The Geographies of Financial Information and Knowledge: A Study of Sell-side Equity Research

Thesis submitted for the degree of Doctor of Philosophy

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"… so theoretically, you can make anything work. But practically, it just doesn't work … there is a reason why things move faster when you are together …"
Sell-side analyst, Sydney

"… what is really missing right now is the buzz …"
Sell-side analyst, Hong Kong

"… so by doing a phone meeting, you have half the information loss and even doing Zoom meetings, for example, we can get 75-80% of the information possible face-to-face …"
Sell-side analyst, Hong Kong

"I would caution against extrapolating [the current circumstances] to a world where some travel and others do not … I think in that scenario, those who don't travel would lose their relationships … because the ones that are travelling would have the face-to-face interactions with both the corporates and clients …"
Sell-side analyst, Hong Kong

This thesis consists of 65,765 words in total or 55,526 excluding all references.

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ABSTRACT

This thesis investigates the geographies of financial information and knowledge as revealed through the geographies of a specific subset of financial professionals: sell-side equity research analysts. These are highly specialised information and knowledge intermediaries who use their individual expertise and accessed information to forecast the future performance of listed companies. Their geographies, therefore, provide insights into various topics including the distribution of tacit knowledge, and the role of proximity and face-to-face interaction in the transfer of information and specialised knowledge.

The research project consisted of two complementary workstreams which are summarised in three papers published in peer-reviewed journals and presented in chapters 4-6. Chapters 1 and 2 introduce and frame the overall research project, and chapter 7 concludes.

The first maps the geography of the sell-side equity research to reveal the distribution of specialised financial knowledge at the global scale. This is the first dataset, to the best of my knowledge, which reveals the global distribution of specialised financial expertise. It shows that specialised financial knowledge is highly concentrated and that information flows are often constrained by national borders. This also provides insights into the role that different financial centres play in information networks and hierarchies.

The second paper investigates the continued importance of face-to-face interaction in the exchange of financial information, using the mobility and proximity restrictions implemented during the COVID-19 pandemic as a natural experiment. It found that virtual platforms were unable to replicate the benefits of face-to-face interaction, as demonstrated by a deterioration in analyst understanding of their covered corporates. This was especially the case for analysts dependent on information sources outside their own country.

The third paper examines how analysts acquire their specialised expertise. The initial transfer of knowledge is enabled through the acute proximity and intense interactivity enabled by office structures. This was demonstrated by the learning process being degraded during the COVID-19 pandemic work-from-home policies. As analysts develop their individual knowledge, however, they become more autonomous and sources outside the office become more important which are accessed through periods of temporary proximity.

Through these three papers, this thesis contributes methodologically and empirically to the existing literature on the geographies of financial information and knowledge. As outlined in chapter 7, the analysis provides novel insights applicable to the extant literature and empirically supports a number of existing conceptual frameworks. The thesis closes by identifying potential future research directions resulting from this analysis.

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Chapter 1

INTRODUCTION

THE GEOGRAPHIES OF FINANCIAL INFORMATION AND KNOWLEDGE: A STUDY OF SELL-SIDE EQUITY RESEARCH

1.1 Introduction

This research project examines the geographies of financial information and knowledge, as revealed through an investigation of a specific subset of specialised financial information and knowledge intermediaries: sell-side equity research analysts. It is the result of my career in the knowledge-intensive business services (KIBS), a strong interest in the role of information and knowledge in financial markets (which external observers frequently find difficult to observe, measure, and understand), my experiences in the hiring and development of specialised financial expertise, and my earlier training as an economic geographer.

But it also has its roots in a question which I frequently had to address as the director of equity research at various investment banks: does it matter where research analysts are located? In a world of constant cost pressures and the perceived ubiquitousness of information and knowledge, there is a strong argument that information and knowledge intermediaries, such as research analysts and other specialised financial professionals, have been released from their earlier spatial constraints. Proponents of this view have drawn further support from the work-from-home policies implemented during the COVID-19 pandemic which seemingly demonstrated the ability of current technologies to ensure the continued access to required knowledge and information processes from any location. As such, I was often asked why locate analysts in expensive cities such as London, New York, and Hong Kong, when they could, it is alleged, do the same role in, and deliver their services from, any lower-cost centre? And although this question was posed to me in my professional capacity, the answer has potential insights for the geographies of KIBS, world cities, and international financial centres.

This is, therefore, a highly personal research project. As an introduction, and to provide the necessary context for my positionality in this study, my entire professional career has been in KIBS. I was first a management consultant specialising in the telecoms industry and based in Singapore. This involved significant travel, primarily within East Asia, but also to Australia, Europe, India and even Brazil (and, as such, providing a first-hand example of the global knowledge pipelines theorised by Bathelt et al. (2004)). In 2006, however, I joined sell-side equity research, which is introduced below, as an analyst covering the Southeast Asian telecommunications industry for Deutsche Bank, which was then one of the world's largest investment banks. Although based in Hong Kong, I was able to leverage on the previous seven years of accumulated experience, including high trust relationships with senior management at the companies I was responsible for covering. In 2010, I assumed management responsibilities as the deputy head of Asia-Pacific equity research at Deutsche Bank, before joining HSBC in 2014 to run their Asian equity research team until 2019. More recently, I returned to Hong Kong in 2023 to build and lead BNP Paribas's Asian equity research team.

This experience, and associated positionality, has been utilised throughout this research project, which seeks to provide new empirical insights in two directions. First, it reveals the distribution of specialised financial knowledge at the global scale. Specifically, it maps the global geography of the sell-side equity research industry by identifying the location of 11,307 individual analysts and the geographical scope of their activities. To the best of my knowledge, this represents the first dataset to map the global distribution of a highly specialised subset of knowledge-intensive financial professionals, i.e., the distribution of tacit knowledge. This addresses earlier concerns that "knowledge is largely unobservable … and largely unmeasurable" (Foray 2004: 9) and that "we have no readily available measures of the complexity, or the tacit nature of knowledge located in particular places" (Balland & Rigby 2017: 4). Furthermore, this mapping exercise provides new insights into the nature of financial information flows and the relative hierarchy of the various financial centres.

The second set of new insights provided in this research relate to the mechanics through which information and knowledge are transferred and acquired within financial ecosystems.

These are contested with the need for physical proximity and in-person communication now debated given technological advances. In part, this debate reflects the methodological difficulties of testing the various proposed theories and concepts (Balland & Rigby 2017, Beaverstock et al. 2000, Döring & Schnellenbach 2006, Huber 2012, Martin & Sunley 2003, Short et al. 1996). But this research took advantage of the unique set of circumstances created by the COVID-19 pandemic. These provided the opportunity to undertake a natural experiment to assess the importance of mobility and physical proximity in financial information flows and the transfer of specialised knowledge by providing a clear and lived comparison between the full mobility enjoyed prior to 2020, and the restrictions enforced between 2020 and 2022. Through a large-scale interview programme focused on the sell-side equity research ecosystem (70 participants), this project has provided evidence that in-person communication and physical proximity remain important in the transfer of information and knowledge with both processes degraded as a result of the various restrictions imposed during the pandemic.

The empirical contribution of this thesis is presented as three distinct papers already published in peer-reviewed journals: Progress in Economic Geography (chapter 4), Geoforum (chapter 5), and Finance and Space (chapter 6). Specifically, in terms of thesis structure, this chapter introduces the research project, including the contested debate on the need for physical proximity in the transfer and acquisition of information and knowledge, the associated methodological challenges, the relevance of sell-side equity research to the debate, and the specific research questions addressed in the three papers. Chapter 2 addresses the extant literature to develop a conceptual framing for the thesis: that finance continues to tend towards opacity, not transparency, despite all the technological advances. The empirical contribution of the thesis is contained within chapters 3-6: chapter 3 introduces the two datasets used in the empirical analysis; chapter 4 maps the global distribution of the sell-side equity research industry (as a proxy for financial tacit knowledge), the geographical scope of their activities, and the reach and role of different financial centres in information hierarchies and networks; chapter 5 assesses the impact of the COVID-19 restrictions on the ability of sell-side equity

research analysts to collect information; and chapter 6 investigates how the same restrictions affected the acquisition of specialised knowledge by analysts during the various phases of their development. Chapter 7 concludes by summarising and discussing the empirical findings, as well as identifying further potential directions and extensions for this research project.

1.2 Defining information and knowledge

This thesis is an investigation into the geographies of information and knowledge within finance. The terms "information" and "knowledge" are presented separately, albeit concurrently, even though the concepts of "being informed" versus "knowing" are now frequently used synonymously given technological advances and the associated conceptualisation that we live in an information age and within knowledge societies (Braf 2002). But the conflation of the two terms also reflects the tight symbiotic and circular relationship between information and knowledge: knowledge is created through information, but simultaneously, information is created through knowledge (Amin & Cohendet 2004). At the same time, technological advances have increased our ability to codify knowledge and distribute it as information, a process which has blurred and confused the definitional boundaries. After all, if information is now viewed as uniformly accessible then it could be seen as axiomatic that knowledge is also now evenly distributed. But this terminological conflation potentially risks confusing the subsequent narrative and may result in misleading conclusions, particularly when assessing the impact of technological advances on the geographies of information and knowledge.

Of the two terms, knowledge is the harder to define (or as Clark wrote, "precise definitions of knowledge are elusive" (2018: 274)). It is a highly heterogenous polysemantic term with multiple different conceptualisations, characterisations, definitions, ontologies, and scales (although those relevant to this research are developed in the following section). But at its simplest, knowledge can be seen as the accumulated cognitive capabilities resulting from the synthesis of multiple different sources of new information over time (Amin & Cohendet

2004, Davenport 1997). This can, however, manifest itself in different ways. As per Johnson et al. (2002), for example, knowledge can refer to the ability to know-what (the knowledge of facts), know-why (the knowledge of processes, relationships, and patterns), know-how (the knowledge to do something), and know-who (the knowledge of who knows what and how to build the necessary relationships to facilitate access to needed information and knowledge). Once acquired, these capabilities, however defined, provide the capacity to access and judge the significance of new information, based on an appreciation of context, circumstances, theories, or other knowledge frameworks, and to then action accordingly (Bell 1999). From this perspective, the concept of knowledge remains grounded in personal interpretative and analytical capabilities (Nonaka & Takeuchi 1995, Polanyi 1962).

It has been suggested that knowledge can be created and accumulated at the collective scale, e.g., at the firm-level. These views position the firm as a knowledge-creating entity with the capacity to create and utilise proprietary knowledge an important determinant of relative competitiveness (Nonaka 2007, Nonaka et al. 2000, Spender 1996). But such conceptualisations do not negate the individual as the primary source of such knowledge. They instead argue that firms, and other entities, can leverage on individual expertise to maximise their overall knowledge capabilities, especially proprietary (Tsoukas & Vladimirou 2001). Nonaka et al., for example, argued that "knowledge is created through the dynamic interactions among individuals and/or between individuals and their environments … the theory of organisational knowledge creation is based on the assumption that individuals and organisations have a potential to *grow together* through the process of knowledge creation" (2000: 2-3, *italics* in the original). Similarly, Spender noted that the ability of an organisation to learn and create knowledge was dependent on the extent to which its "members are malleable beings whose sense of self is influenced by the organisations' evolving identity" and are willing to adopt, and adapt, existing routines and practices (1996: 53-54).

Regardless of the assessed scale, there is a recognition that knowledge is a dynamic construct (Clark 2018, Nonaka et al. 2000). It is in a constant state of evolution through interactions with new information, either through assimilation (additions to existing

knowledge) or accommodation (modifications of existing knowledge), as per Piaget (1985). The starting point of this process is data which is converted into information through context-based order arrangement to convey a message with semantic content (Bell 1999). Amin & Cohendet extended this definition when they wrote, "the codification of knowledge is a process that aims at converting knowledge into messages. These messages can then be processed as information that will serve to 'reconstitute' knowledge later, in a different place, or by a different group of individuals" (2004: 21). But the underlying principle remains the same: information is ordered data which conveys a message to recipients.

The subsequent transmission of information is well explored within information theory (Lu 1999, Yeung 1991), but it is noted that this theory is primarily focused on the optimal technical transmission of information between two systems with different information entropies, not the meaning conveyed, nor the value, relevance or effect of the delivered message. Nor does it explain why the same data may be ordered into a variety of messages by different information producers or why new information may be assimilated and accommodated by some recipients, but ignored by others. How new information is acted upon is dependent on highly individual decision-making processes reflecting specific cognitive capabilities and situational circumstances.

The relationship between a flow of information and a stock of knowledge is, therefore, not linear and proportional (Amin & Cohendet 2004: 19). It is, instead, circular with information requiring knowledge in its generation, distribution, receipt, and subsequent use. Drucker, for example, defined information as "data endowed with relevance and purpose" and noted that converting data into valuable and relevant information requires knowledge (1988: 4). Similarly, Boisot & Canals (2004) argued that data is only information when it is converted into a regular form that can be readily understood and assimilated by the receiving agent, a process which requires a prior level of relevant knowledge and is situationally dependent. This builds on Nonaka & Takeuchi's statement that "information is a flow of messages, while knowledge is created by that very flow of information, anchored in the beliefs and commitment of its holder" (1995: 58-9). Amin and Cohendet supported this contention with their statement

that the distinction between knowledge and information requires a framework which is "not restricted to a simple stock or flow distinction" but that "explicitly recognises the cognitive capabilities of individuals" (2004: 19).

This circular relationship between information and knowledge places the individual at the centre of the process. It is individuals who determine the relevance and significance of new information when received, are responsible for producing potentially valuable information for others, and, at the management level, define the organisational cultures and frameworks which influence the production and sharing of knowledge through information flows. This is not to dispute the importance of firms in providing structures and frameworks to maximise the overall information and knowledge capabilities of their employees, as well as setting the boundaries for individual decisions, actions, and behaviours. But the dynamics involved in the creation of knowledge, and its subsequent use, are all the result of the continued spiralling intersection between new information and existing knowledge, with individual expertise determining the timeliness and effectiveness of the process (Woiceshyn 2009). This, in turn, brings us to the concept of tacit and codified knowledge.

1.3 Tacit and codified knowledge, and technology

Reflecting the complexity of knowledge, different conceptualisations have been advanced and applied. The most common is the distinction between codified (or explicit) and tacit (or implied) knowledge. This builds on Polanyi's various works (1962, 1966, 1967) in which he argued that much knowledge was tacit or as he wrote "is indeterminate, in the sense that its content cannot be explicitly stated" (1966: 4). It is instead subjective, experiential, difficult to express in either written or spoken communication forms, and given it is embodied within and carried by individuals, more local, or at least, more "atomistic" (Gertler 2003; Nonaka et al. 2000). This contrasts with codified knowledge which can be expressed or represented in numerical or written formats (e.g., equations, data, manuals, rules, principles etc.), capable of being stored and accessed when needed, dislocated from its original setting, and easily

transferred over distance. Malecki (2010) further divided tacit knowledge into routine (routinised and embedded in actions and practices) and experiential (developed and shared through common experiences), and codified knowledge into conceptual (articulated through images, symbols, and language) and systemic (systemised and packaged).

The concept of tacit knowledge has an influential role within economic geography. The interlinked literatures on agglomeration dynamics and industrial clusters, for example, both stress the importance of territorially sticky, informal, locally circulated, and costly to codify tacit knowledge. This is seen as a primary factor driving the clustering of economic activities, particularly higher order. Through geographical colocation, not only can firms access and exploit spatially limited knowledge spillovers, but also reduce the costs of acquiring knowledge (Döring & Schnellenbach 2006, Malmberg & Maskell 2002, Malmberg & Power 2005). Furthermore, the clustering process stimulates the creation of additional localised and differentiated knowledge specific to the cluster, which compounds and advances its competitiveness (Bathelt et al. 2004, Storper & Venables 2004). From this perspective, the ability to develop, retain and exploit proprietary, specialised, and complex tacit knowledge is seen across all scales (including national, regional and firm) as a non-replicable competitive differentiator and a contributing determinant of growth and development trajectories.

The tacit/codified binary conceptualisation, however, is associated with various debates and criticisms. The first is that the dichotomy is potentially misleading since most knowledge exists on a continuum between fully codified or wholly tacit (Howells 2002, Nonaka & von Krogh 2009, Polanyi 1966). This reflects the inter-dependency and complementarity between the two forms with the active interaction between the two a requirement for the creation of new knowledge (Amin & Cohendet 2004, French 2000, Nonaka & Takeuchi 1995, Nonaka 2007). After all, building on the above relationship between information and knowledge, codified content has little or no use without the tacit interpretative and analytical expertise (Bathelt et al. 2004, Johnson et al. 2002). As Polanyi wrote, “while tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied (1966: 7) or as Sutton succinctly argued, “to understand something requires prior

understanding" (2001: 85). There is, therefore, a perpetual spiral interaction between codified and tacit knowledge through which new knowledge is created and information is acted upon (Nonaka 2007, Woiceshyn 2009).

The second is the debate over the extent to which knowledge can be codified. It is recognised that knowledge can transition from tacit to codified through several conversion processes, often enabled by the substantial technological advances over recent decades (Nonaka & von Krogh 2009). This has allowed knowledge that was previously implied and internalised within individuals to be made explicit, codified, and socialised (a process which underpins much of the "death of geography" literature). As an illustrative example, Polanyi (1966) cited facial recognition (a capability linked to knowing what and who) as an intuitive act based on an individual's tacit knowledge. But this process has today been fully de-personalised and made explicit with numerous software providers now offering such capabilities. What was previously viewed as a purely tacit capability has now been depersonalised through the codification process. But the codification of knowledge remains complicated given the difficulties of agreeing a common language, syntax, and models, especially those which ensure minimal scope for uncertainty and differences in interpretation, and the costs involved of conversion, documentation, and storage. These constraints result in an uneven potential for codification across the different types of knowledge (what, why, how, and who) with Johnson et al. (2002) suggesting that know-what is the easiest to codify and know-how the most difficult, while know-why and know-who are both resistant to full codification due to their highly individual natures and social constructs.

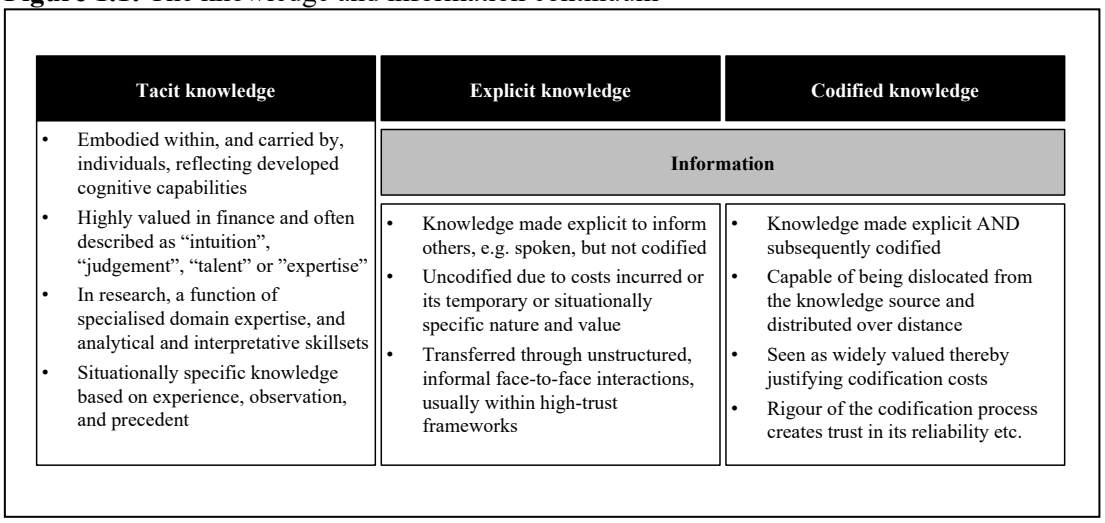
The third is the debate over the extent to which tacit knowledge is grounded in the local. On the one hand, it is argued that its individual and situational characteristics complicate its transfer over distance and ensure that it is best acquired through observation, demonstration, and practice within an interactive and intense learning process based on face-to-face interaction and close physical proximity (Gertler 2003, Howells 2002, Maskell & Malmberg 1999). These factors suggest that the geographies of tacit knowledge are inherently limited leading to an assumed tacit/local and codified/global categorisation. But this distinction is

increasingly contested with various theories arguing that tacit knowledge can now be transferred over distance. At its simplest, this can be achieved through the movement of individuals, either on a permanent or temporary basis (Martin & Rypestøl 2017, Tenold et al. 2021). But it is also argued that new technologies have effectively freed tacit knowledge from the local by allowing its transfer through other forms of relational proximity including cognitive, institutional, organised, and social (Amin & Cohendet 2004, Bathelt & Li 2014, Boschma 2005, O'Leary et al. 2014, Torre & Rallet 2005). This, Amin & Cohendet concluded in strident terms, makes a "mockery of the idea that spatial proximity and 'being there' are one and the same" (2004: 108). From their perspective, the transfer of knowledge, even tacit, is no longer dependent on location nor distance, but on relationships not necessarily anchored within territorial confines.

It is also noted that the tacit/codified conceptualisation is associated with various definitional issues. The most significant is the extent to which codified knowledge is viewed as synonymous with information. After all, if information is context-based order arrangement of data to convey a message with semantic content, and codified knowledge is knowledge that has been documented in a formal and systematic language, then it could be argued that the two terms are effectively the same (Johnson et al. 2002). This conflation is most obvious in the knowledge and information management literatures. Payne & Fryer, for example, stated that "codified knowledge is information" (2020: 74) while Shin & Holden saw codified knowledge as "information-like" (2000: 1344). But even the KIBS literature sometimes conflates the various definitions with Miles et al. writing, "knowledge-intensity is often used as a synonym for information-intensity" (1995: 15). To an extent, this conflation has its roots in the frequent blurring of the terms "codified" and "explicit" within the literature. This presents a potential challenge to our understanding of knowledge and information flows because it assumes that all knowledge once made explicit (even when spoken as per Nonaka & von Krogh (2009: 636)), can be codified. But the codification of explicit knowledge incurs costs, as highlighted above, which need to be assessed against the potential value of documenting and storing such knowledge. As such, not all explicit knowledge, even when used to inform others, will be

codified. It may, therefore, be appropriate to consider explicit knowledge as an intermediary step on the tacit to codified continuum.

Figure 1.1: The knowledge and information continuum



Finally, despite the increasing ubiquity of codified knowledge / information, it can be argued that the importance of individual knowledge and expertise has become more, not less, important as the differentiating factor in the subsequent response to any new information (Maskell & Malmberg 1999). In the absence of any immediate informational advantage, relative outcomes will be determined by how individuals use their acquired "soft" skills and expertise to assess, analyse, interpret, and react to new "hard" information (Lipshitz & Shulimovitz 2007). This is particularly the case in finance which remains highly dependent on specialised individual knowledge, often described as "intuition", "judgement" or simply, "talent". Those with such capabilities are believed to have both highly developed skills (i.e., domain-specific technical knowledge such as pattern recognition) and expertise (i.e., an understanding of how asset prices will react to new information) (Clark 2018). Possession of these capabilities accord individuals with the ability to rapidly process new information and react quicker than competitors (Clark 2018, Hensman & Sadler-Smith 2011, Huff et al. 2006). As such, individual knowledge, expertise, and capabilities, remain very important across the

various financial ecosystems and highly prized. And as introduced below, this has implications for the geographies of finance.

1.4 Information, knowledge, and finance

The geographies of information and knowledge play an outsized and multi-faceted role within economic geography and represent important components of the literatures on globalisation (Baldwin 2016, Friedman 2005, O'Brien 1992), economic development (Lundvall 1998), industrial clusters and other forms of agglomeration (Bathelt et al. 2004, Gertler 2003, Huber 2012, Storper 1997, Storper & Venables 2004), and world cities (Sassen 1999 2001). Many of these literatures emphasize the important role of advanced producer and business services as inputs to the various involved processes (Kekezi & Klaesson 2019, Taylor 2001, Tödtling et al. 2006). Within the business services complex are knowledge-intensive business services (KIBS), which, as the name suggests, develop and provide specialised knowledge as an input to the production processes of other companies. In doing so, they aggregate, develop, and distribute specialised knowledge, thereby supporting the productivity, competitiveness, and innovativeness of local firms (Corrocher & Cusmano 2012, Pinto et al. 2015).

The KIBS sector, however, is not homogenous. The range of activities covered within the categorisation is broad with Miles et al. (1995) differentiating between professional KIBS (P-KIBS) (e.g., advertising, financial services, architecture, surveying, law, management consultancy, and accountancy) and technology-intensive KIBS (T-KIBS) (e.g., software design and development, telecommunication and computer networks, technical engineering, and R&D consultancy). This categorisation has been further developed with von Nordenflycht (2010), for example, outlining a taxonomy based on knowledge intensity, capital intensity, and the need for a professionalised workforce, while Tether et al. (2012) and Pina & Tether (2016) applied Asheim et al.'s (2007) conceptualisation of the various types of knowledge bases (analytical, synthetic, and symbolic) to argue that KIBS exhibit different knowledge orientations, with subsequent implications for their structures, behaviours, and geographies.

Within these various conceptualisations sits finance. Like many other KIBS activities, finance is complex, involving multiple different activities each with their own very specific characteristics, processes, and behaviours. But at a broad scale, the sector is often represented as occupying a primary role at the apex of the overall advanced producer services and KIBS complex (Bassens et al. 2021, Sassen, 2016). This not only reflects the relative scale of finance and its role as a producer and consumer of advanced services, but also the fact that information and knowledge, along with the supply of capital, represent the foundations on which all financial activities are developed and undertaken (Clark & Monk 2013, Grote et al. 2002, Petry 2020). The pursuit of investment returns, for example, requires an understanding of the relative forward attractiveness of different investment opportunities across the various asset classes, countries, industries, and securities, while optimal trading strategies are dependent on understanding market conditions, the expected behaviours of other market participants, and an estimation of how markets will react under different circumstances. Finance has, therefore, always placed a premium on information and knowledge with relative performance and success often viewed as dependent on the ability of individuals and institutions to develop and exploit information and knowledge advantages over competitors.

Technology plays an important role in this process; either to develop and improve proprietary capabilities or to reduce the information and knowledge advantages enjoyed by others. There is, therefore, a tight relationship between finance and technology. Significant improvements in processing capabilities, for example, have allowed the development of proprietary trading platforms which seek to give their users an informational advantage when trading, however marginal. There is now an entire segment of the investment community dedicated to using their proprietary collection and processing of market data to secure an advantage by reacting to signals quicker than competitors. As Zook & Grote (2017) noted, the aim of high-frequency trading is to increase information asymmetries. But conversely, there is another segment of the investment community which aims to reduce the information and knowledge advantages of others by free riding on their collective knowledge capabilities and subsequent investment actions. These passive investors recognise that the accumulation of

knowledge and information incurs costs which can be avoided by simply tracking an index which is the culmination of decisions taken by active investors, i.e., those who actively buy and sell single stocks based on a proprietary investment decision process. From this perspective, they seek to negate the benefits of any proprietary knowledge an active investor may have by mimicking their subsequent investment decisions.

The rapid growth of passive funds has dramatically altered the structure, dynamics, and functioning of markets, across all asset classes, especially in developed markets. It is linked to the "quantification" of finance and has also been associated with the reduced role and value of proprietary information and knowledge in financial markets (French 2008, Sushko & Turner 2018). But this is a potentially misleading interpretation of the involved knowledge dynamics. After all, investors in such funds have decided to allocate capital to them based on an informed consideration of alternative investment opportunities, including active funds (Sorenson et al. 1998). At the same time, there has been a profusion in the number, range, and sophistication of offered passive funds giving investors targeted access to geographies, sectors, themes, and investing styles (including factor specific). Known as "smart beta" products, this increasing complexity of passive offerings recognises the limitations of competing solely on price. They also involve the accumulation of proprietary knowledge and information by the various fund providers in order to produce differentiated and competitive products. At the same time, many active funds have reacted to the emergence of passive funds by committing more resources to proprietary knowledge capabilities, especially given evidence suggesting a positive relationship between inhouse proprietary research and fund performance (Rebello & Wei 2014, Cici & Rosenfeld 2016).

But while information and knowledge remain a core component of all financial activities, advances in management and communication technologies have driven continual changes to the underlying dynamics and structures of financial ecosystems. These changes have had subsequent implications for market participants, whether institutions or individuals. In part, this is seen in improved process efficiencies and the reduced headcount allocated to certain functions (e.g., sales and trading). But it is most visible in the substantial increase in

the amount of financial information available given the greater codification of knowledge. This is reflected in the rapid growth in specialised data and information providers. At time of writing, for example, MSCI, an American provider of financial data including indices, is valued at more than $40 billion, while IHS Markit, a British financial information company, was acquired by S&P Global, a competitor, for $44 billion in 2022. Simultaneously, many stock exchanges have moved to monetise the data produced by activities on their trading platforms (Petry 2020), culminating in the London Stock Exchange acquiring Refinitiv, a provider of data, analytics, and infrastructure, for $27 billion in 2020.

This profusion of information is linked to the "death of geography" argument; the notion that the information and knowledge required to make a financial decision can now be accessed from any location. But as developed in later chapters, this view risks excessively simplifying the complexity of finance and the involved knowledge processes. It assumes, for example, that all knowledge required to produce financial products and make investment decisions can be codified and accessed as information. But such a scenario must be considered highly improbable given the value of knowledge is often situationally specific with significant spatial and temporal determinants. It is ambiguous without fusion with other knowledge, tends to have a short life given the dynamism of financial markets and the need for rapid decision-making, and would incur excessive and unjustified costs if codified in a timely manner. As a result, it can be argued that codified information, e.g., real-time prices, valuation metrics, research recommendations, and corporate disclosures, will only ever represent a small component of the total knowledge set associated with any asset, market, or financial product. The larger proportion, or perhaps more accurately, the more valuable proportion, will, instead, continue to be embodied within individuals as tacit expertise. Although this may be made explicit through face-to-face interaction at various points, it will not be codified given the above constraints.

It may be useful, at this stage, to provide an illustrative example. If a portfolio manager (PM) owns a large position in a company which reports results below market expectations, the PM will have to decide whether to reduce/exit the position, hold, or use any price weakness to

buy more. This decision will have potential relative performance implications, both versus the market but also against competitors, and will be a function of whether the PM views the results as a temporary shock which has already passed, or indicative of a fundamental change to the company's outlook, and hence its fair valuation. Furthermore, the available codified information (e.g., the company's share price, earnings statements, consensus forward estimates, analyst ratings etc.) is now effectively "stale", in industry parlance, as it has not been updated to reflect the new information (the poor earnings results). The PM can solicit views from colleagues and other informed sources, including the company and sell-side research analysts, but immediate reactions to such events are often confused with no clear narrative. Any advice provided will be explicit knowledge accessed through in-person communication (either face-to-face or virtual), not codified, and will often be unstructured and conflicting. The PM will need to form their own opinion on the relevance and significance of the results and react accordingly, i.e., to use their own knowledge and expertise when assessing and reacting to the new information, all within compressed timelines.

This is not an unusual scenario in finance. A myriad of such decisions are taken every day by individuals relying on a process of personal intuition informed by previous experience and acquired knowledge; for example, a buy-side analyst deciding which new information or ideas to escalate internally for potential action, a quantitative strategist deciding which model and factor to weight, a trader deciding which broker to ask to execute an order, or the chief financial officer of a corporate deciding how to raise new equity capital. Furthermore, each of these various financial activities and decision-making processes have their own discrete geographies and geographical implications. The need for the rapid collection of information within compressed timelines and high-trust frameworks, for example, continues to favour physical proximity and colocation. But even those activities taking full advantage of technological advances are often still bound by geographical constraints. High-frequency trading, for example, may reflect one of the most technologically intensive aspects of finance but it remains anchored by the need for physical proximity to the relevant exchange, often

involving colocation within the same building, to minimise latency in data flows (Grinsted 2016, Zook & Grote 2017).

The geographies of information and knowledge are, therefore, inherently intertwined with those of finance (Clark & O'Connor 1997, Faulconbridge et al. 2007, Grote et al. 2002, Lai 2006). The two should not be considered separately but together: to understand the structure and geographies of finance, the associated geographies of information and knowledge must be explored and understood. But investigating the geographies of information and knowledge is methodologically complex, as outlined in the following section.

1.5 The challenges of investigating information and knowledge

The substantial literatures on the geographies of information and knowledge are frequently constrained by methodological challenges which make it difficult to validate many of the associated concepts, as per Short et al.'s (1996) "dirty little secret" and Beaverstock's et al.'s (2000) "Achilles heel" of world city research. It is, for example, widely recognised within the economic geography literature that many of the conceptual mechanisms seeking to explain the acquisition, transfer, and territoriality of knowledge, especially tacit, lack empirical validation and as such, remain theorised or inferred (Balland & Rigby 2017, Beaverstock et al. 2000, Döring & Schnellenbach 2006, Huber 2012, Martin & Sunley 2003, Short et al. 1996). As an example, Huber writes, with reference to Storper & Venables's concept of "buzz", "no definition of buzz unambiguously states which social processes are included or excluded … and it still remains unclear whether and how knowledge quasi-automatically travels among local actors" (2012: 109). Similarly, Martin & Sunley argued that the role social and knowledge networks play within industry clusters was often inferred in the literature, even though the actual involved dynamics remained something of a "black box" (2003: 16).

To a significant extent, this evidential gap highlights the difficulties of defining, observing, and measuring the creation and circulation of knowledge at the individual level on a systemic large-scale basis (Cummings 2004, Howells 2002, Shearmur & Doloreux 2020).

Foray, for example, noted that "knowledge is largely unobservable … and largely unmeasurable" (2004: 9), while Balland & Rigby found that "we have no readily available measures of the complexity, or the tacit nature of knowledge located in particular places" (2017: 4). But it also reflects the difficulty of providing lived comparable scenarios when considering the role of proximity in the transfer of knowledge and information. As a result of this opacity, many of the proposed theories relating to the geographies of knowledge often lack supporting empirical evidence. This criticism is not solely applicable to theories arguing for the continued territoriality of knowledge, but also to those proposing that technological advances have dislocated the various knowledge processes from spatial constraints (as per the various "death of geography" arguments). After all, economic activities, including finance, have not fragmented "into a 'thousand pieces of geography' scattered randomly across the globe" (as per Clark & O'Connor, 1997: 89) as effectively hypothesized by those arguing that spatial factors have lost their influence, but instead continue to demonstrate a natural tendency towards concentration and clustering.

Nevertheless, geographers face significant methodological challenges when seeking to identify, observe, and measure knowledge, especially tacit, and its transfer, at the more micro-levels, including individual (Huber 2012, Martin & Sunley 2003, Rutten & Boekema 2012). This is evident within the relevant literature. Much of the associated empirical analysis on the creation and transfer of knowledge, for example, has been undertaken at the firm and network levels (Malmberg & Power 2005). There is also a tendency to focus on the presumed outputs of knowledge processes, for example, innovation as measured by patents secured, and not the involved generative mechanisms (Balland & Rigby 2017, Jaffe et al. 1993, Kekezi & Klaesson 2019, Ponds et al. 2010). Both these tendencies may reflect methodological constraints and necessities, but they subsequently create the risk of "circular causation" with identifiable outputs being used to "prove" the existence of theorised or assumed mechanisms, rather than the actual processes involved in their production being investigated and understood (Malmberg & Maskell 2002: 435).

This is particularly the case in finance given its various components and processes are typically opaque and ambiguous to external observers, as per Heinemann's "black box" (2014). It is difficult for non-participants to understand the mechanisms, individuals, and knowledge involved in the production of financial products or services. There is a particular lack of available insight into how financial information and knowledge is transmitted and distributed, especially at the global scale. One approach has been to assume a positive causal relationship between financial employment, and the sophistication and specialisation of expertise and capabilities, with the presumption that larger centres, in terms of employment, have greater specialised expertise (Panitz & Glückler 2022, Pažitka et al. 2021). However, this can be viewed as a blunt measure of a centre's accumulated expertise as the use of aggregate employment provides little insight into the capabilities and knowledge, especially specialised and non-replicable, that individuals within each centre may possess (Wood 2006). In fact, it may potentially overstate the relative importance of certain centres within global financial networks, while under-estimating the role and contribution of others.

There is, therefore, a natural tendency within the literature to focus more on financial outputs (e.g., transactions) rather than the production inputs (e.g., individual and institutional expertise). But this can result in misleading conceptualisations of financial geographies given it potentially simplifies the complexity of finance to a single action, the final transaction. It overlooks the extreme complexities involved in the various production and decision-making processes which result in financial actions, and more importantly, the continued importance of individual specialised knowledge in these processes. After all, traders are usually executing the decisions taken by others and most financial products, as with other KIBS, are produced by a relatively small number of highly specialised front-office revenue-generators (Panitz & Glückler 2022, Wood 2006). Not only are these often difficult to identify and access on a globally consistent basis, but their locations can differ significantly from where their products are ultimately traded and made visible. As such, the use of outputs to map financial activities may not accurately reflect the production geographies of financial activities.

Investigations into the geographies of financial knowledge and information are, therefore, frequently constrained by the methodological difficulties associated with the identification, location, and observation of the individual creators, bearers, and distributors of specialised financial knowledge and information, particularly at the global scale. But one such publicly visible subset of specialised knowledge-intensive financial professionals are sell-side equity research analysts. These are introduced in the following section.

1.6 The relevance of sell-side equity research to the debate

Sell-side equity research is a specialised function within financial markets, acting as an information and knowledge intermediary between corporates issuing equity capital and investors (the "buy-side") seeking investment opportunities (Arand et al. 2015, Healy & Palepu 2001). Working for equity brokerages and investment banks (the "sell-side"), sell-side equity analysts advise investors on the relative attractiveness of companies listed on public equity markets through assessments of potential future shareholder value creation which are then publicly expressed as stated opinions. Specifically, they forecast the future financial performance for a defined subset of companies with their summary views codified into earnings forecasts, target valuations, and investment recommendations (the public "buy", "hold", "sell" ratings). In industry parlance, this process is known as coverage with analysts under a regulatory requirement to maintain active coverage on a company from the point of initiation (when an analyst will first define his/her views on a company) through to termination (which is when an analyst formally ends coverage which can happen for various reasons).

The forecasting process is complex, information-intensive, and time sensitive. It requires analysts to assess the most likely forward scenarios across a multitude of determining factors including: revenues (which, in turn, are determined by market competition, products offered, prices, end-user demand etc.); operating costs (including salaries, property and other infrastructure costs, production inputs and commodities); and capital expenditures, including those required to support revenue growth, and upgrade and maintain existing production

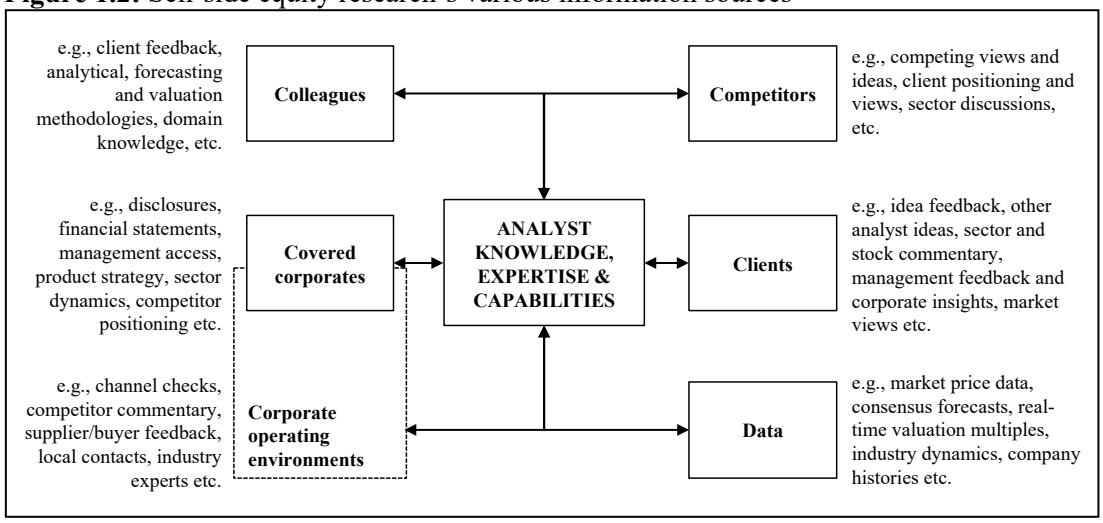
infrastructures. In addition, there are other less tangible factors which may influence a company's future performance, and which analysts need to consider and incorporate into their assessments. These include technological developments (especially those which may either expand a company's addressable market or be disruptive in terms of market competition), government policies, corporate strategies, and management capabilities. Furthermore, the relative importance of all these factors must be considered over long forward horizons. The minimum forecast period is generally three years, but it is not unusual for earnings estimates to be constructed over a ten-year period depending on the valuation methodology adopted.

The ability to develop accurate, and hence, valuable forecasts, views, and opinions, reflects the ongoing interaction between information and knowledge. On the one hand, this is highly dependent on the analytical and interpretative capabilities of individual analysts, for example, how they weight the various drivers of future earnings and value creation when developing their forecasts, and how they assess the relevance and significance of any new information (Cowan & Salotti 2020). There is an existing substantive body of financial economics literature exploring the processes through which this expertise is acquired including previous relevant industrial experience (Bradley et al. 2017), physical proximity to corporates (Bae et al. 2008, Jennings et al. 2017, Malloy 2005), supporting resources (Fang & Hope 2020, Gao et al. 2022), and quality of immediate colleagues (Do & Zhang 2020, Groysberg & Lee 2010). But from an economic geography perspective, the emphasis on individual expertise and tacit capabilities as the dominant input to the knowledge production process makes sell-side equity research one of the more knowledge-intensive business services, along with management consultancy (von Nordenflycht 2010, Falconbridge & Jones 2012). As such, it can be considered distinct from those KIBS more focused on assessing current or past circumstances using codified data and precedent, e.g., accountancy and law.

The relative performance of analysts is also a function of their ability to ensure maximum access to new information. The continual information collection process reflects the need to ensure that their forecasts and investment recommendations incorporate all relevant information on an ongoing process. This is not just to maximise the potential accuracy of their

views, but also to maintain credibility and relevance with clients. After all, there are only a limited number of occasions when an analyst can claim to be "surprised" by an outcome before they lose credibility with investors. Analysts are, therefore, in a constant search for new information, which is subsequently processed and interpreted using their existing knowledge and expertise (e.g., by reference to established principles, defined patterns, and precedent) to determine its relevance and significance. This collection, interpretation and assessment process is highly dependent on the knowledge and expertise of individual analysts. It is an iterative process with analysts using their acquired knowledge to identify what information is needed, to then determine the relevance and significance of the new information, and if relevant, to subsequently modify their existing views and opinions.

Figure 1.2: Sell-side equity research's various information sources



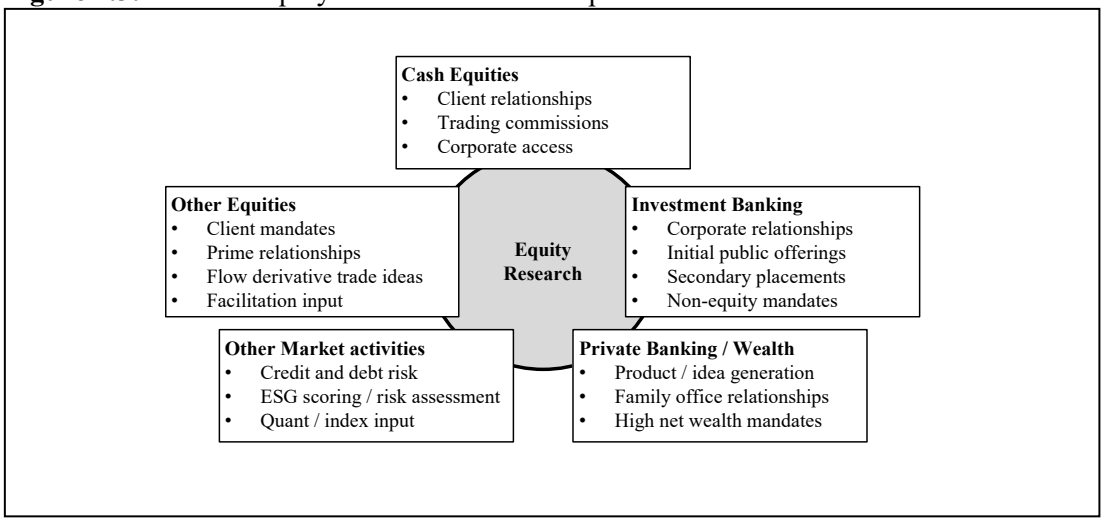
Analysts function, therefore, in an informationally intensive world (figure 1.2). To maximise the accuracy of their forecasts and recommendations, and to provide valuable and differentiated knowledge and information to investors, they will collect information from a wide variety of contacts, which are often geographically dispersed. These can include covered corporates and other companies linked to the relevant markets such as competitors, suppliers, and distributors, as well as clients, colleagues, peers, industry and other experts, regulators, and other government bodies. Many of these relationships are predicated on the reciprocal

exchange of information within high-trust inter-personal relationships. This, however, creates a persistent challenge for analysts who need to develop and maintain such relationships within their unique informational geographies. Some, for example, benefit from being co-located with their corporates and clients within the same city, while others are remote from their information sources and are, therefore, more dependent on virtual platforms as well as periods of temporary face-to-face interaction through manufactured physical proximity.

It should also be noted that sell-side equity research is closely linked with other financial activities. The function typically represents the primary source of information and knowledge on companies and industrial sectors within any investment bank and is an important input to the production of other financial products and services. In equities, for example, the relative competitiveness of a bank's sales-trading, prime services, and equity derivative offerings is often dependent on the quality of its equity research product. It is unsurprising, therefore, that the business is usually co-located with the other equity and trading functions, including those on the buy-side (Lee & Manochin, 2021). At the same time, equity research is closely linked to a bank's investment banking activities, as reflected in the fact that a significant proportion of equity research costs are typically covered by a bank's corporate finance department. Furthermore, its relationships with the non-equity and non-investment banking components of the financial ecosystem, e.g., private banks, wealth management, and retail investors, have become more important as the traditional brokerage business model has come under stress given changes to the buy-side, e.g., on the rise of passive index investing, and regulatory developments, e.g., the unbundling of research payments from trading commissions in Europe (Fang et al. 2020, Lang et al. 2024). These various relationships are summarised in figure 1.3 and given their strength, the geography of sell-side equity research can be seen as indictive of the geographies of many other financial products, services, and processes.

The study of sell-side equity research, therefore, offers a variety of potential insights to both economic and financial geography, especially in terms of the higher-value and more

Figure 1.3: Sell-side equity research's relationships with other financial activities



knowledge-intensive financial services. But to date it has received little attention in the literature (Hall 2007 and Wrigley et al. 2003 are notable exceptions). In part, this may reflect their general framing as "stock-pickers" rather than as specialised knowledge and information intermediaries. As outlined above, however, such a framing does not capture the complexity of their role with sell-side equity analysts representing one of the most knowledge- and information-intensive functions within the broader financial ecosystem. They are dependent on highly developed and specialised individual tacit knowledge and timely access to information, especially differentiated and proprietary. To be successful, they need to have strong individual capabilities across all four aspects of knowledge (what, why, how, and who) with particularly advanced interpretative and analytical skills, given their forecasting role. This also means that the value of their products is a function of access to information and as such, their location reflects the complex and dynamic interaction between the need to minimise costs when accessing information from disparate and dispersed sources in a timely manner, while maximising the value of information collected and subsequently offered to clients. Finally, analysts are visible to external observers, in terms of location, specialisation, and scope of activities, and are, therefore, the only financial and KIBS professionals systematically identifiable at the global scale.

1.7 Research objectives and structure

Building on the above background, this research project seeks to add to the existing literature by addressing three objectives which are developed within three distinct papers already published in peer-reviewed journals: Progress in Economic Geography (chapter 4), Geoforum (chapter 5), and Finance and Space (chapter 6). The three objectives are:

- First, to map the global distribution of specialised knowledge-intensive financial professionals (sell-side equity research) to reveal the knowledge capabilities, specialisations and hierarchies of financial centres, directly addressing Balland & Rigby's statement that "we have no readily available measures of the complexity, or the tacit nature of knowledge located in particular places" (2017: 4).

- Second, to explore the mechanisms through which information is accessed and transferred within financial markets, especially the need for physical proximity in such flows, using the restrictions on mobility and in-person interaction enforced during the COVID-19 pandemic as a natural experiment.

- Third, to investigate the mechanisms through which specialised financial professionals acquire their individual knowledge (domain expertise and required skillsets), especially the need for acute physical proximity, as revealed by the consequences of the COVID-19 pandemic work-from-home policies, heeding Rutten & Boekema's (2012) call to focus on individuals as the principal learning agents within any system.

In terms of the thesis structure, this chapter introduces the research project, including the contested debate around the need for physical proximity in the transfer and acquisition of information and knowledge, the associated methodological challenges in the empirical validation of the proposed theories and conceptualisations, the relevance of sell-side equity

research to the debate, and the arising research objectives. Chapter 2 builds on this introduction and addresses the existing literature to develop a conceptual framing based on evidence that finance continues to tend towards opacity, not transparency, despite all the technological advances. It revisits Clark & O'Connor's (1997) seminal work on how financial geographies are influenced by the relative transparency of financial products and draws on the substantive literature on the importance of information and knowledge networks in finance, as well as some of the findings of this research project, to suggest that the notion that some financial products are now so transparent that they can be produced, valued and priced in any location, remains elusive. This, it concludes, suggests that finance remain influenced by geographical considerations.

Chapter 3 introduces the two methodological workstreams used to address the research objectives. The first workstream was the development of a dataset mapping the global distribution of the sell-side equity research industry (as a proxy for specialised financial knowledge). This involved identifying 11,307 writing analysts, their locations by city, the geographic scope of their coverage activities, and the employee details. The second workstream involved a programme of semi-structured interviews with 70 participants to assess the impact to which the COVID-19 restrictions on mobility and in-person interaction had impacted the ability to access and distribute information, as well as to transfer and accumulate tacit knowledge.

Chapters 4-6 present the papers as published which represent the empirical contribution of the thesis. Chapter 4 maps the sell-side equity research industry to provide new insights into the global distribution of financial knowledge, and the size, reach, and role of different financial centres within information hierarchies and networks. It shows that most activities undertaken by research analysts are domestic, not cross-border, highlighting the continued frictions to information flows created by national borders. Chapter 5 builds on this by investigating the extent to which physical interaction remains important in the origination and distribution of financial information using the COVID-19 restrictions as a natural experiment. Analysts restricted from physically accessing information sources reported a general

degradation in their knowledge, especially versus more proximate competitors. Previously strong social and reciprocal relationships with clients, even those co-located in the same city, were also weakened. Although the loss of relative knowledge was gradual and incremental, it was persistent and self-reinforcing.

Chapter 6 explores the need for physical proximity in the acquisition of specialised tacit knowledge, also using the COVID-19 restrictions as a natural experiment. The analysis finds that specialised and complex knowledge is acquired by junior team members primarily through intense interactions enabled by office working. This learning mechanism was disrupted by the work-from-home policies which resulted in their development being degraded. But as analysts gain expertise (tacit knowledge), they become more autonomous, less dependent on the office as a source of knowledge, and more reliant on temporary and remote relationships. This suggests that physical, relational, and temporal proximity function as alternative mechanisms in the acquisition of knowledge and that their relative importance evolves as knowledge is accumulated.

Chapter 7 concludes by summarising and discussing the key findings of the research project. It also identifies future potential research directions and questions arising from the work undertaken. A fully consolidated bibliography is provided at the end of the thesis.

Chapter 2

LITERATURE REVIEW
TECHNOLOGY, REGULATION, NETWORKS, THE TRANSPARENCY OF FINANCE, AND GEOGRAPHIC IMPLICATIONS

2.1 Introduction

As outlined in the previous chapter, finance is built on information and knowledge, specifically the ability to gain an advantage over other market participants in the various investment processes to secure longer-term financial returns (Clark 2018, Clark & Monk 2013, Clark & O'Connor 1997). This has historically favoured proximity and high-trust networks, which, in turn, created a significant territorial component in the geographies of finance (Clark 2005, Gertler 2003, Storper & Venables 2004). But the relationship between finance and space is now contested given advances in telecommunication and information technologies which have allowed for a greater proportion of financial information to be codified and dislocated from its point of origin (Amin & Cohendet 2004). At the same time, regulators have sought to ensure more equal access to price-moving material information. The cumulative confluence of these two dynamics has, it is argued, eroded finance's spatial link, whether framed as the "death of geography" (O'Brien 1992), "the death of distance" (Cairncross 1998), or simply the declining importance of place (Baldwin 2016). These arguments have also taken support from various financial dynamics including the concentration of trading in specific exchanges and the ability of the industry to continue functioning during the Covid-19 pandemic (Wójcik 2011, Wójcik & Ioannou 2020).

But the extent to which financial information and knowledge can be codified and made universally accessible across space is disputed. In part, this reflects the view that such arguments are based on a simplified conceptualisation of the financial production processes and the relative importance of codified knowledge / information within the various decision-

making mechanisms. As a result, the literature arguing for the decoupling of finance from geography remains excessively focused on the more visible outputs of financial production processes (e.g., trading volumes and locations) or the now ubiquitous availability of certain codified knowledge (e.g., real-time market prices), rather than the complex, and often highly opaque, processes which underpin the production of financial products, and the subsequent investment and trade decisions.

There is a rich literature developing these critiques including the influential work by Clark & O'Connor (1997) on the relative transparency of different financial products. They argued that financial products exist on an informational spectrum from transparent to translucent to opaque with their positions on this continuum subsequently reflected in their production scale and their geographies: opaque products produced in sub-national centres; translucent in national centres; and transparent in global centres. They recognised, however, that products can become more transparent as the relevant information and knowledge is dispersed across space. As this happens, producers lose their information and knowledge advantage and other factors become more important in determining relative competitiveness, including scale, which subsequently favours their volume production in the larger international financial centres.

Within this conceptualisation, therefore, the argument that finance is now disconnected from space is premised on the notion that technological advances and changes to regulatory frameworks have made financial products progressively more transparent. But such views seemingly overlook persistent findings within the financial economics literature that the industry continues to tend more towards opacity than transparency, as evidenced in the continued pervasiveness of spatial information and knowledge asymmetries. Although regulatory changes and technological advances may have reduced their extent over recent decades (Bernile et al. 2019), they remain a chronic feature of financial markets. Not only in the debt and equity markets (Chang 2010, Francis et al. 2022, van Nieuwerburgh 2009), but also in those asset classes considered more transparent by Clark & O'Connor (e.g., foreign exchange trading as per Menkhoff & Schmeling 2008, Piccotti 2016, Ranaldo & Somogyi

2021). The continued presence of such asymmetries suggests that despite all the various advances in communication and information technologies, and the changes to regulatory frameworks designed to improve market functioning and product transparency, there are other factors which continue to result in the uneven distribution of information and knowledge across market participants.

Furthermore, the persistence of "familiarity" effects within finance suggests that participants are either not receiving all available information on alternative investment opportunities, have insufficient expertise and knowledge to interpret the available information to reach optimal investment decisions, or have preferential access to information within their local confines (Massa & Simonov 2006, Seasholes 2010, van Nieuwerburgh 2009). This is also supported by evidence that different financial centres can develop distinct and long-lasting specialised knowledge capabilities which compound through geographically dependent and knowledge determined product innovation, a process which continually adds complexity and opacity, often driven by the pursuit of improved returns (Beaverstock et al. 2013, Clark 2002, Dörry 2015, Lai 2006, Waite 2017). All this suggests that financial products and their markets remain typified by opacity, not transparency, even after the various technological advances and regulatory changes.

Drawing on an inter-disciplinary literature review, this chapter develops the argument that this continued lack of transparency is a function of the role played by information and knowledge networks within finance. A product's transparency is a highly individual construct defined by the intersection of: a) the ability to access the required information to produce, value, and trade a financial product in a timely and efficient manner; and b) the possession of the necessary knowledge to analyse and interpret the acquired information to generate superior future returns. In turn, this is a function of the information networks, and their embedded knowledge capabilities, in which market participants operate (Beaverstock et al. 2021, Lai 2006). Despite technological advances, these networks remain territorially defined, underpinned by high-trust relationships and face-to-face interactions (Bratton & Wójcik 2022, Evers et al. 2010, Storper & Venables 2004). It can be argued, therefore, that there is a

significant spatial element to the concept of transparency in that the assessed transparency of a product, or a market, will reflect the capabilities of the information and knowledge networks in which market participants operate, rather than the product's inherent characteristics (Bassens et al. 2021, Clark 2002, Hall 2007, Lai 2006). As an example, the price and value determinants of a European fixed income product may appear relatively transparent to a market participant in London, but more opaque to a counterparty in New York, Hong Kong, or even Milan.

This chapter develops this conceptual framing with reference to the existing literature. In doing so, it draws upon, and supports, existing arguments highlighting the continued role of space and location in the geographies of finance (Christopherson et al. 2008, Martin 1994, Morgan 2004). It suggests that despite all the technological advances and regulatory changes since Clark & O'Connor published their framework more than 25 years ago, their conceptualisation remains as relevant today to understand the geographies of financial production as it did then, if not more so. That, despite all the various technological advances and regulatory changes over the period, most financial products remain either translucent or opaque, not transparent. As such, the notion that some financial products are now so transparent that they can be produced, valued and priced in any location, remains elusive, and that consequently, the local and national (or domestic) remains the primary scale through which financial geographies continue to be developed.

2.2 Technology, regulation, and the transparency of financial products

Technology and finance are intertwined. In the constant pursuit of advantage, whether in terms of proprietary intellectual property, access to differentiated information and knowledge, or the reduction of costs, participants in the financial services complex have embraced technological developments with enthusiasm. In turn, new technologies have proved transformational to financial structures, behaviours, and dynamics, as seen through the large-scale demise of face-to-face trading, the emerging dominance of automated electronic trading platforms, the

concentration of trading within specific exchanges (e.g., the New York stock exchanges and London Metal Exchange), and the rapid growth of new products enabled by enhanced information processing capabilities (e.g., electronic traded funds and complex structured derivatives).

The primary impact of new technologies has been to enable the greater codification of knowledge and facilitate its subsequent distribution to any location. This process, it is argued, has not only reduced the information and knowledge asymmetries that exist within financial markets (Bernile et al. 2019), but also weakened the territorial fix of finance (Amin & Cohendet 2004, Baldwin 2016, O'Brien 1992). At the simplest, this can be framed as the erosion of geographical frictions to financial activities as demonstrated by the ability to access market prices regardless of location or to trade and consume products simultaneously in geographically remote markets (Cairncross 1998). But the spatial dislocation of finance is also seen in the conceptual argument that the information and knowledge necessary to develop, produce, value, and price a product, regardless of the location of the underlying asset, can now be transferred across space and acquired in any place. This also links to the underlying tenet within the market hypothesis literature that current asset prices incorporate all relevant information available and that technological advances have made markets more efficient over time (Ito et al. 2016, Ţiţan 2015).

At the same time, regulators have sought to improve the transparency of financial markets with various policies introduced to ensure equal access to important information by establishing rules on the release and dissemination of corporate information. These include the US's Regulation Fair Disclosure (Reg FD) and the European Union's Market Abuse Directive (MAD) which both prohibited the selective disclosure of material price-sensitive information and standardised the release of information by listed corporates (Agrawal et al. 2006, Kross & Suk 2012).

The empirical evidence on the effectiveness of these measures is mixed. Bernile et al. (2019), for example, concluded that regulatory changes in the US had significantly reduced the information advantage previously enjoyed by local analysts and eroded the historic out-

performance of local investments. Similarly, Charoenrook & Lewis (2009) found that analysts became significantly more responsive to public disclosures post Reg FD implementation, suggesting a prior private advantage. But on the other hand, Cowan & Salotti (2020) found that analyst forecasting accuracy went up after the benefits of private access to corporates was removed, suggesting the continued development of proprietary information sources. Along the same lines, Koch et al. (2013) suggested that there was continued evidence that some analysts continued to benefit from preferential information sources. More specifically, while corporates could no longer selectively disclose material information, analysts with continued preferential access to management benefited from "mosaic theory" in which they "create material information by using their expertise to combine private non-material information with existing public information" (2013: 641).

Despite the mixed empirical evidence, it is these technological and regulatory developments which provide the basis for the "death of geography" argument. But although this view is seemingly pervasive, there is an extensive and developed counter literature (e.g., Christopherson et al. 2008, Dymski 2009, Gertler 2003, Morgan 2004). The most compelling rebuttal, in my opinion, is that it exaggerates the importance of codified information and knowledge in the financial production processes. It assumes that financial decisions can be made solely with reference to codified information (e.g., current price information) and does not account for the forward-looking nature of the industry, the importance of individual tacit expertise in the forecasting and investment processes, and the unstructured nature of associated information and knowledge flows. As such, it excessively simplifies the complex interaction between codified information and individual expertise, whether analytical, interpretative or predictive, involved in any financial innovation, production, investment, or trade decision. After all, codified information has little value in the financial production process unless combined with tacit expertise, as per Nonaka's (2007) spiral intersection of codified and tacit knowledge.

But a methodological challenge in validating the view that finance remains territorially dependent is the difficulty of observing the information and knowledge processes involved in

the production of financial products and services, especially those more complex and higher value. Although a common theme across much of the knowledge-intensive business service literature (Bassens et al. 2021, Short 1996, van Meeteren et al. 2016), it can be argued that it is particularly acute within financial services given the industry's complexity, dynamism, and opacity to external observers (the proverbial "black box" as per Heinemann (2014)). As such, when it comes to investigating and explaining financial geographies, there is an emphasis on the visible outputs of processes (e.g., the location of transactions, employment, institutions, and offices) rather than the involved production processes, even though there is widespread recognition that information and knowledge underpin the financial production value chain (Clark & Monk 2013, Grote et al. 2002).

Against this backdrop, Clark & O'Connor's (1997) framework on the informational content of financial products and the geographies of their production provide a robust conceptual point of departure. They argued that the production geographies of different financial products are directly influenced, if not determined, by the associated informational and knowledge requirements, i.e., their relative transparency. On the one hand are those financial products well-known to market participants with widely dispersed and standardised knowledge and expertise, highly visible and replicable price determinants, and minimal scope for information or knowledge advantage. Such products are defined as "transparent" within their typology, can be priced and traded in any location, require scale in their production, and are primarily undertaken in global centres.

On the other hand are "opaque" products which are priced and traded on specific subsets of information and knowledge, whether private, local, or transaction specific. They are typified by a high cost of information acquisition, concentrated specialist knowledge, and with significant potential for information or knowledge arbitrage. These characteristics favour more dispersed and local production models in sub-national centres. Between these two extremes are "translucent" products. These are produced using globally accepted standards and frameworks, but whose specific characteristics, including price, are formulated using specialist knowledge or information which is only available within specific geographies, firms, or

populations. The interplay between the need for production scale and their information requirements favours their production in national centres.

Figure 2.1: Clark & O'Connor's typology of financial products

Opaque	Translucent	Transparent
• Products produced and traded using asymmetric information. • Built on a narrow knowledge / information base, either private (proprietary), transaction-specific or highly local. • Production and trading highly dependent on specialised knowledge, especially given risk profile incurred. • Importance of local knowledge favours sub-national centres in their production.	• Products with globally recognised characteristics but with locally-derived inputs, especially in terms of price / valuation determinants. • Requires specialised product-specific knowledge and information in their production and trading. • Investments in such products require information collection to assess potential risks and returns. • Produced in national centres given need for local knowledge and scale in production.	• Products whose qualities, characteristics, and valuation determinants are well understood by market participants. • Required knowledge / information is widely dispersed (ubiquitous) and as such, products can be produced or traded in any location. • Limited scope for information / knowledge advantage and scope for abnormal profits limited. • Scale important in their production so produced in global centres.

Source: Clark & O'Connor (1997: 96-103).

Clark & O'Connor recognised that this categorisation is dynamic and that products can become more transparent as the needed expertise and knowledge to produce, price, and trade them is diffused across the involved financial ecosystem (1997: 100). And from the above technocentric conceptual perspective, it can be argued that this diffusion process is enabled by technological advances and regulatory changes which have made financial products progressively more transparent and, in turn, enabled the geographical dislocation of finance. But there remains significant evidence that finance continues to trend towards opacity, especially in the financial economics literature. As such, the notion of fully transparent financial products, i.e., those that can be produced, valued, and priced regardless of location, remains elusive, even within those asset classes initially categorised by Clark & O'Connor as transparent (e.g., foreign exchange trading).

To an extent, this tendency towards opacity is a function of the ongoing product innovation process through which the pursuit of financial returns results in more transparent products being displaced by those which are more opaque. But it also highlights the fact that despite all the various technological advances, financial information and knowledge are still not uniformly distributed across the various networks in which market participants act. Given

the heterogeneity of these knowledge networks, there will always be differences in the perceived transparency of financial products across market participants, even across those producing, pricing or trading the same product. These two points not only reflect the continued relevance of Clark & O'Connor's conceptual framework, but they also further highlight the continued importance of place and location in the production and consumption of financial products and services.

2.3 Financial products and the continued lack of transparency

Clark & O'Connor developed their framework with reference to the broad asset classes (e.g., equities, fixed income, real estate, or commodities). This reflects the fact that some asset classes are more informationally intensive than others given a larger number of forward valuation and price determinants. But it could be argued that there is a further transparency spectrum within each asset class given the available products will demonstrate a high degree of heterogeneity, not homogeneity.

This can be demonstrated by reference to foreign exchange (FX) trading, an asset-class categorised as transparent within Clark and O'Connor's typology with global scope and priced on ubiquitous, not place-dependent, information, and knowledge (1997: 101). This characteristic, it has been argued, has supported the geographic concentration of FX trading in London and New York, which together dominate the global FX market (Wójcik et al. 2017). It can also be argued, however, that the traded products within the FX asset class are not homogenous but inherently complex with numerous market participants, all with their own motivations, specialised knowledge, and whose understanding varies significantly across currencies and products (Ranaldo & Somogyi 2021). There are numerous currency pairs each with their own market liquidity, regulatory specificities, advantaged market participants, and associated derivative products (often developed by, or for, specific population subsets). Furthermore, the determinants of forward exchange rates remain highly uncertain, ambiguous, and dynamic (Barbosa et al. 2018).

From this perspective of intense complexity, the status of London and New York as the world's largest FX trading centres may not reflect the relative importance of scale within a highly transparent asset class or the relative competitive advantage of those two cities in trading FX products. Their size may be instead a function of their position at the nexus of the world's three most traded currencies pairs: the USD/EUR, USD/GBP, and EUR/GBP pairs (which, together, accounted for 34% of FX turnover in 2022, as per the Bank of International Settlements 2022 Triennial Central Bank Survey). After all, if FX trading is truly transparent and not place-dependent, then London's and New York's more marginal role in the trading of Asian currencies creates something of a conundrum. Hong Kong is the world's largest trading centre for the Chinese renminbi (RMB). It trades significantly more of the currency than London and New York, according to the semi-annual FX volume surveys in April 2023. In fact, London's share of global RMB trading has declined over recent years as the global economy has shifted towards Asia. Similarly, Tokyo's position in JPY trading has increased over the last decade, not declined.

Not only do these trends run contrary to Wójcik et al.'s earlier expectation that the activity is "on course for further concentration" (2017: 282), but it also suggests that Asian traders benefit from information and knowledge when trading their local currencies which cannot be accessed nor replicated in London or New York. This is supported by evidence from financial economics that the FX market remains "opaque and fragmented" (Ranaldo & Somogyi 2021: 391), traders in a currency's home economy continue to benefit from informational advantages (Menkhoff & Schmeling 2008, Piccotti 2016), and that FX traders in Asia often construct different narratives than their peers in Europe and the US when presented with the same information (Wu and Gau 2022). As Ranaldo & Somogyi concluded, "asymmetric information risk in the FX market is systematic, time varying, and disseminated across groups of market participants as well as currency pairs" (2021: 392).

This spectrum of transparency is also visible within other asset classes. In equities, for example, the complexity of financial products has increased significantly over the last two decades. Technologically driven innovation has resulted in the rapid profusion of new products

within the asset class. There is now a substantial number of equity-related and equity-derived products, often designed within specific markets or for specific investors, all with varying degrees of transparency. Single-stock public equities and passive index-backed funds, for example, may be more transparent than other more sophisticated equity products, including complex structured derivative products and private equities, but information and knowledge asymmetries remain endemic throughout the asset class, even for the more transparent products (Bernile et al. 2019, Chang 2010, Malloy 2005). Even within specific equity products, there is a further layer of relative complexity and transparency. In single-stock public equities, for example, it is easier for investors to understand the value determinants, access the needed information, and forecast future earnings for certain companies than for others (Frankel et al. 2006). A large company such as Apple can be positioned at the upper end of this transparency spectrum, while companies in sectors such as oil & gas, telecoms and utilities are often easier to forecast than their peers in faster-moving and more local sectors.

At the same time, there is continual evolution of more complex and opaque products within each asset class. To an extent, this reflects the continued pressure to generate profits and returns. After all, as Clark and O'Connor recognised, increased transparency is associated with reduced information and knowledge asymmetries, and, in turn, reduced potential returns given an increase in the number of market participants (a view supported in the financial economics literature, e.g., Bernile et al. 2019, Ling et al. 2021). This is seen in the rapid growth of products which seek to take advantage of the greater information asymmetries in private markets. These include private equity and private credit (Dyck & Pomorsji 2016, Wood & Wright 2009), as well as the development of non-public equity trading systems (Comerton-Forde & Putnins 2015, Zhu 2014). But other products have also been developed with the purpose of creating non-replicable information advantages. This includes high-frequency trading (HFT) which Zook & Grote concluded, have "the creation of information asymmetries" at their "very core" (2017: 122)

The range of available and traded financial products is, therefore, not a static construct. There is a constant process of renewal with more complex and more opaque products being

continually developed, frequently tailored to specific clients or market circumstances, and which often displace the legacy products, which are more transparent, in terms of relative importance (Khraisha & Arthur 2018). This is the other impact of technology, which is seemingly overlooked in the "death of geography" literature. While much of the extant literature on the impact of technology on finance and financial geographies is primarily focused on the codification and distribution of information and knowledge (and subsequently, increased transparency over space), new technologies also enable the innovation of more complex and diverse financial products and services. This is an ongoing and compounding process through which market participants use proprietary (and often highly individual) knowledge to layer complexity onto existing financial products or to develop new complex and opaque derivative products based on more transparent underlying assets, in the continual pursuit of maximising or improving returns.

This process is associated with a reduction in product transparency, as seen through incremental information and knowledge asymmetries (Awery 2012, Thakor and Merton 2023). New products are frequently developed within specific knowledge networks to take advantage of either specific client requirements, information and knowledge asymmetries, or differences in regulatory frameworks. Consequently, not only are new financial products often developed by a limited number of producers (using propriety and often highly individual knowledge and information), but the consumers of such products do so from a base of limited relevant expertise. As a result, the innovation of financial products is highly localised (Agnes 2000) and although there will be subsequent knowledge diffusion (Beaverstock et al. 2021, Wainwright 2015), this is a continual iterative process through which opacity is perpetually added back into financial ecosystems, thereby countering any relative transparency gains.

2.4 Networks as determinants of relative product transparency

Clark & O'Connor developed their framework through the broad perspective of the Anglo-American financial system, whereby the relative transparency of any specific asset class is a

function of how dispersed the necessary financial knowledge is across that specific population subset (which was dominant within global capital markets at the time of their publication in 1997). But at a more granular scale, the transparency of a specific financial product to any market participant is a dynamic construct defined by the intersection of: a) the ability to access the required information to produce, value, and trade a financial product in a timely and efficient manner; and b) the possession of the necessary knowledge to analyse and interpret the acquired information to generate superior future returns. These both have significant spatial and temporal components, but are also defined by the specific networks within which individual market participants function.

Finance is built on complex networks, at all scales, and these networks play a core role in the definition of financial geographies. This is often framed within the relevant literature in terms of institutional networks, including linkages with other advanced business services and the production layer, and/or capital flows (Bathelt & Li 2014, Coe et al. 2014, Gimici & Lai 2019, Lai 2018, Wójcik & Camilleri 2015). But networks also play a critical role within financial ecosystems in defining information flows and the development of knowledge (Lai 2006). This is well established within the broader economic geography literature but is particularly important in financial geography given the primary role played by information and knowledge in all aspects of financial value chains (Clark & Monk 2013, Grote et al. 2002).

Networks can be seen as the routing mechanisms through which information and knowledge is disseminated through, and dispersed across, financial ecosystems (Beaverstock et al 2021, Lai 2006, Wainwright 2015). They are multi-scalar in nature, including individual, institutional, domestic, regional and international, and result from the dynamic interaction of numerous factors defining their structure, participants, scale, and linkages with other networks. Each market participant will seek to build the necessary networks around them to maximise access to required information and knowledge. But in doing so, they operate within various constraints including available budgets, information requirements, knowledge capabilities, the relative prioritisation of different information sources, the willingness of other information sources to be connected, institutional characteristics, and social considerations. The resulting

networks, therefore, demonstrate high heterogeneity and significantly different information and knowledge capabilities.

This is most obvious in that information does not flow uniformly across networks, despite all the various technological advances. To understand why, it is necessary to consider the intensity of information flows within finance and the costs of accessing and interacting with them. Financial information flows tend to be highly sporadic, unstructured, informal, frequent, short-lived and situationally specific, as per Storper & Venable's (2004) "buzz" or Grabher's (2002) "noise". This hyper-connectivity risks information overload and subsequent process inefficiencies and degraded performance (Kolb et al. 2008). Given time and resource constraints, therefore, all participants actively filter and prioritise new information, both in terms of its perceived value and importance, as well its potential use and application. This process is a function of multiple factors including the perceived quality of the source, frequently defined with reference to trust.

Information does not flow uniformly across financial networks because trust, which remains important within finance (Millo et al. 2023), is not distributed evenly. The general characteristics of financial information mean that its value is often only realised on ex-post basis after being fused with other information (and knowledge) and acted on or rejected (Heinemann 2014). The time available to assess new information is often short with consequent high pressure to decide whether to act on or reject. This decision will be influenced by the extent to which the source is trusted, which, in turn, will be a function of the length of the relationship, frequency of interactions, degree of reciprocity, shared institutional and social characteristics, and perceived intent (Amin & Roberts 2008, Holste & Fields 2010, Peck 2005, Smedlund 2008). And as a general principle within finance, long-standing relationships grounded in inter-personal interactions will be typified by higher perceived trust (Bratton & Wójcik 2022, Millo et al. 2023).

Not all relationships, therefore, will be underpinned by the same level of trust and while an information source may be trusted and prioritised within one network, it may be untrusted and considered lower priority by others. Furthermore, even if the same information source is

equally trusted by recipients, the perceived value of new information, and the subsequent need to act on it, will demonstrate substantial spatial and temporal variations. How information and knowledge flows through any specific network will, therefore, be determined by the complex interaction of highly individual behavioural, social, and situational factors, including cognitive biases (reflecting other investigations into the mechanics of non-financial knowledge networks, e.g., D'Este et al. 2013, Giuliani 2007, Morrison 2008). Each participant acts as an individual switch-point (network node) which either transmits, modifies or rejects the received information based on their own assessment (to borrow from Clark & Monk's (2013) description of financial institutions as "switch-points"). And as a result, any new information will not be available to all, accessed simultaneously, or given the same priority by involved participants.

In addition, how participants within a network act on new information will reflect their understanding of its relative value. This, when combined with the distinct information or knowledge set embedded within any specific network, will determine how new information is distributed, modified, and acted on. This can result in territorially dependent outcomes. In the foreign exchange markets, for example, traders across different financial centres construct different narratives when presented with the same new information (Wu & Gau 2022). Similarly, participants trading the same financial product within the same country will often reach different conclusions, with subsequent investment and performance implications, depending on their informational networks and knowledge capabilities (Agudelo et al. 2019, Chang 2010). At the same time, there is evidence that access to proprietary knowledge capabilities can result in relative outperformance for equity investors (Rebello & Wei 2014) and that high intensity interactions with expert knowledge results in superior outcomes (Do & Zhang 2020).

All this links back to the importance of tacit knowledge in finance (Clark 2018). Sometimes referred to as judgement or intuition, it refers to the ability to interpret, analyse, and act on complex and dynamic inputs, both tacit and codified, before other market participants. It is accumulated through practice and experience, reflecting the continual

interaction between codified and tacit knowledge (Amin & Roberts 2008, French 2000). Networks which accumulate and retain superior tacit capabilities will, over-time, offer their members a knowledge advantage over other market participants. In turn, this will result in the knowledge capabilities of different networks diverging and, reflecting the link between product knowledge, familiarity, and risk appetite, will influence the behaviour of participants within any specific network (Lai 2006, Sidaway & Byson 2002). In aggregate, this will also result in different financial centres exhibiting knowledge specialisations (Clark 2002, Hall 2007, Lai 2012, Wainwright 2015).

It is hypothesized that new technologies enable those outside geographically remote to these knowledge networks (or "islands of expertise" as per Bunnell & Coe (2001: 579)) to access their specialised capabilities. Breaking from the conventional tacit-local, codified-global dichotomy, it is argued that relationship structures, other than proximal, have assumed greater importance in the transfer of information and knowledge (Amin & Cohendet 2004, Vallance 2011) and that such networks may enable and facilitate the transfer of financial product frameworks and standards between geographies (Beaverstock et al 2021, Booth et al. 2014, Wainwright 2015). But the extent to which the information and knowledge required to value, price and trade financial products can flow across geographies, especially national borders, is contested (Bathelt & Glückler 2011, Bratton & Wójcik 2022 2023). In part, this reflects the difficulties associated with codifying financial information and knowledge given the associated costs, the significant spatial and temporal variations in perceived value, and the short longevity of relevance. But it also reflects evidence that national borders remain a core constraint to such flows given cultural, linguistic and social factors, as well as different regulatory frameworks (Bassens et al. 2021, Bratton & Wójcik 2022 2023, Chang 2010, Grinblatt and Keloharju 2001). China's public equity markets provide an example of this given the distinct information and knowledge networks that co-exist in Hong Kong and Shanghai for investors in the country's listed companies (Lai 2011 2012, Meyer 2018).

As a result of these various dynamics, it can be argued that the more important financial information flows and knowledge capabilities remain territorially defined, anchored within

local or domestic networks and underpinned by high-trust and high-frequency inter-personal relationships and face-to-face interactions (Bratton & Wójcik 2022 2024, Evers et al. 2010, Storper & Venables 2004). This is reflected in the substantive evidence that local networks continue to offer market participants, including traders and other intermediaries, informational advantages (Agnes 2000, Anand et al. 2011, Chen et al. 2010, Menkhoff & Schmeling 2008, Piccotti 2016, Ranaldo and Somogyi 2021). This is seen in the persistence of the local investor bias, even when the consequent investment behaviour compromises relative performance (Bade & Walther 2021, Francis et al. 2022, Mukherji & Jeong 2021, Yang et al. 2023). It is also supported by literature highlighting how finance is structured primarily around domestic activities, with cross-border activities a relatively small part of the total financial ecosystem (Bratton & Wójcik 2023, Gemici & Lai, 2019, Wójcik et al. 2018 2019).

This, in turn, comes back to Clark & O'Connor's idea of relative transparency. Despite all the technological advances since they published their conceptualisation in 1997, there is substantial evidence, especially within the financial economics literature, that information flows and knowledge capabilities within finance remain highly uneven and not uniformly distributed across involved networks. In part, this reflects the extreme heterogeneity found across financial networks. As a result, no two participants, even when active in the same product in the same location, will do so from the same knowledge or information base. Network differences, no matter how small or marginal, will compound over time and are magnified across distance, especially across national borders. There will, therefore, be persistent geographical differences in the perceived transparency of any financial product depending on the location of the involved producer and consumer. As an example, the future value and price determinants of a European structured equity derivative product may appear very transparent to an investor based in London given the availability of the necessary information and knowledge within the city's networks, but completely opaque when viewed by a market participant trading the same product from Hong Kong or Sydney.

2.5 The continued influence of geography in finance

The arguments that new technologies have weakened finance's spatial fix are pervasive and conceptually compelling. But it can be argued that they are often based on a simplistic conceptualisation of the various financial production processes given they understate (or do not recognise) the forward-looking and highly competitive nature of the finance industry, the complexity of financial information flows, the heterogeneity of the involved information and knowledge networks, and the continued importance of highly individual analytical, interpretative and predictive tacit expertise in the various production, investment and trading processes. New technologies may allow greater market participation (in part by lowering access costs), more complex and specialised products, and improved efficiencies, but codified information and knowledge will only ever represent a small subset of the total information set accessed by market participants and only has value when combined with highly specialised tacit expertise in the forecasting process. Investment decisions are never based solely on readily available price information, but on a complex and dynamic assessment of how current prices compare to future expectations and valuations (the "so what?" response to any new information).

Such tacit/codified interactions are highly individual, fragmented, rapid, and unstructured (reflecting Storper & Venable's (2004) "buzz" or Grabher's (2002) "noise" conceptualisations). They are undertaken within complex information and knowledge networks, often built on long-standing and high-trust inter-personal relationships. The role of knowledge networks in finance has been extensively addressed within the financial geography literature (Bathelt & Li 2014, Beaverstock 2002, Beaverstock et al. 2021, Dörry 2015, Hall 2007, Lai 2006), but their heterogeneity also directly determines the relative transparency of different financial products given that the information and knowledge required to produce, value and price them is not uniformly distributed across space. It is not simply that networks consist of different individuals, each with their own information sources, specialised knowledge, and cognitive and behavioural habits and biases, but that different networks will

subsequently prioritise and modify new information depending on specific local circumstances. Each market participant, even those active in the same financial product markets, will make their decisions based on a unique set of information flows and knowledge capabilities, no matter how marginal the differences. In turn, this will determine their understanding of the product's future value, price, and return determinants, i.e., its relative transparency.

This complexity highlights the "black box" nature of finance (Heinemann 2014). But it also underpins the ongoing applicability of Clark & O'Connor's conceptualisation, with the caveat that the notion that any product can be fully transparent to all market participants remains contested given the available empirical evidence. FX trading, for example, was defined by Clark & O'Connor as a transparent asset class, but still demonstrates substantial information and knowledge asymmetries. In fact, this literature review suggests that the financial system, from a holistic perspective, remains primarily translucent and opaque, as per Clark and O'Connor's categorisation, and consequently, primarily built within the national, not international, scale.

This view is supported by evidence that domestic activities, not international, dominate finance, even across higher-value products. Wójcik et al. (2019), for example, concluded that more than half of global corporate financing activities were domestic (domestic providers and domestic clients), while Bratton & Wójcik (2023) found that the majority (83%) of all equity research activities were on domestic companies. This is also seen in the growing ability of local banks in Asia to displace international competitors (Gemici & Lai 2019), as well as the continued advantages enjoyed by local participants in many financial products (Ling et al. 2021, Malloy 2005, Menkhoff & Schmeling 2008, Piccotti 2016). Accordingly, it can be argued that a financial centre's relative size in any asset class, or financial product, is not a function of its international competitiveness in that specific activity, but is, instead, simply a function of the underlying size of the domestic financial markets. New York's relative scale, for example, reflects the size of the American debt and equity markets, the continued outsized

role of the USD in FX markets (although a large component of USD trading is for financial purposes), and the city's status as a hedge fund centre.

In summary, this thesis builds the extant literature, including Clark & O'Connor's framework, to suggest that finance still has a natural tendency towards opacity, not transparency, despite all the various technological advances and regulatory changes over recent decades. It consequently continues to be influenced by geographical considerations contrary to the arguments that finance is now dislocated from place. Such arguments, in my view, simplify the complex processes involved in the production and consumption of financial products. These remain highly dependent on access to information and knowledge, and the subsequent fusion with highly individual expertise. This creates a significant territorial component in the production of financial products. But as highlighted in section 1.5 of this thesis, empirically demonstrating the validity of this argument has proved methodologically challenging, especially at larger geographic scales. Directly addressing this methodological constraint is the overarching objective of the research project summarised in this thesis, especially as I believe the study of sell-side equity research analysts will offer potential empirical insights to the contested debate.

Chapter 3

RESEARCH METHODOLOGY AND DATA

3.1 Introduction

The previous two chapters introduced the research presented in this thesis, the relevant literature and conceptualisations, and the research questions. The purpose of this chapter is to set out the overall methodological framework for the empirical research undertaken in the following three chapters. These present three self-contained papers which have been published in peer-reviewed journals. Each paper addresses distinct, albeit inter-related, elements of the topic, as set out in the research questions outlined in the first chapter. More specifically, the empirical analysis presented in the following chapters draws upon two substantive datasets which are introduced and detailed in this chapter.

Table 3.1: A summary of the datasets used in the research project.

	Research Objective	Scale	Methodology	Data source	Data collected	Use in thesis
1	To map the geography of specialised financial knowledge at the individual level.	Global	Primary data collection.	Bloomberg, Refinitiv, LinkedIn, corporate websites.	11,307 analysts identified along with their location, coverage, and employer. Data overlaid with the HQ location of 17,871 covered corporates.	Chp. 4
2	To investigate the importance of proximity in information and knowledge flows using the COVID-19 pandemic mobility / proximity restrictions as a natural experiment.	Asia	Semi-structured interviews with participants in sell-side equity research.	Personal networks.	Interviews with 70 participants to assess the impact of the COVID-19 restrictions on the participant's ability to collect, distribute, and interpret new information and knowledge.	Chps. 5&6

3.2 Methodological framework

The research presented in this thesis is based on two methodological workstreams. The first was quantitative in nature, while the second was qualitative. This use of mixed methods reflects an earlier recognition by Wójcik (2022) that such methodological frameworks play an important role in revealing the various complexities embedded in financial geographies. They provide flexibility in how the discipline, and more broadly, economic geography, investigates various topics with the sequencing of the complementary qualitative and quantitative methods dependent on the specific research questions and approach adopted (Pike et al. 2015, Yeung 2003). The potential challenges associated with mixed-methodology frameworks, and their subsequent triangulation, are recognised, especially when investigating relational studies (Clark 1998, Glückler & Panitz 2021, Yeung 2005). But the methodological framework adopted in this research project was designed to provide empirical insights that a singular quantitative or qualitative approach may not have yielded.

Specifically, the sequencing adopted in this thesis allowed the topic to be explored in a more holistic nature with the quantitative analysis revealing empirical patterns in the geographies of financial information and knowledge, at the global scale, which are then subsequently explored through interviews with participants active in the ecosystem. From this perspective, the methodology aligns with the dynamic and productive relationship between stylised facts and close dialogue (Clark 1998, Clark & Wójcik 2024), especially as many of the concepts and theories dominant in the geographies of information and knowledge (e.g., "the death of geography" or the perceived need for physical proximity in the transfer of uncodified knowledge) can be viewed as contested stylised facts requiring empirical validation. The methodological framework also reflects the call by Glückler & Panitz for studies of networks, information and knowledge in this case, to have a "solid understanding of the actors, the relations, and the context in which actors weave and rewire their relations" (2021: 1532). It is also appropriate to highlight the geographical scale of the research. The quantitative workstream is undertaken at the global scale, thereby addressing Wójcik's

concerns that many studies into the geographies of finance are limited in geographical scope with the subsequent risk that "we miss global patterns and trends" (2022: 249).

In terms of the two workstreams, the first mapped the global distribution of financial knowledge and its associated information linkages. Developing such insights reflects the importance of information and knowledge in the production of financial products (Clark 2018) and the relationship between accumulated individual expertise and the relative complexity, sophistication, and hierarchy of financial centres (Faulconbridge et al. 2007, Wójcik et al. 2018). Mapping the geographical distribution of financial knowledge is, however, challenging given the difficulties of systematically observing individual knowledge capabilities at a global scale. The extreme complexity of the finance industry, the highly specialised nature of involved roles (especially revenue generating), and the relatively small population subsets, all mean that financial knowledge, and its associated information flows, can be extremely opaque to external observers (Hall 2007). This is not just an issue specific to finance but also to other KIBS, including management consultancy (Faulconbridge & Jones 2012, Wood 2006). One approach is to assume a positive causal relationship between aggregate financial sector employment and the sophistication and specialisation of expertise and capabilities (Panitz & Glückler 2022, Pažitka et al. 2021). But the risk associated with such aggregate measures is that they do not differentiate between front-office (revenue generating) and back-office (revenue supporting) functions (Wood 2006). As such, they may not provide accurate insights into the specific capabilities and knowledge that individuals within each centre may possess (Hall 2007), and may consequently under-, or over-state, the relative importance of different centres in the financial production process.

This research addresses this data lacuna by mapping the global distribution of a subset of highly specialised financial professionals: sell-side equity research analysts, who act as important information intermediaries and knowledge repositories within financial ecosystems (Hall 2007, Wrigley et al. 2003). This novel database is introduced below in the following section. It represents, to the best of my knowledge, the first to map the distribution of specialised financial knowledge and information intermediaries at the global scale, as well as

the geographies of their information collection activities. As such, it contributes to the extant literature on the distribution of specialised financial information and knowledge (Beaverstock 2002, Bunnell & Coe 2001, Clark 2002, Lai 2006, Thrift 1994), the relative hierarchies and competitiveness of financial centres (Beaverstock et al. 1999, Pred 1977, Sassen 2001, Taylor et al. 2014), and the geographies of financial behaviours (Francis et al. 2022, Loughran 2008, Wójcik 2009).

The second workstream investigated the patterns revealed in the above mapping exercise through interviews with participants in the sell-side equity research ecosystem, including analysts, to assess the need for physical proximity in the transfer of information and acquisition of knowledge. Semi-structured interviews with financial professionals are a well-established methodology within the geographies of finance literature (*inter alia* Beaverstock 2002, Hall 2007, Lai 2006), but any such engagement with elite populations, including financial professionals, faces numerous methodological difficulties (Clark 1998, Delaney 2007, Mikecz 2012, Robinson 2021). These include the challenge of identifying and securing access to informed interviewees, as well as ensuring their subsequent commitment to being interviewed given time constraints. The engagement process can be further complicated by company policies which effectively prohibit external interactions with non-client third parties given potential reputational, regulatory and information-leakage risks (these policies have become more rigorously enforced given fears over phishing attacks and other attempts to socially engineer access to internal systems). But even when interviews have been secured, the effectiveness of the interaction as an information collection mechanism can be significantly undermined by the associated power and knowledge asymmetries (Clark 1998, Delaney 2007). This is particularly the case when the interviewer does not speak the same "language" as the interviewee or is unable to demonstrate a sufficient level of understanding of the topic, involved circumstances, or expected behaviours.

This research, however, benefited from my previous experience and existing personal relationships and networks within the sell-side equity research industry. As outlined in the introduction, I had previously worked in Hong Kong as both a research analyst and research

manager at Deutsche Bank, and subsequently as the regional director of research at HSBC. Furthermore, as I finish this thesis, I have returned to Hong Kong as the head of APAC equity research for BNP Paribas. Not only did this positionality facilitate privileged access to interview participants and ensure active "close dialogue" between equals within a common understanding and language framework (Clark 1998, Clark & Wójcik 2024), but it also ensured that interviews were informed, balanced, and focused. In some cases, for example, I was able to identify contradictions in interviewee responses and seek immediate clarifications, which improved the quality of the outputs.

The interviews were undertaken during the COVID-19 pandemic which created the novel circumstances for a natural experiment to assess the importance of physical proximity in information flows. Prior to the pandemic, any investigation into the relative importance of proximity, in whatever form, was often constrained by the lack of an experienced comparative scenario. This has frequently complicated attempts to empirically validate many of the proposed theories and hypotheses relating to the need for proximity in the transfer of information and knowledge (as previously highlighted by many researchers including Bassens et al. 2021, Malmberg & Maskell 2002, Short et al. 1996, van Meeteren et al. 2016). The pandemic, however, provided participants with a lived and explicit contrast between the full mobility prior to 2020, and the severe limitations imposed on mobility and face-to-face physical interactions experienced between 2020 and 2022. These restrictions also coincided with a period of stressed financial markets, high investor uncertainty, and heightened demand for information (Wójcik & Ioannou 2020). The simultaneous confluence of these two dynamics – restrictions on mobility and in-person interaction, and peak information demand – created the novel circumstances for a natural experiment to assess the impact of enforced physical separation on information flows, especially as interviewees were able to draw upon their lived experiences between the two contrasting circumstances. Specifically, the extent to which the pandemic restrictions impeded information flows and knowledge transfers were explored through semi-structured interviews, as detailed below.

3.3 Mapping the geographies of specialised financial information and knowledge

Chapter 4 maps the geographies of specialised financial knowledge and the geographical scope of their information collection activities, at a global scale, through the mapping of a subset of specialised financial professionals within the sell-side equity research industry. To do this, the research constructed a unique dataset mapping the location of 11,307 sell-side equity research analysts, and the geography of their 121,430 coverage relationships across 17,871 listed companies, as at end June 2021.

Individual analysts with coverage of listed stocks, i.e., those responsible for providing forecasts and recommendations, are publicly available and were identified through financial databases, including Refinitiv and Bloomberg, as well as through other sources including LinkedIn and corporate websites (which often list the sell-side analysts covering their companies). This research included all identified analysts covering at least one company as of June 2021. Analysts with no coverage, for example, specialists such as managers, strategists, thematic analysts, quants, or ESG analysts, were excluded. Their exclusion from the dataset, however, was not considered material as such specialists represent only a small subset of the overall sell-side equity research industry. More significantly, the research was unable to identify supporting research associates, at least on a consistent global basis. A writing analyst will be typically supported by one to two associates with some more senior analysts, especially those in China and the US, potentially having substantially more. These research associates will take responsibility for a variety of tasks including the construction of models to estimate future earnings and valuations, the writing of research reports, and interacting with corporates and investors, as needed. The total equity research industry, therefore, is significantly larger than implied simply by the number of writing analysts captured in this dataset.

Once analysts were identified, their locations were determined. These were identified through office telephone numbers publicly disclosed on Refinitiv, Bloomberg, and corporate websites. Most country dialling codes are geographic with the initial digits in the number

sequence indicating the city location. In the North American Numbering Plan, for example, 212, 646, 332 and to an extent, 917, are all specific to Manhattan, 312, 337 and 832 to Chicago, 415 to San Francisco, and 416 to central Toronto. In China, 21 is for Shanghai, 10 for Beijing, and 755 for Shenzhen. Similarly, in Europe 44 020 implies an office in London, 33 1 in Paris, and 49 69 in Frankfurt. Use of office telephone numbers, therefore, allows the city location of analysts to be identified. In a small number of situations, the office telephone was not provided or the disclosed number was for a mobile device. In such cases, the physical location of the analyst was identified through other means, including LinkedIn and Bloomberg, or aligned with the location of an identified member in the same research team. In a very small number of cases, it still proved difficult to locate the analyst and they were allocated to the nearest city relative to their coverage in which their employer had an office. In total, analysts were identified in 193 centres with 4,734 in Asia (1,857 in China and Hong Kong), 2,979 in Europe (1,369 in the United Kingdom), 2,872 in the Americas (2,126 in the United States), 347 in Australia and New Zealand, 275 in Africa, and 100 in the Middle East.

Each writing analyst covers a specific set of listed stocks. This coverage was sourced from Refinitiv and Bloomberg. Only active coverage relationships were considered as defined by a change in forecasts, target price or rating on a covered stock within the previous nine months. This was considered necessary to ensure consistency across regions. In some jurisdictions, for example, regulators have strict coverage requirements (e.g., all estimates and recommendations must be current) while in some countries (e.g., China), analysts may not write on covered companies for years at a time. This process resulted in 121,430 coverage relationships of which 48,258 were undertaken by analysts based in Asia, 42,148 by those in the Americas, 25,232 by those in Europe, 3,356 by those in Australia and New Zealand, 1,473 by those in Africa, and 963 by those in the Middle East.

Table 3.2: The distribution of the global sell-side equity research industry, June 2021.

Region / city	Analysts	City Rank	Global share (%)	Coverage relationships	City Rank	Global share (%)
Global	**11,307**		**100.0%**	**121,430**		**100.0%**
of which						
Asia	**4,734**		**41.9%**	**48,258**		**39.7%**
Shanghai	713	3	6.3%	7,545	3	6.2%
Hong Kong	652	4	5.8%	7,275	4	6.0%
Mumbai	597	5	5.3%	6,430	6	5.3%
Seoul	525	6	4.6%	4,431	7	3.6%
Tokyo	499	7	4.4%	6,955	5	5.7%
Taipei	237	9	2.1%	2,276	11	1.9%
Beijing	226	10	2.0%	2,614	9	2.2%
Kuala Lumpur	189	13	1.7%	1,777	16	1.5%
Shenzhen	168	15	1.5%	1,841	15	1.5%
Jakarta	156	16	1.4%	1,076	21	0.9%
Bangkok	152	18	1.3%	1,490	18	1.2%
Singapore	145	19	1.3%	1,384	19	1.1%
Karachi	85	28	0.8%	379	29	0.3%
Ho Chi Minh	83	30	0.7%	281	30	0.2%
Americas	**2,872**		**25.0%**	**42,148**		**34.7%**
New York	1,320	2	11.7%	21,786	1	17.9%
Toronto	293	8	2.6%	3,296	8	2.7%
Sao Paulo	153	17	1.4%	1,772	17	1.5%
Chicago	133	20	1.2%	2,034	14	1.7%
San Francisco	121	22	1.1%	2,041	13	1.7%
Mexico City	86	27	0.8%	640	28	0.5%
Europe	**2,979**		**26.3%**	**25,232**		**20.8%**
London	1,346	1	11.9%	11,934	2	9.8%
Paris	225	11	2.0%	2,362	10	1.9%
Stockholm	175	14	1.5%	1,047	22	0.9%
Frankfurt	127	21	1.1%	1,218	20	1.0%
Oslo	111	23	1.0%	889	24	0.7%
Madrid	102	24	0.9%	834	25	0.7%
Milan	99	25	0.9%	924	23	0.8%
Moscow	95	26	0.8%	775	26	0.6%
Zurich	83	29	0.7%	678	27	0.6%
Australia / NZ	**347**		**3.1%**	**3,356**		**2.8%**
Sydney	224	12	2.0%	2,254	12	1.9%
Africa	**275**		**2.4%**	**1,473**		**1.2%**
Middle East	**100**		**0.9%**	**963**		**0.8%**

Note: Only references the 30 largest research centres.
Source: Refinitiv, Bloomberg, LinkedIn and corporate data.

In addition, for each covered corporate, the location of their headquarters was identified and included in the dataset. This was a manual process as I was specifically interested in the location of senior management rather than registered offices, since information primarily passes from corporates through to financial communities and networks via the senior management levels. Although often the same, there were many situations where companies are nominally headquartered in certain jurisdictions for tax advantages while the management centres, and hence the respective information nodes, are located elsewhere. In addition, a few companies have geographically fragmented management structures with senior executives

dispersed across multiple locations. In such cases, the location of the Chief Financial Officer (or equivalent) was identified and used given the assumption that that role is the primary information conduit between the corporate and the financial community.

Determining the headquarter locations of covered corporates allows for the geographic nature of the relationships between issuers and analysts to be revealed, specifically, the involved distance and whether the relationship is domestic or cross-border (for reference, and as revealed in chapter 4, just 17% of analyst coverage is cross-border and a large proportion of this is by London-based analysts). In addition, however, I collected other relevant information including the industrial sector of each covered corporate as categorised by the Global Industry Classification Standard (GICS) accessed from Compustat Global through the Wharton Research Data Service (WRDS). The GICS structure categorises firms into 11 two-digit sectors (e.g., industrials or financials), 24 four-digit groups (e.g., capital goods or diversified financials), 69 six-digit industries (e.g., machinery or capital markets), and 158 eight-digit sub-industries (e.g., agricultural machinery or investment banking & brokerage). I also collected data on the relative size of each company, as assessed through various metrics including revenues, assets, and market capitalisation.

Lastly, the name and nationality of each analyst's employer was collected. In most cases, this was a relatively straight forward exercise although in a small number of cases, primarily in Asia, analysts can publish under a different brokerage name given international distribution partnerships and joint ventures. In such cases, the name of the analyst's employer was used to ensure consistency. Most brokerages only operate within a single market, but for international brokerages, i.e., those with offices in more than one market or operating as a subsidiary of a foreign company, their nationality was determined by the domicile of the overall group (for example, Goldman Sachs and JP Morgan are American, Barclays and HSBC are British, BNP Paribas is French, Nomura is Japanese, and UBS is Swiss).

This information allowed each individual coverage relationship to be categorised with reference to the typology defined by Wójcik et al. (2019): coverage of a domestic corporate by an analyst working at a domestic brokerage is categorised as *domestic*; coverage of a foreign

corporate by the same analyst represents an *export* activity; coverage of a domestic corporate by an analyst working at a foreign brokerage is categorised as *import*; while if the same analyst covered a foreign corporate, it is defined as *platform* coverage. As illustrative examples, the coverage of Germany companies by an analyst working in London at Morgan Stanley, a US investment bank, covering German companies, is classified as platform coverage, while the coverage of Chinese companies by an analyst working in Shanghai for UBS, a Swiss firm, is classified as import research coverage.

Figure 3.1: The typology of research activities

Domestic research coverage Analyst at domestic research provider Corporate domestically headquartered *n: 74,114 (61.0%)*	**Export research coverage** Analyst at domestic research provider Corporate headquartered overseas *n: 9,900 (8.2%)*
Import research coverage Analyst at foreign research provider Corporate domestically headquartered *n: 27,130 (22.3%)*	**Platform research coverage** Analyst at foreign research provider Corporate headquartered overseas *n: 10,286 (8.5%)*

Note: n refers to the number of coverage relationships.
Source: Adapted from Wójcik et al. (2019).

In summary, this dataset allows for several research directions to be investigated. Not only does it consistently map the global distribution of specialised financial knowledge and expertise, as revealed through the location of sell-side equity research analysts, but it also reveals the geographic extent of their activities and how finance interacts with the real economy. This, in aggregate, provides new insights into the geographic reach of different financial centres, the structure of their financial industries and associated information collection structures and networks, and the knowledge specialisation of individual financial centres, as defined by their research expertise across different industrial sectors.

3.4 Interviews to assess the importance of physical proximity in the acquisition and transfer of financial information and knowledge

Chapters 5 and 6 present evidence on the impact of the COVID restrictions on mobility and face-to-face interactions on the ability of analysts to access and distribute information, as well as to accumulate and transfer tacit knowledge. This evidence was collected through a programme of semi-structured interviews with sell-side equity research analysts, and other relevant individuals, based in Asia. The interviews were focused on the Asian research ecosystem for three reasons: first, Asia experienced some of the most severe COVID-19 restrictions in terms of imposed policies and length of implementation; second, accessing participants was dependent on my professional networks which are all within Asia; and third, the continued relative paucity of research on the region's financial geographies compared to Europe and the United States.

In total, semi-structured interviews were undertaken with 70 participants. These were undertaken during 2021 with the first on 26th January 2021 and the last on 16th November 2021. The interview programme was focused on sell-side research analysts but also involved related functions, including research management, buy-side investors, and covered corporates. Nearly two-thirds (45) of the participants were sell-side research analysts while seven were research managers, primarily working at international investment banks. A further 13 were from the buy-side (analysts and portfolio managers) with the remainder from corporate investor relations and sell-side equity sales. Nearly all the participants were based in Asia with 30 in Hong Kong, 12 in Singapore, seven in Mumbai, and five in Shanghai. The remainder were distributed across Auckland, Jakarta, Kuala Lumpur, London, Seoul, Shenzhen, Sydney, and Taipei. Most of the respondents (74%) were male, although a higher percentage (38%) of the 45 research analysts were female.

Access to interviewees was facilitated by privileged access to the relevant networks given my previous experience within the industry, associated positionality, and existing relationships across the Asian equities ecosystem. I was able to use personal networks to

identify and access participants, including those in senior management positions. I recognised, however, that my networks were centred on Hong Kong, Singapore, Mumbai, Shanghai, and London. As such, I used referrals to access participants in other locations as needed, for example, in Seoul, Sydney, and Kuala Lumpur. Only a small number of approached individuals were unwilling to participate, primarily due to fears over confidentiality and corporate policies on unauthorised access with third parties. A general request from interviewees was that all participation was on a confidential basis with no identifiers used in any subsequent published material, which I was able to assure would be the case. Participants were primarily working at international banks and firms, including Allianz Global Investors, Bank of America, BNP Paribas, Deutsche Bank, Goldman Sachs, Government Investment Corporation (Singapore), HSBC, Jefferies, Macquarie, Morgan Stanley, Nomura, and UBS. The interview programme, however, also included participants from domestic local firms in the larger markets (e.g., ICICI and Edelweiss in India, and CITIC and CICC in China).

Table 3.3: Summary details of participants in the interview programme

ID	Interview date	Type	Role	Location	Sector specialisation
IP01	26/01/2021	Sell-side	Analyst	Hong Kong	Telecom
IP02	27/01/2021	Sell-side	Analyst	Hong Kong	Industrials
IP03	27/01/2021	Buy-side	Management	Singapore	
IP04	28/01/2021	Sell-side	Analyst	Hong Kong	Internet
IP05	28/01/2021	Sell-side	Analyst	Hong Kong	Insurance
IP06	29/01/2021	Sell-side	Analyst	Sydney	Technology
IP07	30/01/2021	Sell-side	Analyst	Mumbai	Technology
IP08	02/02/2021	Sell-side	Analyst	Hong Kong	Internet / education
IP09	04/02/2021	Sell-side	Analyst	Hong Kong	Real estate
IP10	04/02/2021	Sell-side	Analyst	Hong Kong	Internet
IP11	06/02/2021	Sell-side	Analyst	Mumbai	Consumer
IP12	10/02/2021	Sell-side	Analyst	Singapore	Technology
IP13	15/02/2021	Sell-side	Analyst	Sydney	Telecom / Technology
IP14	15/02/2021	Sell-side	Management	Hong Kong	
IP15	16/02/2021	Sell-side	Analyst	Hong Kong	Financials
IP16	17/02/2021	Sell-side	Management	Shanghai	
IP17	19/02/2021	Sell-side	Analyst	Singapore	Consumer
IP18	23/02/2021	Sell-side	Analyst	Hong Kong	Technology
IP19	23/02/2021	Sell-side	Analyst	Mumbai	Healthcare
IP20	28/02/2021	Sell-side	Analyst	Mumbai	Financials
IP21	01/03/2021	Sell-side	Analyst	Hong Kong	Financials
IP22	09/03/2021	Sell-side	Management	Hong Kong	
IP23	14/03/2021	Buy-side	Analyst	Hong Kong	Consumer
IP24	16/03/2021	Sell-side	Management	Hong Kong	
IP25	22/03/2021	Sell-side	Analyst	Shanghai	Healthcare
IP26	24/03/2021	Sell-side	Analyst	Hong Kong	Transport
IP27	26/03/2021	Sell-side	Management	Hong Kong	
IP28	01/04/2021	Sell-side	Management	Hong Kong	
IP29	05/04/2021	Sell-side	Analyst	Kuala Lumpur	Consumer

ID	Interview date	Type	Role	Location	Sector specialisation
IP30	07/04/2021	Sell-side	Analyst	Shanghai	Consumer
IP31	15/04/2021	Buy-side	Portfolio Manager	Sydney	
IP32	21/04/2021	Buy-side	Analyst	Auckland	Generalist
IP33	22/04/2021	Sell-side	Analyst	Taipei	Consumer
IP34	03/05/2021	Sell-side	Analyst	Hong Kong	Telecoms
IP35	05/05/2021	Sell-side	Analyst	Hong Kong	Generalist
IP36	13/05/2021	Sell-side	Analyst	Hong Kong	Real Estate
IP37	14/05/2021	Sell-side	Analyst	Hong Kong	Industrials
IP38	17/05/2021	Sell-side	Analyst	Seoul	Industrials
IP39	17/05/2021	Sell-side	Analyst	Seoul	Financials
IP40	18/05/2021	Sell-side	Analyst	Hong Kong	Internet
IP41	21/05/2021	Sell-side	Analyst	Sydney	Technology
IP42	25/05/2021	Sell-side	Analyst	Jakarta	Financials
IP43	26/05/2021	Sell-side	Analyst	Mumbai	Healthcare
IP44	26/05/2021	Sell-side	Analyst	Singapore	Consumer
IP45	26/05/2021	Buy-side	Portfolio Manager	Singapore	
IP46	27/05/2021	Sell-side	Analyst	Taipei	Technology
IP47	03/06/2021	Sell-side	Analyst	Singapore	Industrials
IP48	04/06/2021	Sell-side	Analyst	Shanghai	Technology
IP49	08/06/2021	Sell-side	Analyst	Shanghai	Technology
IP50	16/06/2021	Sell-side	Analyst	Hong Kong	Consumer
IP51	22/06/2021	Sell-side	Analyst	Seoul	Transport
IP52	22/06/2021	Sell-side	Equity sales	Singapore	
IP53	23/06/2021	Corporate	Investor relations	Singapore	
IP54	29/06/2021	Sell-side	Analyst	Mumbai	Generalist
IP55	05/07/2021	Sell-side	Analyst	Kuala Lumpur	Consumer
IP56	09/08/2021	Sell-side	Analyst	Hong Kong	Industrials
IP57	09/08/2021	Buy-side	Analyst	Hong Kong	Consumer
IP58	10/08/2021	Sell-side	Management	London	
IP59	24/08/2021	Corporate	Investor relations	Mumbai	
IP60	27/08/2021	Buy-side	Analyst	Singapore	Generalist
IP61	27/08/2021	Buy-side	Management	Singapore	
IP62	09/09/2021	Buy-side	Portfolio Manager	Singapore	
IP63	28/09/2021	Sell-side	Analyst	Hong Kong	Generalist
IP64	01/10/2021	Buy-side	Analyst	Hong Kong	Internet
IP65	01/10/2021	Sell-side	Equity sales	London	
IP66	04/10/2021	Buy-side	Analyst	Hong Kong	Utilities
IP67	04/10/2021	Buy-side	Portfolio Manager	Shenzhen	
IP68	05/10/2021	Buy-side	Analyst	Hong Kong	Consumer
IP69	04/11/2021	Sell-side	Analyst	Singapore	Energy
IP70	16/11/2021	Corporate	Investor relations	Hong Kong	

One specific challenge faced when accessing potential participants in mainland China from the UK was the divergence in used communication platforms. I used WhatsApp, Microsoft Teams, and Zoom to undertake the interviews but potential mainland China participants frequently did not have access to these and instead used platforms which I did not have access to (e.g., WeChat and Tencent QQ). As such, the mainland China interviews were confined to those with a Hong Kong mobile number and access to platforms such as WhatsApp

(although this is common across the more internationally orientated China research analysts who are licensed in, and travel frequently to, Hong Kong).

The semi-structured interviews were guided by a predetermined set of questions, although each specific interview sequence differed according to the individual participant's circumstances and experiences. Applied mobility and proximity restrictions, for example, varied between locations while analysts exhibited different behaviours according to their research style and sector coverage. Each interview, however, was designed to explore how the COVID restrictions had impacted the respondent's ability to collect and distribute information, and accumulate and transfer knowledge, as well as the nature of relationships with colleagues, corporates, contacts, and clients. This typically involved the analyst being asked to consider their circumstances at the time of the interview with comparative reference to their experiences prior to the pandemic, i.e., prior to Feb/March 2020.

The interviews were designed, therefore, to investigate a range of inter-related issues. Each started by clarifying the participant's circumstances in terms of research coverage, years of experience and relative seniority, the geographies in which the analyst operated, supporting resources, the analyst's research style, the relative importance of physical access to corporates and clients, and the specific pandemic restrictions they were operating under (including company-imposed work-from-home policies). Once this background had been established, the interviews proceeded to explore various associated topics in detail. The primary lines of investigation were:

- Whether the restrictions on mobility and in-person interactions had impacted their access to required information and as a result, their understanding of covered corporates, especially in terms of the earnings and valuation drivers.

- Whether the restrictions on mobility and in-person interactions had impacted their relationships with clients, in terms of the value of the research services provided and

reciprocal information flows, as well as the ability to develop new, and maintain existing, client relationships.

- Whether the work-from-home policies had impacted relationships with internal colleagues, especially in terms of learning and development, idea generation and sharing, management oversight, working patterns and behaviours (including the speed of involved processes), and the overall quality of the research product.

- Whether the work-from-home policies and other mobility / interaction restrictions had impacted analysts' overall productivity, quality of research product, and relative competitiveness versus other analysts (in terms of ability to deliver value to clients), especially those in less constrained operating environments.

A wide variety of secondary issues were developed and explored throughout the interviews including the role of the office as a social structure for more junior team members and a control function for management, the importance of the office as a structure to maximise productivity, and the continued role of information and knowledge intermediaries in financial ecosystems. In all interviews, however, the aim was to explore, at a very detailed level, what had changed as a result of the new operating circumstances and how these changes had impacted the quality of the research product and analysts' ability to be relevant to clients as information and knowledge intermediaries. Each interview typically lasted one hour which allowed the topic to be explored in detail although in many cases, there were follow-up conversations or email exchanges to clarify points or to collect more information. As such, the total number of participant interactions during the interview programme was more than 100.

The interview programme was undertaken within a framework approved by the University of Oxford's Central University Research Ethics Committee (CUREC approval (SOGE 1A2020–9) was received on 13th January 2021 with the interview programming commencing on 26th January 2021). Full confidentiality was promised to participants with no

personal identifiers used. Most interviews were undertaken over video platforms and were undertaken in English. Some interviews (23) were recorded with permission, although most participants did not want to be recorded. Furthermore, the transcription process created significant additional work (an hour-long interview, for example, could take up to eight hours to transcribe and result in a 6,000-7,000-word transcript). In addition, overarching themes soon emerged and began to be repeated. This resulted in the programme's latter stage interviews being used to find supporting evidence for established themes, to identify and develop new insights and topics, or to cross-reference developed ideas with analysts in different locations or from different components of the research ecosystem (e.g., investors or those working in corporates).

Two of these themes identified during the interviews have already been published in journals and are presented in this thesis. Chapter 5 explores how the pandemic's restrictions on mobility and in-person contact resulted in the degradation of information flows in financial ecosystems, especially from sources embedded in informal local networks as well from reciprocal client relationships. Chapter 6 demonstrates how the work-from-home policies prevented the intense high-frequency, unstructured, and face-to-face interactions so necessary for the transfer of tacit knowledge and significantly slowed the development of junior research analysts and associates. The interviews, however, have provided other insights including the social and command-and-control functions played by offices, and the link for knowledge-intensive workers between autonomy, mobility, and expertise. These all represent future research directions using the interview outputs.

3.5 Summary

This chapter has introduced the methodological framework for the empirical analysis presented in the following chapters. It has outlined the two methodological workstreams used to answer the research questions introduced earlier. Specifically, it has detailed the novel dataset the research used to reveal the geographies of specialised financial knowledge, at a

global scale, and outlined how the COVID-19 pandemic restrictions on mobility and in-person interaction were used as a natural experiment to test the importance of physical proximity in the transfer of information and knowledge in financial ecosystems The empirical analysis begins in the following chapter which explores the geographical distribution and location of specialised financial knowledge.

Chapter 4 (Paper 1)

FINANCIAL CENTRES AND INFORMATION HIERARCHIES: INSIGHTS FROM THE GEOGRAPHIES OF SELL-SIDE EQUITY RESEARCH

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The accessibility and availability of information play an important role in defining the spatial distribution of financial activities and the relative competitiveness and specialisation of different financial centres. But investigations into the geographies of financial information are frequently constrained by the lack of consistent data at a global scale, especially on the distribution and reach of information-intensive financial professionals. This paper addresses this methodological gap by offering insights into the geographies of sell-side equity research, a subset of highly specialised information intermediaries within the financial ecosystem. It identifies and maps the global distribution of 11,307 analysts, the geographic scope of their activities, and the industry structure of their information collection. In aggregate, this gives insights into the size, reach and role of different centres in information hierarchies and networks. Our findings confirm that information resources remain highly concentrated and that most research coverage is in-country rather than cross-border, highlighting the continued frictions to information flows created by national borders. Domestic activities – analysts at domestic brokers covering domestic corporates – is the single largest category of information collection across most financial centres, regardless of size. Import activities are the second most frequent type of information collection highlighting the need of firms to access remote information networks. London is relatively unique at the global level given its platform role as Europe's information nexus, a role shared by Singapore in Southeast Asia and by Dubai in the Middle East.

4.1 Introduction

Reflecting the premise that financial services are built on information (Clark & Monk 2013), the concept of financial centres as information nodes, or "islands of expertise" as portrayed by Bunnell & Coe (2001: 579), is well established (Clark & O'Connor 1997, Grote et al. 2002, Sassen 1999 2001). But information flows and knowledge pools are, by definition, difficult to observe and measure, especially at granular individual scales. In part, this is because of their inherent nature and characteristics. Many information flows used to produce financial products tend to be sporadic, unstructured, informal, and short-lived, or confidential when structured. Similarly, tacit knowledge embodied within and carried by individuals, and distributed via face-to-face communication, remains important within finance despite technological advances (Bratton & Wójcik 2022, Storper & Venables 2004). Both these factors complicate their observation and measurement.

As a result, attempts to quantify the importance, influence, and reach of financial centres as information nodes tend to rely on observable measures such as sector employment, transaction volumes, and office locations (Panitz & Glückler 2022, Taylor et al. 2013, Wójcik et al. 2017). Such broad indicators, however, can mask the extreme diversity of financial activities, the specialisation and scarcity of many information- and knowledge-intensive roles, the specific locations where products are produced, the sources of applied information and knowledge, and the geographic reach of participants in each centre (Wood 2006). Given the more information- and knowledge-intensive roles within finance remain highly individual-specific, it may be more appropriate to identify the global distribution of such financial professionals and the geographic scope of their activities. Such individual level data, in aggregate, should provide insights into the relative role and influence of different financial centres as information nodes or knowledge pools.

Consistent identification of individuals within specific financial specialisations on a global basis and determining their geographic scope of activities is methodologically difficult

given data availability. This paper addresses this challenge and empirically contributes to the literature on financial centres by mapping the global geography of a subset of highly specialised information- and knowledge-intensive financial professionals: sell-side equity research analysts. These play a critical role within the equity and other financial ecosystems by acting as information intermediaries between corporates seeking equity funding and investors searching for investment opportunities. They add value through the collection and interpretation of information to forecast the future performance of listed companies, as expressed through earnings estimates and investment recommendations. In industry parlance, they "cover" companies with each coverage relationship representing an individual information link. They are one of the most information- and knowledge-intensive population subsets within finance and have strong informational ties with investors, corporates, colleagues, and competitors. Their location results from the complex and dynamic interaction between the need to minimise costs when accessing information from disparate and dispersed sources in a timely manner, while maximising the value of information collected and offered to clients.

Given their role as information intermediaries between the "real economy" and financial networks, and their links with a wide-range of other financial activities, the geographies of sell-side equity research are seen as indicative of the relative sizes of the informational complexes across centres and the importance of different financial centres as information nodes. As such, the paper presents a novel dataset detailing the locations of 11,307 analysts working at 797 research providers, as well as the geographies of their aggregate 121,430 coverage relationships across 17,871 corporates, as at end June 2021. This is the first dataset, to the best of our knowledge, which details the global distribution of a highly specialised subset of front-office finance professionals.

Using this data, the paper seeks to explore the extent to which geography still influences the equity research industry and thereby, the relative importance of financial centres as information nodes. It does this through three mechanisms.

The first is to map the global geography of sell-side equity research analysts to provide new insights into the relative sizes of the information complexes across financial centres. The equity research industry is highly concentrated with nearly three-quarters of all analysts based in the 20 largest centres. The primacy of London and New York as information nodes is evident with the two cities accounting for a nearly a quarter of all analysts. London dominates the European research industry with significantly larger capabilities than any other regional centre. With few exceptions, the industry is structured around national centres. China is an exception to this pattern, hosting four of the world's 15 largest research complexes. This may reflect its nascent financial development and higher information asymmetries.

The second is to map the geographic reach of analyst activities as revealed through their research coverage, whereby each coverage relationship represents a unique information link. In aggregate, this indicates the informational reach of different financial centres. Equity research is found to be primarily in-country focused, with most coverage (83%) undertaken on domestic corporates, particularly in the Americas and Asia. This empirically supports Clark & O'Connor's (1997) categorisation of equities as translucent and dependent on local information in their production and pricing. This finding is also consistent with the essentially local nature of many investment banking products (Agnes 2000, Wójcik et al. 2019). It also provides evidence of the impediments to information flows created by national borders. London and Singapore are the main exceptions to this domestic focus.

The third mechanism is to apply Wójcik et al.'s (2019) typology of financial activities and to assess the structure of research activity, and associated information links, by considering analyst location, the nationality of research providers, and the headquarter locations of covered corporates. This gives, in aggregate, insights into the role individual centres play in the supply of financial information and knowledge. Most centres, including New York, Shanghai, and Tokyo, have inward looking information complexes with domestic activities dominating, i.e., analysts at domestic research providers covering domestic corporates. Import research activities, whereby analysts at foreign brokerages cover domestic corporates, is the second most common type of research activity, with Hong Kong and Sydney

particularly dependent on this industry structure to collect and analyse information. Paris is the most notable example of a centre structured around export activities, i.e., domestic providers covering foreign corporates. Platform coverage, when an analyst at a foreign provider covers a foreign corporate, is the single largest research structure in London, Singapore, and Dubai. London's dominance within Europe is underpinned by American and European banks who concentrate their European research within the city. Singapore serves a similar role in Southeast Asia.

The following section outlines the literature framing financial centres as information nodes but details the methodological challenges in understanding their relative importance and reach. Section 3 introduces sell-side equity research analysts as information intermediaries and the potential insights their geographies offer. Section 4 summarises the novel dataset on the location of sell-side equity research analysts and their geographical scope. Section 5 uses this data to introduce a ranking of equity research centres and investigate the extent to which coverage is in-country or cross-border. Section 6 applies Wójcik et al.'s (2019) typology to identify the structure of equity research activities across the various centres and to provide insights into the role of different centres as information nodes. Section 7 concludes, outlines the implications, and identifies further research directions.

4.2 Financial centres as information nodes

Comparative assessments of the relative sizes, hierarchies and international relevance of different centres are a core component of the World Cities and financial centre literature. With respect to the financial centre discourse, these assessments are typically framed either in terms of a specific centre's relative importance in capital flows, as per Friedmann's "basing points" for global capital (1986: 71), or as nodes of strategic information and pools of specialised knowledge necessary to produce financial services and products (Faulconbridge 2006, Grote et al. 2002, Wainwright 2015). In the latter framing, the available information and accumulated knowledge within any centre influences its relative sophistication, hierarchical status, and

overall competitiveness (Clark 2002, Lai 2006 2012, Thrift 1994). This reflects the importance of information and knowledge in the creation of advanced producer services, with finance occupying a primary role at the apex of the overall knowledge-based complex (Bassens et al. 2021, Sassen 2016). Furthermore, there are distinct geographies across financial activities depending on the type and specificity of information required in their production and pricing (Clark & O'Connor 1997). This, in turn, is reflected in the relative specialisations and hierarchies of financial centres.

There is substantive literature investigating the capabilities of specific ecosystems embedded within individual centres and involved in the production of financial products; including, for example, private wealth management (Beaverstock et al. 2013), investment fund management (Dörry 2015, Waite 2017), retail financial advisory (Lai 2016) and equity research (Hall 2007). The continued importance of local information is also seen as a driver for the internationalisation of advanced producer service companies (Heeg & Bitterer 2015). Although these all highlight the role of financial centres as "islands of expertise", as per Bunnell & Coe (2001: 579), it is methodologically challenging to reveal on a consistent basis the information and knowledge embedded within any specific centre, their informational reach, and how such expertise compares on a relative basis within information and knowledge hierarchies. It is not simply that information flows and accumulated knowledge within any specific centre are difficult to observe and measure, but that to do so consistently on a global basis creates an additional layer of complexity. As a result, the financial centre literature tends to use three observable proxies as indicative of a centre's information and knowledge capabilities.

The first of these attributes, aggregate employment, can be seen as a measure of a centre's complexity in terms of the variety and quality of services produced, and the availability of specialised skillsets and expertise (Panitz & Glückler 2022, Wójcik 2011 2012). The underlying presumption is that relatively larger employment is positively associated with increasingly specialised services, more sophisticated competences and expertise, and greater international competitiveness and reach. The second attribute, the type and quantity of

financial activities undertaken, also stresses the range and scale of a centre's financial functions as an indicator of its relative importance and global reach (Poon et al. 2004, Wójcik et al. 2017), as well as the role that different financial products have in determining a centre's information needs (Clark & O'Connor 1997). The third attribute is the physical presence of companies, banks and other financial institutions, both domestic and foreign, with an emphasis on foreign entities providing new networks (including informational), products and expertise (Choi et al. 2016, Taylor et al. 2013 2014, Wójcik et al. 2019).

The use of all these attributes presents methodological challenges. Measures of sector employment frequently mask the diversity of financial specialisations, especially the distinction between information- and knowledge-intensive revenue-generators, which are more important contributors to a centre's competitiveness, and supporting back-office functions (Panitz & Glückler 2022, Wójcik 2012, Wood 2006). Similarly, indicators of financial transactions undertaken in a centre may over-emphasise the execution component of financial activities and overlook the role other centres have in their origination and production, including providing the necessary information and knowledge (Clark & O'Connor 1997). And although the physical presence of offices may be observed, their internal characteristics are typically unknown to external observers. Different offices may exist to undertake one or more functions, including to fulfil regulatory requirements, serve local clients, provide local execution and distribution capabilities, access local capital, or to collect, collate and disseminate information (Bagchi-Sen & Sen 1997, Faulconbridge et al. 2008, Taylor et al. 2014).

These challenges constrain our ability to understand the role that different centres have in the various financial information and knowledge networks, especially those used to produce financial products, and their corresponding information hinterlands (Gehrig 2000, Laulajainan 2003). Although information networks within individual cities have been extensively studied, as detailed above, such granularity is lacking on a global basis. This relates to a broader issue within economic geography, the lack of consistent data on the behaviour, actions etc of individuals within financial ecosystems at the global scale. This complicates the empirical

validation of many concepts, our understanding of how financial services are produced in practice, and the structure and international reach of the different information networks embedded within various centres.

This paper follows the work by Wójcik et al. (2019) which offered new insights into the international structure and reach of financial centres by aggregating office-level data on a global basis and categorising corporate finance activities according to the respective nationalities of banks and of their clients. But while this framework provides new insights into the roles that different centres play within the international financial system, it is based on transaction data which reflects the geographical structures of trading rather than the information and knowledge networks used in the production of financial products.

Within finance, such networks are typically built on relatively small subsets of highly specialised information- and knowledge-intensive professionals with highly individual tacit expertise. But locating such populations is methodologically difficult. The involved individuals are relatively opaque to external observers with both their locations and scope of activities difficult to map globally on a consistent basis (this is a challenge across studies of knowledge-intensive business services as per Faulconbridge & Jones's (2012) overview of management consultancy). An exception to this general rule, however, are sell-side equity research analysts which, given the nature of their role, are one of the most visible subsets of specialised finance professionals. By mapping their geographies, including their location and geographic scope, it is possible to develop new insights into the relative importance of financial centres as information nodes and their relative international reach.

4.3 Sell-side equity research as a specialised information intermediary

Sell-side equity research analysts work for equity brokerages and investment banks (the sell-side), and act as information intermediaries between corporates issuing equity capital and investors (the buy-side) seeking investment opportunities (Arand et al. 2015). Reflecting the premise that finance is built on information (Clark & Monk 2013), equity research analysts

are one of the primary mechanisms through which information is transmitted from the "real economy" into financial ecosystems, thereby linking the production and financial networks (Coe et al. 2014).

Specifically, analysts provide specialised information on listed companies, including earnings forecasts and investment recommendations. This requires the accumulation of highly individual tacit expertise through the collection of information through high-trust networks, and its subsequent interpretation and application. Through this process, they become experts on groups of companies within specific countries or sectors, which, in turn, makes them critical and highly valuable components within financial ecosystems. The value of information delivered by a bank's equity research team will determine the strength of its client relationships and will also directly impact the quality of other financial products, including prime services and equity derivatives. It is unsurprising, therefore, that the business is usually co-located with the other equity and trading functions, including those on the buy-side (Lee & Manochin 2021).

But while the primary function of equity research is to address the high information asymmetries and opacity embedded in equity markets (as per Clark & O'Connor 1997), the business has strong informational links with other activities within the broader financial ecosystem, including corporate finance (Bradshaw et al. 2006). Not only does equity research traditionally act as an important source of information and knowledge for investment bankers and their corporate clients, but it also plays a critical price discovery role during new capital issuance. Furthermore, its relationships with the non-equity and non-investment banking components of the financial ecosystem have become more important. The traditional brokerage business model has come under stress given the confluence of changes to the buy-side (for example, the rise of passive index investing) and regulatory developments (for example, the unbundling of research payments from trading commissions in Europe). This has necessitated the development of new revenue sources and consequently, many research departments have been repurposed into general information and knowledge hubs within their

organisations with their services now offered beyond their traditional clients, including to private banks, wealth management, and retail investors.

The location of equity research analysts, therefore, reflects the complex and dynamic interplay between the ability to source differentiated and potentially valuable information in a timely and cost-effective manner, and the need to ensure optimal access to clients. This is further complicated by two factors. The first is the continued importance of face-to-face communication and physical proximity in the origination and distribution of financial information (Bratton & Wójcik 2022). This influences the geographic scope and informational boundaries of analyst activities. The second is that this is a dynamic situation with significant spatial and temporal components to client information demands. The industry's geography is never at an equilibrium but is constantly changing as the informational context evolves, as seen in its decline in Europe but continued growth in Asia, especially in China.

The geography of sell-side equity research is, therefore, highly indicative of the informational complexes underpinning financial activities. But it also reflects the geographies of investment banks and their information- and knowledge-intensive products, which, to date, have been overlooked by geographers (Heinemann 2014, Wójcik 2012). And unlike other subsets of information intermediaries and knowledge-intensive specialists, including, for example, management consultants, the visibility of research analysts makes them relatively unique within the financial community. Yet, apart from Hall (2007) and Wrigley et al. (2003), they have attracted little attention from geographers despite the insights they offer. This lack of scholarship is particularly significant given the industry's role as the nexus for information flows and the importance of information in the production of financial products (Clark & O'Connor 1997). They are the most visible producers of financial knowledge, and their geographies reflect the structure of the informational networks used in the production of knowledge-intensive financial products, and the need for spatially embedded expertise, as well as technical and regulatory constraints (Beaverstock et al. 2021).

4.4 Mapping the distribution and reach of sell-side equity research analysts

We use a novel and unique dataset which details the geography of one of finance's most information- and knowledge-intensive activities: sell-side equity research. It is the first attempt, to the best of our knowledge, to map the specific locations, global distribution, and geographic reach of a specialised population subset of financial professionals. The data provides new insights on how an information collection activity, critical to the financial ecosystem, is structured spatially and, therefore, complements the existing literature on financial centres, which use a variety of broader measures.

A total of 11,307 sell-side equity research analysts were identified from multiple sources including Refinitiv, Bloomberg, LinkedIn, and corporate websites. Only analysts covering at least one company as at end June 2021 were included. The dataset excludes analysts with no company coverage, e.g. equity strategists and thematic analysts, although this is not material given the small number of such specialists. It also does not include supporting research associates.

The city location of analysts was determined through office telephone numbers publicly disclosed on Refinitiv, Bloomberg or corporate websites. When no telephone number was provided, the disclosed number was for a mobile device or the country does not use area dialling codes, the analyst's location was sourced through LinkedIn or Bloomberg. In a few cases, it was still impossible to determine an analyst's specific location and they were allocated to the nearest city relative to their coverage in which their employer had an office. Analysts were identified in 193 centres. Of the 11,307 identified analysts, 4,734 were in Asia (1,857 in China and Hong Kong), 2,979 in Europe (1,369 in the United Kingdom), 2,872 in the Americas (2,126 in the United States), 347 in Australia and New Zealand, 275 in Africa and 100 in the Middle East.

Data on the name and nationality of each analyst's employer was also collected. In a small number of cases – primarily in Asia – analysts publish under a different brokerage name to their employer due to international distribution partnerships. In such cases, the name of the

analyst's employer was used to ensure consistency. Most brokerages only operate within a single market, but for international brokerages, i.e., those with offices in more than one market or a subsidiary of a foreign company, their nationality was determined by the domicile of the overall group.

The geographic reach of analysts and their information links was defined through their research coverage. This was collected in a two-stage process. First, the companies covered by each identified analyst were sourced from Refinitiv and Bloomberg. Only active coverage relationships were included as defined by a change in forecasts, target price or rating on a covered stock within the previous nine months. This excluded any non-active coverage and ensured standardisation across analysts as some regulatory regimes have less strict coverage requirements. This resulted in 121,430 identified coverage relationships. The second stage identified the headquarter location of each corporate to determine whether coverage was domestic or cross-border. This was defined as the location of senior management rather than registered office. This distinction ensured that the analysis was based on the information nodes of companies, especially for those registered in offshore locations. In addition, some companies have geographically dispersed management structures and, in such cases, the location of the Chief Financial Officer (or equivalent) was used given the assumption that this position would be the primary information conduit to the financial community.

Finally, to give insights into the structure of the research complexes and, therefore, the informational role played by different centres, each identified coverage relationship (information link) was categorised using the typology defined by Wójcik et al. (2019) which makes reference to the locations of the respective analyst and headquarters of the covered companies, and the nationality of the analyst's employer. Coverage of a domestic corporate by an analyst at a domestic brokerage is categorised as *domestic*, while coverage of a foreign corporate by the same analyst represents an *export* activity. Coverage of a domestic corporate by an analyst at a foreign brokerage is categorised as *import,* while if the same analyst covered a foreign corporate, it would be defined as *platform coverage*. This categorisation was applied to each coverage relationship. An analyst can simultaneously undertake both domestic and

export coverage, or import and platform coverage. For example, an analyst in London working at Morgan Stanley (a US bank) could cover both UK headquartered companies (import coverage) as well as European headquartered corporates (platform coverage).

Figure 4.1: The typology of research activities based on the nationality of the research provider and covered corporates.

Domestic activity Domestic provider Domestic corporate *n: 74,114 (61.0%)*	**Export activity** Domestic provider Foreign corporate *n: 9,900 (8.2%)*
Import activity Foreign provider Domestic corporate *n: 27,130 (22.3%)*	**Platform activity** Foreign provider Foreign corporate *n: 10,286 (8.5%)*

Source: Adapted from Wójcik et al. (2019)

4.5 The geographies of sell-side equity research

As with many other specialised financial and investment banking activities, for example corporate finance and foreign exchange trading (Wójcik et al. 2017 2019), sell-side equity research is geographically concentrated. The ten largest research centres account for 57% of all analysts and the top 20 for 72%.

London and New York are the two largest research centres by a significant margin – together representing 24% of total analysts and 28% of all coverage relationships – although the two cities have contrasting roles as information nodes, as detailed in the following section. Shanghai is the third largest research centre in terms of the number of analysts, with Hong Kong fourth (China has four of the 20 largest research centres with Beijing tenth and Shenzhen 15th). Mumbai is the fifth largest followed by Seoul, Tokyo, Toronto, and Taipei. Seven of the ten largest research centres and 13 of the largest 20 are located within the Asia-Pacific, reflecting its more multi-polar structure in comparison to the other regions.

Table 4.1: The 30 largest equity research centres, June 2021.

Centre	Analysts	Rank	Global share (%)	Coverage relationships	Rank	Global share (%)	Research structure (*)
London	1,346	1	11.9%	11,934	2	9.8%	Platform (42%)
New York	1,320	2	11.7%	21,786	1	17.9%	Domestic (67%)
Shanghai	713	3	6.3%	7,545	3	6.2%	Domestic (90%)
Hong Kong	652	4	5.8%	7,275	4	6.0%	Import (61%)
Mumbai	597	5	5.3%	6,430	6	5.3%	Domestic (71%)
Seoul	525	6	4.6%	4,431	7	3.6%	Domestic (76%)
Tokyo	499	7	4.4%	6,955	5	5.7%	Domestic (63%)
Toronto	293	8	2.6%	3,296	8	2.7%	Domestic (83%)
Taipei	237	9	2.1%	2,276	11	1.9%	Domestic (61%)
Beijing	226	10	2.0%	2,614	9	2.2%	Domestic (94%)
Paris	225	11	2.0%	2,362	10	1.9%	Export (41%)
Sydney	224	12	2.0%	2,254	12	1.9%	Import (62%)
Kuala Lumpur	189	13	1.7%	1,777	16	1.5%	Domestic (69%)
Stockholm	175	14	1.5%	1,047	22	0.9%	Import (52%)
Shenzhen	168	15	1.5%	1,841	15	1.5%	Domestic (93%)
Jakarta	156	16	1.4%	1,076	21	0.9%	Domestic (64%)
Sao Paulo	153	17	1.4%	1,772	17	1.5%	Domestic (54%)
Bangkok	152	18	1.3%	1,490	18	1.2%	Import (52%)
Singapore	145	19	1.3%	1,384	19	1.1%	Platform (48%)
Chicago	133	20	1.2%	2,034	14	1.7%	Domestic (83%)
Frankfurt	127	21	1.1%	1,218	20	1.0%	Domestic (40%)
San Francisco	121	22	1.1%	2,041	13	1.7%	Domestic (80%)
Oslo	111	23	1.0%	889	24	0.7%	Domestic (47%)
Madrid	102	24	0.9%	834	25	0.7%	Domestic (53%)
Milan	99	25	0.9%	924	23	0.8%	Domestic (53%)
Moscow	95	26	0.8%	775	26	0.6%	Domestic (52%)
Mexico City	86	27	0.8%	640	28	0.5%	Domestic (54%)
Karachi	85	28	0.8%	379	29	0.3%	Domestic (96%)
Zurich	83	29	0.7%	678	27	0.6%	Domestic (67%)
Ho Chi Minh	83	30	0.7%	281	30	0.2%	Domestic (94%)
World	11,307			121,430			

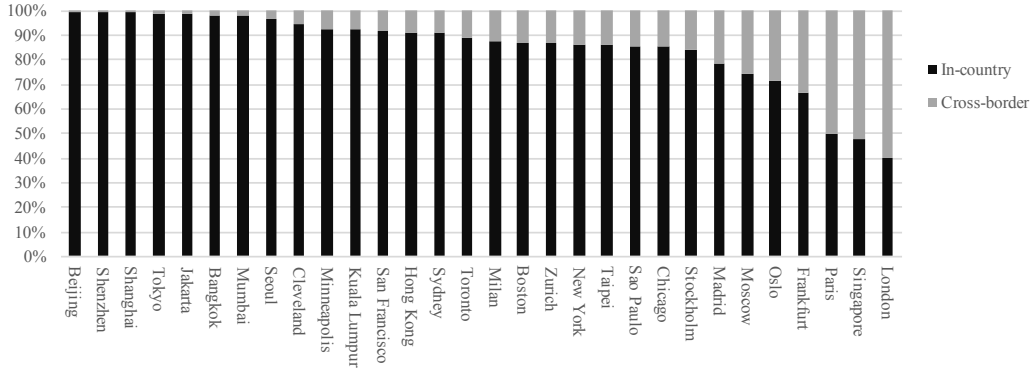
*Note: * Percentage refers to the total number of a centre's coverage relationships within that category, as per Figure 4.1.*
Source: Authors based on Refinitiv, Bloomberg, LinkedIn and corporate data.

To an extent, this distribution mirrors that of equity trading. The US has the largest research complex and the largest capital markets. China has the second largest equity market and likewise, the second largest research complex. As equity markets become smaller, the supporting research complex also declines in size reflecting reduced informational requirements. But this pattern is not linear and there are notable exceptions. The combined market capitalisation of US exchanges represents 40% of the global total (as per the World Federation of Exchanges as at June 2021) and yet the US accounts for a relatively smaller 19% and 29% of total analysts and coverage relationships, respectively. In contrast, the UK's research complex is far larger than expected given the size of its domestic equity market. The London Stock Exchange represents just 3% of global market capitalisation but London has

12% and 10% of total analysts and coverage relationships, respectively. There are other such examples. India's equity markets are half the size of Japan's by market capitalisation, and yet India has substantially more analysts. Similarly, there are more analysts in Vietnam than South Africa despite the latter's market capitalisation being five times larger.

One explanation for such disconnects is that investor demand for information is elevated in some markets because of greater information asymmetries. It is also possible that some research complexes gain scale by extending their informational hinterland beyond their domestic markets. But international information collection represents a small component of total research activities with just 17% of all coverage relationships involving a corporate headquartered outside an analyst's domestic market, or just 12% if London, which accounts for 36% of all cross-border relationships, is excluded. Furthermore, cross-border coverage is primarily intra- rather than inter-regional with only 5% of all coverage involving a corporate headquartered in a region outside the analyst's own. London, for example, is a European, not global, information hub with just 11% of its coverage involving non-European companies.

Figure 4.2: Split between in-country and cross-border research coverage across the 30 largest research centres.



Source: Authors based on Refinitiv, Bloomberg, LinkedIn and corporate data.

There are, however, significant variations between the regions with cross-border coverage substantially more common in Europe, at 44% of all relationships, than in the Americas (12%) or Asia (6%). This may reflect reduced informational frictions within standardised regulatory frameworks (Faulconbridge 2004). This is seen in the concentration of the region's equity research industry in London, which accounts for 45% and 47% of all

European analysts and coverage, respectively, with more analysts than Paris, Stockholm, Frankfurt, Oslo, Madrid, Milan, Moscow, and Zurich combined. An indication of this regional primacy is that London-based analysts undertake more coverage on Germany headquartered companies than their peers in Frankfurt.

In contrast, the Americas and Asia have relatively little cross-border coverage. New York may be the world's largest research centre by coverage relationships (London is marginally larger in terms of analysts), but only 14% of its coverage involves foreign corporates. This dynamic is also apparent in Canada. But the domestic bias is most extreme in Asia where cross-border coverage is near absent across many of its financial centres. For example, less than 1% of coverage undertaken in Beijing, Shanghai, and Shenzhen is cross-border. This may reflect the lack of domestic investor demand for information on foreign corporates, but there is a similar absence of cross-border coverage in Tokyo (1% of all research coverage), Jakarta (1%), Bangkok (2%) Mumbai (2%) and Seoul (4%). Even Hong Kong's research activities are now focused on China with just 9% of its coverage on non-Chinese and non-Hong Kong corporates. Only analysts in Singapore, with its status as Southeast Asia's hub for international banks, undertake significant cross-border coverage.

The in-country focus of sell-side equity research reflects the importance of being able to source local information and the difficulties of accessing such information across national borders, particularly when linguistic, cultural, and regulatory frictions are acute. It also empirically supports Clark & O'Connor's conceptual categorisation of equities as a translucent asset, i.e., with globally recognised properties but priced on local information (1997: 96-97). With few exceptions, including London, Paris, Singapore, Amsterdam and Dubai, the size of a centre's equity research complex is a function of the demand for local rather than offshore information. Clark & O'Connor also proposed that translucent products would be produced within national centres given the need for local information and the importance of scale economics in their production (1997: 101). This is seen in the distribution of sell-side equity research. London accounts for 99% of all research in the UK, with Milan, Madrid and Paris similarly important. In Asia, Bangkok, Jakarta, Kuala Lumpur, and Seoul all account for 100%

of the industry in their countries, while Tokyo-based analysts undertake 98% of all Japan's research coverage, and Mumbai-based analysts for 90% of India's.

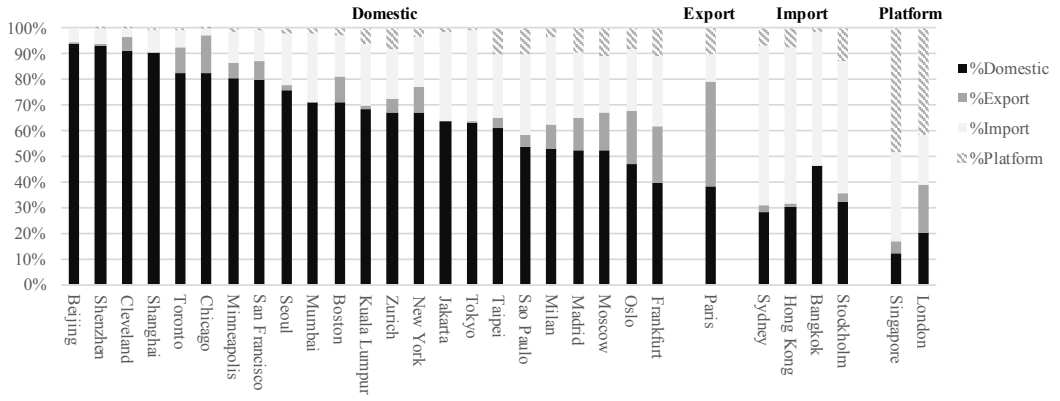
There are some sub-national centres which have sizable research complexes. In Canada, for example, Calgary and Vancouver undertake 15% and 7%, respectively, of all research undertaken in Canada. Calgary has a relatively large research presence specialising in the mining and energy sectors, reflecting the local economic structure. The industry in the US is also fragmented with analysts identified in 55 cities. New York is the base for a relatively low 63% of the country's research coverage with San Francisco and Chicago each accounting for 6%, and Boston for 3%. This distribution may reflect local economic circumstances but also the spatially fragmented history of the US's capital markets. Similarly, Frankfurt is Germany's largest research centre but only accounts for slightly more than half (56%) of the country's research activities, with the industry also present in Hamburg, Stuttgart, Munich, and Hannover, a function of the country's historically decentralised capital markets (Klagge & Martin 2005).

China has no dominant research centre with both Shanghai and Hong Kong accounting for 38% and 36%, respectively, of all equity research undertaken by analysts in the country. Beijing accounts for 13% and Shenzhen for 9%. This multi-polar structure highlights Hong Kong's legacy status as the China hub for international banks. The research produced in Hong Kong and Shanghai has historically been targeted at different client types, with their own information requirements, and international banks have only recently begun to establish large-scale onshore research capabilities. It is notable that Beijing has a larger equity research complex than Shenzhen despite its significantly smaller stock exchange. This may reflect Shenzhen's proximity to Hong Kong (Meyer 2016), while Beijing's importance to China's research ecosystem is anchored by two large research providers with roots in state-owned enterprises, highlighting the role that the state has in the evolving financial geography of China (Jones 2020, Lai 2012).

4.6 The typologies and roles of the different research centres

Applying Wójcik et al.'s (2019) typology of financial activities to research activities reveals not just the different industry structures of the various research centres, especially in terms of international orientation, but also their role and purpose as information nodes. Given the translucent nature of equities, it is unsurprising that the most common research structure is domestic, i.e., analysts working at domestic brokerages covering domestic companies. This is the most frequent activity in 23 of the 30 largest research centres and 64 of the largest 80.

Figure 4.3: The structure of the equity research industry in the 30 largest equity research centres.



Note: Categorised according to the single largest research activity, as a percentage of all research coverage undertaken in centre.
Source: Authors based on Refinitiv, Bloomberg, LinkedIn and corporate data.

This industry model is particularly evident in the US with all its research centres primarily structured around domestic coverage delivered by domestic research providers. The American informational complex is inherently domestic in orientation. Even in New York, the most international of US centres, nearly two-thirds of coverage undertaken is domestic with less than a fifth categorised as import. This highlights the marginal role foreign research providers have as information providers within the US. They account for just 17% of all research coverage undertaken within the country with Barclays the sole foreign broker among the ten largest research providers in the US.

This industry structure is a persistent theme across the Americas with domestic coverage accounting for more than 50% of all research produced across each of the region's 25 largest research centres. International brokers, however, are more important in South America, particularly in Mexico City and Sao Paulo where they account for 43% and 42% of all research undertaken, respectively. As a result, the two centres have a limited regional role with 15% and 10% of their research categorised as platform coverage, respectively. There is, however, a degree of overlap between their geographic reach with 52% of the platform activities in Sao Paulo involving coverage of Mexican firms, while 31% of those in Mexico City are on Brazilian firms.

Asia-Pacific's research centres are also primarily structured around domestic activities. This is most pronounced in China with more than 90% of all coverage undertaken in Beijing, Shanghai, and Shenzhen categorised as domestic. This structure reflects China's current and historic regulatory frameworks. Foreign firms have only recently started undertaking onshore research with Shanghai emerging as their preferred location with 9% of its coverage categorised as import compared to 6% for both Shenzhen and Beijing. Hong Kong is one of the few centres globally where import activities are the most important and within the region, only Sydney has a higher dependency on foreign firms to provide domestic coverage. Foreign firms do not use Hong Kong as a regional research hub but as their base for China coverage, with 89% of their research in the city on mainland corporates. This highlights Hong Kong's role as the China gateway for international investors (Jones 2020, Lai 2012).

China's inward-looking informational orientation is a theme across Asia, resulting in a geographically fragmented structure (Lai et al. 2020). The localised nature of Asian information flows results in domestic and import coverage representing the majority of research activities. The only real distinction between its centres is the degree to which domestic coverage is provided by local or foreign firms; a balance reflecting the competitiveness of local brokerages, regulatory constraints, and the relative importance of local and international clients. Given the high international investor interest in the Australian and Chinese equity markets, it is no surprise that foreign brokerages are the largest providers of research in both

Sydney and Hong Kong. But local firms dominate elsewhere in Asia, reflecting the more marginal role of American and European providers (Gemici & Lai 2019). In Seoul, domestic and import activities account for 76% and 20% of total coverage, respectively, while the same splits in Mumbai are 72% and 27%, and 69% and 24% in Kuala Lumpur.

Singapore is the regional exception. Although it has a smaller research complex than Kuala Lumpur and Bangkok, both in terms of analysts and coverage relationships, it is the only Asia-Pacific centre with platform coverage as the largest research activity. Foreign brokerages account for more than four-fifths of all research undertaken in the city and unlike other centres in Asia, it has a regional hinterland with 53% of its coverage on non-Singaporean firms. This cross-border coverage is primarily undertaken by foreign brokerages and their use of the city as a regional nexus for information collection, gives the city a regional status disproportionate to the size of its equity market.

In addition to Singapore, there are just three other centres where platform coverage is the single largest activity: London, Amsterdam, and Dubai. Nearly three-quarters of activities in Dubai are categorised as platform, the highest proportion across the four centres. Dubai's research complex is highly dependent on foreign brokerages using the city as their Middle Eastern hub despite the city's small financial markets. Its regional scope contrasts with the other significant Middle Eastern research centres, Tel Aviv and Riyadh, which are both structured around domestic activities.

As detailed above, London is the world's largest research hub in terms of analysts and the second largest by coverage relationships. It is significantly larger than expected given the size of the London Stock Exchange and this disproportionate scale is derived from the city's platform and export activities, which account for 42% and 19% of its coverage, respectively. Nine of London's ten largest research providers are foreign with Barclays the sole British representative. Nearly all the largest research providers, both American and European, concentrate their European research teams in London. This gives the city unparalleled critical mass, underpins its relative competitiveness, and entrenches its status as the primary information nexus within the region.

No other European centre rivals London's primacy. Amsterdam is also structured around platform activities but is less than a twentieth of London's size. Paris is the region's second largest research centre, but it is also substantially smaller than London and is structured around French research providers. These do, however, undertake significant cross-border coverage making it one of the few cities where export activities are most important. Stockholm and Copenhagen are the only centres in Europe to have import coverage as their largest research activity. But all other European research centres, including Frankfurt and Milan, are structured around domestic activities, reflecting, in large part, the tendency of the larger European firms to concentrate research activities in London.

Africa has a relatively small equity research ecosystem with just five significant centres. Johannesburg is the largest followed by Cairo, Lagos, Tunis, and Nairobi. Import coverage is the largest component of Johannesburg's research activities, highlighting the importance of foreign brokers to its research complex. The other centres are structured around domestic activities except for Tunis which undertakes a more regional role. Nearly two-thirds of its research coverage is categorised as export with a significant proportion on companies headquartered in Morocco, Saudi Arabia, and the UAE.

4.7 Conclusions and implications

There is substantive literature investigating the mechanisms through which informational networks and territorially embedded expertise underpin the production of financial products within individual financial centres (e.g. Clark 2002, Hall 2007, Bassens et al. 2021). But extending and validating the conceptual insights offered by these studies at the global level is often constrained by methodological challenges; in particular, the difficulties of revealing in a consistent manner at the global scale the informational and knowledge complexes embedded within different centres, and their international reach and structure. As such, attempts to define global informational hierarchies tend to rely on metrics which are more indicative of financial outputs than the sources of information and knowledge used in their production.

This paper addresses this by using the geographies of sell-side equity research analysts who function as critical information intermediaries within financial ecosystems. It does this through three mechanisms: first, by identifying the global distribution of individual analysts; second, by defining the geographic reach of their activities; and third, by categorising their activities according to the structure of the coverage. As a result, this analysis provides new insights into the relative importance and role of different financial centres as information nodes. But in doing so, it also provides empirical evidence supporting a number of long-standing conceptual presumptions first hypothesised by Clark & O'Connor (1997).

The first is that with few exceptions, equity research activities are inherently domestic in orientation with just 17% undertaken on foreign corporates. Despite technological advances which some have argued have eroded the influence of geography and the spatial fix (Amin & Cohendet 2004, Friedman 2005, O'Brien 1992), the importance of local information, knowledge, and circumstances remains a theme in many micro-level studies of individual financial centres. This analysis adds to this literature by providing evidence at the global scale that financial informational networks remain geographically constrained with centre hinterlands rarely extending beyond national borders. It also empirically supports Clark & O'Connor's (1997) categorisation of equity products as a translucent asset class dependent on local information in their production and pricing.

As such, it highlights the continued importance of spatial factors in the definition of informational networks. There remains an apparent advantage in being close to information sources as seen in the continued importance of face-to-face communication and the territorial embeddedness of specialised knowledge (Bratton & Wójcik 2022, Storper & Venables 2004). This is a persistent theme at the global scale. The lack of cross-border coverage, especially outside Europe, not only highlights the difficulties of collecting information across national borders (Bae et al. 2008, Chang 2010), but also the difficulties of providing informational value to clients in competition with more proximate domestic analysts. The frictions associated with information flows are particularly pronounced in Asia given the confluence of regulatory, cultural, and linguistic factors. This may explain why the region is unlikely to see the

emergence of a primary pan-regional information nexus with the industry expected to remain fragmented across the various national centres (Lai et al. 2020).

As such, and with few exceptions, the relative sizes of the identified information complexes are determined by local circumstances rather than a centre's international reach and competitiveness. This study, for example, further adds to the literature highlighting the primacy of the New York and London axis within global finance (Taylor & Derudder 2022, Wójcik 2013). But the two should not be seen as directly comparable with both having very different informational complexes, at least in terms of reach and structure. New York is built around domestic analysts covering domestic corporates and working at domestic banks. Its information networks are territorially defined, and their relative size is a function of the substantial demand and supply of information given the size of its capital markets. These local dynamics are repeated across many financial centres, which tend to be built on domestic informational complexes. And although equities are by nature highly dependent on local information and circumstances, this is also the case for many other investment banking activities which frequently require access to highly localised information in their production, including corporate finance and derivative products (Agnes 2000, Clark & O'Connor 1997, Wójcik et al. 2019).

This is also seen in the finding that import research activities (an analyst working at a foreign provider but covering domestic corporates) is the second largest industry model (22% of all coverage relationships) as international banks connect with local information pools in important financial markets. Internationalisation of advanced producer services is often framed by the need to access new clients or to establish global networks (Taylor et al. 2014) but within finance, as with other knowledge-intensive business services, the need to access information can also be a powerful driver of such expansions. Hong Kong is the most notable example of this given its historic role as a gateway for international financial companies and investors participating in China's financial markets (Jones 2020, Lai 2012). And although Shanghai now has a larger research complex than Hong Kong, the mainland city's domestic orientation is even more pronounced than New York's. Furthermore, Hong Kong retains a

number of advantages for international banks including its legal system and talent pool (Meyer 2018).

Reflecting the difficulties of accessing information across national borders, only a few centres have research complexes based on the international accumulation of information. The most notable example is London which is singularly responsible for more than a third of all global cross-border coverage relationships. Its relative scale is derived from its status as Europe's information and knowledge node with this position underpinned by foreign banks, including both American and European. This regional dominance continues a long-term pattern supported by relatively frictionless information flows within the European Union's single regulatory framework (Clark 2002, Faulconbridge 2004). This does raise the question, however, as to whether the UK's exit from the European Union will create frictions which will impede such flows and encourage the decentralisation of such information-intensive financial activities from London over time (Lavery et al. 2018, Panitz & Glückler 2022).

But few other centres are comparable to London's informational reach and structure. Singapore is the closest in structure despite having a significantly smaller research industry. Its complex is dominated by foreign brokerages undertaking regional coverage, reflecting its status as the Southeast Asian hub for international banks (Meyer 2015). It holds this specialised role despite having a smaller research complex than a number of other Southeast Asian centres. Dubai has a similar specialised function in the Middle East (Portes 2020), in part reflecting its efforts, as detailed by Sigler (2013), to act as a relational intermediary between western capital and the region.

The research presented in this paper also reveals the centres through which information is transferred from the "real world" into financial ecosystems. From this perspective, research centres are the nodes through which information passes between the production and financial networks and within which information and knowledge are combined to finance the production layer. The equity research industry is highly concentrated in national centres, as hypothesised by Clark & O'Connor given the translucent characteristics of equities, the benefits of scale and agglomeration in their production, and the importance of access to information (Clark

2002, Clark & O'Connor 1997, Thrift 1994). There are few significant sub-national research centres and those that do exist reflect history (e.g., in Germany), scale (e.g., in the US), or local economic circumstances (e.g., Canada and the US). But in all these examples, the national centre is primary with the smaller centres undertaking a specialised role or function, for example, as an information gateway for a locally significant industry. The exception is China where the informational complex remains highly fragmented across Shanghai, Hong Kong, Beijing, and Shenzhen. This may be indicative of persistently high informational asymmetries within the country.

In summary, this paper has explored the geographies of sell-side equity research to provide new insights into the geographies of financial information and knowledge. It has demonstrated that the collection of information in financial ecosystems is generally domestic in nature, not international, and that, with few exceptions, the size, structure and reach of the informational complex within any centre tends to be a function of local circumstances rather than international reach. This provides evidence of the continued influence of geography in many financial information flows, and in defining the relative importance of different financial centres as information nodes.

There is, however, scope to extend the analysis in two directions. The first is to explore how the geographies of sell-side equity research have changed. For example, has the industry become more or less international in nature, more or less concentrated in national centres, and have domestic activities become more or less important? Addressing these questions should provide further empirical insights into the changing geographies of financial information and knowledge. The second direction is to investigate the types of specialised knowledge held by research analysts across the various centres. This would allow the extent to which expertise is dependent on local geographic circumstances to be explored, especially as initial analysis suggests that some smaller sub-national centres exist as highly specialised information nodes for locally significant industries.

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Chapter 5 (Paper 2)

FINANCIAL INFORMATION, PHYSICAL PROXIMITY AND COVID: THE EXPERIENCE OF ASIAN SELL-SIDE EQUITY RESEARCH ANALYSTS

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The need for physical proximity and face-to-face communication in financial information flows is contested. But the movement restrictions imposed across Asia during the COVID-19 pandemic, together with the elevated information needs as financial markets became stressed, provided the unique circumstances for a natural experiment to test the extent to which physical interaction is important in the origination and distribution of financial information. Drawing upon 70 interviews undertaken across Asia during 2021, primarily with sell-side analysts who act as information intermediaries in the financial ecosystem, this article provides evidence that physical proximity and face-to-face communication remains highly valued, particularly when accessing information embedded in informal local networks and originated through reciprocal client relationships. Analysts physically restricted from contacts at corporates and within their associated operating environments, reported a degradation of knowledge, especially versus more proximate competitors. The enforced physical separation also weakened previously strong social and reciprocal relationships with clients, even those co-located in the same city. Although these trends may be gradual and incremental rather than dramatic, they are persistent and self-reinforcing, and demonstrate the continued benefits of proximity and face-to-face interaction, with longer-term implications for financial geographies.

5.1 Introduction

The need for proximity in the origination and distribution of information is contested given advances in communication and information technologies. These, it is argued, have eroded the constraints of geography and have allowed other factors to become more influential in defining economic and financial geographies (Baldwin 2016, Cairncross 1998, O'Brien 1992 2009). Although this contradicts arguments in favour of physical proximity and face-to-face interaction (e.g. Gertler 2003, Grabher 2002, Storper 1997, Storper & Venables 2004) and has attracted trenchant criticism (e.g. Christopherson et al. 2008, Clark & O'Connor 1997, Martin 1994, Morgan 2004), it has proven difficult to demonstrate the extent to which the influence of proximity has been eroded or remains relevant given the inherent difficulties of empirically validating many of the theoretical mechanisms (Bassens et al. 2021, Malmberg & Maskell 2002, Short et al. 1996, van Meeteren et al. 2016). This is particularly the case for financial information flows given their complexity, the invisibility of many of these flows to external observers, and the relative paucity of evidence on the behaviour of its users. But more fundamentally, it also reflects the lack of scenarios allowing comparison between permitted proximity and enforced physical separation.

The COVID-19 pandemic provided a unique opportunity to test the importance of proximity and more specifically, face-to-face communication, in financial information flows given the contrast between the full mobility prior to 2020 and the severe limitations on physical interaction implemented during 2020 and 2021. From the start of the pandemic in early 2020, for example, many Asian countries adopted restrictions including: limits on physical meetings, both social and business-related; prohibitions on entry by foreigners; enforced quarantines and lockdowns; and maximum permitted travel distances. These proved highly successful at constraining both mobility and face-to-face interactions, but coincided with a period of extreme investor uncertainty and stressed financial markets (Wójcik & Ioannou 2020). There was, therefore, heightened demand for information as investors considered worst-case scenarios and revised asset valuations accordingly.

The confluence of these two dynamics – restrictions on mobility and in-person interaction, and peak information demand – created the novel circumstances for a natural experiment to assess the impact of enforced physical separation on information flows. After all, if geography no longer influences access to information, then the restrictions should have had no significant impact on the ability of participants in financial markets to source and distribute required information during this difficult and turbulent time.

Specifically, this article investigates the impact of the COVID restrictions on a subset of highly specialised financial information intermediaries: sell-side equity research analysts. Equity markets are informationally intensive and are supported by a large ecosystem designed to address the information asymmetries between corporates issuing equity capital and investors seeking investment opportunities. Sell-side analysts (i.e., those working at brokerages and investment banks) play a critical role within this ecosystem by collecting and providing information to investors (the buy-side). As information intermediaries, they operate simultaneously within two geographies: that of information origination and collection (i.e., the sourcing of information for interpretation); and that of information distribution (i.e., its dissemination in regulated and codified formats to buy-side investors).

Sell-side analysts are responsible for providing investment recommendations and information on specific sets of listed companies (or in industry parlance, for "covering" these corporates), whether defined by sector or country. To undertake this role, they collect information from a wide variety of contacts. These include covered corporates, as well as relevant linked companies such as competitors, suppliers, and distributors. Other important sources include reciprocal relationships with clients, colleagues, and peers. Except for the regulated and codified releases from listed corporates, analysts primarily collect tacit, local, and unstructured information for interpretation and application in codified valuation models, investment recommendations, and written reports. This information requires high trust frameworks for its successful collection and transfer which, in turn, are facilitated by strong inter-personal relationships and face-to-face communication. This, however, creates a persistent challenge for analysts who need to develop and maintain such relationships across

geographically dispersed and complex contacts. Furthermore, each analyst has a unique informational geography. Some, for example, will benefit from permanent proximity with their corporates and clients with physical access facilitated through co-location within the same city. In contrast, others will be remote from their information sources and will be more dependent on virtual platforms as well as periods of temporary face-to-face interaction through occasional and manufactured physical proximity (as per Grabher 2002).

Any investigation into the behaviour of financial professionals faces numerous methodological difficulties, including identifying and securing access to interviewees, as well as the associated power and knowledge asymmetries (Clark 1998, Robinson 2021). These challenges have constrained the empirical validation of many of the theories underlying financial and economic geographies (as per Short et al.'s (1996) "dirty little secret" of world cities research). This research, however, benefited from privileged access to, and 'close dialogue' (Clark 1998) with, sell-side analysts. One of the authors previously worked in Asian equity research in various roles including as the Director of Research in one of the region's largest brokerages. This positionality facilitated access to interview participants and ensured more balanced knowledge symmetries during the interviews.

A total of 70 semi-structured interviews were conducted during 2021 (see Annex), and were guided by a predetermined set of questions, although each interview sequence differed according to the individual participant's circumstances and experiences. Each interview typically lasted one hour which allowed the topic to be explored in detail. The majority of participants were sell-side research analysts (45) and research managers (7), primarily working at international investment banks and covering a range of sectors. A further 13 were from the buy-side (analysts and portfolio managers) with the remainder from corporate investor relations and sell-side equity sales.

The research is focused on Asia, partly to address the relative paucity of research on its financial geographies compared to Europe and the United States, but mainly because the region adopted some of the most severe restrictions during the pandemic. By location, 30 of the participants were based in Hong Kong, 12 in Singapore, 7 in Mumbai and 5 in Shanghai.

The remainder were distributed across Auckland, Jakarta, Kuala Lumpur, London, Seoul, Shenzhen, Sydney and Taipei. The high proportion of participants in Hong Kong and Singapore reflects the role these two cities play in the Asian geography of international investment banks. Hong Kong is the largest equity research centre for such banks in the region, although the majority of research undertaken in the city is on Chinese corporates. There are, however, border controls between Hong Kong and China. Singapore serves a similar nodal role for international investment banks within Southeast Asia.

This article provides evidence supporting arguments in favour of the continued need for physical proximity and face-to-face interaction in the origination and collection of financial information. The COVID restrictions on physical interactions resulted in a deterioration in the quality of information analysts could access from local informal networks, clients and corporates, including those co-located within the same city. Nearly all analysts reported a gradual but persistent degradation in their understanding of covered corporates, particularly those covering companies more embedded in the local context or in fast-moving sectors. This was especially acute for analysts undertaking cross-border coverage and resulted in the loss of client traction given their reduced informational value relative to other more proximate peers who could maintain face-to-face engagement with sources. Although these developments may be gradual in nature, they are nevertheless insidious and self-reinforcing, and as such, highlight the continued influence of physical proximity and face-to-face communication to the geographies of finance. This may also provide insights as to why financial activities are prone to agglomeration and the geographic "stickiness" of information and knowledge (Clark 2005, Gertler 2001 2003).

Moving forward, Section 2 introduces the contested debate on the role of physical proximity in financial information flows and the relevance of sell-side equity research, as an important information intermediary, to the debate. Section 3 identifies the information flows which were disrupted by the restrictions on mobility and face-to-face interaction, while Section 4 highlights the geographical consequences of these disrupted flows. Section 5 concludes.

5.2 To be close or not to be close

Financial markets are built on information (Clark and Monk 2013), but the role of geography in determining access to information is contested. On the one hand, there is substantial evidence from both financial economics and economic geography that access to information is geographically uneven. This is visible in the "local bias" inherent in many investment decisions (*inter alia* Bade & Walther 2021, Chen et al. 2010; Coval & Moskowitz 2001, Gehrig 1993), as well as spatial variations in corporates' access to capital (Francis et al. 2022, Loughran 2008, Wójcik 2009). On the other hand, however, it is argued that improved communication and information management technologies have dramatically eroded the influence of geography on determining access to information. Some now see information as all-pervasive and as a result, argue that location should provide no informational advantage (Cairncross 1998, Friedman 2005, O'Brien 1992). This is further supported by arguments that the benefits of proximity to information sources, e.g. to corporates and local networks, have been reduced by regulatory prohibitions on the selective disclosure of material information (Bernile et al. 2019, Cowan & Salotti 2020).

These "end of geography" arguments build on the time-space compression witnessed over the last two centuries (Baldwin 2016, Warf 2011). But its application to the geography of finance has received much criticism (e.g. Christopherson et al. 2008, Clark & O'Connor 1997, Martin 1994, Morgan 2004). The main criticism is that it is based on a flawed and simplified characterisation of information flows in financial markets. Although new technologies have had a significant impact on the communication and management of primarily codified information, e.g. real-time prices, valuation metrics, research recommendations, and corporate disclosures, these represent a small proportion of the total information spectrum for many financial products. As per Asheim et al.'s (2007) typology of different knowledge bases, most financial products are based on synthetic knowledge and have a higher reliance on face-to-

face communication given the emphasis on client-tailored solutions, the importance of trust, and the tacit nature of the experience and know-how competencies required.

The argument that geography no longer matters, therefore, risks exaggerating the importance of codified information and excessively simplifies the complex private/public, formal/informal, local/global and codified/tacit information types on which financial products and markets are built (Morgan 2004). In fact, a scenario in which all relevant information is codified and readily accessible must be considered improbable given four factors: i) codified information, given its greater accessibility, rarely provides opportunities for market participants to achieve the informational arbitrage often required to deliver out-performance; ii) much needed information tends to have a short lifespan given the underlying dynamism of financial markets; iii) the costs of timely codification can be excessive; and iv) the value of codified information in isolation is often low without its subsequent fusion with tacit information and knowledge (Amin & Cohendet 2004, Bathelt et al. 2004).

The continued importance of tacit and informal information and knowledge in fast-moving, uncertain, and spontaneous financial markets creates an information-intensive and -dense ecosystem, which can be referred to as 'buzz' (Storper & Venables 2004) or 'noise' (Grabher 2002). To an extent, this intensity reflects the polysemantic and nebulous nature of financial information: the importance and value of a single piece of information is often context specific with significant spatial and temporal dimensions, and a frequent ex-post realisation of its underlying value after fusion with other information, both codified and tacit (Bathelt & Glückler 2011, Heinemann 2014). But more importantly, such an ecosystem remains typified by a high requirement for proximity between participants to facilitate the timely transfer of fluid (i.e., constantly changing), complex, context dependent, and predominantly tacit information within a high trust framework (Evers et al. 2010, Storper & Venables 2004).

Trust is particularly important in the transmission of tacit and unstructured information. While codified information benefits from the rigour, structure and scrutiny of the codification process, the informal and individual nature of tacit information means that it is associated with

an embedded degree of uncertainty and unreliability. Its recipients must decide whether to use or reject the information and this will invariably depend on the extent to which the source is trusted (Holste & Fields 2010). This is likely to be higher in long-standing and reciprocal inter-personal relationships, typified by a high frequency of interaction within informal or formal networks defined by shared institutional or social characteristics (Holste & Fields 2010, Peck 2005, Smedlund 2008, Vallance 2007). Reciprocity through the mutual and beneficial exchange of information and shared expertise is a core element of such relationships (Amin and Roberts 2008, Amin with Thrift 2007), while face-to-face interaction is the mechanism most likely to establish the required level of trust (Storper & Venables 2004). This is not to say that every interaction within an information network needs to be face-to-face, but that the accumulation of trust within such networks will be a function of the frequency of physical connection. This would be expected to be higher with co-located contacts and may explain why professional networks tend to be geographically entrenched within specific individual centres (Bassens et al. 2021).

It is unsurprising, therefore, that social and business networks play such an important role in many financial geographies, including determining the informational and knowledge advantages demonstrated by specific centres (Beaverstock 2002, Clark 2002, Lai 2006, Thrift 1994, Thrift & Leyshon 1994). These networks not only influence access to information, but have specific spatially defined untraded interdependencies, e.g. accepted conventions, uncodified rules and working terminologies (Storper 1997, Wainwright 2015). These distinctive characteristics also subsequently shape the interpretation, dissemination, and use of information (Thrift 1994, Ho 2009). Although technologies can complement the information flows within and between such networks, e.g. by accelerating verification and the speed of transmission, they cannot fully replicate the benefits arising from co-location or face-to-face interactions (Bathelt & Glückler 2011, Morgan 2004). In fact, the increased frequency of contact resulting from improved communication technologies may subsequently drive more face-to-face interactions (Gaspar & Glaeser 1998). This is particularly likely for participants

in highly regulated environments, such as finance, who may choose not to disseminate certain information over electronic platforms to avoid surveillance and regulatory constraints.

These dynamics create self-reinforcing and localised information and knowledge clusters in which all actors contribute to the overall information mosaic, no single participant has a complete understanding of the situation, face-to-face interactions remain important, and just 'being there' provides significant advantages given the ability to access the relevant networks (Gertler 2003). Physical proximity within clusters provides participants with lower cost access to a full range of cognitively diverse participants with information transfer facilitated by a shared technical language, a common understanding and local circumstances (Huber 2012, Malmberg & Maskell 2002). Furthermore, given many information exchanges are bilateral and reciprocal in nature, they are often important contributors to the co-production of new information and knowledge specific to the involved network and cluster (Asheim et al. 2007, Bettencourt et al. 2002).

Actors remote to any cluster can access its information pool through connecting pipelines, with this infusion of "global pipelines" into the "local buzz" further developing a cluster's interpretation and innovation capabilities (Bathelt et al. 2004). They can also achieve temporary proximity by travelling to the cluster (Grabher 2002). But the risk is that remote participants will only ever be able to access a subset of the total available information through such mechanisms especially in products more grounded in the local, in geographies where 'buzz' may be more important, and in markets which lack the structures to codify information (Clark & Monk 2013, Lai 2006). Furthermore, even if some tacit, informal or local information can be reproduced and shared across more distant locations, particularly if aided by organisational, institutional or other forms of temporary proximity (Faulconbridge 2006, Gertler 2003), the requirement for the timely transfer of financial information, the frequent need to seek clarifications, and the importance of trust when determining the value of received information, will all tend to advantage physical proximity and more frequent face-to-face interaction.

It is recognised that different asset classes and financial products have different characteristics in terms of information requirements. Clark & O'Connor (1997) argued that asset classes exist on a spectrum of transparency reflecting information accessibility and the extent to which information can be scaled and applied to other geographies. These differences in informational content demonstrate the inherent difficulties of applying the geography of one financial product to others. Foreign exchange trading, for example, may be concentrated in London and New York as a result of technological advances and ubiquitous information (Wójcik et al. 2017), but other asset classes are often deeply rooted in their immediate local context, have a greater reliance on tacit, unstructured, and informal information, and are constrained by national regulations, which have assumed greater importance post the 2008 Global Financial Crisis (O'Brien & Keith 2009).

In the Clark & O'Connor taxonomy, equities are a translucent product with globally recognised properties but priced on local information. This creates an informationally intensive equities ecosystem with a large research component within asset managers (the buy-side), and investment banks and brokerages (the sell-side). Sell-side equity research analysts play a sophisticated role in this ecosystem. Through the accumulation of information from spatially dispersed local sources, and its subsequent interpretation and distribution to buy-side clients, they address persistent information asymmetries between corporates issuing equity capital and investors seeking investment opportunities. To paraphrase Clark & Monk (2013), they act as centralised switch-points in equity markets by aggregating and directing information flows from, and to, relevant participants. Their actions also result in the accumulation and diffusion of knowledge within the broader equities ecosystem through their important codification role and central position in the spiral interaction between tacit and codified information and knowledge (Nonaka 2007, Nonaka & Takeuchi 1995). This collection, interpretation, codification and distribution process reduces overall information search costs for equity investors, and it remains a critical component of the equities ecosystem.

Given the importance of sell-side equity research, there is a significant body of financial literature investigating the activity, including the extent to which analysts more proximate to

their covered companies have advantageous access to information flows. Some studies have found evidence of locational benefits as seen in superior forecasting accuracy (*inter alia* Bae et al. 2008, Jennings et al 2017, Malloy 2005), which may highlight the advantages of easier access to management (Soltes 2014). Reflecting the "end of geography" thesis, however, Bernile et al. (2019) argued that regulatory and technological developments had improved access to information flows in equity markets and had, therefore, eroded the historic more proximate forecasting advantage, at least in the United States.

Despite this substantive financial literature and the role of sell-side equity research in financial markets, the industry has received little attention in economic geography (Hall 2007 and Wrigley et al. 2003 are rare exceptions). This may be because its integration within brokerages masks its location and activities, particularly in comparison with other knowledge-intensive business and professional services, which are more visible to external observers and have, therefore, been subject to greater scrutiny (*inter alia* Faulconbridge 2006, Faulconbridge & Jones 2012, Tether et al. 2012). In our view, however, the status of sell-side equity research as the informational nexus of equity markets makes it an ideal sector to investigate the importance of proximity and physical connectivity in the origination and distribution of information, as revealed by the experienced impact of the COVID restrictions in comparison to the previously unrestricted environment.

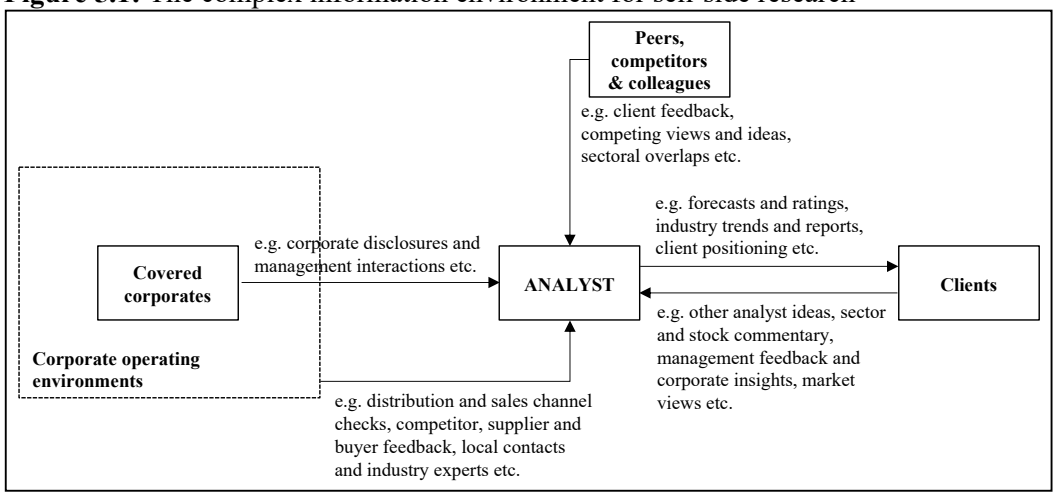
5.3 Enforced physical separation and the disruption of information flows

Analysts operate within a complex, dynamic and time-sensitive information environment (Figure 5.1), although this paper specifically focuses on the information sourced from corporates (and their operating environments) and clients. To produce their outputs, whether forecasts, recommendations or other services, analysts collect information from a variety of sources within both formal and informal networks, some distinct and others overlapping. Formal sources include corporate releases of material information as well as structured engagements with corporate management. Informal sources tend to provide more local and

tacit information through ad-hoc and unstructured channel checks, industry experts, competitors and suppliers, as well as client interactions.

Each analyst has a unique informational geography and will use a variety of mechanisms to connect with sources and collect information depending on the nature of the specific relationship, including whether the source is co-located or remote, and the characteristics of the information collected and transferred. As outlined below, however, the COVID restrictions on physical face-to-face interactions limited analyst access to many of these sources as revealed through three mechanisms: i) the degradation of information flows from informal and local networks; ii) the reduced informational benefits arising from co-location with clients; and iii) the lower quality of information received from engagement with the management of covered corporates, including those co-located.

Figure 5.1: The complex information environment for sell-side research



5.3.1 Degradation of informal and local information flows

Although the relative importance of informal and local sources may differ across sectors, many companies have opaque earnings drivers or operate within constrained geographies. Their forecasting, therefore, requires the collection of significant amounts of local and informal information (Karadas and Papakroni 2019). These include: checks on distribution and sales channels to estimate revenue trends; engagement with suppliers and buyers to determine input

costs, production volumes and demand; discussions with industry experts and local contacts to understand broader trends, including technological and regulatory; and meetings with competitors and buyers to verify competitive trends.

Analysts frequently described these informal and local sources as more important in the forecasting process than corporate disclosures (given their historic and standardised nature) or management engagement (given regulatory constraints and positive bias). As a Southeast Asian technology analyst stated, "the local information is incredibly important since you can't be factually incorrect and you need to know what is the on-the-ground reality to forecast accurately" (IP12). This can even be the case in sectors dominated by large firms. An analyst covering Chinese internet companies, for example, noted that many of the country's e-commerce trends had local origins and identifying them before they became national was important to forecasting accuracy (IP04). Similarly, a buy-side analyst believed that it was easier to trust an analyst's views and offered information when s/he could demonstrate a "first-hand understanding" of a company's situation (IP60).

The challenge is how to access such information. In some situations, new technologies have removed the need for physical proximity, especially when conducting channel checks. One buy-side analyst, for example, detailed how his firm used satellite imagery to estimate the output of power plants, the number of visitors to shopping malls and traffic on toll roads (IP66). Technologies have also reduced local barriers to information flows, particularly linguistic with automatic translation of local language media ensuring accessibility regardless of location.

But while new technologies may provide remote analysts with some visibility into a company's local context, analysts still frequently referred to the need to source other types of information through a physical in-person presence. This was particularly the case when the information source was a local contact or industry expert. Such relationships were often described as difficult to manage given their one-way nature. In the past, information could be paid for but with tighter anti-bribery regulations, the incentives for such sources to engage with analysts have been diminished. Analysts, therefore, viewed the expertise required to

identify the quality and relevance of a source, build and maintain the required inter-personal relationships, and extract the required information through personal obligations and closeness (as per Huber's (2012) work on social proximity in personal knowledge relationships), as a highly developed skill which took a significant investment and face-to-face interaction to develop. They were unwilling to delegate such activity to other colleagues given the sensitive and personal nature of such relationships. This was even the case for analysts undertaking cross-border coverage when they had a local supporting resource. Many analysts in Hong Kong, for example, had onshore associates in China but were reluctant to use them to acquire information given their relative inexperience and lack of personal relationships with targeted contacts. Similarly, a Singapore-based analyst used his Jakarta-based associate for channel checks but not for engaging in-person with sources (IP17).

Prior to the pandemic, the need for analyst involvement in the collection of local information necessitated frequent access to contacts on an in-person basis. But after the COVID restrictions were imposed, it proved more difficult to source the same information remotely via virtual means. Not only was it often found to be harder to maintain existing relationships without in-person engagement, but the use of virtual communication channels resulted in a decline in the information disclosed by sources. Multiple analysts commented on how contacts were more reserved on the phone or in videoconferences versus face-to-face communication, reflecting fears that conversations on virtual platforms could be recorded given the unregulated and informal nature of the information transfer. A buy-side "grassroots" researcher specialising in the retail industry, for example, described that prior to the pandemic she would extract information through direct face-to-face conversations with sales personnel in shops. During the pandemic, she had to cold-call potential contacts which proved far less effective, both in terms of securing respondents as well as the quality of information provided. She estimated that her success rate in engaging potential sources had fallen from approximately 60% pre-COVID to less than 20% during the pandemic (IP57).

Some corporates tried to address the emerging information deficit by using video platforms to showcase their products, operating environments, distribution channels, and

connect suppliers and customers with analysts. A number of real estate analysts, for example, highlighted how developers used such mechanisms to introduce their latest projects to aid the valuation and forecasting process. Although such attempts were welcomed given the circumstances, there was a persistent concern that they allowed corporates to control the information flow. Without the ability to personally collect and verify information, there was a persistent degree of distrust in the content received. As one analyst explained, "Real estate valuations are very local. But while they can show you how wonderful a new development is, they don't show you what is just two streets away, or how much other development is in the area or how bad the traffic is getting in or out. That is why I need to visit in person" (IP09).

As such, reduced physical access to local information networks, and specifically, the inability to interact face-to-face with sources, as a result of the COVID restrictions was frequently cited as the most significant contributor to the degradation of analysts' knowledge during the pandemic. It was recognised, however, that the rate of degradation varied across respondents. This reflected differences in sector coverage and analyst experience, as well as variations between countries in the severity and duration of imposed restrictions. For example, analysts covering sectors not dependent on local dynamics, e.g. energy, telecom and utilities, were less likely to cite the restrictions as an impediment to information collection. But the need for many analysts to access local contacts on a face-to-face basis to identify and extract relevant information for interpretation and forecasting, has longer-term geographical implications, as detailed subsequently.

5.3.2 Reduced informational benefits from co-location with clients

As with many knowledge-intensive services (Bettencourt et al 2002), clients play a significant role in the production of sell-side research by acting as important information sources. One analyst claimed, for example, that clients accounted for "probably half our investment or research ideas" (IP05), while another considered some investors as so knowledgeable that she would alter her entire schedule if it ensured a face-to-face meeting with them (IP37). As such,

analysts often differentiated between two types of client relationships: transactional and reciprocal. Whereas transactional relationships involved one-way information flow from the analyst to the client, reciprocal relationships were based on a higher degree of familiarity and trust, and were typified by more social interactions, greater informality, and a more balanced, dynamic, and accretive exchange of information.

There was broad recognition that reciprocal relationships took time to form given the importance of demonstrating value and establishing trust. It was also recognised that the process was aided by personal interaction with a pervasive view that they were easier to develop and maintain with co-located clients given the greater potential for more frequent face-to-face engagement. That is not to say new reciprocal relationships were impossible to form without such physical proximity since analysts were often able to leverage on existing institutional relationships within their brokerages and there was substantial previous experience of communicating over virtual platforms given time and cost pressures. But throughout the interviews, there was a consensus that higher-value reciprocal relationships required personal rapport to be established and that this was easier with a face-to-face connection, especially as such interactions allowed analysts to understand the specific needs and styles of individual clients more quickly. In addition, such relationships were easier to maintain virtually if grounded in earlier physical connections.

Many analysts indicated a hierarchy of client engagement mechanisms framed by the dynamic interaction of relative cost and perceived value, with value defined by the complexity of information to be transferred, the ability to persuade a client to the analyst's view and the potential for reciprocal information exchange. Although it was recognised that not all information transfer necessitated a physical or even virtual connection, physical face-to-face meetings were frequently seen as more effective than virtual platforms at transferring complex information, building trust and encouraging two-way engagement. In part, this reflected a general tendency of clients to be more reserved over virtual channels. As one analyst explained, "It just becomes more difficult to build that two-way interaction when you are not physically face-to-face. They will still ask questions but it is just more difficult and different"

(IP56) while another noted, “The experience is different. I sometimes think they worry that I am recording them” (IP41). This concern was valid. Two investors, for example, noted that they were under strict instructions not to inform external parties of their investment holdings, stock interest and market views and as such, were always much more conscious about what they said when on a virtual platform which was being recorded, or could be (IP45, IP62).

As a result, there was an underlying and embedded geographic dimension to the nature of analyst-client relationships. Analysts located in Hong Kong and Singapore, for example, benefited from being co-located with a significant proportion of their clients and as such, more frequently emphasised the reciprocal informational aspects of such relationships. In contrast, those in more peripheral centres, e.g. Mumbai and Seoul, rarely enjoyed the benefits of acute client proximity and were, therefore, more comfortable with virtual based transactional relationships with limited two-way information transfer.

This distinction became more obvious during the COVID restrictions with analysts in Hong Kong and Singapore complaining that it was difficult to replicate the benefits of reciprocal relationships over virtual platforms. Many of them stated that the inability to physically meet clients, especially within social contexts, had gradually eroded existing relationships, limited information flows and reduced their overall understanding. As one analyst outlined, “I would often meet my clients for drinks or dinner after work and that was important to the relationship. But you can’t right now. Everywhere is closed at 6pm in Hong Kong. So of course the client facing time is much less and that has changed the relationships I have” (IP26). This sentiment was widely shared across both Hong Kong and Singapore. In contrast, those in the peripheral centres generally reported no significant impact. As a Mumbai-based analyst noted, “It is ironic that my colleagues in Hong Kong and Singapore are complaining about the difficulties of maintaining client relationships and losing client traction without being able to meet them, while this is how we in India have always had to function” (IP07).

The COVID restrictions highlighted the advantages of client proximity, particularly in terms of facilitating the development of deeper relationships based on strong social

connections and face-to-face communication. These improved analysts' access to information. But although co-location with clients was viewed as beneficial to forming the high-trust relationships necessary for reciprocal and accretive information exchange, analysts accepted that the strength of client relationships was primarily determined by the quality and value of information provided. Given time constraints, clients were seen as highly selective on the relationships they were prepared to invest in and develop. As such, analysts recognised that client relationships would only become more reciprocal and progressively self-reinforcing when they had demonstrated their relatively superior informational value and as trust was built. As one analyst argued, "If I produce good research grounded in local context and information, then clients will want to listen to me. Clients will always follow the quality of the research wherever they may be" (IP11).

5.3.3 Lower quality engagement with corporate management

Corporates provide information to analysts through two mechanisms: disclosures of material events; and direct engagement with management. Such information flows are heavily regulated with strict prohibitions on the selective disclosure of price sensitive (market-moving) information (*inter alia* Agrawal et al. 2006, Kross & Suk 2012). They function, therefore, within formal and structured frameworks. Corporate disclosures, for example, are simultaneously published on corporate and exchange websites, while analyst interactions with management teams are frequently chaperoned by investor relations to ensure that only permissible information is disclosed and discussed.

There was no evidence that corporate disclosures were disrupted by the COVID restrictions. In fact, the consensus across analysts was that issuers had ensured consistency of such disclosures, particularly during the early stages of the pandemic when investor needs were elevated. As a Sydney-based analyst put it, "corporates did a really good job at making sure there was an informed market all the way through COVID … they were very good at communicating [with investors and analysts], especially in terms of changes to [earnings]

guidance and as a result, there were few surprises during reporting season" (IP13). It was also recognised that some corporates became more responsive to requests, while others addressed investors' urgency for more information by increasing reporting frequency and/or providing new metrics.

But while disclosures act as the building blocks for subsequent valuation analysis, they are seen as low in the information hierarchy given their standardised, historic, and ubiquitous nature. They provide a baseline to work from but provide few inputs to the actual forecasting process. It is necessary, for example, to know a company's audited financials at the start of any forecast period as well as historic trends. Forward guidance may also indicate how a company expects earnings to trend over the short-term. But to predict a company's longer-term financial performance requires the collection and interpretation of many other different and non-standardised types of information, which are subsequently fused with these disclosures through the interpretation process.

Analysts engage directly with the management of covered corporates to collect such information. While such interactions should in principle provide no undisclosed material information given regulatory constraints, they were frequently viewed by analysts as an opportunity to create new and supplementary information. On the one hand, they allow known issues to be explored and for a better understanding of a company's earnings drivers, both of which should improve forecasting accuracy. More importantly, however, there was a general recognition that such meetings, if managed appropriately, could result in the discovery of entirely new information and provide proprietary insights, at least for a period of time. As one analyst explained, "I know they know something I don't but will find useful. Any meeting is my opportunity to try and identify that nugget and that extraction process is a skill" (IP43), a skill aided by inter-personal relationships. It was also often noted that "preferred analysts", i.e., those with stronger management relationships, appeared to have an informational advantage over their peers. This was supported by a number of buy-side analysts who stated that they viewed sell-side analysts with demonstrably stronger relationships with management as possessing a superior understanding of a corporate than those without.

Prior to the COVID restrictions, in-person engagement with management was preferred. Revealing the benefits of face-to-face interactions (Storper & Venables 2004), this preference reflected a widespread recognition that such communication provided increased potential for new information discovery and more opportunities to clarify any ambiguity. One analyst quantified this informational quality gap between the different communication channels. Compared to a face-to-face meeting with management, she believed that a phone call typically resulted in "half the information loss" while even a meeting conducted via videoconference would only provide "75-80% of the information possible face-to-face" (IP09).

There were few dissenters to the idea that face-to-face meetings with management were more valuable than other forms of engagement. Various, albeit intangible, reasons were cited for this, of which the most common was that in-person meetings provided an opportunity to "read" management or as one analyst put it, to "read between the lines" (IP06). Similarly, a number of analysts stated that they frequently learnt more from the small talk surrounding a meeting than from the actual content discussed. This was not replicable over virtual platforms given "there is no such thing as "off-the-record" on a Zoom call" (IP44). Another reason provided was that in-person meetings gave analysts a degree of control unavailable with the physical separation embedded in telephone or video-conference interactions. Some analysts noted that management on a telephone call or videoconference would put themselves on mute prior to answering a difficult question, leave the meeting while it was ongoing or be visibly unengaged. Such behaviours were more difficult when face-to-face. Furthermore, face-to-face meetings give greater opportunities for spontaneity or digression which, in turn, aid information origination.

Not all analysts saw value in engaging with management with the required frequency of such engagements a function of issuer size and sector. There was seen to be less need to engage with the management of a large company in a slow-moving sector (e.g. utilities, energy or telecoms) than with smaller companies in faster-moving sectors (e.g. consumer or internet). Furthermore, the need for, and nature of, such relationships reflected an analyst's accumulated knowledge of the covered corporate. Analysts with new coverage tended to engage with

management more frequently, while experienced analysts saw less urgency for such interactions. As one seasoned analyst put it, “there is no point in meeting them … what can they tell or show me that I do not know already, could not access from other sources or could simply guess” (IP01).

But the analysts who valued management engagement, which were the majority, recognised that the quality of information received from such meetings was incrementally lower without the benefits of face-to-face interaction. Not materially on an individual engagement basis but sufficient to compound over time and impact an analyst’s knowledge as the pandemic continued. Consequently, the overall quality of information received from corporates during the pandemic was reduced as a result of the required shift to virtual platforms, despite efforts by management teams to engage regularly with the sell-side throughout the pandemic. As one Hong Kong-based analyst summarised, “My companies do not change significantly over three or six months … what we knew in January [2020] was still valid in June [2020] … but now I have not seen my companies for more than 18 months and I can feel it” (IP50).

5.4 The geographical consequences of disrupted information flows

As with many revenue-generating finance professionals, access to information is critical to an analyst’s ability to provide value to clients and secure a relative advantage versus peers. A recurring theme was that clients were perpetually hungry for any new and incremental information, ideally before it was widely disseminated or before other market participants could access, interpret and act on it. As one analyst detailed, “Clients don’t want to be told what to buy or sell, they want information, interpretation and knowledge” (IP04), or as another commented, “We need to provide insights other brokers don’t have. It is not necessarily the depth or quality of our published research but simply that incremental data point other people do not have” (IP06). One investor, for example, started every meeting with a sell-side analyst with the simple questions “what’s new?” and “why does it matter?” (IP62). As such, if an

analyst enjoys and is able to maintain an informational advantage versus peers, no matter how marginal, then that will be reflected in subsequent relative client traction.

The restrictions on face-to-face interactions and movement disrupted information flows, primarily through the three mechanisms detailed above. These resulted in nearly all participating analysts reporting a gradual but persistent degradation in their knowledge and understanding of covered corporates during the pandemic. But the rate of knowledge degradation was not consistent given differences in analyst location, company coverage and relative experience, with analyst location important given the lack of uniformity between countries in the length and severity of enforced restrictions.

The experiences of analysts in Hong Kong and Singapore were particularly revealing in how the limits on travel and face-to-face interactions constrained access to information. Before COVID, Hong Kong provided a good balance between client co-location and access to mainland-based corporates, with Singapore holding a similar role in Southeast Asia. Although the COVID restrictions did not prevent analysts in both centres from developing forecasts and forming investment views, they did diminish the overall information pool available when undertaking such activities, especially when compared to analysts in other locations where face-to-face interaction with sources was still possible.

Hong Kong-based analysts, for example, not only found themselves physically excluded from the management and operating environments of their covered corporates in China, but also prevented from accessing the social networks with co-located clients, so important as an information source, due to the city's onerous restrictions on in-person interactions. In contrast, at the time of the interviews in 2021, their competitors in Shanghai, Shenzhen and Beijing were frequently able to maintain physical face-to-face access to sources and were consequently able to provide the differentiated, local, and tacit information demanded by clients. The same theme was repeated by Singapore-based analysts undertaking cross-border coverage across Southeast Asia, although to a lesser extent given reduced client interest in the region and the more truncated nature of the travel restrictions. As one Hong Kong analyst noted, "The clients still demand the same thing as in the pre-COVID period: they want the local insight, they want

to see what is going on on-the-ground, they want to be ahead of their competitors … and that is something I am struggling with" (IP02). Similarly, a Singapore-based Southeast Asian consumer analyst recognised that she could not provide the local context and information demanded by clients given her inability to physically access her contacts and as such, had seen an "alarming" loss in client traction (IP44).

As a result, a persistent concern expressed by both Hong Kong- and Singapore-based analysts was that the quality of their offered products and information was likely to be seen by clients as inferior versus those of more proximate competitors with superior physical access to sources. As one analyst summarised, "I would caution against extrapolating the current circumstances to a world where some can physically see their corporates and clients, and others cannot. I think in that scenario, those who cannot will lose their relationships and traction because face-to-face interaction with corporates and clients always gives you an advantage" (IP05).

But while individual analysts found their access to information degraded by the lack of physical access and face-to-face interaction during the pandemic, it is notable that no buy-side participant described a complete breakdown in information flows. Although there were periods when the quality of received information was lower than expected, especially during the pandemic's early frantic phases, the underlying complexity and dynamism of the equities ecosystem, and its associated information networks, meant that needed information could always be accessed in some form. This was described as "Hydra-like" by one investor as he highlighted that as the value of some sell-side analysts declined, others would appear and assume greater importance (IP45).

The overall ecosystem, therefore, adjusted quickly to the substantial informational deficits which emerged in Hong Kong and Singapore during the pandemic, traditionally two of the region's more important information nodes. Some buy-side participants active in China reported that their preferred sell-side analysts had become dominated over the past two years by those based in Shanghai, Beijing and Shenzhen, at the expense of those in Hong Kong. Similarly, a Singapore-based hedge fund accelerated plans to locate analysts in China and a

buy-side analyst at a large U.S. asset manager voluntarily relocated to Shanghai from Hong Kong to be physically closer to information sources, including sell-side research. As a result, many Hong Kong-based analysts noted that they had lost client traction during the pandemic while colleagues in mainland China had seen improvements as investors adjusted their information networks.

These outcomes highlight the persistent benefits arising from physical proximity and face-to-face engagement with corporates, clients and industry contacts. These may appear marginal or even invisible to external observers, but in the competitive and high frequency world of finance, any advantage, no matter how small, will become prized, self-reinforcing, and entrenched. In many cases, such face-to-face interaction can be derived through temporary proximity with the analyst travelling to access the information source. But analysts able to engage more frequently on a face-to-face basis with information sources, whether corporates, contacts or clients, would, over time, be expected to have access to an overall superior information pool than their competitors. This should, in turn, result in a higher quality product and greater value to clients.

It is this gradual but self-reinforcing process which may partially explain the tendency of financial activities to agglomeration and the geographic "stickiness" of information and knowledge (Clark 2005, Gertler 2001 2003). Although the world cities and financial geography literatures emphasise the disproportionate roles of relational proximity, networks, and agglomeration externalities (Sassen 2001, van Meeteren et al. 2016), the relevant spatial scales often remain contested (Bassens et al. 2021). This has been further complicated by the frequent presumption that information and communication advances allow relationships previously embedded in the local to be freed of geographical constraints (Baldwin 2016, Cairncross 1998, O'Brien 1992, O'Brien & Keith 2009). Our study into the revealed behaviours, working patterns and experiences of financial professionals, however, highlights the persistent territoriality of information and knowledge (Storper 1997: 71-72). This reflects the continued importance of tacit, local, and unstructured information within finance and the demonstrable incremental benefits of face-to-face communication in its transfer. This chimes

with the study of professional services in Brussels by Bassens et al. (2021) which found that the involved relationships tended to be more local than often presumed, with the metropolitan scale most relevant.

It also provides evidence supporting the importance of social and cultural networks within financial geographies (Beaverstock 2002, Clark 2002, Hall 2007, Ho 2009, Lai 2006, Thrift 1994). These provide the architectures for the distribution of uncodified information through high-trust and reciprocal relationships developed and maintained through regular face-to-face interactions. Some of the information within such networks may be subsequently codified and accessible over distance by external parties, as per Bathelt et al.'s (2004) "global pipelines". But as revealed by the impact of the COVID restrictions on information flows, those active within the network would be expected to benefit from continued superior access to information given the characteristics of financial information and the advantages of face-to-face communication. And in turn, it is this persistent informational advantage which may contribute to the relative competitiveness of specific financial centres (Clark 2002).

5.5 Conclusion

As highlighted by Malmberg & Maskell (2002) and others, one of the challenges facing the debate on the role of proximity in financial information flows is the paucity of empirical evidence on the behaviour of the involved actors, particularly under contrasting scenarios. To a significant extent, this reflects the inherent difficulties of isolating specific causal factors and interdependencies, as demonstrated by the rarity of experimental methodologies in economic and financial geography (Wójcik 2022). But the severe restrictions imposed during the COVID pandemic, along with the surge in investor informational needs during a period of heightened financial stress, provided the novel circumstances for a unique natural experiment to assess the extent to which enforced physical separation impacted information flows. This was investigated through the collection and analysis of first-hand feedback from sell-side research analysts in Asia, who act as important financial information intermediaries within the equities

ecosystem. This was facilitated by the authors' access to interviewees and the more balanced knowledge symmetries during the interview process, given previous industry experience and personal involvement in the relevant professional networks.

Our findings support existing arguments in favour of physical proximity and the continued importance of face-to-face interactions in the origination and distribution of financial information (*inter alia* Asheim et al 2007, Gertler 2003, Storper & Venables 2004). Although analysts use virtual and electronic mechanisms extensively in the transfer of lower-value and more codified information, face-to-face communication was frequently seen as more valuable when transferring tacit, complex, sensitive, unstructured and/or time-urgent information, especially if real-time clarifications were needed or if the exchange was informal, required a high degree of trust, or benefited from reciprocity. There was also widespread recognition that relationships grounded in the physical were easier to transfer to a virtual environment and survived longer. This has implications which go beyond the geography of finance, especially as it supports existing literature which position electronic virtual communication mechanisms as complements, rather than substitutes, for face-to-face interactions (Bathelt & Glückler 2011, Gaspar & Glaeser 1998, Morgan 2004).

The restrictions on movement and face-to-face interactions imposed during the COVID pandemic disrupted information flows and resulted in nearly all analysts reporting a gradual but persistent degradation in their understanding of covered corporates. This was particularly the case for analysts covering companies operating in constrained geographies and in more fast-moving sectors, and for analysts who had previously relied on reciprocal exchanges with co-located clients as an important information source. The relative benefits of face-to-face communication were further revealed through the difficulties faced by analysts undertaking cross-border coverage who found their informational disadvantage versus more proximate local analysts widened noticeably when domestic restrictions were eased ahead of those limiting international travel. This subsequently resulted in the loss of client traction by remote analysts versus local competitors, and the restructuring of investor resources and relationships to maintain access to higher quality information sources.

The continued significance of proximity and face-to-face communication for information flows has implications for the geography of financial centres. First, although it is often possible to access remote information sources on a face-to-face basis through temporary proximity (Grabher 2002), the revealed advantages of such engagements are magnified through a higher frequency of interaction. This may explain the benefits of permanent proximity as enabled through co-location. It may also explain why much information and knowledge remain 'territorially sticky', and the importance of social and cultural networks as structures for embedding informational advantages and influencing the relative competitiveness of financial centres (Clark 2002 2005, Gertler 2001 2003, Storper 1997, Thrift 1994). As such, the presumption that new technologies enable access to all required information regardless of location, risks under-estimating the continued role of tacit, unstructured, and informal information within financial markets, and the importance of face-to-face communication in its transmission. It also under-estimates the often-substantial barriers to cross-border information flows within Asia given cultural, linguistic and regulatory frictions, as revealed during the pandemic. Given these frictions, it is unlikely that the multi-polar financial geography of Asia has become any more concentrated over recent years (Lai et al. 2020).

Second, it raises specific questions for the future hierarchies of Asia's financial centres, especially the role of Hong Kong and Singapore as regional centres. As with many financial professionals, especially those in intermediary or advisory functions, analysts' locations should optimise physical access to all required information sources, including both corporates and clients, whether domestic or foreign. Historically, Hong Kong and Singapore represented such optimal locations. But analysts in both centres found themselves significantly disadvantaged by the COVID restrictions as a result of their physical exclusion from client social networks as well as from their corporates due to the cross-border travel prohibitions. In particular, Hong Kong's role and status has been challenged given the severity and duration of the city's restrictions. The difficulties of accessing information reported by analysts based in the city would indicate that Hong Kong has lost relevance as an information node or

knowledge cluster versus the mainland Chinese centres. This risks eroding its traditional China gateway role for international banks (Jones 2020, Lai 2012) and accelerating the transformation of its status within the country (Wójcik et al. 2022), especially if Shanghai, Shenzhen or Beijing are able to maintain their current superior informational advantages.

In conclusion, this article demonstrates the continued influence of physical proximity and face-to-face communication in financial information flows, at least in translucent and opaque asset classes, including equities (Clark & O'Connor 1997). The argument that improved technologies have allowed the codification of all necessary information and its distribution to any location, simply does not reflect the underlying complexity of financial information flows, the continued importance of tacit, unstructured and informal information, and the persistent benefits of proximity and face-to-face communication, as demonstrated by the experienced consequences of the COVID restrictions. These benefits may not always be visible to external observers but to active participants, especially information intermediaries such as sell-side equity analysts, they remain very real and as such, continue to play an important role in their specific geographies as well as the broader geographies of financial centres.

Annex: Interview participants

ID	Date	Type	Role	Location	Specialisation
IP01	26/01/2021	Sell-side	Analyst	Hong Kong	Telecom
IP02	27/01/2021	Sell-side	Analyst	Hong Kong	Industrials
IP03	27/01/2021	Buy-side	Management	Singapore	
IP04	28/01/2021	Sell-side	Analyst	Hong Kong	Internet
IP05	28/01/2021	Sell-side	Analyst	Hong Kong	Insurance
IP06	29/01/2021	Sell-side	Analyst	Sydney	Technology
IP07	30/01/2021	Sell-side	Analyst	Mumbai	Technology
IP08	02/02/2021	Sell-side	Analyst	Hong Kong	Internet / education
IP09	04/02/2021	Sell-side	Analyst	Hong Kong	Real estate
IP10	04/02/2021	Sell-side	Analyst	Hong Kong	Internet
IP11	06/02/2021	Sell-side	Analyst	Mumbai	Consumer
IP12	10/02/2021	Sell-side	Analyst	Singapore	Technology
IP13	15/02/2021	Sell-side	Analyst	Sydney	Telecom / Technology
IP14	15/02/2021	Sell-side	Management	Hong Kong	
IP15	16/02/2021	Sell-side	Analyst	Hong Kong	Financials
IP16	17/02/2021	Sell-side	Management	Shanghai	
IP17	19/02/2021	Sell-side	Analyst	Singapore	Consumer
IP18	23/02/2021	Sell-side	Analyst	Hong Kong	Technology
IP19	23/02/2021	Sell-side	Analyst	Mumbai	Healthcare
IP20	28/02/2021	Sell-side	Analyst	Mumbai	Financials
IP21	01/03/2021	Sell-side	Analyst	Hong Kong	Financials
IP22	09/03/2021	Sell-side	Management	Hong Kong	
IP23	14/03/2021	Buy-side	Analyst	Hong Kong	Consumer
IP24	16/03/2021	Sell-side	Management	Hong Kong	
IP25	22/03/2021	Sell-side	Analyst	Shanghai	Healthcare
IP26	24/03/2021	Sell-side	Analyst	Hong Kong	Transport
IP27	26/03/2021	Sell-side	Management	Hong Kong	
IP28	01/04/2021	Sell-side	Management	Hong Kong	
IP29	05/04/2021	Sell-side	Analyst	Kuala Lumpur	Consumer
IP30	07/04/2021	Sell-side	Analyst	Shanghai	Consumer
IP31	15/04/2021	Buy-side	Portfolio Manager	Sydney	
IP32	21/04/2021	Buy-side	Analyst	Auckland	Generalist
IP33	22/04/2021	Sell-side	Analyst	Taipei	Consumer
IP34	03/05/2021	Sell-side	Analyst	Hong Kong	Telecoms
IP35	05/05/2021	Sell-side	Analyst	Hong Kong	Generalist
IP36	13/05/2021	Sell-side	Analyst	Hong Kong	Real Estate
IP37	14/05/2021	Sell-side	Analyst	Hong Kong	Industrials
IP38	17/05/2021	Sell-side	Analyst	Seoul	Industrials
IP39	17/05/2021	Sell-side	Analyst	Seoul	Financials
IP40	18/05/2021	Sell-side	Analyst	Hong Kong	Internet
IP41	21/05/2021	Sell-side	Analyst	Sydney	Technology
IP42	25/05/2021	Sell-side	Analyst	Jakarta	Financials
IP43	26/05/2021	Sell-side	Analyst	Mumbai	Healthcare
IP44	26/05/2021	Sell-side	Analyst	Singapore	Consumer
IP45	26/05/2021	Buy-side	Portfolio Manager	Singapore	
IP46	27/05/2021	Sell-side	Analyst	Taipei	Technology
IP47	03/06/2021	Sell-side	Analyst	Singapore	Industrials
IP48	04/06/2021	Sell-side	Analyst	Shanghai	Technology
IP49	08/06/2021	Sell-side	Analyst	Shanghai	Technology
IP50	16/06/2021	Sell-side	Analyst	Hong Kong	Consumer
IP51	22/06/2021	Sell-side	Analyst	Seoul	Transport
IP52	22/06/2021	Sell-side	Equity sales	Singapore	
IP53	23/06/2021	Corporate	Investor relations	Singapore	
IP54	29/06/2021	Sell-side	Analyst	Mumbai	Generalist
IP55	05/07/2021	Sell-side	Analyst	Kuala Lumpur	Consumer
IP56	09/08/2021	Sell-side	Analyst	Hong Kong	Industrials
IP57	09/08/2021	Buy-side	Analyst	Hong Kong	Consumer

IP58	10/08/2021	Sell-side	Management	London	
IP59	24/08/2021	Corporate	Investor relations	Mumbai	
IP60	27/08/2021	Buy-side	Analyst	Singapore	Generalist
IP61	27/08/2021	Buy-side	Management	Singapore	
IP62	09/09/2021	Buy-side	Portfolio Manager	Singapore	
IP63	28/09/2021	Sell-side	Analyst	Hong Kong	Generalist
IP64	01/10/2021	Buy-side	Analyst	Hong Kong	Internet
IP65	01/10/2021	Sell-side	Equity sales	London	
IP66	04/10/2021	Buy-side	Analyst	Hong Kong	Utilities
IP67	04/10/2021	Buy-side	Portfolio Manager	Shenzhen	
IP68	05/10/2021	Buy-side	Analyst	Hong Kong	Consumer
IP69	04/11/2021	Sell-side	Analyst	Singapore	Energy
IP70	16/11/2021	Corporate	Investor relations	Hong Kong	

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Chapter 6 (Paper 3)

ACUTE PROXIMITY AND THE ACQUISITION OF SPECIALISED FINANCIAL KNOWLEDGE: EVIDENCE FROM SELL-SIDE EQUITY RESEARCH AND THE IMPACT OF THE COVID-19 PANDEMIC

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The importance of acute physical proximity in the transfer of tacit knowledge is vigorously debated within economic geography. On the one hand, the characteristics of tacit knowledge favour face-to-face transfer within localised settings. On the other hand, it is argued that technological advances have reduced this territorial fix and have elevated other forms of relational proximity in importance. This paper contributes to this debate by drawing upon 70 interviews with equity research analysts, as highly specialised, tacit knowledge-intensive financial professionals. We investigate their need for acute proximity when acquiring tacit knowledge, referencing evidence provided by the COVID-19 restrictions on physical proximity. Examining lived experiences, before and during the pandemic, we find that specialised and complex knowledge is acquired by junior team members primarily through intense interactions enabled by office working. The work-from-home policies interrupted this learning mechanism and degraded their development. But as analysts gain expertise, they become more autonomous, less dependent on the office as a source of knowledge, and more reliant on temporary and remote relationships. This suggests that physical, relational, and temporal proximity function as alternative mechanisms in the acquisition of knowledge and that their relative importance evolves as individual tacit knowledge is accumulated.

6.1 Introduction

The geographies of knowledge play a central role within economic geography. The creation, transfer, and assimilation of knowledge are all seen as critical components of topics as diverse as globalisation, economic development and competitiveness, agglomeration, clusters, advanced business services, world cities, and financial centres. But our understanding of the various spatial dimensions of knowledge, especially in terms of how it flows across space, is constrained by methodological challenges, which often prevent the empirical validation of many theorised concepts (Beaverstock et al. 2000, Short et al. 1996).

This is particularly evident when it comes to discussions about the geographies of tacit (or implied/inferred) knowledge. The characteristics of such knowledge emphasise the role of the individual as the principal carrier of expertise, with the subsequent presumption that its transfer requires face-to-face communication, high-trust reciprocal relationships, and physical proximity (Gertler 2003, Maskell & Malmberg 1999, Storper & Venables 2004). Improved communication technologies, however, contest this presumption. There is a well-developed argument, also found in the management and organisational literatures, that the high-trust relationships needed for tacit knowledge transfer can now be maintained outside territorial constraints, with other forms of relational proximity assuming greater importance (Amin & Cohendet 2004, O'Leary et al. 2014). A related and more nuanced view is that it is possible for tacit knowledge to flow between remote actors through relationships grounded in periods of temporarily manufactured proximity (Grabher 2002, Torre 2008).

All three perspectives have strong conceptual foundations. But the nebulous and opaque nature of tacit knowledge makes its observation and measurement complicated, especially when compared to alternative forms of codified knowledge. As such, many of the associated theories are difficult to validate, as witnessed by the debate over the need for acute proximity in its transfer. This paper addresses this issue by exploring how a subset of highly specialised knowledge-intensive financial professionals – sell-side equity research analysts – acquire their individual expertise, and the relative importance of acute proximity in the process.

Equity research is one of the most knowledge-intensive functions within finance. Equity research analysts provide value to investors by using their knowledge to forecast the future performance and valuation of listed companies. The production and relative quality of their output is dependent on the accumulation of complex and highly specialised knowledge, embodied within and carried by individuals, not institutions, and tailored to specific client requirements through reciprocal relationships (Bettencourt et al. 2002). It is, therefore, typified by high human capital intensity, low capital intensity, a dependency on tacit expertise, and high individual autonomy (von Nordenflycht 2010). Although analysts use both codified and tacit knowledge in a spiral intersection to form new knowledge (Nonaka 2007), they are reliant on their individual tacit expertise to interpret complex and dynamic inputs, explicit and assumed, and generate future views which are codified into earnings forecasts, valuations, and investment recommendations. These are modified as new information is accessed through a process of individual-specific interpretation and analysis. This analytical expertise, often referred to within the financial community as 'judgement' or 'intuition', is developed through a continual and iterative process, involving intense reciprocal interactions with colleagues, clients, and other contacts.

Although the factors influencing analyst expertise have been investigated within the financial literature (Bae et al. 2008, Bradley et al. 2017, Do & Zhang 2020, Malloy 2005), the insights that the activity offers into the geographies of knowledge and finance have been rarely explored within economic geography (Wrigley et al. 2003). This is despite the distinctiveness of equity research as a knowledge-intensive business service (KIBS) given its greater reliance on tacit knowledge to forecast future outcomes. This contrasts with other KIBS which make greater use of codified knowledge and precedent (for example, accountancy and law). This reflects von Nordenflycht's (2010) recognition that not all KIBS are comparable in terms of the use of tacit and codified knowledge in their production processes. But it is notable that the more tacit-intensive KIBS have received less attention from geographers, in part because the individual and autonomous nature of knowledge makes them more elusive to observation, exceptions including Faulconbridge & Jones (2012), Hall (2007), and Wrigley et al. (2003).

The analysis presented in this paper draws upon semi-structured interviews with 70 participants in sell-side equity research including 45 analysts and seven research managers, primarily working at international investment banks, with the remainder from the buy-side (including analysts and portfolio managers), corporate investor relations and sell-side equity sales (see Annex). Nearly all the participants were based in Asia with 30 in Hong Kong, 12 in Singapore, seven in Mumbai, and five in Shanghai. The remainder were distributed across Auckland, Jakarta, Kuala Lumpur, London, Seoul, Shenzhen, Sydney, and Taipei. The majority of respondents (74%) were male, although a higher percentage (38%) of the 45 sell-side analysts interviewed were female. One of the authors previously worked as the Asian Director of Research at an international investment bank and this facilitated privileged access to these highly specialised financial professionals.

The interviews were undertaken during 2021 and were designed to assess the need for acute proximity in the acquisition and accumulation of needed knowledge and information, referencing the impact of the COVID-19 restrictions on physical proximity. All participants experienced sustained periods of mandated work-from-home during 2020 and 2021 regardless of their location, often enforced by their employers who maintained restrictions often longer than official policies. There were some differences between banks in how they applied work-from-home policies in the latter years of the pandemic, but these were not significant in the earlier years. In addition, it is recognised that no research associates (the junior members of research teams) were interviewed due to difficulties in identification and access. Given the importance of individual learning within equity research, it could be argued that this limits the ability of this paper to draw conclusions. However, most of the analysts involved had supporting associates, who they were responsible for developing, and had started their careers as associates. As such, they were able to opine, with confidence, on the development trajectories of their associates, the involved learning mechanisms, and the need for acute proximity, as revealed through the COVID-19 restrictions on such proximity.

A pervasive theme to emerge from the interviews was that acute proximity remains important in the transfer and acquisition of complex tacit knowledge, particularly in the early

stages of accumulating this expertise. The highly specialised knowledge required to become an effective analyst, especially the critical interpretative, analytical, and forecasting capabilities, is primarily learnt within teams in a cascading process enabled by extended periods of intense person-to-person interaction and connectivity within office structures. But the loss of acute proximity disrupted this learning mechanism, with the virtual platforms enabled by communication technologies unable to replicate the intensity of interactions experienced within offices. There was, therefore, a broad consensus across interviewees that research associates had seen their development significantly disrupted by working-from-home. Not only was the rate of learning and development slowed, but the complexity of knowledge that could be transferred over virtual platforms was reduced.

The importance of acute proximity, however, is a function of an analyst's development. As analysts accumulate expertise, they become increasingly autonomous and more mobile with the role of the office as a structure to access and create new knowledge diminished. There is a reduced need for the permanent hyper-connectivity of offices. Analysts are instead able to use their accumulated expertise to selectively identify incremental knowledge needs. These are subsequently acquired through periods of manufactured physical proximity with sources and contacts outside the office or through relationships formed in the physical but transferred to the virtual. This suggests that physical, relational, and temporal proximity should not be viewed as distinct and separate propositions, but as alternative mechanisms for the acquisition of tacit knowledge which coexist and whose relative importance evolves as such knowledge is acquired and accumulated.

The following section introduces the debate on the importance of physical proximity in the transfer and acquisition of specialised and complex knowledge, especially tacit. Section 3 draws upon the interviews to outline the mechanisms through which research analysts acquire knowledge and develop their individual tacit expertise, while Section 4 provides supporting evidence on how the COVID-19 restrictions on physical proximity disrupted these mechanisms. Section 5 concludes.

6.2 Tacit knowledge and the contested geographies of its transfer

The geographies of knowledge play an outsized and multi-faceted role within economic geography and represent important components of the evolving literatures on globalisation, economic development, industrial clusters and other forms of agglomeration, and world cities. On the one hand, the process of globalisation is seen to have been facilitated by technological improvements which have reduced the costs of codifying knowledge and its dissemination over distance (Amin & Cohendet 2004, Baldwin 2016, O'Brien 1992). On the other hand, the ability to produce, modify, disseminate, and assimilate knowledge is now viewed as one of the most important determinants of economic growth and development (Lundvall 1998). Furthermore, the increasing geographic concentration of economic activity, as evidenced by the persistence of industrial clusters, despite technological advances, is seen to highlight the continued importance of spatially situated and territorially embedded knowledge (Bathelt et al. 2004, Gertler 2003, Storper 1997, Storper & Venables 2004).

It is recognised that not all types of knowledge are the same with a substantial literature, building on Polanyi's seminal work (1966 1967), drawing a general distinction between codified (or explicit) and tacit (or implied). Although widely used by scholars, this dichotomy can be misleading since most knowledge exists on a continuum between wholly codified or wholly tacit (Howells 2002). But at its simplest, the former can be expressed or represented in numerical or written formats (e.g., equations, data, manuals, rules, principles etc.), stored within institutions, dislocated from its original setting, and easily transferred over distance. In contrast, the latter is inherently subjective, experiential, embodied within and carried by individuals. It is difficult to express in either written or spoken communication forms and is, therefore, inherently more local, or at least, more 'atomistic' given its individualistic nature (Gertler 2003, Nonaka et al. 2000).

The two forms of knowledge are frequently presented as separate, for example, see Cowan et al.'s (2000) distinction between codified know-what and tacit know-how. At the same time, technological developments have allowed a greater proportion of knowledge to be

codified, thereby seemingly diminishing the importance of the tacit variety. But this techno-centric approach potentially underestimates the interdependencies between the two forms. To be useful, codified knowledge needs to be interpreted and applied within specific circumstances, which requires tacit expertise. They should, therefore, be seen as complementary, and it is the active interaction between the two which is instrumental in the creation of new knowledge, (Amin & Cohendet 2004, French 2000, Nonaka 2007, Nonaka & Takeuchi 1995, Nonaka 2007, Polanyi 1966). After all, codified knowledge has little or no value without tacit interpretative and analytical expertise (Bathelt et al. 2004, Johnson et al. 2002). Not only is this expertise typically specific to, and carried by, individuals, but in a world of increasingly ubiquitous codified data, it could be argued that the importance of individual tacit knowledge and expertise has become more, not less, important as the differentiating factor in knowledge creation.

Within economic geography, therefore, tacit knowledge is theorised as the more valuable. It is often seen as a non-replicable competitive resource as economies become more knowledge-based (French 2000, Howells 2002) and a central component of the learning economy and innovation process (Gertler 2003, Lundvall 1998). Specifically, the interlinked literatures on agglomeration dynamics and industrial clusters both stress the importance of territorially sticky, informal, locally circulated, and costly to codify tacit knowledge. This is seen as a primary factor driving the clustering of economic activities, particularly higher order. Through colocation, not only can firms access and exploit spatially limited knowledge spillovers, but also reduce the costs of acquiring knowledge (Döring & Schnellenbach 2006, Malmberg & Maskell 2002, Malmberg & Power 2005). Furthermore, the clustering process stimulates the creation of additional localised and differentiated tacit knowledge specific to the cluster, which advances its competitiveness (Bathelt et al. 2004, Storper & Venables 2004).

The broader role of knowledge spillovers in the formation of clusters is contested (Gordon & McCann 2005, Huber 2012), but there is more substantive debate over the degree to which geographic proximity, e.g., permanent co-location, is a pre-requisite for tacit knowledge transfer. On the one hand, it is recognised that its underlying characteristics make

it “extremely difficult to transfer” and require “considerable amounts of time and practice” (Amin & Cohendet 2004: 23). It is difficult to assimilate (Howells 2002) and is best acquired through observation, demonstration, and practice (Maskell & Malmberg 1999). This, in turn, requires an interactive and intensive learning and acquisition process based on face-to-face communication and close physical proximity, as per Gertler’s (2003) “being there”, within committed, durable, stable, and reciprocal relationships (Boschma 2004 2005, Storper & Venables 2004). These tend to be found in high trust frameworks, both formal and informal, when mutual interests are defined, framed, and enabled by shared languages, values, cultures, and conventions (Boschma 2005, Gertler 2003, Maskell & Malmberg 1999, Neely 2018). Institutions, including firms, typically provide these frameworks. They provide the boundaries and structures within which knowledge is created, used, and distributed, but also the social frameworks, contexts, and behaviours, which act as the common platform for employees to interact and share knowledge, especially tacit.

The presumption that tacit knowledge is locally embedded has attracted debate with a focus on the extent to which these networks and relationships are location specific or can function over scales other than local. New technologies, for example, can replicate the advantages of physical face-to-face interaction unbound from the spatial fix and facilitate the transfer of more complex knowledge, including tacit, over any distance. This has shifted the debate on proximity from geographical to other relational forms including cognitive, institutional, organised, and social (Amin & Cohendet 2004, Bathelt & Li 2014, Boschma 2005, O’Leary et al. 2014, Torre & Rallet 2005). The argument is that the factors necessary for the exchange of tacit information, including trust, shared values, common language, etc., are embedded within shared relationships, including social networks outside organisations, and these can now be maintained over distance between people who may never meet in person. This, Amin & Cohendet concluded in strident terms, makes a “mockery of the idea that spatial proximity and ‘being there’ are one and the same” (2004: 108). From their perspective, the transfer of knowledge, even tacit, is no longer dependent on location nor distance, but on relationships not necessarily anchored within territorial confines.

This view has been criticised. One argument is that it overstates the ability of organisational structures to facilitate and encourage the consistent flow of knowledge across locations (Morgan 2004, Rutten & Boekema 2012). There is also a view, evident in the management and organisational studies literature, that virtual relationships can never fully replicate those formed in the physical, especially in terms of the required connectivity and underlying trust to maximise knowledge transfers (Kolb et al. 2008). While permanent co-location facilitates and encourages the transfer of tacit knowledge through greater connectivity, intensity, and a higher frequency of unstructured knowledge transfers (Boschma 2005), increased distance conversely reduces the opportunities for informal contact (Kiesler & Cummings 2002). But an emergent view is that even if face-to-face interaction and physical proximity remain important for the transfer of tacit knowledge, these may not necessitate permanent co-location. They can instead be achieved through periods of temporarily manufactured physical proximity within shared institutional, organisational, or cognitive frameworks (Grabher 2002, Torre 2008). But while temporary co-location should, at least from a conceptual basis, allow for the transfer of needed knowledge and the formation of high trust inter-personal relationships, empirical evidence to-date has not been supportive (Müller & Stewart 2016).

The 'tacit knowledge transfer needs physical proximity' debate is extensive but suffers from two methodological challenges. The first is that many of the conceptual mechanisms explaining how knowledge is acquired and transferred lack empirical validation (Balland & Rigby 2017, Beaverstock et al. 2000, Döring & Schnellenbach 2006, Short et al. 1996). This reflects the difficulties of defining, observing, and measuring the creation and circulation of knowledge, especially tacit (Cummings 2004, Foray 2004, Howells 2002). As a result, attempts to empirically validate hypotheses tend to rely on the outputs of presumed knowledge processes, for example patents (Balland & Rigby 2017, Jaffe et al. 1993, Ponds et al. 2010), rather than the generative mechanisms involved. This creates the risk of 'circular causation' with outputs used to 'prove' the existence of theorised mechanisms (Malmberg & Maskell 2002: 435). This reflects the difficulties of measuring tacit knowledge but also the broader

challenges geographers face when engaging with individual learning and knowledge transfer processes, instead of those at the level of firms, networks, and economic systems (Malmberg & Power 2005). This highlights Rutten & Boekema's (2012) call for a focus on individuals as the principal learning agents within any system or network.

The second challenge is the risk of generalising any findings or hypotheses relating to knowledge transfer beyond the specific circumstances under investigation. This reflects the extreme heterogeneity embedded within the entire concept of 'knowledge', across its definition, creation, use, and transmission. To an extent, the tacit versus codified categorisation seeks to address this complexity but it also risks simplifying the issue since the arising duality conflicts with the proposition that most knowledge can exist simultaneously in both forms (Howells 2002). Furthermore, how knowledge is used and created differs significantly across individuals, institutions, and activities. This is apparent when considering the various knowledge-intensive business services (KIBS) which, despite the generic term, are rarely comparable in terms of knowledge processes, and exist on a spectrum of knowledge intensity (von Nordenflycht 2010). There are also frequent and substantial differences in the relative importance of tacit and codified knowledge as inputs. Activities predicated on forecasting the future, e.g. equity research, investing, and strategy consultancy, are inherently more dependent on individual tacit expertise than those assessing current circumstances using codified data and precedent, e.g., accountancy and law.

Recognising these challenges, we seek to contribute to the literature by exploring the mechanisms involved in the creation, accumulation, and transfer of tacit knowledge by investigating the behaviours of a specialised and knowledge-intensive subset of financial professionals: sell-side equity research analysts. They work for equity brokerages, often within investment banks, and provide value to investors (their clients) by using their individual tacit expertise to forecast the future performance of companies based on an assessment of the most probable outcomes for their future profitability and returns. This requires analysts to assess the most likely scenarios across a multitude of determining factors including revenues (which, in turn, are determined by competition, products offered, prices, end-user demand etc.), operating

costs (including salaries, property and other infrastructure costs, production inputs and commodities), and capital expenditures, especially those required to support revenue growth, and upgrade and maintain existing production infrastructures. In addition, there are other less tangible aspects of a company's outlook which may influence its future performance, and which analysts need to consider and incorporate into their assessments, including technological developments, government policies, and management capabilities.

Analysts operate, therefore, in an information-intensive and time-sensitive environment with multiple inter-dependencies creating a high degree of complexity and uncertainty, compounded by significant spatial and temporal factors. To develop accurate, and hence, valuable, forecasts and recommendations requires highly developed individual skills and expertise, based on deep specialised knowledge learnt and formed through experience. The factors influencing analysts' relative interpretative, analytical and forecasting capabilities have been extensively explored in financial economics, including industrial expertise (Bradley et al. 2017), proximity to corporates (Bae et al. 2008, Malloy 2005, Jennings et al. 2017), and available supporting resources (Fang & Hope 2020, Gao et al. 2022). But the same literature also provides evidence that proximity to colleagues is important. Do & Zhang (2020), for example, demonstrated that the hiring of a well-ranked analyst into a brokerage positively impacted the performance of incumbent analysts, while Groysberg & Lee (2010) found that analysts working with higher-ranked colleagues were less likely to move to a competitor. Both these are potentially indicative of the importance of tacit knowledge transfers within equity research teams.

The judgement, expertise, and capabilities offered by any analyst, and his/her immediate team, is the cumulative function of his/her acquired tacit knowledge, as reflected in interpretative and analytical skills, and access to other source of knowledge and information, including colleagues, clients, regulators, and industry contacts. This creates a degree of path dependency with successful, or unsuccessful, past behaviours being passed through team hierarchies. Although this is comparable with other KIBS (Gertler 2001), equity research is much more dependent on tacit knowledge and individual expertise given its forward-looking

nature (more comparable, for example, to management consultancy than accountancy or law). While analysts use codified knowledge, e.g. standardised valuation methodologies, the all-important inputs to these frameworks are individually tailored to specific, often highly dynamic circumstances. To produce accurate forecasts and value-creating recommendations, analysts need advanced expertise acquired and developed through the accumulation and modification of tacit knowledge. This rest of this paper, therefore, investigates how analysts acquire this knowledge and more specifically, the importance of acute proximity in this process, with reference to the impact of the enforced work-from-home policies implemented during the COVID pandemic as a unique natural experiment.

6.3 How analysts acquire knowledge and learn the research trade

Equity research is a highly autonomous activity with the relative value and competitiveness of individual analysts determined by their ability to use acquired knowledge and skills to generate accurate forecasts and recommendations. This expertise is highly individual-specific and is acquired and modified over time through iterative and intense learning and development processes.

There are two broad development paths for analysts to achieve a minimum level of required expertise. One is to acquire the specialised knowledge in a related organisation, e.g. management consultancy or corporate, before carrying it across into equity research. Upon joining equity research, they can immediately apply this expertise and become a writing analyst covering companies. This was the route one of the authors followed when he moved to equity research from strategy consultancy. This path is, however, less common than the second option which involves joining the function in a junior role, often as a university graduate, and working as a research associate over a multi-year period under the tutelage of an experienced analyst. As they develop their expertise, associates will either be promoted or leave, with the better performers being given coverage responsibilities within four-to-six years

of starting. Most equity analysts come through this route although they may move between different research houses during their development.

Research associates primarily acquire knowledge through two internal mechanisms. The first are formal and structured development programmes which some, although not all, research houses offer. Undertaken in small group sessions, typically involving a few hours every week, these provide codified frameworks and general guidance across a range of skills and capabilities considered important within research, including financial modelling, valuation methodologies, and communication, both written and spoken. This is often considered necessary as many associates arrive with limited applicable technical expertise, even when their university education was in aligned subjects. A senior analyst at a major American bank, for example, complained how one of his associates had an engineering degree and an MBA from leading universities but could not build a "simple discounted cashflow valuation model" (IP04). Another analyst detailed how on her first day, she was given a valuation model and told to update it which was a problem as she "had never used Excel before in such a way and had no idea where to start" (IP50), while a research manager expressed his surprise at how limited the applicable skills of many graduate and MBA hires frequently proved to be (IP22).

The effectiveness of such structured training is, however, debated. On the one hand, guidance on how to write reports, present analyses, and format models is viewed as valuable in providing a foundation for subsequent development. It is also a core component of a process to replicate and embed previously successful behaviours across different teams. This is particularly important in teaching the 'house presentation style' and maximising consistency across analyst outputs and behaviours. One investor, for example, complained that the inconsistent formats of sell-side valuation models meant that he often had to spend valuable time working out the structure and flow of models produced by different analysts, even from the same house (IP62). Such training could, therefore, impose standard (codified) model templates, provide best-practice examples of how to write, and thereby, improve the quality of the research product.

However, it is recognised that such programmes could not provide nor teach the interpretative skills necessary to assess the future implications and potential outcomes of current circumstances and new information, across a wide range of very different industries. They could not teach, for example, what assumptions and estimates should be applied to accurately forecast a company's earnings or define the most probable base-case valuation, even though it is this capability which clients value above all else. As one analyst put it, "we are being paid to predict the future, not to report the past" (IP40) or as another explained, "what matters is not the what but the so-what" (IP26). In other words, it is not the relatively ubiquitous codified knowledge that clients value, but the specialised tacit expertise carried by individual analysts, as reflected in their forecasting and predictive capabilities. In fact, the ability to accurately forecast revenues, margins, and costs is considered so valuable within finance that it is often referred to in hallowed terms as 'intuition' or 'judgement' and analysts with such skills are prized by clients, echoing Clark's (2018: 273) suggestion "that there is a premium on individual skills and expertise in financial markets".

The respondents generally thought that these skills cannot be taught in a structured manner as they are often situationally specific and require application of logic and expertise to a unique and frequently changing set of circumstances. Every industry has different earnings and valuation drivers, and many analysts define their expertise not by reference to their technical valuation or communication capabilities, but by their ability to define, understand and forecast the earnings and valuation drivers of specific sectors. They are not generic 'equity analysts' but 'industrial', 'consumer' or 'technology' analysts. Even these categorisations do not reflect the degree of individual specialisation. Consumer analysts can be 'luxury', 'staples' or 'discretionary' focused, while technology analysts frame their expertise by reference to 'hardware', 'memory' or 'semiconductors'.

It was widely recognised that such highly specialised capabilities and knowledge are acquired and developed through a knowledge cascading process enabled by sustained periods of observation, practice, experience, and assimilation alongside more senior colleagues. This is the second mechanism through which associates learn and create knowledge. There was as

much emphasis throughout the interviews on learning-by-watching and learning-by-listening as learning-by-doing, with tuition, guidance and examples provided through close contact and engagement with senior analysts. Through observation, associates learn and repeat successful behaviours, and incrementally adapt them to suit their own strengths and weaknesses. To an extent, this reflects the informal management processes adopted within firms typified by high human capital intensity and autonomous working practices (von Nordenflycht 2010). Given the required specialised knowledge is embodied within individuals and not institutions, it can only be transferred on a person-to-person basis rather than codified, retained, and transferred within institutions. As such, the knowledge transfer process is intense and highly intimate. As one senior analyst explained, juniors "learn by watching you and working closely with you" (IP04), while another recounted the maxim repeated by her senior analyst when she was starting her career: "just sit, don't talk, listen and watch everything I do" (IP37).

This process is usually facilitated by analysts sitting in acute proximity to their supporting associates, with teams grouped together within open-plan offices. Not all respondents liked such office formats since it impeded their ability to call clients or to secure the necessary absence of distractions to think. But there was widespread agreement that they did encourage a greater degree of intra- and inter-team communication, something which managers prioritised, reflecting the scholarship on the role of offices as a structure to maximise learning (Duffy 1997; Thrift 2000). A director of research, for example, detailed how, based on his own experience, he had moved his senior analysts out of their glass-fronted offices into an open-plan seating format. As he explained, "I was watching senior analysts keep getting up, walk out to their juniors, have a short conversation, and then walk back to their offices. And they would be doing this all the time. I concluded it would be just easier for all involved to be next to one another" (IP22).

Such acute proximity results in a working environment typified by frequent, spontaneous, disjointed, informal and highly iterative interactions; an even more intense version of Storper & Venables's (2004) "buzz" (a term used unprompted by some participants to describe the office environment). Issues and questions are raised and resolved in rapid

succession. One analyst detailed how she learnt by her senior sitting beside her and frequently telling her, "No, that is not the right way, do it this way" which resulted in her "learning quickly what to do or not to do … and it made me a better analyst" (IP44). Another explained how he would have models open on his computer with the junior sitting next to him and would change forecasts while explaining the changes and answering any questions his junior may have (IP14). Similarly, another outlined how his juniors would spend their first few months with him sitting alongside him and watching him build models, write notes, and talk to clients, with him answering their questions in real-time (IP32). Open-plan offices also meant that associates could learn incrementally by over-hearing conversations within other teams. This was likened to a process of osmosis whereby a variety of discussions are continually overheard and each, in turn, contributes an incremental idea or new information to the associate's overall understanding (IP56).

Through this intense interaction, undertaken over multiple years, associates acquire and accumulate interpretative and forecasting capabilities specific to a certain industry. At the same time, trust is formed as associates develop relevant expertise and become more valued by the respective analyst, often within highly personal bonds. A Hong Kong-based analyst joked about how he spent more time with his supporting associates than with his family and often knew them better than his own children (IP04). Another recognised that the intensity of the relationship meant that boundaries frequently became blurred with a near complete integration of working and personal lives (IP17). One healthcare analyst, for example, dined with his associate every night before returning to the office to carry on working (IP25), while another bought his associates a coffee-making machine and would take them out once a month to "thank them for their work" (IP51).

This knowledge transfer process is resource intensive and imposes significant costs on senior analysts, and not all embrace the burden of knowledge transfer with comparable enthusiasm. This was despite an overall recognition that the short-term costs of developing their associates are more than offset by the long-term benefits. As one research manager argued, "it really is a case of short-term pain, long-term gain. Those analysts who spend less

time developing their associates suffer more as a result" (IP28). Another explained, "I keep telling analysts that the point to understand is that this matters for you selfishly because if your associate is a better associate, you profit because … you don't do as much work and that is good for you" (IP11). Not that this process is always successful. The interviews provided several examples of failed associate-analyst relationships, usually because analysts were either unwilling to commit the time necessary to develop the associate or because they concluded that the associate was unable to achieve the required standards. But the optimal outcome is for associates to achieve a certain level of expertise not just so that they can more effectively support the analyst, but also ensure a certain level of duplicated knowledge within the team.

This acquisition of expertise and the subsequent duplication of knowledge by associates has a direct impact on the mobility and autonomy of more senior analysts. There is a natural developmental process whereby analysts become more autonomous, less dependent on office functions, and more mobile as they acquire individual expertise. To an extent, this process is forced. In order to access new and differentiated information and knowledge, analysts need to access external sources (e.g. clients and corporates) on a face-to-face basis through short periods of temporary proximity (Bratton & Wójcik 2022). These trips can involve weeks 'on-the-road', often in different time-zones, with some analysts spending more than half their working time outside the office. However, analysts are expected to maintain active coverage and such extended periods out-of-the-office are only possible with the in-office capabilities provided by supporting associates. A well-trained associate can support a travelling analyst by drafting reports, updating models, and communicating ideas to, and answering questions from, both internal colleagues and external clients. The mobility of analysts is, therefore, effectively anchored in the office by their associates and the greater the associate expertise, the less office-bound analysts become.

There is another process whereby senior analysts voluntarily disengage from the office once they have accumulated a certain level of knowledge and developed strong high-trust relationships with internal colleagues. Experienced analysts frequently viewed office-working through a different lens than less experienced colleagues. Although many senior participants

accepted that office-working had benefits, especially in terms of creating a structure with clearly delineated time boundaries and working patterns, there was less emphasis on the office as a place to acquire knowledge, especially tacit. Physical proximity is still viewed as important, but the sources of new knowledge increasingly move outside the office and are accessed through short periods of manufactured proximity. Such temporal proximity is highly effective for more experienced analysts because the parties involved have sufficient expertise to know what specific knowledge is to be transferred or acquired. As a result, there is less urgency across more experienced analysts to be in persistent acute proximity to colleagues since they gradually become less valuable as a new knowledge source. One senior analyst "needed to be in the office to do certain things, but not as much" (IP04), while another went as far as to argue that being in the office was "a distraction and does not really help me" (IP51). As an extreme example, a head of research recounted how one of his best performing analysts was "never in the office and his desk never used. And yet he was consistently one of [our] most successful vote getters" (IP14).

The above findings, therefore, suggest a distinction in the need for the acute and persistent physical proximity enabled by offices when acquiring knowledge according to the relative accumulated expertise of the individual. Whereas research associates are highly dependent on the hyper-connectivity and intense interactivity of office structures to acquire and accumulate the knowledge required for their own development, more experienced research analysts often view the office 'buzz' as a distraction and internal connections as less important. Instead, their more valuable knowledge sources typically transition to outside the office's physical boundaries to be accessed on a temporal basis within high-trust relationships. This distinction became more apparent during the COVID-19 pandemic, as detailed in the following section.

6.4 Evidence from the unequal impact of the COVID-19 work-from-home policies

The above distinction on the need for acute physical proximity in the acquisition of tacit knowledge is supported by findings from the interviews that the effects of the COVID-19 restrictions on physical proximity, including the work-from-home policies, were not experienced uniformly across analysts and their associates.

Although some writing analysts experienced initial difficulties with the transition from office to home, (for example, reduced home computer processing power, lack of screens and printers, and poor broadband connectivity), many welcomed the opportunity to work-from-home in large part because they felt released from the confines of the office and its intense working environment – from what Kolb et al. (2008) termed "hyper-connectivity" – as well as the need to travel. This gave them substantial additional time to develop new understandings and insights. Many analysts, for example, reported that the quality of their written product improved during the periods of lockdown, although it was noted that the increase in product flow was not commensurate with the increase in hours dedicated to writing, i.e., productivity declined. At the same time, more experienced analysts were able to carry relationships established over many years through physical interaction to the virtual, both with internal colleagues and external clients. As such, they were still able to access their information and knowledge sources, at least initially.

The general view across respondents, however, was that the intense, disjointed, spontaneous, and often micro-level interactions facilitated by office structures proved difficult to replicate virtually, to the detriment of the more junior team members. Despite access to technologies enabling remote team-working, e.g. video-conference platforms and shared drives, it was recognised that these created a degree of friction and necessitated additional effort. As one analyst explained, "theoretically I can set up MS Teams and have my model visible to everyone else, but all that adds another hour or two and it is just faster to do it yourself. There is a reason why things move faster when you are together" (IP13). This sense that time is scarce and that anything which extends or complicates a process is inherently

disruptive, was pervasive throughout the interviews. Another participant outlined how in the office, he would conference his associate into client calls simply by putting the client on speaker, a process which according to him, involved "milliseconds". Outside the office, however, he found conferencing in his associate to calls "very problematic" as clients are "impatient" and do not want to be put on hold during the call set-up, even for a few minutes (IP18). In addition, some analysts simply did not have the capabilities at home to use the various platforms. An India-based analyst noted that the village he had retreated to during the pandemic, lacked the broadband bandwidth to support video platforms. As a result, he became reliant on a weak mobile signal which led to "difficult and frustrating calls with clients and colleagues" (IP54).

Given resource pressures, especially time, this resulted in a weakening of previously strong internal working relationships, including those between analysts and their associates. As one Sydney-based senior analyst outlined, the intense office interactions he previously had with his associates were "just not happening in this kind of environment. It just takes too long to send models back and forth. It is just easier to say, 'stuff it, I will do it, I will fix it, answer it and get it done'" (IP06). Similarly, an analyst in Hong Kong complained that team relations were "not as tight as we were" with substantially reduced interactions and a decline in team morale (IP08), while another in the same city detailed how she would regularly conference her associates into calls with clients and corporates on an ad-hoc basis when in the office, but this proved difficult when working-from-home. As a result, the nature of her associate interactions had changed markedly from frequent and unplanned, to occasional and scheduled (IP36).

Another implication was that the loss of inter-personal connectivity previously encouraged by offices often reduced the pressure analysts felt to engage with other colleagues, including their associates. Sometimes this was a deliberate action with the functionalities of communication technologies being used to create barriers to engagement. As one Hong Kong analyst commented, "in the office, associates can pester you or make sure you do not leave for home without answering their question. When at home, it is much easier for me to ignore and deflect" (IP34). Another outlined how she would prevent interruptions when working at home

by muting or blocking incoming calls, even from colleagues (IP36). Sometimes the reduced sense of needing to engage with colleagues was simply a function of "out of sight, out of mind" (as per Kolb et al.'s "hypo-connectivity" (2008: 183)). The lack of acute proximity meant that interactions moved from being spontaneous and informal to being formal, scheduled and often forced. As a Mumbai-based analyst with a large supporting associate base noted, "it is much harder to maintain relationships [with my associates] outside the office especially as I do not have the time to call each of them for 15-to-20 minutes every few hours" (IP11). Behaviours evolved to reflect the new circumstances and subsequently, the nature and frequency of interactions changed. One analyst in Hong Kong noted that he would regularly go for coffees with his associate when in the office but had gone for days without speaking to her during the lockdowns, which made him feel "guilty" for not providing the right guidance and tuition (IP47).

This erosion of inter-team relationships had a punitive impact on associate development. It was widely accepted that the transfer of specialised knowledge and expertise from senior analysts to junior team members, previously facilitated by acute proximity, was interrupted by the enforced physical separation, especially as communication technologies proved unable to fully replicate the intensity of the office environment. As one research manager asked, "the real question is, are they really learning at home?" (IP13). And the usual answer was "no", at least not to the same extent when in the office, with many analysts expressing concerns about the development of their associates during the pandemic. One senior analyst in Mumbai concluded, "for my associates, their learning goes down significantly at home because sitting next to me they learn a lot but staying at home it's very tough for them to do so. So in my view the learnings of my associates have gone down certainly in the last one year" (IP07). A Sydney based head of research expressed a similar concern. He was worried that "the juniors are not learning anything really. Their level of development has dropped off significantly … their career development is stalling" (IP13). This was a shared view. Another research manager concluded that his associates had "effectively lost a year of training and development" during 2021 (IP22), while a Singapore based analyst detailed how his company's return-to-office plan

prioritised the junior team members as “their need to get back into the office is significantly greater” (IP62).

Some research managers were not surprised by the slowdown in junior development in response to the lost acute proximity since they already had reference to precedent. In response to budget pressures, many houses now use offshore associates, i.e., supporting associates located in a lower-cost country. They typically undertake lower-order tasks such as maintaining datasheets and updating models after earnings. Although offshore associates are within the same organisation, with relational proximity, they are not viewed as comparable to those co-located with their seniors, with many analysts struggling to develop their offshore associates beyond a certain level of expertise. The difficulties of tacit knowledge transfer over distance mean that the value of offshore associates is considered lower than their co-located peers. Some heads of research, for example, noted internal assessments indicating that offshore associates are typically only a quarter to a third as effective as their co-located peers, a loss accepted on cost grounds (IP22, IP24). And if an offshore associate does show promise, they are often relocated to their same office as their analyst for development purposes; again demonstrating that acute proximity is necessary to acquire more advanced and complex expertise.

6.5 Conclusions

The importance of physical proximity, especially permanent co-location, in the transfer of tacit knowledge is one of the more contested debates within economic geography, primarily due to the inherent difficulties associated with validating many of the advanced theories and concepts (Balland & Rigby 2017, Beaverstock et al. 2000, Short et al. 1996). This study, however, provides new empirical insights into how tacit knowledge and expertise is acquired by a subset of highly specialised and knowledge-intensive financial professionals. Specifically, our findings provide evidence that acute proximity remains valuable for the transfer and

accumulation of tacit knowledge, as per Bathelt et al. (2004), Gertler (2003), Morgan (2004), and Storper & Venables (2004). This is revealed through two mechanisms.

First, we demonstrate that acute proximity remains essential in the development of junior team members. Research associates typically enter the industry with limited applicable expertise and as a result, embark on a rapid learning and development trajectory. This early-stage acquisition of specialised and complex knowledge by research associates is primarily through intense, intimate, informal, spontaneous, and repetitive face-to-face interactions with senior analysts through which knowledge is cascaded within team hierarchies. This is a multi-year process, involving learning-by-watching, learning-by-listening, and learning-by-doing, through which associates acquire and develop the needed interpretative, analytical, and forecasting expertise to become a writing analyst. This process is enabled by the acute proximity, hyperconnectivity, and intensity of interactions experienced within office structures.

Second, we provide evidence that the COVID-19 work-from-home policies disrupted this learning mechanism, with virtual platforms unable to replicate the 'buzz' and intensity of office environments. The challenges of transferring tacit knowledge remotely over virtual platforms were reflected in the widespread views that offshore associates are persistently less effective than their co-located peers and that co-located associates had 'lost' significant learning time when working-from-home. This was a view widely expressed by analysts regardless of location. The views expressed by participants in India, for example, were consistent with those in Australia, China, Hong Kong, and Singapore. And although the surveyed sample was primarily Asia based, follow-up conversations with analysts in Europe and the United States have highlighted comparable themes. In addition, this loss of associate development time was reflected by managers prioritising their return to the office when permitted and, although not tested in the interviews, it is presumed that they were able to return to their pre-pandemic development trajectories once back in offices.

But the study also suggests that once analysts acquire a certain level of expertise, the office becomes less important as a structure to facilitate such knowledge acquisition. Analysts

become increasingly autonomous with experience and consequently, less dependent on permanent and high-frequency connectivity with colleagues to acquire knowledge. Their connectivity requirements evolve with the reduced need for the hyper-connectivity within offices (Kolb et al. 2008). In fact, senior analysts often consider the 'buzz' and 'noise' embedded within office environments as an impediment to their knowledge production. They instead use their accumulated expertise to selectively identify incremental knowledge needs, which are subsequently acquired through temporary periods of manufactured face-to-face proximity outside the office or through relationships formed in the physical and subsequently transferred to the virtual. This supports the arguments of Amin & Cohendet (2004), Grabher (2002) and O'Leary et al. (2014), although this dislocation is only possible because of the expertise carried by experienced analysts and acquired earlier through acute proximity.

Reflecting von Nordenflycht (2010), we recognise that not all knowledge-intensive business services are comparable and that equity research, given its forward-looking nature, is relatively unique in being significantly more reliant on individual tacit knowledge as an input to its production than other KIBS, which are generally more dependent on precedent and codified knowledge. But the tacit-intensive nature of equity research means that it provides insights applicable to the broader debate on the need for physical proximity in the acquisition and transfer of tacit knowledge. This study, for example, confirms the continued need for physical proximity in the transfer of tacit knowledge, especially when individuals are in the early stages of their knowledge development. It also highlights the continued importance of the office as a mechanism to enable the intense, intimate, unstructured, and spontaneous interactions necessary for this transfer. Once analysts accumulate a level of tacit expertise, however, other forms of proximity assume greater importance when acquiring new and incremental knowledge. There is a weakening of the spatial fix with more experienced analysts less 'anchored' to office structures than their more junior colleagues, at least in terms of knowledge acquisition. As such, the highly individualised nature of equity research expertise already provides more experienced analysts with the autonomy, mobility, and control that many other financial professionals now aspire to (Cockayne & Treleaven 2023). There was,

for example, a tendency for senior analysts to work outside office confines even prior to the COVID-19 pandemic.

This research, therefore, reveals the nuances involved in the 'tacit knowledge transfer needs physical proximity' debate, reflecting Faulconbridge's (2006: 517) call to be "more subtle in our arguments about its geographies". This study suggests that physical, relational, and temporal proximity should not be viewed as distinct and separate propositions, but as alternative mechanisms for the acquisition of tacit knowledge which coexist and whose relative importance evolves as knowledge is acquired and accumulated. The need for acute proximity and co-location with colleagues within office structures is critical in the initial accumulative stages and without the intense face-to-face interactions enabled by office-working, the complexity and sophistication of knowledge that can be transferred is limited. This highlights the continued learning function of offices (Duffy 1997, Thrift 2000). At this stage, other forms of relational proximity have more marginal influences, as seen in the difficulties of transferring knowledge to offshore associates within the same organisation. But once an individual has accumulated sufficient tacit expertise, other mechanisms, sources, and forms of proximity, including temporary and relational, assume greater importance when acquiring incremental specialised information and knowledge (Bratton & Wójcik 2022).

The analysis in this paper presents various potential research directions. We recognise, for example, that finance remains highly gendered (Pollard 2013) and that perceptions on the role of the office as a structure for learning, development and knowledge transfer may differ between male and female analysts, especially if the reliance on acute proximity as a development mechanism fosters and entrenches patrimonialism (Neely 2018). While we did not identify any significant nor consistent gender differences during the interviews (and also note that finance in Asia tends to be more gender-diverse than in Europe or the US), this is a question that merits further investigation. Related is that this paper did not explore the impact of work-from-home on organisational power structures and networks (as highlighted by Cockayne & Treleaven 2023). It was notable that some research managers made passing references to the importance of the office as a command-and-control mechanism when

justifying why they were keen for their teams to return to office working, although this topic was not fully explored in the interviews. Similarly, some of the interviews suggested that offices serve an important social function for junior team members, especially in cities such as Hong Kong where living space is limited, while more experienced analysts frequently highlighted the role of the office as providing a defined working structure and environment. These are all potential avenues for further research and analysis.

Annex: Interview participants

ID	Date	Type	Role	Location	Specialisation
IP01	26/01/2021	Sell-side	Analyst	Hong Kong	Telecom
IP02	27/01/2021	Sell-side	Analyst	Hong Kong	Industrials
IP03	27/01/2021	Buy-side	Management	Singapore	
IP04	28/01/2021	Sell-side	Analyst	Hong Kong	Internet
IP05	28/01/2021	Sell-side	Analyst	Hong Kong	Insurance
IP06	29/01/2021	Sell-side	Analyst	Sydney	Technology
IP07	30/01/2021	Sell-side	Analyst	Mumbai	Technology
IP08	02/02/2021	Sell-side	Analyst	Hong Kong	Internet / education
IP09	04/02/2021	Sell-side	Analyst	Hong Kong	Real estate
IP10	04/02/2021	Sell-side	Analyst	Hong Kong	Internet
IP11	06/02/2021	Sell-side	Analyst	Mumbai	Consumer
IP12	10/02/2021	Sell-side	Analyst	Singapore	Technology
IP13	15/02/2021	Sell-side	Analyst	Sydney	Telecom / Technology
IP14	15/02/2021	Sell-side	Management	Hong Kong	
IP15	16/02/2021	Sell-side	Analyst	Hong Kong	Financials
IP16	17/02/2021	Sell-side	Management	Shanghai	
IP17	19/02/2021	Sell-side	Analyst	Singapore	Consumer
IP18	23/02/2021	Sell-side	Analyst	Hong Kong	Technology
IP19	23/02/2021	Sell-side	Analyst	Mumbai	Healthcare
IP20	28/02/2021	Sell-side	Analyst	Mumbai	Financials
IP21	01/03/2021	Sell-side	Analyst	Hong Kong	Financials
IP22	09/03/2021	Sell-side	Management	Hong Kong	
IP23	14/03/2021	Buy-side	Analyst	Hong Kong	Consumer
IP24	16/03/2021	Sell-side	Management	Hong Kong	
IP25	22/03/2021	Sell-side	Analyst	Shanghai	Healthcare
IP26	24/03/2021	Sell-side	Analyst	Hong Kong	Transport
IP27	26/03/2021	Sell-side	Management	Hong Kong	
IP28	01/04/2021	Sell-side	Management	Hong Kong	
IP29	05/04/2021	Sell-side	Analyst	Kuala Lumpur	Consumer
IP30	07/04/2021	Sell-side	Analyst	Shanghai	Consumer
IP31	15/04/2021	Buy-side	Portfolio Manager	Sydney	
IP32	21/04/2021	Buy-side	Analyst	Auckland	Generalist
IP33	22/04/2021	Sell-side	Analyst	Taipei	Consumer
IP34	03/05/2021	Sell-side	Analyst	Hong Kong	Telecoms
IP35	05/05/2021	Sell-side	Analyst	Hong Kong	Generalist
IP36	13/05/2021	Sell-side	Analyst	Hong Kong	Real Estate
IP37	14/05/2021	Sell-side	Analyst	Hong Kong	Industrials
IP38	17/05/2021	Sell-side	Analyst	Seoul	Industrials
IP39	17/05/2021	Sell-side	Analyst	Seoul	Financials
IP40	18/05/2021	Sell-side	Analyst	Hong Kong	Internet
IP41	21/05/2021	Sell-side	Analyst	Sydney	Technology
IP42	25/05/2021	Sell-side	Analyst	Jakarta	Financials
IP43	26/05/2021	Sell-side	Analyst	Mumbai	Healthcare
IP44	26/05/2021	Sell-side	Analyst	Singapore	Consumer
IP45	26/05/2021	Buy-side	Portfolio Manager	Singapore	
IP46	27/05/2021	Sell-side	Analyst	Taipei	Technology
IP47	03/06/2021	Sell-side	Analyst	Singapore	Industrials
IP48	04/06/2021	Sell-side	Analyst	Shanghai	Technology
IP49	08/06/2021	Sell-side	Analyst	Shanghai	Technology
IP50	16/06/2021	Sell-side	Analyst	Hong Kong	Consumer
IP51	22/06/2021	Sell-side	Analyst	Seoul	Transport
IP52	22/06/2021	Sell-side	Equity sales	Singapore	
IP53	23/06/2021	Corporate	Investor relations	Singapore	
IP54	29/06/2021	Sell-side	Analyst	Mumbai	Generalist
IP55	05/07/2021	Sell-side	Analyst	Kuala Lumpur	Consumer
IP56	09/08/2021	Sell-side	Analyst	Hong Kong	Industrials
IP57	09/08/2021	Buy-side	Analyst	Hong Kong	Consumer

IP58	10/08/2021	Sell-side	Management	London	
IP59	24/08/2021	Corporate	Investor relations	Mumbai	
IP60	27/08/2021	Buy-side	Analyst	Singapore	Generalist
IP61	27/08/2021	Buy-side	Management	Singapore	
IP62	09/09/2021	Buy-side	Portfolio Manager	Singapore	
IP63	28/09/2021	Sell-side	Analyst	Hong Kong	Generalist
IP64	01/10/2021	Buy-side	Analyst	Hong Kong	Internet
IP65	01/10/2021	Sell-side	Equity sales	London	
IP66	04/10/2021	Buy-side	Analyst	Hong Kong	Utilities
IP67	04/10/2021	Buy-side	Portfolio Manager	Shenzhen	
IP68	05/10/2021	Buy-side	Analyst	Hong Kong	Consumer
IP69	04/11/2021	Sell-side	Analyst	Singapore	Energy
IP70	16/11/2021	Corporate	Investor relations	Hong Kong	

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Chapter 7

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

7.1 Introduction

The first chapter of this thesis introduced the three objectives framing the research project which were addressed in chapters 4-6. These chapters are summarised in the following sections which discuss their core conclusions, and relevance and contributions to the existing literature. Section 7.5 develops an outline within which this research project could be expanded, including potential research questions for future analysis. The chapter summarises and closes the project with some final remarks.

Table 7.1: Summary of the three papers included in the thesis.

Paper / Chp.	Objective	Summary of findings
1 / Chp. 4 Financial centres and information hierarchies: insights from the geographies of sell-side equity research.	To map the geography of specialised financial knowledge at the individual level to reveal the global distribution of tacit knowledge in finance.	• Knowledge and information resources within financial ecosystems are concentrated. • Most information flows are domestic not cross-border given the frictions imposed by national borders. • London, Singapore, and Dubai have relatively unique "platform" roles as information nodes in their regions.
2 / Chp. 5 Financial information, physical proximity and COVID: the experience of Asian sell-side equity research analysts.	To assess the importance of physical proximity and face-to-face communication in the transfer of financial information.	• Virtual platforms were unable to replicate the benefits of in-person face-to-face interaction during the COVID pandemic. • Remote analysts found it difficult to access the full information set, particularly information embedded in informal local networks. • Analyst knowledge and understanding declined during the pandemic.
3 / Chp. 6 Acute proximity and the acquisition of specialised financial knowledge: evidence from sell-side equity research and the impact of the COVID-19 pandemic.	To investigate the need for acute proximity in the transfer of specialised financial knowledge and expertise.	• Specialised and complex knowledge is acquired through intense interactions enabled by acute proximity. • Work-from-home interrupted this learning mechanism. • As analysts become more experienced, they become less dependent on acute proximity to colleagues, and more reliant on temporary and remote relationships.

7.2 The geography of specialised financial knowledge

This research project is the first, to the best of my understanding, to systematically reveal the distribution of specialised financial knowledge, at the global scale. Chapter 4 mapped the global sell-side equity research industry by identifying and locating 11,307 research analysts, the geographic scope of their activities, and the nature of their employers. As outlined at the beginning of this thesis, sell-side equity research is a highly autonomous activity, dependent on highly developed and complex individual expertise and skillsets. Its geography, therefore, reveals the distribution of tacit knowledge within the financial services industry, thereby directly addressing earlier concerns that "knowledge is largely unobservable … and largely unmeasurable" (Foray 2004: 9) and that "we have no readily available measures of the complexity, or the tacit nature of knowledge located in particular places" (Balland & Rigby 2017: 4). This exercise also provided novel insights into the distinct roles undertaken by the various financial centres within information and knowledge hierarchies, thereby contributing to the existing literature on financial centres as information nodes and pools of specialised knowledge (Bunnell & Coe 2001, Faulconbridge 2006, Grote et al. 2002, Wainwright 2015).

Financial knowledge is found to be highly concentrated. Although research analysts were identified in 193 different centres, nearly a quarter (24%) were based in either London or New York, highlighting the continued relative primacy of these two centres within global finance (Taylor & Derudder 2022, Wójcik 2013), while the 20 largest research centres accounted for 72% of all analysts. But with few exceptions, the size of a research complex within any specific financial centre is not a function of international reach. The substantive majority (83%) of research coverage is domestic in orientation, not cross-border, i.e., the informational hinterlands of financial centres remain geographically constrained and rarely extend beyond national borders, despite the various technological advances and regulatory changes. This finding highlights the continued influence of geography on information flows, especially given the apparent frictions imposed by national borders (supporting similar

conclusions in the financial economics literature, e.g., Bae et al. 2008, Chang 2010). These include cultural, regulatory, and linguistic, and are particularly acute in Asia as demonstrated by the minimal cross-border coverage undertaken within the region. Just 6% of the region's research coverage was found to be cross-border with this model accounting for less than 1% of research coverage undertaken in Beijing, Shanghai, and Shenzhen, and with similarly negligible levels in Tokyo (1% of all coverage), Jakarta (1%), Bangkok (2%), Mumbai (2%), and Seoul (4%). A finding which supports Lai et al.'s (2020) early conclusion that the Asian financial industry was likely to remain fragmented with no obvious primary pan-regional centre.

There are three obvious exceptions to the general finding that research activities are domestically focused: London, Singapore, and Dubai. London dominates the European research industry. It accounted for 45% of all European analysts with more than those in Frankfurt, Madrid, Milan, Moscow, Oslo, Paris, Stockholm, and Zurich combined, while the majority (60%) of research coverage undertaken by London-based analysts is on non-British headquartered companies. London's research complex is significantly larger than would be expected given the size of its equity market but derives its scale from the tendency of international firms, both American and European, to hub their European research activities in the city. Nine of London's ten largest research providers are foreign, with Barclays the sole British representative. It functions as Europe's information and knowledge node, a position enabled by relatively frictionless information flows within the region (Clark 2002, Faulconbridge 2004), and which may also explain why half of research coverage undertaken in Paris is also cross-border in nature.

But London's status as a platform centre with foreign research providers using the city to undertake regional coverage is relatively unique. Singapore has a similar platform role in Southeast Asia but is significantly smaller (145 analysts in Singapore versus 1,346 in London). Dubai has a comparable emerging role in the Middle East with foreign firms using the city as the regional information and knowledge node, highlighting its emergence as a hub for western capital within the region (Portes 2020, Sigler 2013). In addition, there is another small subset

of centres which have information and knowledge complexes underpinned by foreign firms (i.e., they "import" such capabilities). Hong Kong is the most notable example of such a structure. Reflecting earlier literature positioning the city as a gateway for foreign capital into mainland China (Jones 2020, Lai 2012), foreign research providers use the city as their base for coverage of mainland corporates. The other notable example of such an "import" research structure is Sydney which has a high dependency on foreign firms to provide domestic coverage.

This analysis, therefore, not only reveals the distribution of tacit knowledge across financial centres, but also provides insights into the roles that various financial centres have in the various information and knowledge hierarchies. From this perspective, research centres can be seen as nodes through which information passes from the production layer into financial ecosystems after being processed in the relevant research "islands of expertise" (Bunnell & Coe 2001: 579). These flows, as measured by research activities, are substantively domestic, not international, in structure. With few exceptions, i.e., London, they involve analysts collecting information on domestic, not foreign, companies; excluding London, for example, 88% of all global research activities are domestic. Furthermore, when firms develop international research capabilities, they do so primarily to undertake domestic coverage within specific countries with 73% of all research by foreign providers undertaken on corporates domestic to the analyst ("import" coverage). These findings, when tied with the notion that finance is built on information and knowledge (Clark & Monk 2013, Grote et al. 2002, Petry 2020), help to reposition finance firmly back in the domestic, or local, sphere by contributing to the literature on the continued information and knowledge advantages enjoyed by local market participants versus their foreign competitors (Agnes 2000, Gimici & Lai 2019, Ling et al. 2021, Menkhoff & Schmeling 2008, Piccotti 2016, Wójcik et al. 2019).

Furthermore, this analysis supports Clark and O'Connor's conceptualisation of equities as a translucent asset class, i.e., produced within globally recognised frameworks but dependent on local information in their production and pricing. This is seen in the finding that most research activities are domestic, not international, in nature. But it is also demonstrated

by the finding that the industry is highly concentrated in national centres given the translucent characteristics of equities, the benefits of scale and agglomeration in their production, and the importance of access to information (Clark 2002, Clark & O'Connor 1997, Meyer 2005, Thrift 1994). There are few significant sub-national research centres and those that do exist reflect history (e.g., in Germany), scale (e.g., in the US), or local economic circumstances (e.g., Canada and the US). But in all these examples, the national centre is primary with the smaller centres undertaking a specialised role or function, for example, as an information gateway for a locally significant industry (which, as detailed in section 7.5, merits further investigation). The exception to this general principle is China where the informational complex remains highly fragmented across Shanghai, Hong Kong, Beijing, and Shenzhen. This may reflect the persistently high informational asymmetries within the country.

7.3 The need for physical proximity in information flows

But if the information flows involved in sell-side research coverage are substantively local in structure, then the obvious subsequent question is why? After all, a pervasive argument is that technological advances and regulatory changes have reduced geographic constraints to information flows and the ability to access knowledge (Baldwin 2016, Cairncross 1998, Friedman 2005, O'Brien 1992 2009). Yet Chapter 4 demonstrated that research providers continue to prioritise domestic information collection over cross-border structures. This was explored in Chapter 5 which investigated the need for physical proximity and in-person connectivity in financial information flows using the circumstances provided by the COVID-19 pandemic as a natural experiment. This provided a unique and experienced comparative scenario between the full mobility enjoyed prior to 2020, and the restrictions imposed during the pandemic. The impact of the restrictions on a variety of issues, including the ability to collect information, was assessed through semi-structured interviews with 70 participants from across the sell-side equity research complex.

As demonstrated throughout this thesis, analysts operate in a complex, dynamic, time-sensitive, high-frequency, and information-intensive environment. Their ability to provide value to clients is, in large part, a function of their ability to access, interpret, and process differentiated information before competitors. Each analyst will, therefore, have a unique informational geography and will use a variety of mechanisms to collect information from a large variety of sources, both formal and informal, depending on the location of the source and the characteristics of the information to be collected. Many of these processes, however, were interrupted by the COVID-19 restrictions resulting in a reduced ability to collect information from informal and local networks, reduced informational benefits arising from co-location with clients, and lower quality information received from corporate management teams. As a result, the overarching conclusion was that the restrictions had resulted in nearly all participating analysts experiencing some degree of degradation in their knowledge and understanding of covered corporates.

One of the principles underpinning the idea that physical proximity is no longer required in information flows is that improved technologies allow for face-to-face interactions to be undertaken within virtual environments, e.g., on videoconferencing platforms. But a general theme throughout the interviews was that such virtual platforms could not fully replicate the benefits of physical face-to-face engagements and their use consequently resulted in a degree of information loss. One respondent, for example, suggested that a videoconference could only provide 75-80% of the information transfer possible when face-to-face. In-person face-to-face interactions, therefore, remained the preferred mechanism when transferring specialised, complex, sensitive, unstructured, and /or time-urgent knowledge, especially if real-time clarifications were needed, the exchange was informal, or the interaction benefited from real-time reciprocity.

Several explanations were advanced to explain this. Multiple constraints were highlighted when using virtual platforms including an inability to read non-verbal cues, the loss of both control and spontaneity, the inability to develop personal rapport, and fears that interactions were being recorded. But another reason was that much information exchange is

situationally specific with significant spatial and temporal variations in perceived value, and typically short lifetimes in terms of relevance. As such, most relevant or applicable knowledge remains tacit or explicit, not codified, and exchanged through the spoken word with the interaction critical in identifying the knowledge required through a reciprocal process between the participants (Amin & Roberts 2008, Bettencourt et al. 2002). Furthermore, inter-personal trust is particularly important in such exchanges, reflecting its continued importance within finance (Evers et al. 2010, Millo et al. 2023, Storper & Venables 2004). While codified knowledge undergoes a process of scrutiny and validation during the codification process, uncodified knowledge has an embedded degree of uncertainty and unreliability, and the decision to accept and use it will be dependent on the extent to which the source is trusted (as per Holste & Fields 2010).

Analysts will use a combination of communication mechanisms according to the characteristics of the information and knowledge to be accessed and transferred (e.g. complexity and sensitivity), the relationship with the counterparty, the interaction between potential costs and perceived value, and the need for reciprocity. Only by using the most appropriate mechanism can access to the full information set be optimised. This supports earlier arguments which position virtual communication mechanisms as complements, not substitutes, for in-person face-to-face interactions (Bathelt & Glückler 2011, Gaspar & Glaeser 1998, Morgan 2004). But it also explains why nearly all the participating analysts cited a degradation in their understanding of covered companies. After all, finance can be characterised as an information rich, knowledge dependent, high frequency, and short time-frame environment, as per Storper & Venables's (2004) "buzz" and Grabher's (2002) "noise". In such an environment, any information differential will compound quickly. If, for example, an analyst can only collect 90% of the information set that a competitor can access over any specific period, then the relative relevance of the analyst to clients will diminish quickly.

This was seen through two insights provided by the interviews. The first was that the loss of situational awareness was not uniform across the respondents with the rate of decline a function of several factors including sector coverage, location, experience, and supporting

resources. In general, however, analysts covering companies operating in constrained geographies and in more fast-moving sectors (e.g., in the consumer sectors) experienced a more rapid degradation in their understanding than those covering companies operating at the international scale and in slower-moving sectors (e.g. in the energy, telecommunication or utility sectors). This was seen to be a function of the required frequency of information collection and the location of relevant sources. In higher-frequency and locally embedded coverage sectors, the reduced ability to access the overall knowledge set compounded quicker than in those sectors requiring a slower frequency of new information collection. This supports evidence from financial economics that the impact of changes to analyst recommendations is higher for companies which are smaller, younger, and higher growth (Devos et al. 2015, Frankel et al. 2006).

The second supporting insight was the difficulties reported by analysts in Hong Kong and Singapore during the pandemic. Specifically, there was a broad consensus that analysts undertaking cross-border coverage were significantly disadvantaged versus competitors more proximate to the same companies and able to physically access relevant information sources and locally embedded knowledge. More proximate analysts were seen to have an information and knowledge advantage during the pandemic which was subsequently reflected in investors changing the relative prioritisation of their sell-side relationships. Many analysts in Hong Kong, for example, reported a loss of client traction during the pandemic with investors preferring to use Shanghai-based resources. Such informational advantages may not always be visible to external observers but given the continued importance of information and knowledge in finance, they remain a core determinant of relative competitiveness and performance, and as such, the geographies of finance. This dynamic reflects the continued importance of Lai's earlier finding that in finance, "access to local knowledge is seen as essential" (2006: 638).

Physical face-to-face interaction, therefore, is still seen as critical in the transfer of a specific subset of uncodified knowledge within finance, e.g., complex, unstructured, time-sensitive, high-frequency, and informal. An inability to access this subset, as demonstrated

during the pandemic, has a material, and potentially rapid, impact on an analyst's understanding of his/her covered corporates, especially relative to those with continued access to the larger overall information and knowledge set. It is recognised that such face-to-face interactions can be undertaken within temporary constructs with analysts travelling to meet information sources, reflecting the notion of occasional manufactured proximity (as per Grabher 2002) or other forms of global knowledge pipelines (Bathelt et al. 2004). But this needs to be considered alongside the requirement for frequency and the costs incurred in manufacturing such temporary proximity. Higher frequency, unstructured, informal and situationally specific exchanges of information and knowledge, which dominate the various financial decision-making processes, will require the original source(s) to be more accessible. This favours closer geographical proximity, thereby supporting Gertler's "being there" (2003) and highlighting the importance of relatively localised information and knowledge networks (Bassens et al. 2021, Beaverstock 2002, Clark 2002, Hall 2007, Ho 2009, Lai 2006). This is particularly the case when analysts are acquiring their specialised individual expertise and skillsets, as subsequently explored in chapter 6 of this thesis.

7.4 The need for physical proximity in the acquisition of tacit knowledge

The sell-side equity research function is dependent on highly developed specialised individual knowledge. The judgement, expertise, and capabilities offered by any analyst, and his/her immediate team, is the cumulative function of his/her domain expertise (on a specific subset of companies or industry sector), and analytical, interpretative, and forecasting skillsets. All these capabilities must be acquired and developed by research analysts if they are to develop a high-quality research product and deliver value to clients.

Various factors have been identified in the financial economics literature as determining an analyst's relative capabilities. These include previous industrial expertise (Bradley et al. 2017), proximity to corporates (Bae et al. 2008, Malloy 2005, Jennings et al. 2017), and available supporting resources (Fang & Hope 2020, Gao et al. 2022). But there is also evidence

within the same literature that specialised knowledge transfer from immediate colleagues is an important component of this process (Do & Zhang 2020, Groysberg & Lee 2010). Such findings support earlier work highlighting the importance of acute proximity in the transfer and accumulation of tacit knowledge (e.g. Bathelt et al. 2004, Gertler 2003, Morgan 2004, Storper & Venables 2004). Chapter 6 of this thesis further engaged with this topic by investigating the need for acute proximity, e.g. permanent co-location, in the transfer and acquisition of tacit knowledge, using the COVID-19 restrictions as a natural experiment. It did so by exploring how individuals, sell-side equity research analysts, acquire their specialised knowledge, thereby heeding calls to focus on individuals as the principal learning agents within any system or network (Malmberg & Power 2005, Rutten & Boekema 2012).

A pervasive theme to emerge from the interviews was that the early accumulation of specialised knowledge is highly dependent on acute proximity within office structures. These enable a high-frequency, unstructured, spontaneous, interactive, and repetitive learning environment with new analysts acquiring needed and relevant expertise through intense person-to-person interactions within an office structure, as per Kolb et al.'s (2008) "hyper-connectivity". This results in the cascading of knowledge within team hierarchies with the senior more-experienced analysts developing the capabilities of their junior team members. The importance of acute proximity in this process was demonstrated by the impact of the COVID-19 work-from-home policies. Respondents expressed a consistent view that virtual platforms were unable to replicate the intensity of office environments and as such, the involved learning processes were significantly degraded. Not only was the rate of learning and development slowed, but the complexity of knowledge that could be transferred over virtual platforms was significantly reduced. This also reflected earlier evidence that the expertise and capabilities of remote offshore associates, i.e., those not co-located with senior analysts, were frequently considered inferior to their co-located peers (a finding which supports earlier work by Grote & Täube 2007).

But the research also provided evidence that the need for permanent acute proximity in the acquisition of knowledge is a function of acquired expertise. As analysts develop their

expertise and capabilities, they become less dependent on office structures and high-frequency permanent connectivity with colleagues as a source of new knowledge. In fact, experienced analysts often cited the "buzz" and "noise" of office environments as an impediment to their individual knowledge processes. They instead become more autonomous, untethered from office structures and the associated spatial constraints, and are able to use their accumulated expertise to selectively identify incremental knowledge requirements across a larger range of information sources. These are subsequently accessed and acquired through other forms of relational proximity, including temporary periods of manufactured face-to-face proximity outside the office or through relationships formed in the physical and subsequently transferred to the virtual. This was an established phenomenon even prior to the COVID-19 restrictions and supports the arguments of Amin & Cohendet (2004), Grabher (2002), and O'Leary (2014). But this dislocation is only possible because of the expertise carried by experienced analysts and acquired earlier through acute proximity and the associated knowledge cascading process.

These findings highlight the complex nature of the processes involved in the acquisition of tacit knowledge, reflecting Faulconbridge's (2006: 517) call to be "more subtle in our arguments about its geographies". More specifically, it suggests that physical proximity and other forms of relational and temporal proximity (as theorised by *inter alia* Amin & Cohendet 2004, Bathelt & Glückler 2011, Torre & Rallet 2005), should not be viewed as distinct and separate propositions, but as alternative mechanisms for the acquisition of tacit knowledge which coexist and whose relative importance evolves as individual capabilities are acquired and accumulated (as per Vallance 2011). The acute proximity enabled by office structures may be critical in the early stages of knowledge acquisition but once analysts have sufficient expertise, other sources of new information and knowledge assume greater importance. As detailed in chapter 5, this typically involves senior analysts accessing other sources of knowledge and information, such as clients and corporates, outside the office on a face-to-face basis. From a practitioner's perspective, however, this creates a contradiction with junior analysts dependent on the office-presence of their more senior peers, but the senior analysts more focused on the acquisition of knowledge and information outside the office confines.

How research providers manage and reconcile this contradiction will determine the overall capabilities and expertise of their research team, and hence, value to clients.

7.5 Limitations and future research directions

Despite the detailed analysis presented in the thesis, it is possible to identify areas in which the research could have been improved or further developed. In particular, despite the richness of the various datasets, the extent of the research project was constrained by the lack of time. This limited the scope of the research project and prevented a number of potential specific analyses from being undertaken, as detailed below. These could be undertaken if this research project is further extended.

First, the geographies of specialised financial knowledge as outlined in Chapter 4 is at a specific date (June 2021). This reflected the difficulties of identifying and locating individual sell-side analysts, especially on an historic basis. But as a result, the research presented the geographies of specialised knowledge at only a single point in time and did not develop insights into their evolution over time. One potential development of the research, therefore, would be to undertake the same exercise for an earlier date (e.g. June 2011). Although this would be a substantial undertaking, it would allow for a better understanding of how the geographies of specialised financial knowledge have evolved. One specific question it would answer, for example, is whether cross border coverage has become more important over time, as would be implied by advances in technologies and regulatory changes. It would also provide more insights into the evolving roles and structures of the various financial centres, especially as the global economy shifts towards Asia.

Second, related to the above, is that the research project did compile various datasets on how the larger American and European research providers (e.g., Barclays, Deutsche Bank, Goldman Sachs, JP Morgan, Morgan Stanley, and UBS) have structured their global research activities. These include the location and coverage of their analysts since 2006. Given these firms structure their research teams to maximise the value of the information and knowledge

they provide to their more important clients (which are typically the major western institutional investors), the changing geographies of their research activities could be seen to reflect the changing global footprint of western capital. As such, it is intended to develop this analysis by detailing the global expansion (and in several cases, subsequent retreat) of American and European research providers to reveal the international geographies of western capital.

Third, is to use the geographies of sell-side equity research to further develop the connection between production and financial networks given finance's continued dependency on situational information and knowledge taken from the production layer, and the continued importance of geographic proximity in the information collection processes. As such, the geographies of equity research highlight the financial centres through which specialised information and knowledge on specific industries is extracted from the production layer, is interpreted and processed, and subsequently enters the various financial networks and ecosystems, at the local, regional, and global scales. Research coverage, for example, has already indicated an uneven distribution of industrial knowledge with some smaller sub-national centres existing as highly specialised information nodes for locally significant industries. Biotech analysts, for example, are concentrated in New York; Calgary and Houston both have substantial concentrations of oil & gas analysts; while the largest concentrations of metals & mining and semiconductors expertise are found in Toronto and Taipei, respectively. Extending the analysis, therefore, to explore the knowledge specialisation of various financial centres may reveal the links between financial and production geographies.

Fourth, the interview programme was undertaken in Asia. To an extent, this focus addressed the relative paucity of research on the region's financial geographies, as well as my own personal networks. It is recognised, however, that Asia is a unique informational environment, especially relative to Europe and the US, and, as such, it is unclear to what extent the findings are applicable outside the region. This limitation is further complicated by the fact that the circumstances which provided the natural experiment have now passed. But one potential route to explore the impact of the pandemic's restrictions on information flows at the global level would be to investigate the relative accuracy of analyst forecasts before, during,

and after the pandemic. After all, if the relative accuracy of analyst forecasts is a function of access to information, then it could be hypothesized that: first, earnings accuracy would have been lower during the pandemic, than before or after; and second, that analysts undertaking cross-border coverage would have seen a decline in forecasting accuracy relative to competitors undertaking the same coverage on a domestic basis. This analysis would reveal whether the findings outlined in Chapter 5 resulted in lower quality analyst forecasts and whether they were specific to Asia, or also applicable to the other regions.

Fifth, although the interviews were structured, their nature provided rich insights into a variety of related topics, including perceptions on the role of the office. Some research managers, for example, made references to the importance of the office as a command-and-control mechanism when justifying why they were keen for their teams to return to office working. This was often linked to the supervisory requirements imposed by regulators. Similarly, some interviewees suggested that offices serve an important social function for junior team members, as well as providing an extension for their living circumstances. This was particularly the case in cities where living space is limited, e.g., Hong Kong. But even more experienced analysts frequently highlighted the role of the office as providing a clear demarcation between work and private lives, a distinction that often became blurred during the work-from-home periods. One extension of the analysis presented in this research product would be to explore these topics in more detail.

Sixth, this research has highlighted the continued importance of in-person face-to-face interactions in the exchange of specialised financial information and knowledge. It has argued that without such in-person face-to-face interactions, analysts are unable to access a critical subset of unstructured knowledge which places them at an informational disadvantage. But it did not explore how analysts react to new information, i.e., whether to reject or use, and if to use, in what manner. This is important because it is the culmination of different reactions which explains why new information and knowledge do not flow in a uniform manner across networks. This is not simply a function of how it is passed between individuals but also the way in which it is modified as it does so. This issue became increasingly topical as the research

project developed, especially in terms of the analytical findings. It is a complex topic and could not be addressed within this research project given time constraints. But the factors determining how analysts react to new information, and subsequently process it and distribute it, are highly relevant to the geographies or information and knowledge, and merit more detailed investigation.

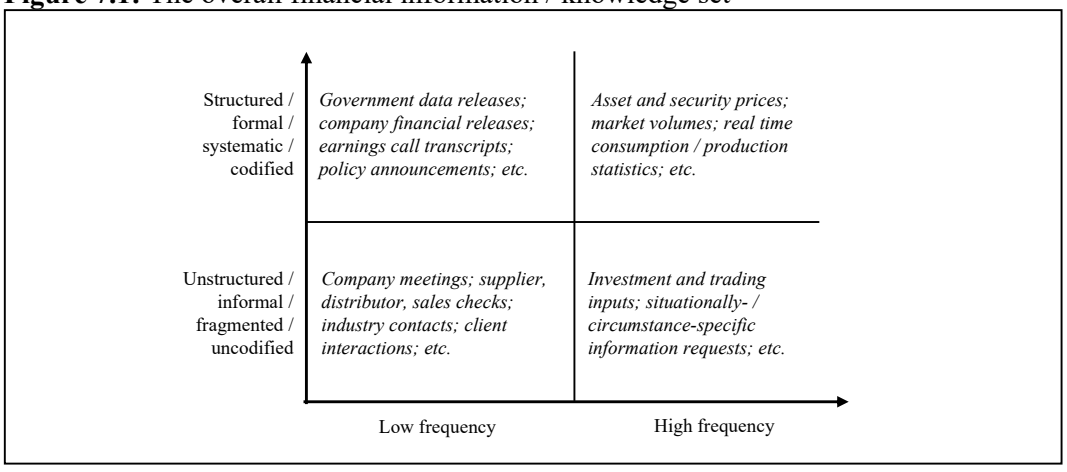
In addition to the above potential analytical extensions, there are many other related topics which could be explored in detail. The research project raised, for example, potential questions for the outlook for London and Hong Kong given their existing roles in European and Chinese information networks, respectively. If the UK's departure from the European Union results in increased informational frictions, then London's status could be potentially diminished over the longer-term. At the same time, Hong Kong is the hub within which international capital and institutions centralise their China information and knowledge networks. But Hong Kong's status could be diminished if its information environment becomes more restrictive or if the role of international capital in China becomes more marginal. There is also potential to undertake a similar mapping exercise across other KIBS, including management consultancy. This would allow potential differences between the various KIBS to be identified and explored.

It would also be interesting to explore whether the role of proximity in the acquisition of information and specialised knowledge, as demonstrated in Chapters 5 and 6, has a cultural or gender dimension. Is face-to-face interaction, for example, more important in Asia than the US or Europe? Do the different genders perceive differences in the role of the office as a learning environment? Although not fully explored in the interviews, there were suggestions that such influences exist. These are, therefore, topics which merit further investigation. And finally, this research has drawn extensively, when appropriate, on the financial economics literature. One potential extension of this project would be to investigate and fully develop the overlap between the financial geography and financial economic literatures. This would build on other interdisciplinary overlaps, such as previous investigations into the impact of Fintech innovations in finance (Wójcik 2020).

7.6 Final remarks

Financial knowledge, and its associated information flows, are highly opaque. This has, in my view, allowed for the impact of new technologies and regulatory frameworks on the accessibility of information and knowledge to be both mischaracterised and exaggerated. In large part, I believe this reflects a failure to understand just how complex, unstructured, and spontaneous information flows in finance are, and the continued importance of individual knowledge and expertise, especially in the forecasting process. As outlined in figure 7.1, codified knowledge only represents a small component of the industry's overall knowledge stock which continues to be primarily tacit in nature, embodied within, and carried by, individuals. But the ability to challenge the all too pervasive and conceptually compelling technocentric "death of geography" thesis has been constrained by the methodological difficulties faced by external observers, including geographers, when studying finance and its various processes. As highlighted above, this has resulted in a natural tendency to focus on the more visible outputs of financial activities (e.g. trading and transactions) than the opaque, complex, and highly individual production processes which result in those outputs.

Figure 7.1: The overall financial information / knowledge set



It is hoped that this research project has sought to address this debate by providing a range of relevant empirical insights relevant to earlier theoretical conceptualisations,

particularly those linked to the continued role of geography in finance (e.g. Clark & O'Connor 1997, Gertler 2003, Storper & Venables 2004). It has leveraged on my own substantial professional experience, a novel dataset on the global geography of a highly specialised knowledge-intensive financial activity (sell-side equity research), and the unique circumstances created by the COVID-19 pandemic, to reveal the financial geographies of tacit knowledge as well as the continued importance of in-person face-to-face interaction in its acquisition and transfer. This is not to dispute the relevance of codified knowledge as well as virtual and electronic communication mechanisms within other forms of relational proximity, as theorised by *inter alia* Amin and Cohendet 2004, Bathelt et al. 2004, and Graber 2002. These are all used extensively in equity research and are particularly important at reducing costs and improving efficiencies. But as outlined above, codified knowledge will only ever remain a subset of the overall knowledge stock and participants relying primarily on this knowledge subset will find themselves at a disadvantage versus better informed peers. Any such disadvantage will compound rapidly given finance's high frequency, short timelines, and spontaneous structure.

In contrast, uncodified knowledge may be difficult to observe but it remains a core and valued component of finance given the characteristics of the industry and the difficulties of codifying specialised knowledge and short-lived information. As demonstrated in this research project, the transfer of uncodified knowledge is optimised through face-to-face interactions within high trust inter-personal relationships. But the impossibility of analysts being co-located with every information source is recognised. The need for geographical proximity to any particular information source will reflect its relative importance and the required frequency of interaction, which in turn, is a function of the rate at which knowledge refreshes, new knowledge is created, and the value of sourced information decays. Analysts need to ensure proximity to important knowledge sources, especially when a high frequency of interaction is required or involved. This is why acute proximity with senior team members and internal sales-traders is considered important, but access to corporates in less information-

intensive sectors can be on a remote basis with periods of manufactured temporary physical proximity.

So returning to the question earlier posed in section 1.1 ("does it matter where research analysts are located?"), the answer remains yes. The decision where to base analysts must optimise their access to the full knowledge dataset required for them to undertake their forecasting and intermediary services. It needs to ensure maximum access to information and knowledge sources (corporates, clients, colleagues, etc.) and ensure that they are not at a material informational disadvantage versus their competitors. As such, their geographies remain very much defined by the geographies of information and knowledge, which, in turn, continue to demonstrate strong spatial and territorial links, despite all the various technological advances. And although this project may have investigated this topic through the lens of sell-side equity research, the findings are believed to be applicable to other financial activities given the importance of information and knowledge across all aspects of finance. From this perspective, therefore, the geographies of information and knowledge continue to have a critical input to the overall geographies of finance.

Finally, I started on a personal note and will also close on one. I have worked in sell-side equity research since 2006 and before that I was a management consultant. Both careers were demanding and as such, I never really had the opportunity to understand the various dynamics, constructs, and frameworks within which I was working. I knew, for example, that face-to-face interaction was important when developing relationships with clients or trying to extract information from industry contacts, but I never really understood why. Similarly, I knew that the best performing analysts were relatively rare talents and that expertise was cascaded within team structures, as evidenced by the tendency of high-quality analysts to hire and develop the next generation of good analysts. But the concepts of tacit, unstructured, complex, or uncodified knowledge were largely unknown to me. It was very much a case of failing to see the "wood for the trees".

This research project has, therefore, been an important learning process for me. It has helped me better understand the various complexities of sell-side equity research as

information and knowledge intermediaries, frame my thoughts and views on its optimal organisation, and consider how to maximise the outputs of the activity. From that perspective, this has been a very valuable exercise. At the same time, however, I hope that I have been able to contribute my substantive practical experience to the emerging literatures on the geographies of finance. Finance is complex and opaque to external observers, including geographers, and as such, I hope that this thesis, and the three accompanying published papers, have provided new insights into its internal workings. My further hope is that the analysis presented will be subsequently expanded and that I will be able to provide more subsequent insights by leveraging on my professional experience and networks. If so, this thesis will prove to be just the beginning of a more expansive research project.

APPENDIX: CO-AUTHORSHIP STATEMENT

The three papers which constitute the empirical body of this thesis (chapters four, five, and six) were co-authored with my supervisor, Dariusz Wójcik. I declare, however, that I undertook the majority of involved work in their preparation. Specifically, I defined the research methodology, and subsequently undertook all data collection, analysis and interpretation, the writing of the initial drafts, and all required changes and edits during the peer review process. Dariusz Wójcik provided guidance with respect to the conceptual framework, the research methodology, and feedback on the initial drafts.

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