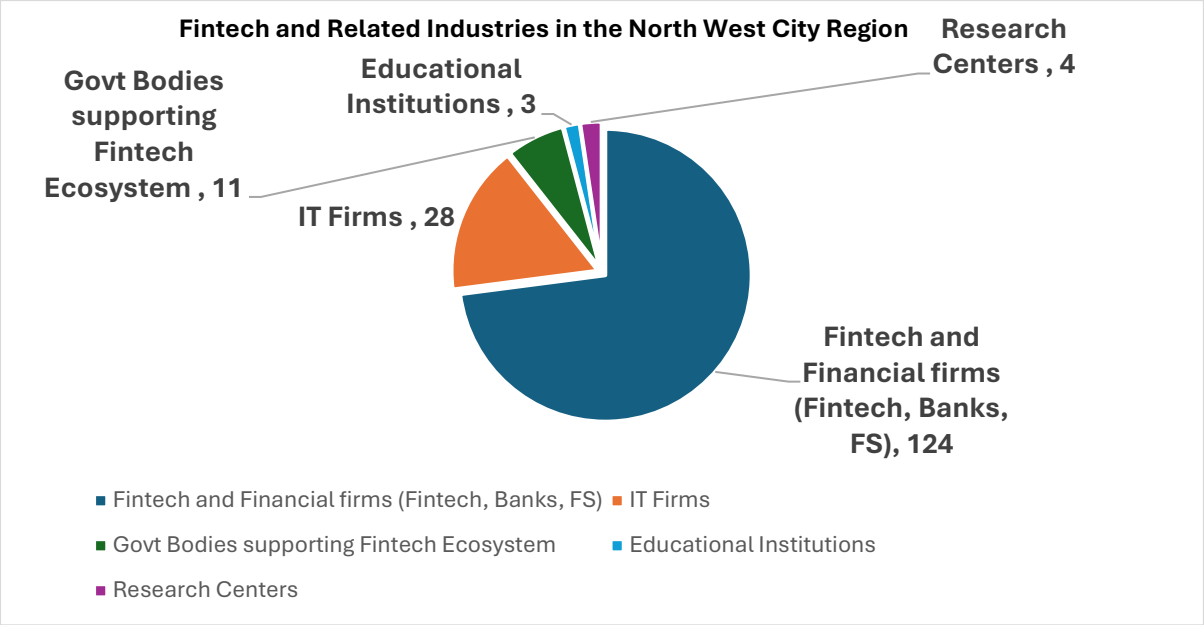

Figure 4: Fintech and related industries in the North West City Region

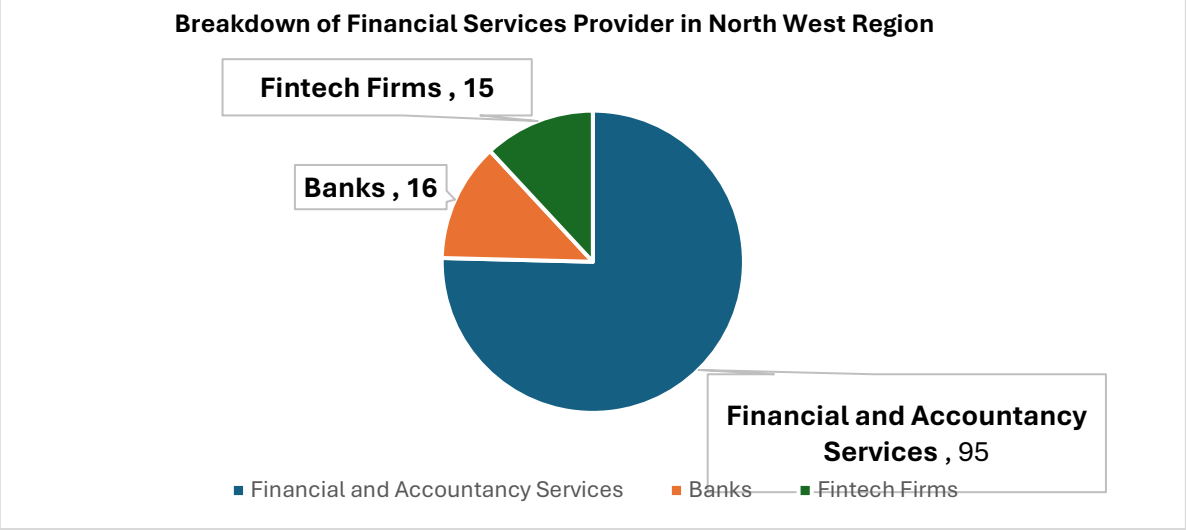

Figure 5: Breakdown of Financial Services

After having our final lists of different components of the fintech ecosystem, plotted fintech companies in the region using Google Maps to visualize the dispersion of the companies in the region. After expert opinion and the number of fintech companies, we identified the concentration of fintech companies in two regions, namely Letterkenny and Londonderry.

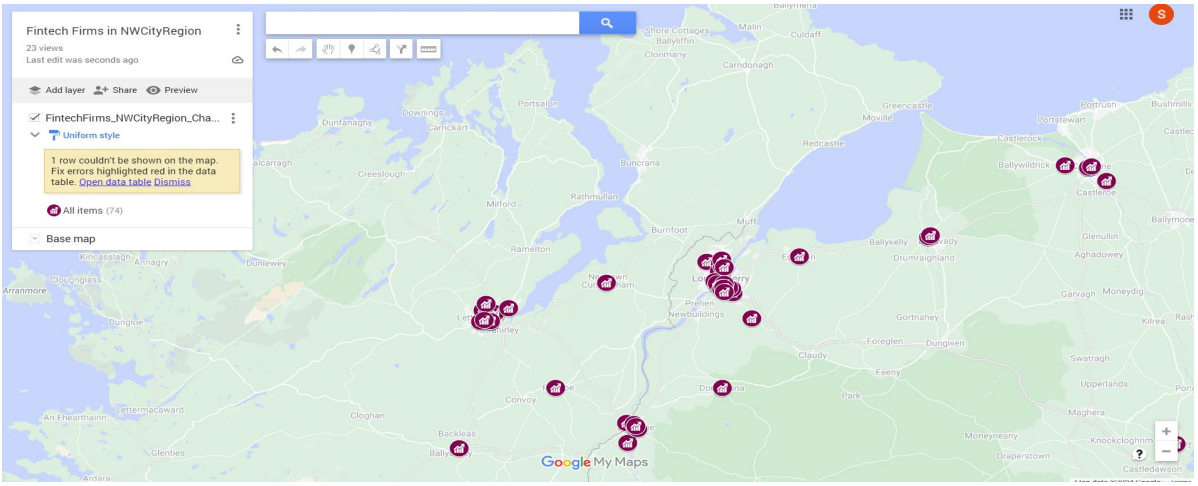

Figure 6: Visualization of Fintech companies

As highlighted in the literature, industrial clusters are not formed by mere concentration of corporations in a geographic location (Fowcs-Williams 2012; Ketels 2017). Clustering happens when companies from the same sector and related industries interact with each other and create linkages, corporations, and networks within and beyond the proximity, external to the cluster boundaries (Byrne 2016; Walsh 2020). For understanding of the business environment and the level of interaction among corporations in the region, an in-depth analysis of the business linkages is conducted based on the 4I linkage model (Hobbs 2010). It helped us in understanding the micro business environment for fintech firms in the region, which was made possible by in-depth interviews with different stakeholders of the fintech ecosystem.

The strength of the relationship among different components of the fintech ecosystem is measured using the 4I linkage model, through in-depth interviews. The 4I linkage model focuses on 4 key aspects of the relationship which are: Intensity, Importance, Involvement, and Investment which are further measured by other features as highlighted in the interview guide. In the first section of our in-depth interview, we collected introductory information from fintech companies to have an idea regarding when the company started its operation in the region, how many employees are in the company, what type of fintech niches the company is serving, and which fintech niche the company is more focused on.

The 4I linkage methodology gives a flexible framework that is based on a few questions for defining the local geographic scope of clusters for identification and analysis purposes, which in our case, is as follows:

- All the components of fintech reside within the North West City Region of Ireland.
- The administrative region for the fintech cluster resorts under NUTS 3. However, there is a lack of availability of data on the fintech sector.
- The firms in this region are within a range of 2 hour drive and have face-to-face contact.

There are eight different categories of linkages that have been identified based on previous literature (Porter 1998b, 2000a; Sölvell *et al.* 2003, 2008; Byrne 2016). Following are the identified categories of the linkages (Byrne 2016, p.131-132). These categories are further divided as per the triple helix model for data collection after expert opinions. The three primary actors of the triple helix model: academia which consist of innovation centers, a research and development center, and universities in the region. The second primary actor of the triple helix model is the government which includes government agencies and industry associations. The other primary actor is industry which consists of peers, customers, suppliers, specialist services, and training services. The defined linkages are divided into four categories depending upon the distance between the surveyed company and one of the primary actors of the triple helix model which are: Local, National, European, and International. Local linkages are located within the defined local geographic scope, where “national” refers to within a country, European to being on the Europe level, and international is anywhere in the world. This method investigates the linkages external to the clusters in detail, which helps in assessing the geographic reach of the

cluster which is missing in Porter's work (2000). The perceived significance of these linkages is assessed from the perspective of the surveyed company. A series of Likert scale questionnaires are used to assess the perceived significance of each linkage based on connection, influence, integration, and interdependence during the interview. The reasons for assigning the specified significance were also asked. Each dimension is given a score between 1 and 10, which are added up to give a linkage's perceived significance score out of 40. There is a division of the perceived significance score into four bands under which each of the calculated perceived importance scores of the linkages fall. This scale measures the strength of the relationship of different factors of fintech components with the three basic actors of the triple helix model in this study and thus explains a system's dynamics and linkages. We also inquired in detail about the reasons for the perceived significance of each linkage and how it could be improved or strengthened, which helped us in making policy recommendations for the region and the fintech sector.

5. The Value of the Suggested Approach

This approach enhanced the comprehensiveness of the fintech cluster in the region which enabled us to understand the underlying mechanisms driving industrial cluster formation and development. It highlighted the type of linkages and collaborations that exist among different components of the fintech ecosystem in the region of interest which would help researchers and policymakers to make policy recommendations for the region in general and the fintech sector in specific. One of the key advantages of this approach is its flexibility in adapting to the dynamic nature of the fintech sector, especially in an emerging phenomenon where new niches and companies continuously emerge. This adaptability allowed the researchers to overcome challenges such as the lack of publicly available data on fintech companies and the evolving nature of the sector.

Furthermore, the mixed method approach enabled a nuanced understanding of fintech clustering beyond just physical proximity. It delved into local linkages, collaborations, and networks among fintech companies, highlighting the importance of these factors in developing robust clusters. This depth of analysis is crucial for identifying strengths, weaknesses, opportunities, and threats within the fintech ecosystem, which in turn can inform policy recommendations for regional development and sector-specific interventions. By employing a mixed method approach, this study not only contributes to academic knowledge but also provides actionable insights for policymakers, industry stakeholders, and researchers aiming to understand and support fintech clustering initiatives.

In conclusion, the value of the mixed method approach lies in its ability to provide a holistic and nuanced perspective on fintech clustering in a specific geographic region. By integrating qualitative and quantitative methodologies, this study goes beyond surface-level analysis and dives deep into the intricate dynamics of the fintech ecosystem. This comprehensive understanding is essential for developing targeted strategies, fostering collaboration among stakeholders, and unlocking the full potential of fintech clusters for economic growth, innovation, and competitiveness. As fintech continues to shape the financial landscape globally, our study could serve as a valuable roadmaps for navigating and harnessing the opportunities presented by this rapidly evolving sector.

6. Conclusion

Through a blend of quantitative and qualitative data insights, this study provides a comprehensive understanding of the industrial clustering phenomenon while enabling academicians and policymakers to identify and map the industrial clusters which would lead to the identification of strengths and weaknesses of the fintech cluster in the region and contribute to both theory and practice. This study bridges the gap between theoretical concepts and real-world application while emphasizing the importance of practical outcomes and actionable insights which will assist the researchers to suggest a policy recommendation for the fintech sector specifically, and for regional development in general. The methodology used in this study could serve as a roadmap for unlocking the full potential of fintech clusters, contributing to economic growth, innovation, and competitiveness in the rapidly evolving global financial landscape.

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References

Abbasi, K., Alam, A., Du, M.A., and Huynh, T.L.D. (2021) 'FinTech, SME efficiency and national culture: Evidence from OECD countries', *Technological Forecasting and Social Change*, 163, available: https://doi.org/10.1016/j.techfore.2020.120454.

Alaassar, A., Mention, A.-L., and Aas, T.H. (2022) 'Ecosystem dynamics: exploring the interplay within fintech entrepreneurial ecosystems', *Small Business Economics*, 58(4), 2157–2182, available: https://doi.org/10.1007/s11187-021-00505-5.

Brown, R. (2000) *Cluster Dynamics in Theory and Practice with Application to Scotland* [online], Citeseer, available: https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=7b85a909b1583a71f94b03ef7f5638bc337a7c25 [accessed 18 Feb 2024].

Buckley, R., Arner, D., Zetzsche, D., and Gibson, E. (2020) 'Building Australia's Fintech Ecosystem: Innovation Hubs for a Competitive Advantage', *JOURNAL OF BANKING AND FINANCE LAW AND PRACTICE*, 31(2), 133–140.

Byrne, E.M. (2016) 'Incorporating Network Theory and Visulatisation into Cluster Analysis: A Hybrid Methodology Applied to European ICT Clusters'.

Carroll, M.C., Reid, N., and Smith, B.W. (2008) 'Location quotients versus spatial autocorrelation in identifying potential cluster regions', *The Annals of Regional Science*, 42(2), 449–463, available: https://doi.org/10.1007/s00168-007-0163-1.

Casper, S. (2007) 'How do technology clusters emerge and become sustainable?: social network formation and inter-firm mobility within the San Diego biotechnology cluster', *Research Policy*, 36(4), 438–455, available: https://www.sciencedirect.com/science/article/pii/S0048733307000510?casa_token=4CAjCX8zu3cAAAAA:PQvxbWBIDnzJwXQTvEsfkeVQO-2oeqh1G--yzlCnWwWvNotrD506Z-9G36G__Dk5dRRHSPJRmg [accessed 18 Feb 2024].

Cortright, J. (2006) 'ECONOMIC DEVELOPMENT'.

Cortright, J. (n.d.) 'ECONOMIC DEVELOPMENT'.

De Propris, L. (2005) 'Mapping local production systems in the UK: Methodology and application', *Regional Studies*, 39(2), 197–211, available: https://doi.org/10.1080/003434005200059983.

Feser, E.J. and Bergman, E.M. (2000) 'National Industry Cluster Templates: A Framework for Applied Regional Cluster Analysis', *Regional Studies*, 34(1), 1–19, available: https://doi.org/10.1080/00343400050005844.

Ffowcs-Williams, I. (2012) *Cluster Development: The Go-to Handbook : Building Competitiveness through Smart Specialisation*, Nelson, N.Z.: Cluster Navigators.

Gazel, M. and Schwienbacher, A. (2021) 'Entrepreneurial fintech clusters', *Small Business Economics*, 57(2), 883–903, available: https://doi.org/10.1007/s11187-020-00331-1.

Giuliani, E. (2013) 'Network dynamics in regional clusters: Evidence from Chile', *Research Policy*, 42(8), 1406–1419, available: https://www.sciencedirect.com/science/article/pii/S0048733313000796?casa_token=K2P7esRhc9gAAAAA:f8hKi4uBx1iJwUnMAwAPx8h5A13NVmpfWgkXEUHmzZ6poVuTXtme_8n1Ow7nsjqz6WCHZ1Eb7A [accessed 18 Feb 2024].

Giuliani, E. and Pietrobelli, C. (2011) 'Social network analysis methodologies for the evaluation of cluster development programs', available: https://www.academia.edu/download/47241060/Social_Network_Analysis_Methodologies_fo20160714-14762-1syebpp.pdf [accessed 18 Feb 2024].

Guo, J., Fang, H., Liu, X., Wang, C., and Wang, Y. (2023) 'FinTech and financing constraints of enterprises: Evidence from China', *Journal of International Financial Markets, Institutions and Money*, 82, available: https://doi.org/10.1016/j.intfin.2022.101713.

den Hertog, P., Leyten, J., Limpens, I., Whalley, J., and Chapter, S. (1999) 'Approaches to cluster analysis and its rationale as a basis of policy', *RISE project, University of Brighton, Brighton*.

Hobbs, J. (2010) 'A framework for analysis of spatial specialisations of industry', available: https://sword.cit.ie/allthe/636/ [accessed 18 Feb 2024].

Hoover, E.M. (1948) 'The location of economic activity McGraw-Hill Book Co', *New York*.

Isard, W. (1956) 'Location and-Space Economy. New York: JohnWiley and Sons'.

Jiao, Z., Shahid, M., Mirza, N., and Tan, Z. (2021) 'Should the fourth industrial revolution be widespread or confined geographically? A country-level analysis of fintech economies', *TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE*, 163, available: https://doi.org/10.1016/j.techfore.2020.120442.

Ketels, C. (2017) 'Cluster Mapping as a Tool for Development', 52.

Ketels, C. and Protsiv, S. (2021) 'Cluster presence and economic performance: a new look based on European data', *Regional Studies*, 55(2), 208–220, available: https://doi.org/10.1080/00343404.2020.1792435.

Ketels, C.H.M. and Memedovic, O. (2008) 'From clusters to cluster-based economic development', *International Journal of Technological Learning, Innovation and Development*, 1(3), 375, available: https://doi.org/10.1504/IJTLID.2008.019979.

Lai, K.P.Y. and Samers, M. (2021) 'Towards an economic geography of FinTech', *Progress in Human Geography*, 45(4), 720–739, available: https://doi.org/10.1177/0309132520938461.

Laidroo, L. and Avarmaa, M. (2020a) 'The role of location in FinTech formation', *Entrepreneurship & Regional Development*, 32(7–8), 555–572, available: https://doi.org/10.1080/08985626.2019.1675777.

Laidroo, L. and Avarmaa, M. (2020b) 'The role of location in FinTech formation', *Entrepreneurship and Regional Development*, 32(7–8), 555–572, available: https://doi.org/10.1080/08985626.2019.1675777.

Napier, G. and Bjerregaard, H. (2013) 'Towards an International Food Cluster in Denmark: An analysis of the food sector in Central Denmark Region', *REG X–The Danish Cluster Academy*.

O'Connor, S., Doyle, E., and Brosnan, S. (2017) 'Clustering in Ireland: development cycle considerations', *Regional Studies, Regional Science*, 4(1), 263–283, available: https://doi.org/10.1080/21681376.2017.1402361.

Parenti, R. (2020) 'Regulatory sandboxes and innovation hubs for FinTech', *Study for the Committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg*, 65.

Porter, M. (1998a) 'Clusters and competitiveness', *Harvard Business Review*, 76(6), 140–147.

Porter, M.E. (1998b) 'The Adam Smith Address: Location, Clusters, and the New Microeconomics of Competition'.

Porter, M.E. (2000a) 'Location, Competition, and Economic Development: Local Clusters in a Global Economy', *Economic Development Quarterly*, 14(1), 15–34, available: https://doi.org/10.1177/089124240001400105.

Porter, M.E. (2000b) 'Location, competition, and economic development: Local clusters in a global economy', *Economic development quarterly*, 14(1), 15–34.

Porter, M.E. (2012) 'The economic performance of regions', in *Regional Competitiveness*, Routledge, 131–160.

'porter_clusters_and_the_new_economics_of_competition.pdf' (n.d.).

Powell, W.W., Koput, K.W., and Smith-Doerr, L. (1996) 'Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology', *Administrative science quarterly*, 116–145, available: https://www.jstor.org/stable/2393988 [accessed 18 Feb 2024].

Rosenfeld, S.A. (2002) *Creating Smart Systems: A Guide to Cluster Strategies in Less Favoured Regions* [online], Regional Technology Strategies Carrboro, North Carolina, available: https://www.academia.edu/download/66932599/Creating_Smart_Systems_A_guide_to_cluste20210504-23596-yx0izk.pdf [accessed 18 Feb 2024].

Snowdon, B. and Stonehouse, G. (2006) 'Competitiveness in a globalised world: Michael Porter on the microeconomic foundations of the competitiveness of nations, regions, and firms', *Journal of International Business Studies*, 37(2), 163–175, available: https://doi.org/10.1057/palgrave.jibs.8400190.

Sölvell, Ö., Ketels, C., and Lindqvist, G. (2008) 'Industrial specialization and regional clusters in the ten new EU member states', *Competitiveness Review: An International Business Journal*, 18(1/2), 104–130, available: https://doi.org/10.1108/10595420810874637.

Sölvell, Ö., Lindqvist, G., and Ketels, C.H.M. (2003) *The Cluster Initiative Greenbook*, 1st ed. ed, Sweden: Ivory Tower.

Thakor, A.V. (2020) 'Fintech and banking: What do we know?', *Journal of Financial Intermediation*, 41, 100833.

Walsh, B.M. (2020) 'A V-LINC Analysis of Agrifood and Tourism Specialisations in West Cork: Analysis, Impressions and Policies for Future Growth', *A V*.

Warf, B. (1995) *Industrial Location: Principles, Practice, and Policy*, Taylor & Francis.

Weber, A. (1909) 'Über den Standort der industrien, Tübingen', *English Translation: The Theory of the Location of Industries*.

Wójcik, D., Keenan, L., Pažitka, V., Urban, M., and Wu, W. (2022) 'The Changing Landscape of International Financial Centers in the Twenty-First Century: Cross-border Mergers and Acquisitions in the Global Financial Network', *Economic Geography*, 98(2), 97–118, available: https://doi.org/10.1080/00130095.2021.2010535.