# Exploring South Korean Foreign Direct Investment Motives and State-Level Location Decisions: US Evidence 1995-2008

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## Abstract

This study uses a novel application of panel fuzzy-set Qualitative Comparative Analysis (fsQCA) in the International Management field. Specifically, using a unique database that captures sub-industrial Foreign Direct Investment (FDI), as well as its location, we explain location decisions of high-technology South Korean (henceforth Korean) Multinational Enterprises (MNEs), when first entering the USA, in the period from 1995 up until the 2008 financial crisis. A variety of home country conditions, combined with a desire for technological upgrading, encouraged firms to seek locational advantages. Additionally, regional characteristics, rather than FDI being for a single purpose over time, allow a typology of reasons for Korean FDI to be developed. We show evolving trends of Korean FDI in the US with home country and regional perspectives interacting to attract FDI into US states with different characteristics and argue this is consistent with US policy which seeks to attract inward investment to foster economic development.



**Key words:** FDI motive, High-technology industries, Investment development cycle, Location choice, Korea

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## 1. Introduction

The literature on Emerging Market Multinational Enterprises (EMMNEs), such as those from the Asia-Pacific region, has developed by comparing internationalising firms from emerging economies, with "western" Multinational Enterprises (MNEs). This approach, based on Rugman's (1981, 1996) CSA/FSA framework, posits that EMMNEs internationalize to seek a broader set of advantages. Modified by Bhaumik et al. (2016), it links EMMNEs' internationalization motives to advanced technology access (Lee and Slater, 2007; Alvarez and Marin, 2013; Yoo and Reimann, 2017). This literature sees EMMNEs engaging in FDI either to enhance their firm-specific assets through technology access or to leverage location advantages abroad for production.

The literature highlights existential similarities and differences with western firms in internationalisation processes (Gammeltoft and Cuervo-Cazurra, 2021). The technology-sourcing literature explores knowledge flowing from local firms to foreign affiliates, and knowledge transfer from affiliates to parents (Driffield et al., 2016; Ahworegba et al., 2020), while EMMNE-focused studies emphasize acquiring knowledge-intensive assets from the West. FDI from Asian EMMNEs to more developed countries occurred in the 1980s (Kumar and Kim, 1984), Korea is a particularly interesting case for International Business (IB) scholars, both historically and geographically.

Post-war, Korea experienced rapid economic development, its industries and exporting production transformed from labour-intensive to heavy/chemical industries, and then knowledge-intensive industries such as IT products (Kim et al., 2018). Pangarkar (1998) classified Korea as less open to trade and investment than other Asian economies like those in Singapore and Hong Kong.

According to Dunning's (1980) investment development cycle/path, location motivation is affected by the home country's investment position, and by the host country's development stage. Thus, FDI patterns (Han and Brewer, 1987) supporting Dunning's (1980) eclectic theory, change over time. For instance, Han and Brewer (1987) identified avoiding trade restrictions as critical for Korean high-tech FDI into the US between 1970-1982. This motivation evolved over time, with Pangarkar (1998) noting a substantial 450% increase in Korean FDI into North America during 1982-1987. Host countries will have different, and changing, processes to home countries in economic development terms, affecting Korean MNEs location motivation for setting up or acquiring foreign value-adding activities. Erramilli et al.'s (1999) 1973-1990 Korean FDI study noted a transition from physical distance as the primary market selection criterion to a greater emphasis on economic considerations. Within host countries, even in advanced economies like the US, there are great disparities between regions regarding FDI attraction factors (Kim et al., 2018). Thus, a state-level approach adds further nuance to previous nation-level approaches (e.g. Alvarez and Marin, 2013; Yoo and Reimann, 2017).

Simultaneously, US domestic policy often seeks to attract FDI for employment purposes, often prioritising short-term, rather than longer-term benefits around knowledge creation or technological development (Mudambi and Mudambi, 2005). This is consistent with US industrial policy to attract jobs to disadvantaged areas (Blomstrom et al., 2005), influencing how technology-sourcing FDI by EMMNEs can enter regional economies (Kim et al., 2016), suggesting a need for multi-faceted approach to examine reasons for the geographical spread of FDI *within* nations.

The existing literature pays little attention to how investment and EMMNE's FDI motivation patterns evolve over time. Even fewer studies focus on how new investment positions development affects subsequent location choices, particularly at sub-national level. We aim to address these gaps, by investigating Korean high-technology firms' motivations undertaking FDI in developed countries such as the US, with consideration given to Korea's industrial development process, and changes over time in different motivation strengths and geographical spread *across* the US's states.

Our focal point is to scrutinise Korean high-technology FDI motivation in the US, reconceptualising Dunning's (1993) FDI motivation framework to examine links between location decisions made by Korean high-technology firms in the US and economic structures of US states, conceptualised as conditions relevant to Market-seeking, Efficiency-Seeking, Strategic-technology-asset seeking, and Resource-seeking. We also explore the changing motivation patterns in Korean development processes. This has important implications for government policy relevant to costs and benefits of future home and host countries. We unravel mechanisms explaining Korean outward FDI into a country's regions, to produce contributions to international theory that can be integrated into existing models such as Investment Development Cycle (IDC) and various FDI models. The research question we explore is whether and how presence of high-levels of Korean high-technology FDI into the US requires multiple signals to work together, and how the strength of these change temporally, affecting FDI distribution amongst US states over time.

As these IB business issues are interrelated and represent distinct internationalisation aspects, we adopt a configurational approach, which has become prominent in business research (Misangyi et al., 2017; Pezeshkan et al., 2020; Chen and Liu, 2021; Aluko et al., 2024). Dess et al. (1993) indicate the long history of literature in strategic management around configurations and configuration analysis, which itself builds on typology and taxonomy approaches (Miller, 2018), identifying that examining configuration is valuable because configuration-based analysis brings together multiple domains and stability, and allows examination of complex multivariate relationships. Earlier cluster-based analyses (Cadez and Guilding, 2012) focused on internal processes and complementarities within individual configurations, and identified parsimonious numbers of configurations. Qualitative Comparative Analysis (QCA) (Miller, 2018) and fsQCA show greater ability to identify greater numbers of possible configurations, compare across them and examine their relationships with performance-related outcomes (Miller, 2018).

In modelling location decisions, our choice of fsQCA has to consider various factors and alternative methodological options. For example, the **Independence of Irrelevant Alternatives (IIA)**, assumes that the choice between alternative locations is unaffected by the presence of other alternatives. This can be unrealistic in the context of MNEs location decisions, where the introduction or removal of a location can significantly alter the attractiveness of other locations (Fedderke et al, 2024). Researchers, therefore, often use nested-logit models to group locations into nests based on similarities, such as geographic proximity or economic characteristics, allowing for more nuanced substitution patterns (Fedderke et al, 2024). Our use of fsQCA effectively takes this approach by focusing only on the choice of location *within the USA*, effectively assuming that the decision to locate in the USA has already been made. Consequently, the results from the fsQCA must be seen as identifying the recipes that determine how such FDI is *distributed within the USA location.*

Another important consideration is the distinction between **sectoral, national, spatial, and regional effects**. Sectoral effects refer to the specific characteristics and requirements of different industries. For example, high-tech industries might prioritize locations with advanced infrastructure and skilled labour, whilst more basic manufacturing industries might focus on cost factors and supply chain logistics (Schmidt et al, 2017). In our case, we effectively control for this consideration by only considering high-technology South Korean firms.

This allows the research to focus on effects that differ within a country such as the USA, such as political stability, regulatory environment, and economic policies, which influence investment attractiveness (Schmidt et al, 2017). Additionally, spatial effects involve the locations' geographic characteristics, including those related to markets (e.g. size, wealth, concentration) and the agglomeration economies firms can access through locating near to each other, such as shared services, labour pools, and, importantly, knowledge spillovers (Goerzen et al, 2013).

Agent-based modelling (ABM) and spatial econometrics are two approaches that have been used to model multinational location decisions requiring sophisticated analytical techniques to capture the complexity inherent in these decisions (Horaguchi and Susumago, 2022). ABM allows for simulation of interactions between agents (e.g., firms, governments) and their environment, whilst spatial econometrics focuses on spatial dependence and heterogeneity in data to analyse how location-specific factors influence MNEs' decisions (Horaguchi and Susumago, 2022).

However, ABM has potential limitations (Knudsen 2024), as have spatial econometric approaches (Vega and Elhorst, 2013). FsQCA is seen as more flexible, particularly in terms of its ability to be used with small and medium-sized datasets, making it more suitable for exploratory studies (Lai et al, 2024) in comparison with ABM, often requiring much more detailed data on agent behaviours and interactions, and spatial econometrics, which necessitates more comprehensive spatial data and knowledge of spatial relationships (Lai et al, 2024). Furthermore, fsQCA results are often seen as more easily interpretable and actionable compared to ABM outputs and spatial econometrics approaches (Geremew et al, 2024). FsQCA offers a different configurational theorizing-based approach by focusing on causal complexity and configurational analysis, which allows for examining how different combinations of conditions lead to specific outcomes. Traditional models, such as those in regional science and economics, often rely on assumptions of linearity, independence of variables, and the independence of irrelevant alternatives. FsQCA, by contrast, allows for non-linear interactions, considers multiple conjunctural causations, and does not impose restrictive assumptions like variable independence. This makes fsQCA particularly suited for analysing complex phenomena such as FDI location decisions, where various factors—sectoral, national, spatial—interact in a non-additive way.

FsQCA also has specific advantages (Liu et al, 2021) over ABM and spatial approaches in terms of its ability to deal with situations of complex causality, being able to identify necessary and sufficient conditions related to the outcome, and thereby providing insights not easily captured by ABM or spatial econometrics (Liu et al, 2020). Consequently, fsQCA offers sufficient benefits over ABM and spatial econometric methods in terms of being able to handle complex causality, relatively small data sets, and offering easier interpretability, to justify its use in this study. FsQCA also has advantages, identified in Huang et al. (2021), over regression and Structural Equation Modelling based approaches, because it is able to deal simultaneously with conjunctional causation (conditions only have an effect in conjunction with other conditions, rather than on their own) equifinality (multiple combinations lead to the same outcome) and asymmetry (combinations for the presence of the outcome differ from those for the absence of the outcome). This allows research to investigate causal complexity (Misangyi et al., 2017), providing relevant configuration-based analysis (Ragin, 2008).

This research therefore focuses specifically on fsQCA (Ragin, 2008), because it allows conceptualization of the research question and data analysis in configurational terms, facilitating rethinking of extant theory (Fainshmidt et al., 2020). This helps to address a fundamental problem that much of the literature in this area faces, namely that it conflates issues. For example, if an association is found between FDI location decision and technological intensity traditional approaches infer this to mean technology sourcing FDI is taking place, or between GDP and FDI and infers market-seeking

FDI. Because fsQCA considers the role of multiple conditions simultaneously, it can critique this literature, identifying combinations of conditions related to an outcome, making an interesting contribution by identifying how combinations of reasons for location fit together. FsQCA is also more useful than cluster techniques in contexts where there is a specific research question, allowing examination of where conditions are substitutes or complements for each other, are necessary or sufficient, and / or core or peripheral in producing particular outcomes (Miller, 2018). Kraus et al. (2018, p.33) therefore concludes that fsQCA is becoming increasingly popular because it can capture such complexity "through testing theory-based conditions and contextual influences rather than focusing on single effects of individual variables". We add value to the fsQCA analysis by conducting longitudinal and geographical analysis based on panel data, using panel fsQCA (see Garcia-Castro and Ariño, 2016; Beynon et al., 2020), the intention being to explain the complex phenomenon of Korean FDI in the US in a more meaningful, dynamic, way.

This paper informs academics, multinationals, and policy makers, who need to understand changing FDI motives over time. Accordingly, we extend the debate from why such firms do this, or whether their development is different from western MNEs, to how firms use location choice to engage in changing purposes and in turn how these impacts their location decisions over time. To maximise fsQCA's benefit, we employ Furnari et al.'s (2020) configurational theorising three three-stage iterative process: scoping, linking, and naming. Scoping identifies relevant signals forming configurations, linking focuses on how signals connect with one another, whilst naming involves labelling configurations to identify their overarching, higher-level themes. This approach not only identifies multiple configurations that can produce the same outcome but can summarise them into overarching patterns (Furnari et al., 2020).

In terms of contributions from the research, the results for the general proposition 1 highlights that the presence of high-levels of Korean high-technology FDI into the US are found to require multiple signals to work together and that multiple signal combinations are related to the presence of such FDI. Specifically, the results for proposition 2 indicate that market-seeking *and* technology-seeking do complement each other to explain presence of high-levels of Korean high-technology FDI, whilst the results for proposition 4b show that resource-seeking in the absence of strategic-technology-asset seeking explain absence of high-levels of Korean high-technology FDI. Supporting proposition 5 the relative strengths of the combinations of signals (recipes), and their geographic coverage amongst US states can also be seen to change over time.

The study also identified that, contrary to the propositions (at least partly), efficiency-seeking, and strategic-technology- asset-seeking complement each other to explain presence of high-levels of Korean high-technology FDI, but only when combined with the absence of market-seeking, and efficiency-seeking in the absence of strategic-technology-asset-seeking explains the absence of high levels of Korean high-technology FDI, but again only when combined with absence of a market-seeking motive. Conversely, resource-seeking, and strategic-technology-asset seeking do not explain presence of high-levels of Korean high-technology FDI, the absence of resource-seeking being required. At the state-level, the results also suggest most have bypassed the government-driven Higher Education Research and Development (HE R&D driven route to attraction of Korean FDI, either by already having the requisite conditions for presence of high levels of Korean high-technology FDI (e.g. California, Massachusetts), building their offering on efficiency-seeking agglomerations in high-technology manufacturing (e.g. Washington) or strategic-technology-assets (e.g. New Jersey). Only Arizona (in the post 2000 period) appears to be potentially trying to use the HE R&D based route (thus far not achieving presence of high-levels of Korean high-technology FDI), whilst Georgia has resolutely maintained its HE R&D based non-High R&D performance.

## 2. Theoretical Framework FDI motives

Scoping the literature to review relevant theoretical frameworks identified the eclectic paradigm as a starting point, from which motives for specific FDI location decisions can be deduced (Wagner, 2020). This is outlined in table 1 below.

**(Table 1 about here)**

The theoretical framework combines national and firm-specific factors (such as ownership, locational, and internalisation advantages), to explain international trade and production patterns (Dunning, 1993). Dunning classified firms' FDI motives engaging into four groups. These are natural resource-seeking, market-seeking, efficiency-seeking and strategic-technology-asset-seeking. The resource-seeking FDI motive is driven by demand to access raw materials such as minerals, metals, and fuel. Securing a cheap, safe, and reliable supply drives firms to seek natural resources. If transport costs aren't low and stable, it becomes more economical to produce goods near the resource, leading firms from industrialized nations to establish foreign operations. Efficiency-seeking investments aim to obtain cost-advantages. MNEs reconfigure activities internally due to rising home country costs, especially in labour-intensive sectors. To boost efficiency, they establish operations in low-cost locations, aligning with investments that rationalize existing MNE operations. Market-seeking investment aims to enter and supply larger, wealthier, or more advanced foreign markets, with local production offering marketing advantages. Finally, strategic-technology-asset seeking FDI aims to acquire key assets crucial for long-term competitiveness. Such strategic-technology-asset seeking FDI is internally driven, where competitiveness is the prime concern when deciding to position abroad. For EMMNEs, existing literature (Bhaumik et al., 2010; Guillen and Garcia-Canal, 2009; Narula, 2012; Peng et al., 2008) examines how firms access technological capabilities by investing in developed host countries, a challenge when their firm-specific advantages differ from their Western counterparts.

For developed economy MNEs, firms are involved in FDI to exploit and develop the value of their FSAs abroad (Madhok, 1997; Trevino and Grosse, 2002), switching their FDI motives to prioritise different attraction factors in host countries (Trevino and Grosse, 2002). Peng et al. (2008) and Guillen and Garcia-Canal (2009) identify different EMMNEs' FDI drivers, first internationalising through CSAs, such as economies of scale, to increase competitive advantages and overcome inherent "liability of foreignness" (Bhaumik et al., 2010; Bhaumik and Driffield, 2011). They are also looking for technology-sourcing and technological upgrading in developed host-markets (Bhaumik et al., 2016; Driffield and Love, 2003). Dunning and Narula (1996) argue that as countries advance from emerging to developed status, they shift from labour-intensive to knowledge-intensive assets. However, existing literature on EMMNEs lacks focus on how their investment patterns and FDI motivations evolve over time. Less studies focus on *how* new investment position developments affects their *subsequent location choices*.

In the Korean context the literature on FDI is basically concerned with this relationship between outward FDI and Korea's industrial development (Kim et al., 2018; Buckley et al., 2022). Erramilli et al.'s (1999) Korea-focused study identified that internationalisation was very relevant, particularly when combined with strategic and economic frameworks. Korean firms, encouraged by Korea's rapid industrial change and development, expanded their operations overseas to consolidate their position at the technological frontier, transforming the country's FDI motives over time. These motives are in a similar vein to asset exploitation and exploration (Buckley et al., 2007), at the start of the period Korea competitive in labour intensive sectors, such as apparel and textile, and by the end a global leader in integrated circuit technology (Kim et al., 2018). According to Kim et al's. (2018) model, FDI to less developed countries from Korea maps conveniently onto the standard OLI paradigm, driven typically either by market-seeking facilitated by ownership advantages over local firms, or alternatively efficiency-seeking FDI. Oppositely, market-seeking FDI to developed countries is seen as being facilitated through efficiency or through other CSAs at home.

However, there is a shift towards technology-seeking FDI, as firms seek to bolster their stock of firm-specific advantage. During 1973-1990, USA attracted 25% of Korea's manufacturing FDI (Erramilli et al., 1999), to overcome liability of foreignness (Bhaumik et al., 2016) in the eye of customers and potential collaborators.

US domestic policy often seeks to attract inward investment not based not on technological collaboration, but on job creation in economically lagging states, highlighting the need to examine FDI flows across regions with diverse economic histories and performance. Mudambi and Mudambi (2005) observed that inward investment incentives often prioritize short-term job creation over long-term gains like technological growth. Blomstrom et al. (2005) similarly noted that U.S. industrial policy uses job creation incentives to attract FDI to disadvantaged areas, enabling emerging market firms to enter advanced economies by pledging local employment. These findings suggest traditional EMMNE frameworks (see Figure 1) need a more nuanced, multi-faceted approach.

**(Figure 1 about here)**

Figure 1 illustrates how Korean firms facilitate home competitiveness via FDI in advanced economies. Traditional literature (e.g., Bhaumik et al., 2016) acknowledges FSAs within EMMNEs, though they differ from Western firms. The internationalization mechanisms by which these firms build and enhance FSAs influence their location choices for technology-sourcing FDI, fostering capacity building, partnerships, and access to frontier technology. Buckley et al. (2022) show that Korean FDI drives technological upgrades through ties with outward FDI destinations and trade patterns; for example, Korean technology-seeking FDI in the OECD electronics sector aligns with imports of high-value goods, indicating Korea's geographic spread in technological development.

Kim et al. (2018) highlights how Korea's industrial restructuring shapes its FDI model, where evolving home-country economic traits influence FDI location and motives over time. Initially technologically weaker, Korean high-tech firms have grown their competitiveness, shifting from technology-seeking to market-seeking FDI, as seen with firms like LG and Samsung. In the U.S., this shift aligns with the investment development cycle (Dunning, 1981), where firms develop FSAs and CSAs, fuelling FDI to source technology, expand FSAs, and pursue market-seeking FDI in high-value markets as they progress along the investment development path (Dunning, 1986).

## 3. Theoretical Framework: Linking FDI Motives through Configurational conceptualisation

Analyses of Korean high-technology industries' FDI motivations have primarily used econometric, regression-based methods, treating market-seeking, resource-seeking, efficiency-seeking, and strategic-technology-asset motivations (technology-seeking in high-tech) as separate variables, aligned with Dunning's four main FDI motives. This approach reflects both the theoretical framework of FDI motivation and the reliance on regression models for data analysis.

However, a limited body of literature explores interlinked FDI motives, often through qualitative methods. For instance, Curran et al. (2017) found that Chinese FDI in the EU renewable energy sector was both market- and technology-seeking, a pattern also noted by Gao and Schaeper (2018) in France. Baskaran et al. (2017) observed FDI driven by a mix of efficiency and market-seeking motives. Hollenstein (2009), using cluster analysis, identified four motive clusters blending technology-seeking, efficiency-seeking, market-seeking, and resource-seeking motives, suggesting the value of a configurational approach.

We aim to develop a framework that captures the interlinked relationships between FDI motivations in Korean high-technology FDI and tracks changes over time. Moreover, we aim to identify not only when and how the presence of one motivation taxonomy affects the appearance of High-technology FDI, but also when the lack of this taxonomy has an impact on the absence of such FDI. Scoping the literature, the first stage of configurational theorizing (Furnari et al., 2020), and Figure 1's discussion of links among motivations, we develop a simplified framework (see Figure 2) that linking these motivations and their combined influence on outcomes.

**(Figure 2 about here)**

The linking stage of configurational theorising (Furnari et al., 2020) explains how different signals connect with one another. From this we develop a set of non-longitudinal and longitudinal propositions, initiating recipes' identification (or at least some of their "ingredients") that the existing literature suggests are possible, from which contributions can be derived. Propositions development and empirical design should recognise that most IB phenomena are inherently configurational (Fainshmidt et al., 2020). FsQCA "enables researchers to more adequately theorize and empirically examine causal complexity" (Misangyi et al., 2017: 257). Our first, *very broad* proposition, which effectively tests the relevance of the fsQCA approach, is therefore: -

> Proposition 1: The presence of high-levels of Korean high-technology FDI into the US in specific US states require multiple signals to work together such that.
>
> > Proposition 1a: The presence of one signal alone is not sufficient to explain the presence of high levels of Korean high-technology FDI and thus conjunctionality exists.
> >
> > Proposition1b: There are multiple combinations of signals that explain the presence of high levels of Korean high-technology FDI, and this equifinality exists.

We then turn to the *specific* combinations of conditions related to Korean high-technology FDI in the US. Strategic-technology-asset seeking FDI, specifically, is internally driven by firms; the Korean FDI model (Kim et al., 2018), generally following a pattern where paths flow to developed countries, with a change from technology seeking FDI to market-seeking FDI while considering Korea's own investment position within the investment cycle (Dunning, 1981). From the standpoint of these FDI motives we see that, firms are involved in FDI to exploit and develop the value of their FSAs abroad (Madhok, 1997; Trevino and Grosse, 2002). Previous literature has built on Dunning (1993), analysing location choice through FDI motives. For Korean FDI in the US, based on Korean FDI research (e.g. Kim et al., 2018), Korean High-technology firms have, despite their initial technological weakness, been increasing their competitiveness over time by honing their motives for internationalising and tweaking their location preferences to utilise the different dynamic views of home market perspective and/or firm perspective and/or regional perspective. This means that, whilst still primarily seeking technology, they will also seek relatively attractive state level markets, within the US context, and so:

> Proposition 2: Signals of market-seeking motivation complement the technology-seeking motivation to explain the presence of high-levels of Korean high-technology FDI into the US in specific US states.

The traditional literature (see Bhaumik et al., 2016), recognises the FSAs' existence within EMMNEs. They are not, however, the same form as in western firms, and the mechanisms by which they acquire and enhance their stock of firm-specific assets is potentially important in their location decisions regarding technology-sourcing FDI. Specifically, strategic-technology-asset seeking benefits of location choice has led Korean firms achieving obtain long term competitiveness, thereby upgrading their assets in developed countries (Kim et al., 2018). Technology-seeking FDI allows building on existing capacity, by collaboration and accessing frontier technology. Because of the focus of US economic development (through attraction of FDI for employment purposes) policy, previously noted, however, we argue this influenced how technology sourcing FDI by emerging market firms has also been attracted to US state economies which are currently relatively less focused on high technology manufacturing *than other US states*. Conversely, FDI that seeks efficiency *without* strategic technology seeking *also* being present will be seen as less desirable and sustainable and more likely to be of a relatively low level in comparison. Thus:

> Proposition 3a: Signals of efficiency-seeking complement the strategic-technology-asset seeking motivation to explain the presence of high levels of Korean high-technology FDI into the US in specific US states.
>
> Proposition 3b: Substituting signals of efficiency-seeking in the absence of strategic-technology-asset seeking motivation explain the absence of high levels of Korean high-technology FDI into the US in specific US states.

High-technology firms undertaking strategic-technology-asset seeking (patents) also seek key-knowledge enhancing resources such as university generated R&D, to fuel such strategic-technology-assets. Conversely, where such strategic-technology-asset seeking is absent, such resource-seeking is likely substitutive and general, undertaken by firms lacking key IP protection capacity. Consequently:

Proposition 4a: Signals of resource-seeking complement the strategic-technology-asset seeking motivation to explain the presence of high levels of Korean high-technology FDI into the US in specific US states.

Proposition 4b: Substituting signals of resource-seeking in the absence of strategic-technology-asset seeking motivation explain the absence of high levels of Korean high-technology FDI into the US in specific US states.

Finally, there will likely be longitudinal aspects to the strengths of the combinations of conditions (recipes in the results), given the impact of changing home and host environments on the strengths of the conditions driving South Korean high-technology FDI into the US in specific US states, in terms of their relative strength and geographical coverage leading us to:

Proposition 5a: The relative strengths of the recipes explaining the presence and absence of high levels of Korean high-technology FDI into the US in specific US states will change over time.

Proposition 5b: The distribution of the recipes explaining the presence and absence of high levels of Korean high-technology FDI into the US in specific US states will change over time.

## 4. Method, data, and initial calibration

### *4.1. Overview of Method*

FsQCA is the technique used, following an inductive approach (Ragin, 2008; Schneider and Wagemann, 2010), to identify configurational relationships between the conditions (representing resource-seeking, market-seeking, efficiency-seeking, strategic-technology-asset seeking) and outcome (FDI). Underpinning this set theoretical analysis are combinatorial logic, fuzzy-set theory, and Boolean minimization, detecting the combinations of case conditions necessary or sufficient to produce the outcome (Kent and Olsen, 2008). FsQCA is increasingly used, in a variety of research contexts (see Roig-Tierno et al., 2016; Kraus et al., 2018; Pickernell et al., 2019; Piñeiro-Chousa et al., 2019; Thomann and Maggetti, 2020; Aluko et al., 2024), which continues to develop along with contentions on what is best practise (e.g. Greener, 2023; Douglas et al., 2020).

FsQCA is also able to be used in combination with longitudinal, panel data (see Garcia-Castro and Ariño, 2016, and more recently, Beynon et al., 2020), with consistency-oriented measures of pooled consistency (POCONS), between year consistency (BECONS), and within year consistency (WICONS) (Guedes et al., 2016), relevant to this longitudinal set-theoretic research, specifically in proposition 5. This study is believed to be amongst the first to attempt to employ these longitudinal measures in the field of internationalisation (Beynon et al., 2020, employed the approach on a large entrepreneurship data set in a different context), important in the context of exploring the use of fsQCA based approaches as alternatives to more longstanding methods discussed earlier.

### *4.2 Overview of Conditions and Outcome*

Table 2 shows the conditions and outcome used to operationalise Figure 2. Their use in previous research, and data sources are identified.

**(Table 2 about here)**

#### 4.2.1. Market-seeking: GDP Per Capita

Bearing the capacity to internationalise, many EMMNEs seek access to areas with high obtainability of capital resources. Therefore, a positive relationship between potential consumption and FDI may be assumed (Stone and Jeon, 1999; Grosse and Trevino, 1996; Tallman 1988; Kyrkilis and Pantelidis, 2003; Thomas and Grosse, 2001). These studies discuss market size's impact, as a potential consumption proxy, on FDI. Using the same proxy at state level, we identify GDP per capita as an appropriate metric within this study.

#### 4.2.2. Efficiency-Seeking High and Medium High-Technology Manufacturing

MNEs involved in labour-intensive industries are considered to have key issues related to issues such as wage levels and unionisation (Halvorsen, 2012). These issues don't deter FDI in higher-wage, high-productivity industries. Instead of using labour cost differentials to assess investment levels in high-tech and knowledge-intensive sectors, we base measurements on the labour force. Kim and Choi (2020) and Wang et al. (2020) note that high-tech industry clusters attract more high-tech investment by providing access to skilled labour. We assess the importance of high-tech and knowledge-intensive employment (as a labour availability indicator) by measuring its proportion in each state.

#### 4.2.3. Strategic-technology-asset Seeking: Patent Applications

According to Driffield and Love (2007), FDI in R&D-intensive host sectors can be viewed as technology-sourcing, even if the source sector lacks R&D. Driffield et al. (2010) argue that inward investors and host locations engage in reciprocal knowledge and technology exchange. In this context, we focus on the value of regional knowledge. Observing resource allocation toward innovation reveals a region's impact, with R&D spending as a key driver of economic growth. Regional attractiveness for technology-seeking is assessed using PCT patent applications per million people and total R&D spending percentage.

4.2.4. Resource-seeking: R&D in Higher Education sector

Halvorsen (2012) and Giammanco and Gitto (2019) suggest academic R&D attracts FDI. Halvorsen finds this particularly true for smaller U.S. firms seeking external R&D due to limited resources, while Giammanco and Gitto identify a positive link between higher education R&D and FDI in the high-knowledge medical sector.

4.2.5: Outcome: Foreign Direct Investment

As in Driffield et al. (2021) and Buckley et al (2022), this paper uses a unique dataset derived from official Korean data. As with Buckley et al (2022) we also log the data for Foreign Direct Investment. Unlike those two studies, however, the data used is at US-state-level, rather than country level.

*4.3. Sample and Data Issues: High-Technology Korean FDI data*

Data on regional demography, economic indicators, and innovation indicators, such as patent applications in regions, R&D expenditure by sector, skilled labour by sector, are sourced from OECD. The focus of this empirical analysis is on the distributed presence of Korean high-technology firms in the US. Therefore, two main data sources have been combined in this study: the overseas investment statistics of The Export-Import Bank of Korea ("EXIM Bank") and OECD statistics. We collected data on Korea's outward FDI from the EXIM bank. The data include the location of subsidiaries, total amount of FDI, investing motivations, industrial sector, and so on. Our analysis focuses on the Korean high-technology and knowledge-intensive service industries, based on the official OECD-Eurostat definitions, as highlighted in Table 3.

**(Table 3 about here)**

We focus our study on the pattern that is seen in the location choice of FDI in Korean industries and services heavily reliant on high-technology or knowledge. Given the correlation between state-level R&D development and location determinants of technology seeking FDI, this is a particular topic of interest. The data at our disposal includes all the variables across all US states from 1995 to 2008. This period was decided upon to exclude external factors such as the global financial crisis while exploring the development of Korea's economic growth based on previous Korean FDI models (e.g. Kim et al., 2018) and previous Korean FDI research, and because data for all conditions was not available after 2008. A graphical understanding of the frequency of the inclusion of the states across the different years is given in Figure 3, totalling 166 US state-year observations.

**(Figure 3 about here)**

In Figure 3, each US state is shown. Those shaded white denote no state-year observations for that state are included in the considered dataset. The greyscale shading of states across the map, from light to dark, denote 1 up to thirteen inclusions of state-year observations for the individual states. We note here, having different numbers of state-year observations for the different states is not a problem when employing panel fsQCA (see Beynon et al., 2020). To gauge an understanding of the considered conditions and outcome, a series of sets of boxplots are presented showing the respective values of conditions and outcome over the separate years considered, see Figure 4.

**(Figure 4 about here)**

In each plot in Figure 4, boxplots covering the individual years considered are shown. Also shown in each plot are the results from ANOVA test investigating the variation in values over the different years. ANOVA results show the RGDPPC condition to be significantly different over the different years considered.

## 5. FsQCA

Following the discussion of fsQCA in section 4.1 (Ragin, 2008; Schneider & Wagemann, 2010; Kraus et al., 2018), we illustrate fsQCA implementation aspects, i.e. i) calibration, ii) necessity analysis, iii) truth table construction, iv) sufficiency analysis and v) longitudinal analysis.

### *5.1. Calibration*

In fsQCA, we need to calibrate the condition and outcome case values from their respective scales to fuzzy membership values (over similar 0 to 1 ranges of values). Here, this is undertaken using the Direct method (Ragin, 2008), as outlined in Andrews et al. (2016) and Beynon et al. (2021). For calibration transparency (Ragin, 2008; Misangyi et al., 2017), figure 5 provides a visualization of this process for each condition and outcome.

**(Figure 5 about here)**

In Figure 5, in each plot, the solid line is the constructed associated probability density function (pdf), with three dashed vertical lines the associated qualitative anchors (left to right - threshold of full non-membership ($5^{th}$ percentile of pdf), crossover point ($50^{th}$ percentile of pdf) and full membership threshold ($95^{th}$ percentile of pdf), and the dotted line the subsequent fuzzy membership function (over the 0–1 domain on the right y-axis). At the base of each plot, points represent the value of the respective condition and outcome. A feature of the calibration process is 'sense checking' (Beynon et al., 2021), with a number of issues/considerations undertaken, i) with the added issue of the values shown with certain US states over different years this mitigated state specific intervention on the qualitative anchors evaluated and ii) cases (state-year observations) either side of the established crossover-points were further considered (not reported here), with no arguments given to enact changes to crossover-points.

To clarify the calibration impact on cases, three versions of the data are shown for a sample of cases (considered in the analysis undertaken), see Table 4.

**(Table 4 about here)**

Table 4 presents three U.S. state-year cases with original values (top rows), fuzzy membership values (middle rows, from calibration), and strong membership values (0 or 1; footnote 2, for conditions only). Strong membership values enable configuration analysis (combinations of 0s and 1s across conditions).

The shift in terminology reflects a focus on the degree of membership or high-condition presence/absence or outcome.

*5.2. Necessity analysis*

We check for necessity amongst the conditions (presence and absence of them), to identify which individual conditions, if any, are necessary for the outcome (presence and absence of them) to occur (see e.g. Douglas et al., 2020). Sets of consistency values to quantify the scale of this necessity are calculated Ragin (2008), see Table 5 and Figure 6.

**(Table 5 and Figure 6 about here)**

In Table 5, each presence and absence condition and outcome combination are represented by consistency values. For a condition, the pairs of values representing its presence and absence to the outcome can be represented as a point in a scatterplot, see Figure 6 (note the axes are both measured over the 0.4 to 1.0 sub-domain of the 0.0 to 1.0 full domain). In Figure 6, pairs of points are joined by a line since each condition is tested against both the presence and absence of the outcome. The adjudication of the presence of necessity is through a threshold value of 0.9 (Vis & Dul, 2018, denoted by shaded region in scatterplot). Inspection of the details in Table 5 and Figure 6 indicate no condition (neither in terms of its presence or absence) is considered necessary regarding the outcome (neither in terms of presence nor absence).

*5.3. Truth table construction*

Following necessity analysis, the next stage considered is the associated truth table for the dataset, to exposit the logical combinations of conditions (configurations) and association to the outcome and not-outcome. The truth table in Table 6, includes only those configurations with at least one case (state-year observation) associated with it in strong membership terms (only configuration 13 (1100) is not shown – here termed a logical remainder[1]).

**(Table 6 about here)**

For each configuration shown, the second to fifth columns give the 0 or 1 strong membership values of conditions which describes them, next column (No.) gives the total number of cases associated with that configuration (in strong membership terms). The last four columns depict the consistency and PRI score levels of the respective configuration to the presence and absence of the outcome (separate for each) (e.g. Mello, 2022; Greener, 2023). Two threshold values are required to interpret the association of a configuration to an outcome or and/or not-outcome (Ragin, 2008).

[1] A logical remainder row in FsQCA, is a logically possible combination of conditions lacking empirical instances—either because the researcher has inadequate information about such cases or because the cases simply do not exist (see Ragin, 2008, p. 131).

i) Frequency threshold - a criterion for classifying some configurations as relevant and others as *remainders* based on the numbers of cases associated with them (noting when the total number of cases in a study is large, the issue is not which combinations have at least one case associated with them, but which combinations have enough instances to warrant further consideration (assessing the subset relation with the outcome) and
ii) Consistency threshold – a criterion for the association of a configuration to the outcome and or not-outcome (or neither) based on an acceptable level of dissimilarity (of the within-case relationships between the conditions and the outcome) for the cases represented by the configuration.

Following Beynon et al. (2020), frequency and consistency thresholds are jointly considered. As in Andrews et al. (2016), a consistency threshold is set based on frequency to ensure configurations align with either outcome or non-outcome. PRI-scores were checked, with caution advised if scores fall below 0.500 (Mello, 2022). Figure 7 assists in evaluating these thresholds.

**(Figure 7 about here)**

Figure 7 shows possible frequency thresholds on the x-axis, indicating configurations with case numbers above each threshold in strong membership terms. It illustrates how these thresholds affect configurations tied to the outcome's presence/ absence and their impact on consistency threshold, aligning with Ragin's (2008) suggestion to explore various thresholds and observe consistency changes. Based on a frequency threshold, the left y-axis gives the minimum consistency threshold to employ, rather than fixing a mechanical threshold (say 0.8 as in extant literature, Ragin, 2008), which also assures a configuration will not be associated with both the presence and absence of the outcome, but only one (solid line joining circle points). The frequency threshold impacts which configurations are considered for determining the consistency threshold, with the dashed line representing consistency values. On the right side of the graph, the red line marks the number of cases within configurations meeting both thresholds. Reviewing the graph requires analysing both lines together, showing that a high cases inclusion corresponds to a frequency threshold near nine and a consistency threshold around 0.832 (indicated by the arrow on the left y-axis).

Table 6 displays the effects of these two threshold values, aligning with Figure 7. Configurations with fewer than nine cases (configurations 1, 3, 8, 9, 12, and 16) are marked as remainders, as they don't meet the frequency threshold. Consistency threshold effects mean that configurations must exceed this value to be considered for the presence or absence of the outcome. In Table 6, all configurations meeting the frequency threshold have bolded consistency values above the threshold, meaning none are excluded as remainders. None of the further-considered configurations have a PRI-score below 0.5 for either outcome.

### *5.4. Sufficiency analysis*

Table 7 presents the sufficiency analysis of configurations, regarding their association with the presence or absence of the outcome. A key aspect of this analysis is selecting solution forms (see Ragin, 2008), which relate directly to the role of remainder configurations—those not associated with either the outcome (high HT-FDI presence) or non-outcome (absence of high HT-FDI).

Three solution forms are considered (Douglas et al., 2020): Complex (excludes logical remainders), Intermediate (includes easy counterfactual remainders), and Parsimonious (includes all remainders). Here, FDI motives for high-tech FDI can act as complements or substitutes, complicating easy counterfactual identification. For South Korean FDI, the data span a shift from technology-importing to technology-exporting, adding temporal complexity. We use complex and parsimonious solutions (Andrews et al., 2016; Beynon et al., 2021), with complex equating to intermediate due to easy counterfactuals' absence (Verweij and Trell, 2019).

Table 7 presents from the sufficiency analyses for complex and parsimonious solutions. Circle notation (Ragin and Fiss, 2008; Douglas et al., 2020), uses filled circles for condition presence, unfilled for absence, and blank spaces for irrelevant conditions; large and small circles indicate core and peripheral conditions. Each recipe includes consistency, PRI score, raw coverage, and unique coverage values (Ragin, 2008).

**(Table 7 about here)**

In Table 7, core conditions remain consistent across recipes for high high-technology-FDI presence and absence, with variations in peripheral conditions forming neutral (or sibling) permutations (Fiss, 2011; Douglas et al., 2020). For the complex solution, recipes COFDI1 and COFDI2 represent high high-technology FDI, while CNFDI1 and CNFDI2 represent its absence. A robustness check with a 0.85 consistency threshold confirmed COFDI1 and COFDI2 remained stable for the outcome. However, pathways for the non-outcome changed slightly, including core condition shifts, and covered only 65% of cases compared to over 78% at the original threshold.

### 5.5 Longitudinal technical exposition

Misangyi et al. (2017) highlights fsQCA's potential to analyse change over time using longitudinal data. Our panel fsQCA (Castro & Ariño, 2016; Guedes et al., 2016), adapts set consistency and coverage measures for longitudinal set-theoretic research (Misangyi et al., 2017, p. 274). The data considered is state-year observations, covering 1995 to 2008 (Figure 8) (dark grey shaded states included in the analysis).

**(Figure 8 about here)**

The details of panel fsQCA employed can be expressed in different sets of consistency values based on how the longitudinal data is partitioned (Castro and Ariño, 2016; Guedes et al., 2016) i) Pooled consistency (POCONS) – is an all data consistency the same as that given in the sufficiency analysis, ii) Between year consistency (BECONS) – is when the data is partitioned by year and individual year consistency values calculated, and iii) Within year consistency (WICONS) - is when the data is partitioned by general case (here US state) and individual case consistency values calculated.[2] COFDI1 is found to be less consistently associated with the outcome over time, whilst for COFDI2 the opposite is true. For high high-technology FDI absence, CNFDI1 has fewer states showing consistency than CNFDI2, and overall, more states have strong consistency to the high high-technology FDI absence recipe when compared to the presence of high HT-FDI recipe.

A Recent development on fsQCA has been its consideration in a temporal dimension, acknowledging data is often considered over several years. Panel fsQCA was introduced in Castro and Ariño (2016) and Guedes et al. (2016). Here, we concentrate on the consistency considerations of original consistency (POCONS), between-year consistency (BECONS) and within-year consistency (WICONS) (Beynon et al., 2020).

BECONS split up this consistency formula by year of interest, so giving a single BECONS for each year. Therefore, a BECON above the original consistency (POCON) means there is a better subset-relationship for that specific year (less counterfactual evidence than existing across all years). Consequently, if the BECONS line is sloping up over time then the set of conditions are becoming more consistently associated with the outcome (i.e. the recipe is becoming less fuzzy).

*Presence of High HT-FDI*

**(Figure 9 about here)**

There are clearly fluctuations over time, BECONs identifying that strength of that recipe is changing, COFDI1 becoming less consistent over time (and shocked downwards after 2001), whilst COFDI2 becomes more consistent over time.

**(Figure 10 about here)**

For the relevant WICONS values for each high HT-FDI presence recipe, around 12 states for COFDI1 to 15 states for COFDI2 states have strong consistency in terms of the recipes with which they are associated. The other states have different levels of inconsistency across the years for which they are included in the analysis. Thus, COFDI1 has fewer states showing consistency than COFDI2.

**(Figure 11 about here)**

[2] It is noted that panel fsQCA approach includes consistency and coverage values, here only consistency values considered.

*Absence of High HT-FDI*

**(Figure 12 about here)**

CNFDI1 has stable BECONS over time, so this recipe has a stable association with the outcome as an absence of high HT-FDI attraction strategy, HERD a stable attractor as a basic resource for Korean FDI. This recipe is maintaining the consistency of its relationship with the absence of high HT-FDI outcome. Conversely, CNFDI2 has rising BECONS over time, so this recipe has strengthening association with the outcome as an absence of high HT-FDI attraction strategy.

**(Figure 13 about here)**

For the relevant WICONS values for each absence of high HT- FDI recipe, around 11 states for CNFDI1 to 21 states for COFDI2 states have strong consistency in terms of the recipes with which they are associated. The other states have different levels of inconsistency across the years for which they are included in the analysis.

**(Figure 14 about here)**

## 6. Discussion

Discussion of the results evaluates the results against the propositions, to determine whether they are supported or need to be reframed. Then, recipes are named, consistent with Furnari et al. (2020).

### *6.1 Non-Longitudinal Propositions 1-4*

Proposition 1: high-levels of Korean high-technology FDI presence into the US require multiple signals to work together such that the presence of one signal alone is not sufficient to explain high levels of Korean high-technology FDI is clearly supported, in this generic level and at the specific 1a and 1b levels. Proposition 2: market-seeking and technology-seeking motivation signals complement each other to explain high levels of Korean high-technology FDI presence is supported by COFDI1, but the absence of a resource-seeking motive is required.

Proposition 3a, efficiency-seeking, and strategic-technology-asset seeking motivation signals complement each other to explain presence of high-levels of Korean high-technology FDI is partially supported by COFDI2, also requiring the absence of a resource-seeking motive. Proposition 3b: signals of efficiency-seeking in the absence of strategic-technology-asset seeking motivation explain absence of high levels of Korean high-technology FDI is partially supported by CNFDI2, but also requires the absence of a market-seeking motive. This therefore leads us to reframe these propositions as:

> Proposition 3a: Signals of efficiency-seeking, and strategic-technology-asset seeking motivation complement each other to explain presence of high levels of Korean high-technology FDI into the US in specific US states, but only when combined with the absence of a market-seeking motive.

Proposition 3b: Signals of efficiency-seeking in the absence of strategic-technology-asset seeking motivation explain low levels of Korean high-technology FDI into the US in specific US states, but only when combined with the absence of a market-seeking motive.

Proposition 4a: Signals of resource-seeking, and strategic-technology-asset-seeking motivation complement each other to explain presence of high levels of Korean high-technology FDI into the US in specific US states, is not supported as expected, instead the absence of a resource-seeking motive required for both COFDI1 and COFDI2. Proposition 4b: signals of resource-seeking in the absence of strategic-technology-asset-seeking motivation explain absence of high levels of Korean high-technology FDI into the US in specific US states is supported.

*6.2. Longitudinal Propositions*

In the longitudinal geographical analysis, COFDI1 shows increased consistency, expanding its applicability across more states. Delaware is most consistently in COFDI1 over the entire period, followed by New Jersey, California, Massachusetts, Washington, and Illinois, with a general increase in the number of states associated over time. Thus, the recipe is becoming more relevant geographically but its relationship with the presence of high FDI outcome (shown by BECONS) is also weakening. California is the most consistently associated state with COFDI2 recipe, followed by Washington, New Jersey, and Massachusetts, but unlike COFDI1 the number of states associated in any given year remains consistent over the period. Thus, the recipe is not widening its appeal but is becoming more embedded in this small number of states. COFDI2, is becoming more consistently associated (shown by BECONS) with the outcome over time. Therefore, sophisticated market-seeking is becoming a less consistent recipe, but with widening appeal, whilst strategic cluster efficiency-seeking is becoming the more consistent recipe but remains only in a small number of states where this recipe appears to be becoming more embedded.

For CNFDI1 there is a generally strong bias towards Southern States and/ or warm weather states, with Texas the most consistently associated followed by Georgia, Florida, Alabama, and Louisiana (as well as Nevada and Arizona), other states such as Illinois, New York, and South Dakota, intermittently appearing. There is also an (uneven) rise in states associated year on year, with this innovation resource-seeking motive indicating that the (lower level) FDI into these states is looking to tap into basic R&D from universities. For CNFDI2 this recipe is becoming less geographically spread over time, and indeed reducing to only one state per year between 2005 and 2008. As with COFDI1, this recipe is focused with only a small number of states, notably Texas, Florida, Arizona, Washington, and Michigan. However, whilst the recipe, generally, is covering fewer states year on year, CNFDI2 is also becoming much stronger over time (in terms of the BECONS consistency of its relationship with the low FDI outcome), suggesting increased relative embeddedness in those states where it is present.

Results indicate robust high-tech manufacturing states attract efficiency-seeking FDI. While Eren et al. (2019) found faster growth in flexible, anti-union Right-to-Work (RTW) states, this study shows high levels of Korean high-tech FDI are concentrated in non-RTW states, with RTW states often seeing little or no such investment. This indicates that non-RTW states, with higher average wages and possibly more rigid labour markets, may also have higher human capital quality, making them increasingly attractive for high-tech Korean FDI as efficiency motives decline.

Finally, when examining the number of recipes states are associated with, California, Washington and New Jersey are the only states consistently associated with more than one (high presence of FDI), in the post 2000 period suggesting that it is here that presence of high-levels of Korean FDI is becoming most strongly embedded through multiple sets of overlapping reasons. For Massachusetts, this effect is also seen but only for some years. For low FDI, only Florida shows this effect, indicating that absence of high FDI is becoming most strongly embedded for multiple sets of overlapping reasons in this state. Thus, longitudinal analysis indicates that both proposition 5a (The relative strengths of signals of resource-seeking, market-seeking, efficiency-seeking and strategic-technology-asset-seeking will change over time) and 5b (The distribution of FDI amongst the US states will change over time) are supported.

### *6.3. Naming the Recipes*

Following Furnari et al. (2020), we name the recipes to create a Korean high-technology FDI motivation typology, incorporating geographical and temporal elements.

- COFDI1: Coastal-Growing-Weakening. Mixed Strategic Technology and Market not Resource-seeking.
- COFDI2: Coastal-Stable-Embedding high-FDI presence. Mixed Strategic Technology and Efficiency not Resource-seeking.
- CNFDI1: Southern-Growing-Consistent high-FDI absence. Resource not Strategic Technology Seeking.
- CNFDI2: Geographically Broad-Contracting-Embedded high-FDI absence. Efficiency not Strategic Technology or Market-seeking.

## 7. Conclusions

Examination of links between location decisions made by Korean high-technology firms in terms of their location decisions between states within the US enhances our general understanding of the growth and competitiveness of Korean firms, of the relationships between FDI and regional characteristics in "within country" location decisions, and therefore of "the economic structure and dynamic comparative advantage of regions and countries" (Dunning, 1998; 46). The longitudinal analysis identifies a range of enhancements to current understanding of how the FDI motivations and consequently locations of EMMNEs into developed economies, such as those from Korea into the USA, adjust both over time, but also across economic geographies *within the developed economy,* as both the EMMNE's motivations and the economic offering of the location change. Applying Dunning's (1977; 1993) FDI motivations set, conceptualised as sets of complementary/ substituting conditions (recipes) rather than individual motivations, for Korean MNEs investing in the US, we see Korean FDI establishing innovation and production activities in each state according to the *mixture* of economic characteristics of each US state. Furthermore, we identify the relative strengths of these recipes, and their geographic coverage changes over time, identifying changing FDI motivation mixtures both spatially and temporally. We therefore make the following contributions:

Contributing to theoretical knowledge, the results for the general proposition 1, highlight that high levels of Korean high-technology FDI presence into the US *require multiple signals* to work *together, and that multiple combinations of these signals are related to the presence of such FDI*. Results for proposition 2, supporting findings from Curran et al (2017) and Gao and Schaeper (2018) (albeit for) Chinese FDI in the EU context, signals of market-seeking motivation and technology-seeking motivation complement each other to explain presence of high levels of Korean high-technology FDI. Building on cluster-analysis approach of Hollenstein (2009), the results for proposition 4b also show that signals of resource-seeking in the absence of strategic—technology-asset-seeking motivation explain absence of high levels of Korean high-technology FDI. Adding to the literature in this field longitudinally, and supporting proposition 5, the relative strengths of the signals' combinations (recipes), and their geographic coverage amongst US states can be seen to change over time.

The study also identified, however, that contrary to propositions 3a, 3b, and 4a which were based on existing literature such as Baskaran et al. (2017), signals of efficiency-seeking, and strategic-technology-asset seeking motivation complement each other to explain presence of high levels of Korean high-technology FDI, but only when combined with the absence of a market-seeking motive, and signals of efficiency-seeking in the absence of strategic-technology-asset seeking motivation explain the absence of high levels of Korean high-technology FDI, but again only when combined with the absence of a market-seeking motive. Conversely, signals of resource-seeking, and strategic-technology-asset seeking motivation do not explain presence of high levels of Korean high-technology FDI, the absence of a resource-seeking motive being required. This contributes to knowledge of the complexity of FDI decision making in a *within country* context.

Practical and policy implications suggest that government promotion of HE R&D can attract high-tech FDI, but only if it fosters high-tech manufacturing and patenting that enhances private-sector R&D

relative to HE, encouraging strong Korean high-tech FDI presence. Adding to the literature and general knowledge in this area, findings suggest that most states have bypassed the HE R&D driven route altogether, either by already having the requisite conditions for high levels of Korean high-technology FDI presence (e.g. California, Massachusetts), building their offering on efficiency-seeking agglomerations in high-technology manufacturing (e.g. Washington) or strategic-technology-asset seeking (e.g. New Jersey). Only Arizona (post 2000) appears to be trying to use the HE R&D based route (thus far not achieving presence of high levels of Korean high-technology FDI), whilst Georgia has resolutely maintained its HE R&D based non-High R&D performance.

Limitations and directions for future research stem from the findings. Whilst the research has covered an important time period in the development of FDI by Korean EMMNEs, we must also recognise that there is also a likely time-specific nature to these patterns. The presence of high and absence of high levels of Korean high-technology FDI recipes show we are at a moment in history where we evidence a change regarding motivation patterns followed by the Korean development processes. This has important implications for government policy in terms of potential costs and benefits of future home and host countries. Future research could usefully explore the changes that continue to occur over time as Korean high-technology FDI in the US further evolves, which would directly build upon the findings of this study and allow comparisons to be made. This is particularly important for exploring further the role of government policy and its effects on such FDI, Arizona and Georgia being obvious states of future interest in this regard.

From a methodological perspective, we acknowledge that some of the techniques used are in early development and further refinement will be needed in future studies. For example, panel fsQCA demonstrates two issues, i) the fsQCA technique is itself developing, and ii) its ability to track changes in the geography (breadth) and strength (depth) of the recipes over time makes understanding of the ‘workings’ of the technique better, but also highlights the need to maximise clarity. As an example, the consistency value heatmaps are shown for the first time and offer granular information in a clear comparable form but require further refinement for better elucidation.

This study has offered a full fsQCA elucidation. This paper has also illustrated the mechanisms that can provide a unified approach for Korea’s FDI location choice with technological upgrading in the US, scrutinising Korean high-technology FDI motivation in the US to reconceptualise Dunning’s (1993) FDI motivation framework, and show how *combinations* of motivations explain presence or absence of high levels of Korean high-technology FDI.

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**Table1. Theoretical Framework derived from Eclectic Paradigm**

| Concept | Context | Description |
|---|---|---|
| Ownership Advantages | Firm-specific advantages | A firm has advantages that allow multinationalisation to take place |
| Locational Advantages | Country-specific advantages | Host countries have advantages that make FDI optimal |
| Internalisation Advantages | Internal use of advantages | Exploitation of advantages is best undertake by the firm itself |
| Investment Motivation | Market, Resource, Efficiency, Strategic Asset | FDI is motivated by organisational requirements |

**Source: Derived from Wagner (2020)**

**Table 2. Description of conditions and outcomes and sources of data**

| Conditions | | Scale | Proxy for | Example in previous literature | Source of Data |
|---|---|---|---|---|---|
| RGDPPC | GDP per capita | (Log of) GDP per capita in US dollars PPP for each state | Market-seeking | Stone and Jeon (1999); Grosse and Trevino (1996); Tallman (1988); Kyrkilis and Pantelidis (2003); Thomas and Grosse (2001) | OECD statistics |
| HMT | High and medium high-technology manufacturing | High and medium high-technology manufacturing (as % of total manufacturing) for each state | Efficiency Seeking | Kim and Choi (2020); Wang et al. (2020) | OECD statistics |
| PCT | Patent Applications | Patent applications per million population in each state | Strategic-technology-asset Seeking | Driffield and Love (2007); Driffield et al. (2010) | OECD statistics |
| HERD | R&D in Higher Education sector | Total R&D from Higher-education sector/ Total R&D for each state | Resource-seeking | Giammanco and Gitto (2019); Halvorsen (2012) | OECD statistics |
| **Outcome** | | **Scale** | **Proxy for** | **Example in previous literature** | **Source of Data** |
| HT-FDI | Foreign Direct Investment | High-technology total FDI log (Output Variable) for those states where any FDI occurred in that year | Foreign Direct Investment | Driffield et al. (2021); Buckley et al. (2022) | Korean Exporting Import Bank |

* Examples of previous studies where the variable condition / similar was used in same / similar context

**Table 3. Classification of High-Technology Industries / Knowledge-Intensive services**

| | |
|---|---|
| High-technology industries | Pharmaceuticals<br>Aircraft & spacecraft<br>Medical, precision& optimal instruments<br>Radio, television & communication equipment<br>Office, accounting & computing machinery |
| High-technology knowledge-intensive services | Post and telecommunications<br>Computer and related activities<br>Research and Development |

**Table 4. Description of cases based on original values (top), fuzzy membership values (middle) and strong membership label[3] (bottom)**

| Sample | RGDPPC | HMT | PCT | HERD | HT-FDI |
|---|---|---|---|---|---|
| **Interval scale** | 10.405 | 0.352 | 39.900 | 0.210 | 6.555 |
| | 10.273 | 0.497 | 117.400 | 0.138 | 11.873 |
| | 10.695 | 0.503 | 275.700 | 0.096 | 10.214 |
| **Fuzzy membership score** | 0.118 | 0.089 | 0.050 | 0.685 | 0.349 |
| | 0.035 | 0.675 | 0.275 | 0.393 | 0.959 |
| | 0.684 | 0.713 | 0.821 | 0.164 | 0.883 |
| **Strong membership** | 0 | 0 | 0 | 1 | |
| | 0 | 1 | 0 | 0 | |
| | 1 | 1 | 1 | 0 | |

**Table 5. Details of necessity-based consistency values**

| Necessity | Consistency | |
|---|---|---|
| Condition | Outcome | Not-outcome |
| RGDPPC | 0.734 | 0.615 |
| HMT | 0.734 | 0.606 |
| PCT | 0.725 | 0.626 |
| HERD | 0.525 | 0.800 |
| Not-Condition | Outcome | Not-outcome |
| ~RGDPPC | 0.613 | 0.716 |
| ~HMT | 0.639 | 0.682 |
| ~PCT | 0.545 | 0.786 |
| ~HERD | 0.658 | 0.649 |

[3] Strong membership labelling is based on 0 (has fuzzy membership value < 0.5) and 1 (has fuzzy membership value ≥ 0.5).

**Table 6. Truth table and frequency and consistency threshold implications**

| Cnfg | RGDPPC | HMT | PCT | HERD | No. | Consistency \| PRI score | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **HT-FDI** | | **~HT-FDI** | |
| ~~1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~5~~ | ~~0.853~~ | ~~0.481~~ | ~~0.861~~ | ~~0.509~~ |
| 2 | 0 | 0 | 0 | 1 | 24 | 0.691 | 0.249 | **0.881** | 0.712 |
| ~~3~~ | ~~0~~ | ~~0~~ | ~~1~~ | ~~0~~ | ~~8~~ | ~~0.884~~ | ~~0.557~~ | ~~0.853~~ | ~~0.44~~ |
| ~~4~~ | ~~0~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~4~~ | ~~0.891~~ | ~~0.528~~ | ~~0.878~~ | ~~0.472~~ |
| 5 | 0 | 1 | 0 | 0 | 11 | 0.785 | 0.417 | **0.839** | 0.564 |
| 6 | 0 | 1 | 0 | 1 | 17 | 0.751 | 0.366 | **0.856** | 0.634 |
| 7 | 0 | 1 | 1 | 0 | 12 | **0.862** | 0.574 | 0.813 | 0.426 |
| ~~8~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~1~~ | ~~3~~ | ~~0.884~~ | ~~0.533~~ | ~~0.867~~ | ~~0.467~~ |
| ~~9~~ | ~~1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~7~~ | ~~0.858~~ | ~~0.439~~ | ~~0.874~~ | ~~0.502~~ |
| 10 | 1 | 0 | 0 | 1 | 11 | 0.784 | 0.316 | **0.885** | 0.637 |
| 11 | 1 | 0 | 1 | 0 | 18 | **0.871** | 0.627 | 0.779 | 0.363 |
| ~~12~~ | ~~1~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~2~~ | ~~0.893~~ | ~~0.542~~ | ~~0.874~~ | ~~0.458~~ |
| 14 | 1 | 1 | 0 | 1 | 10 | 0.831 | 0.472 | **0.844** | 0.512 |
| 15 | 1 | 1 | 1 | 0 | 24 | **0.854** | 0.657 | 0.711 | 0.323 |
| ~~16~~ | ~~1~~ | ~~1~~ | ~~1~~ | ~~1~~ | ~~5~~ | ~~0.885~~ | ~~0.542~~ | ~~0.864~~ | ~~0.458~~ |
| FsQCA threshold details | | Frequency Threshold ≥ 9 | | Consistency Threshold ≥ 0.832 | | 3 (54) | | 5 (73) | |
| Cnfg | RGDPPC | HMT | PCT | HERD | No. | Consistency \| PRI score | | | |
| | | | | | | **HT-FDI** | | **~HT-FDI** | |
| ~~1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~5~~ | ~~0.853~~ | ~~0.481~~ | ~~0.861~~ | ~~0.509~~ |
| 2 | 0 | 0 | 0 | 1 | 24 | 0.691 | 0.249 | **0.881** | 0.712 |
| ~~3~~ | ~~0~~ | ~~0~~ | ~~1~~ | ~~0~~ | ~~8~~ | ~~0.884~~ | ~~0.557~~ | ~~0.853~~ | ~~0.44~~ |
| ~~4~~ | ~~0~~ | ~~0~~ | ~~1~~ | ~~1~~ | ~~4~~ | ~~0.891~~ | ~~0.528~~ | ~~0.878~~ | ~~0.472~~ |
| 5 | 0 | 1 | 0 | 0 | 11 | 0.785 | 0.417 | **0.839** | 0.564 |

**Table 7. Sufficiency analysis results from consideration of, RGDPPC, HMT, PCT and HERD conditions against the presence (HT-FDI) and absence (~HT-FDI) of high HT-FDI.**

| **Conditions** | **HT-FDI** | | | | |
|---|---|---|---|---|---|
| | **HT-FDI** | | | **~HT-FDI** | |
| **Complex Solution** | **COFDI1** | **COFDI2** | | **CNFDI1** | **CNFDI2** |
| *Market-seeking* (RGDPPC) | ● | | | | ⊖ |
| *Efficiency Seeking (*HMT) | | ● | | | ● |
| *Strategic-Technology-Asset Seeking* (PCT) | ⬤ | ⬤ | | ⊖ | ⊖ |
| *Resource-seeking* (HERD) | ⊖ | ⊖ | | ● | |
| Configurations (In strong membership terms) | 11 15 | 7, 15 | | 2, 6, 10, 14 | 5, 6 |
| Consistency* | 0.816 | 0.845 | | 0.805 | 0.834 |
| PRI score* | 0.628 | 0.668 | | 0.649 | 0.625 |
| Raw Coverage* | 0.584 | 0.569 | | 0.613 | 0.453 |
| Unique Coverage* | 0.093 | 0.078 | | 0.264 | 0.105 |
| Solution Consistency, PRI score, Coverage | 0.813, 0.641, 0.662 | | | 0.800, 0.642, 0.717 | |

* The consistency and coverage values are over the whole data set of cases (not just from those configurations shown associated in strong membership terms. Parsimonious solution measures are also available like those given for the complex solutions in above table.

**Figure 1. Scoping Theoretical framework of the research: Building Korean location choice in the US**

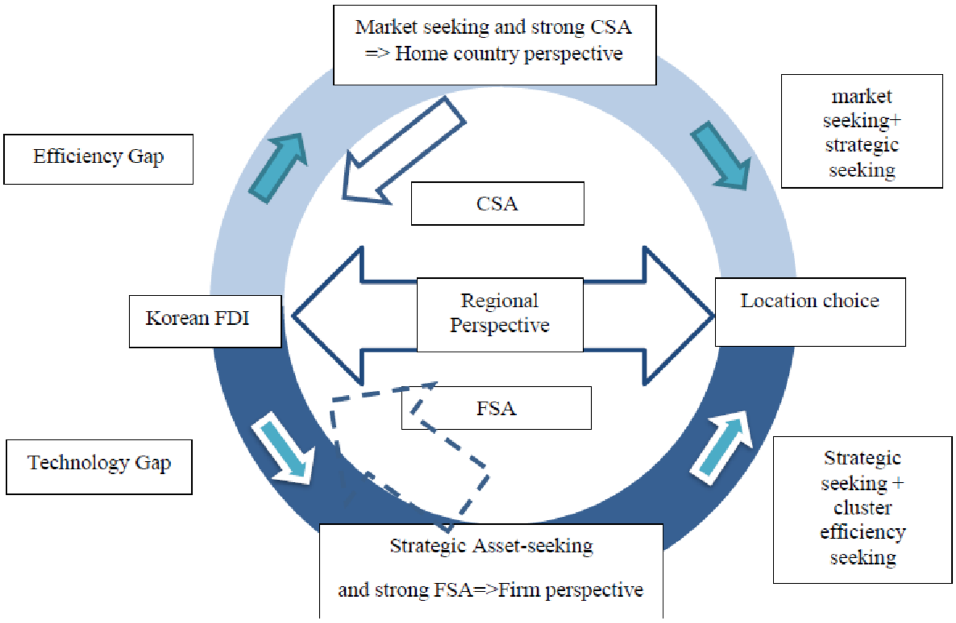


**Figure 2. Linking Framework**

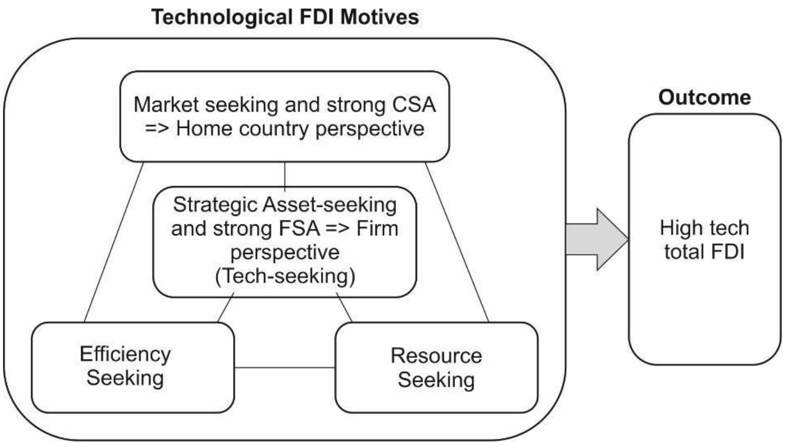

**Figure 3. Map of Included States (with number of inclusions over considered years)**

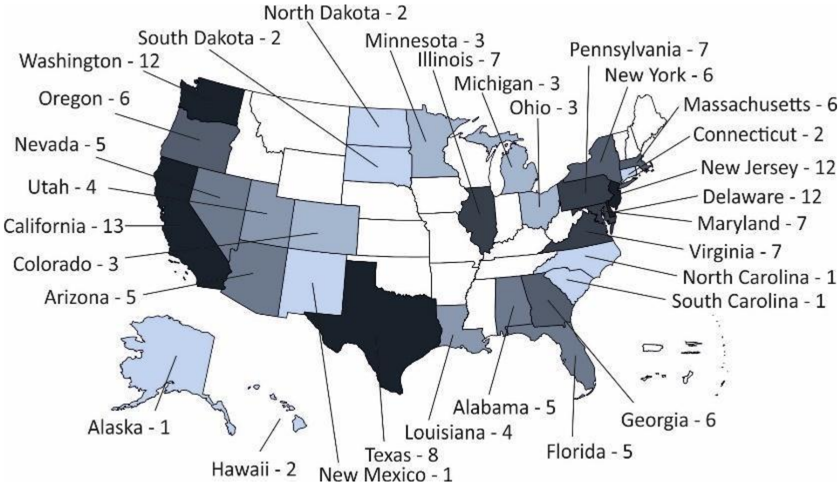


**Figure 4. Boxplot representation of condition and outcome values over the separate years**

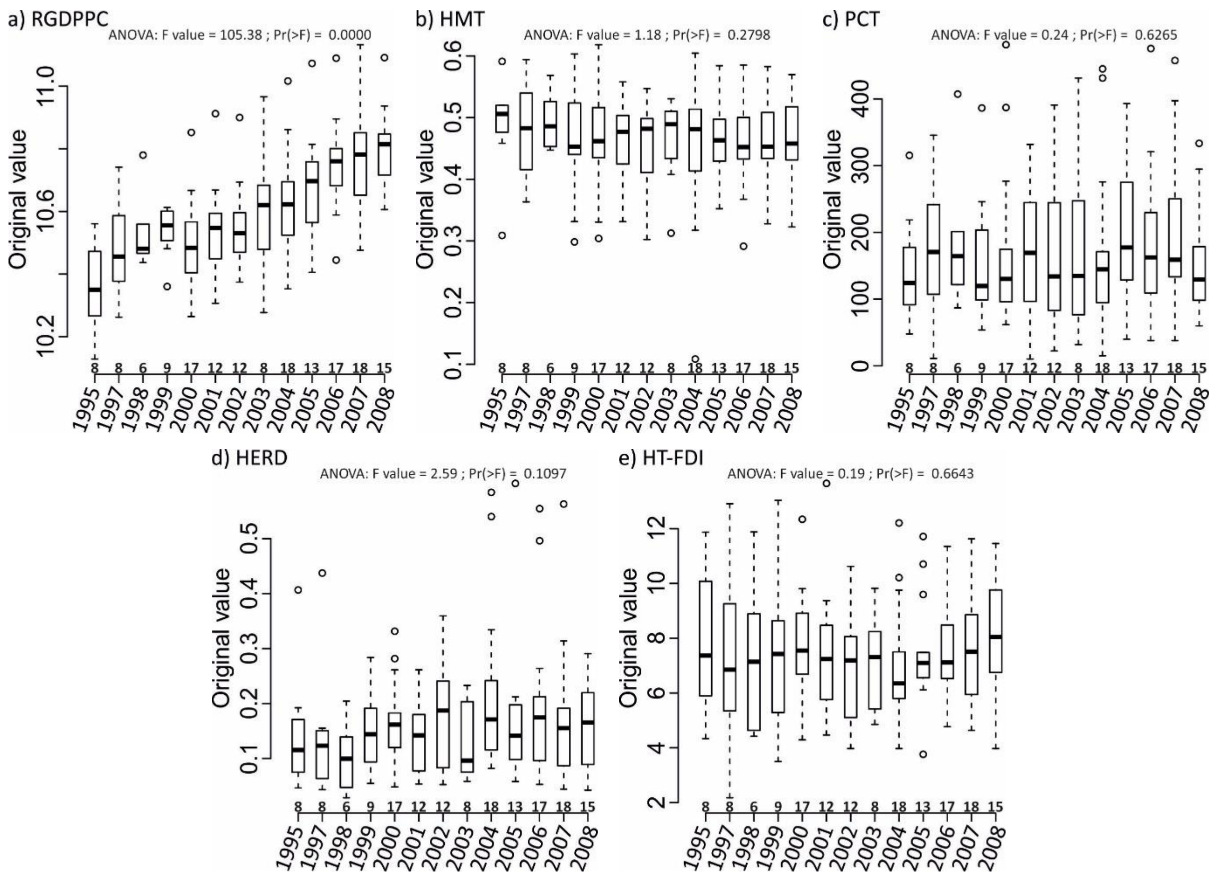

**Figure 5. Visualisation of calibration of conditions and outcome (using Direct method)**

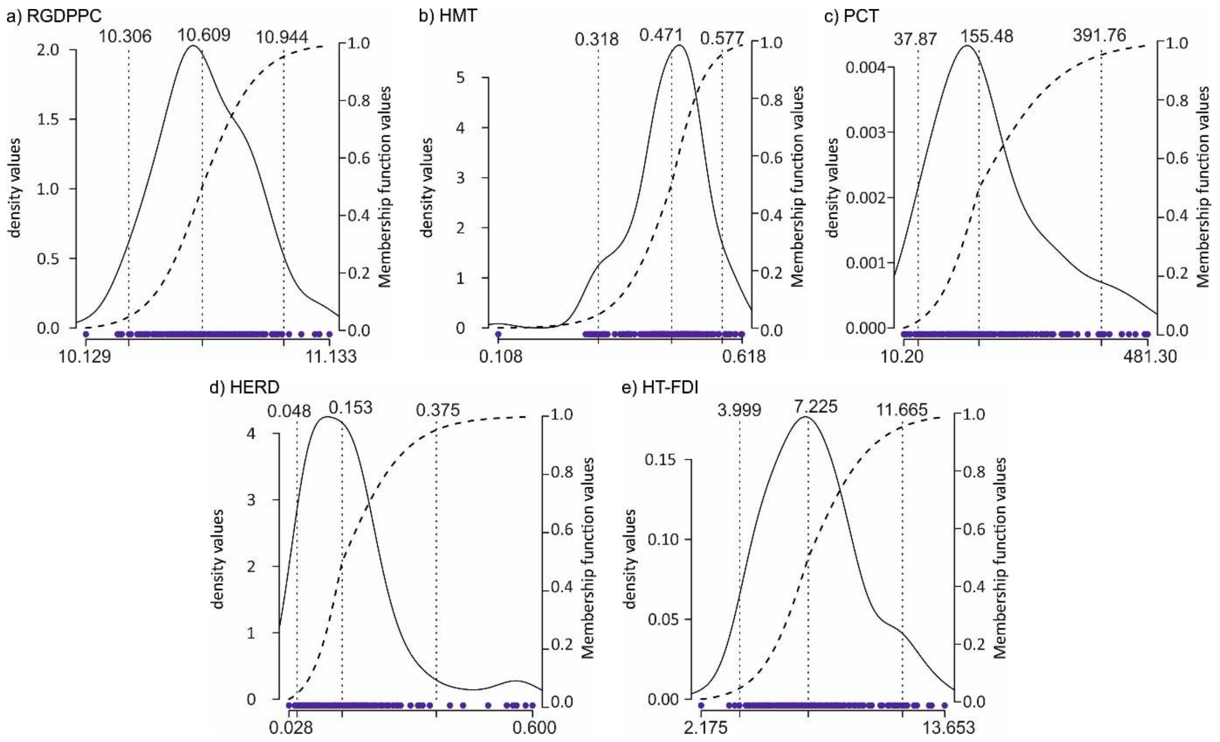


**Figure 6. Details of necessity-based consistency values**

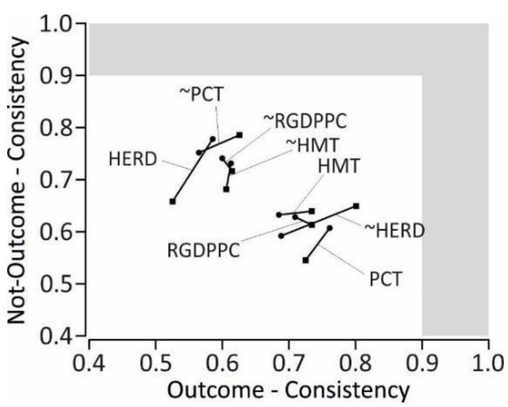

**Figure 7. Graphical evidence to elucidation of required frequency and consistency threshold values**

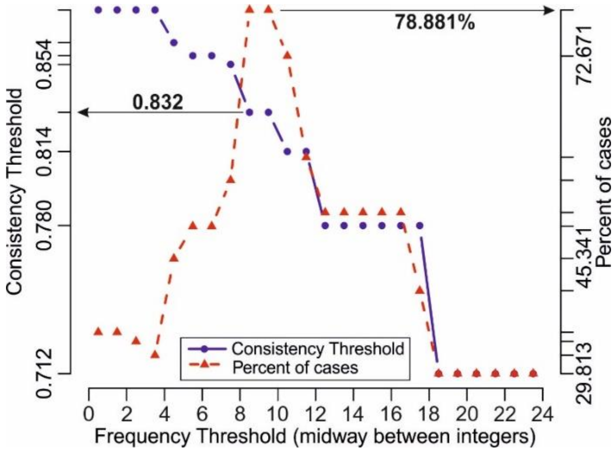


**Figure 8. States considered (1995 through to 2008)**

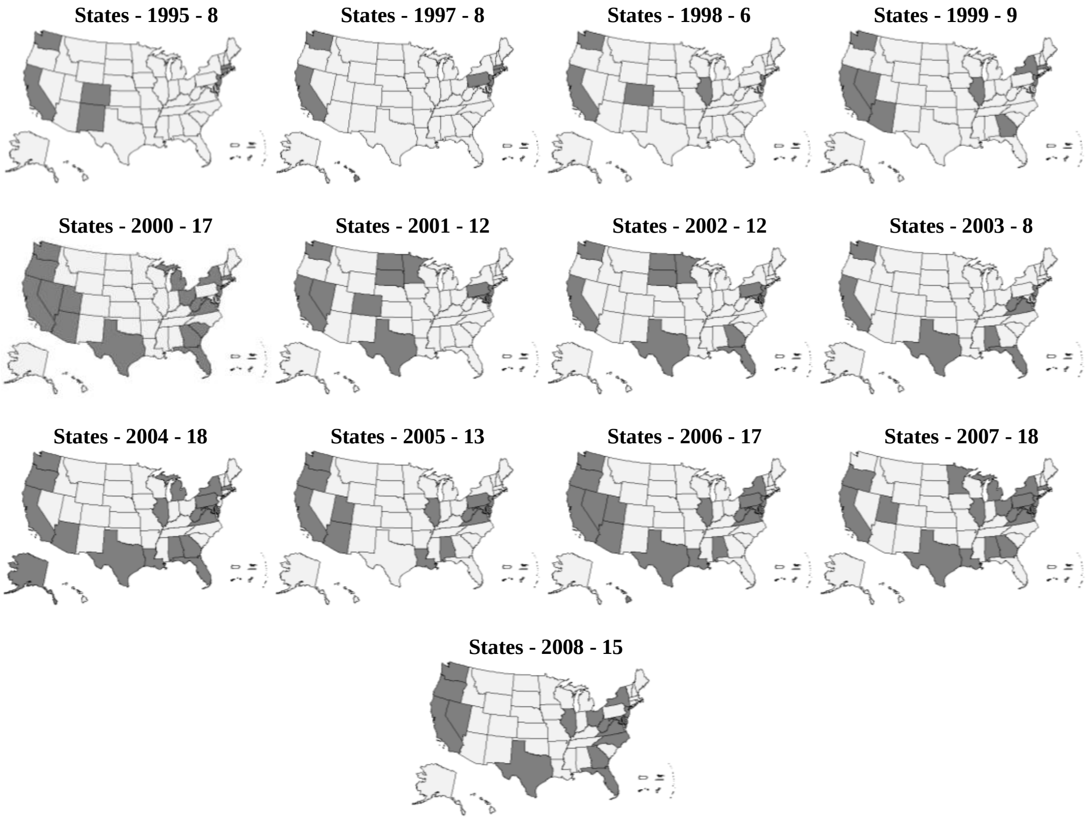

**Figure 9. Presence of High HT-FDI - BECONS**

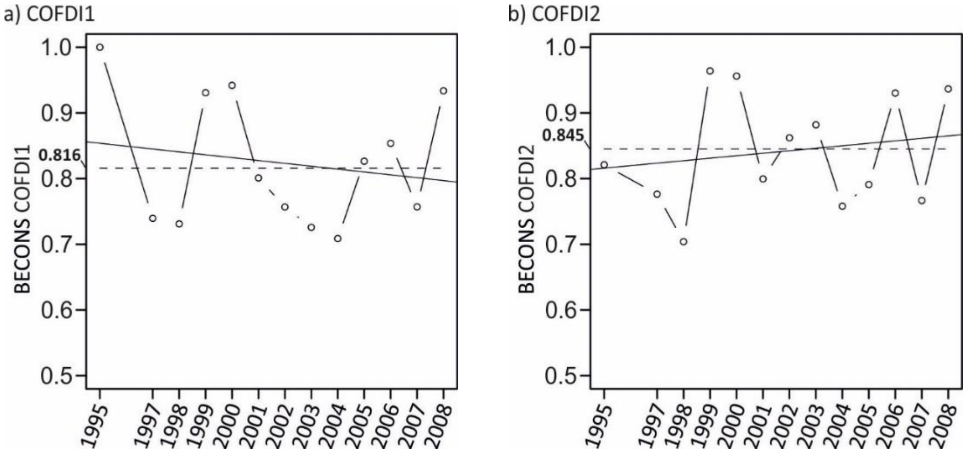


**Figure 10. Presence of High HT-FDI - WICONS**

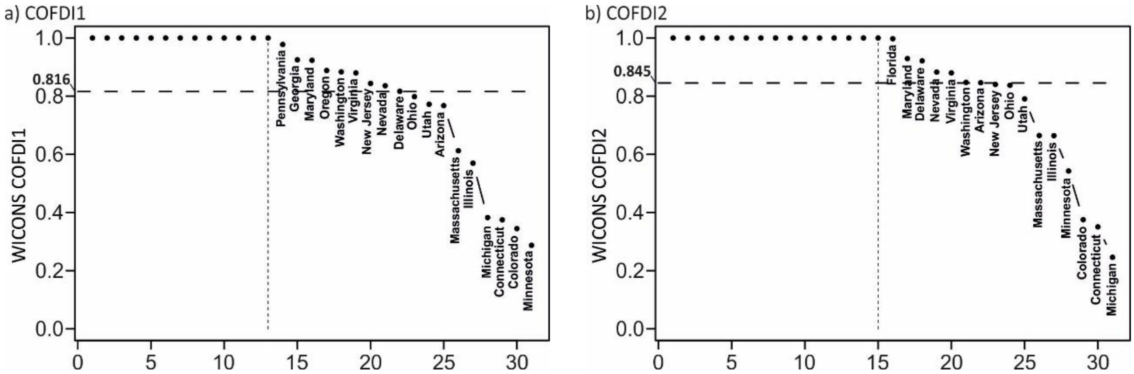


**Figure 11. COFDI1 (left) and COFDI2 (right) recipes' heatmaps of state-year observation consistency values**

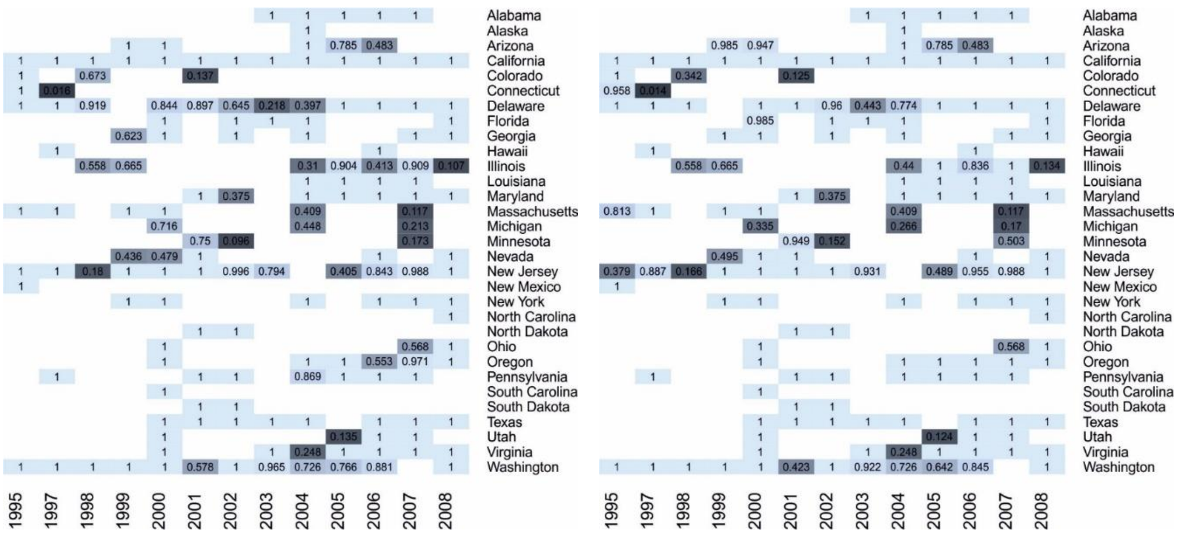

**Figure 12. Absence of high HT-FDI - BECONS**

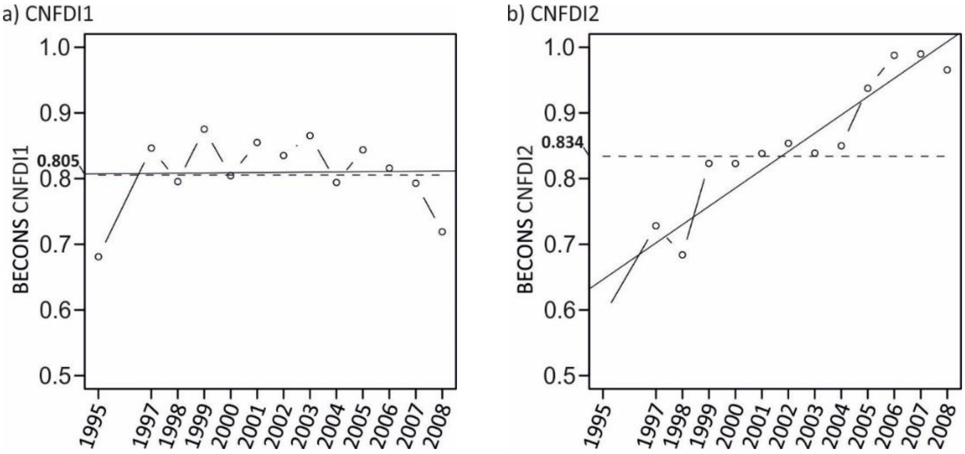


**Figure 13 Absence of high HT-FDI WICONS**

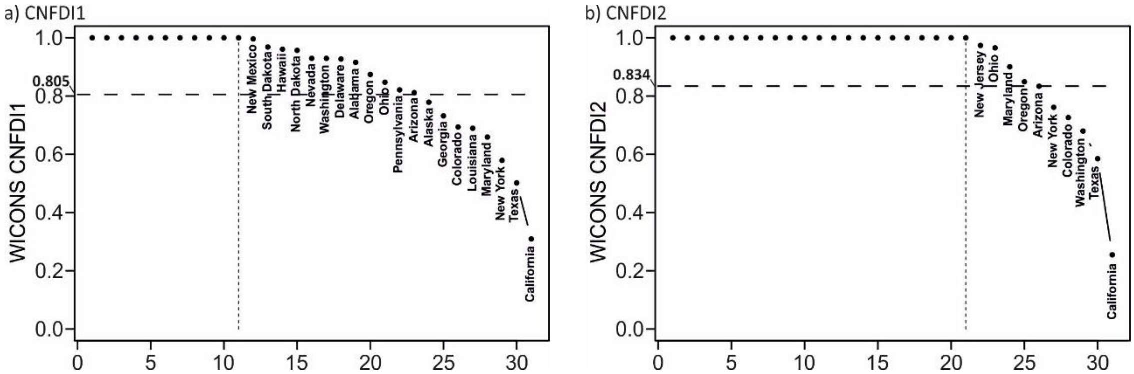


**Figure 14. CNFDI1 (left) and CNFDI2 (right) recipes' heatmaps of state-year observation consistency values**