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China's technological catch-up through foreign IP acquisitions: Disaggregating the effects of cross-national distance

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ABSTRACT

While the effects of proximity on the technological catch-up of emerging economy firms are well documented, little is known about how the sub-dimensions of cross-national distance impact such firms' acquisition of foreign IP. Cross-national distance is a complex, multi-dimensional construct that has the potential to influence catch-up in different ways, especially for Chinese firms. We use the established Wharton indicators of cross-national distance (Berry et al., 2010) to understand foreign IP acquisition by Chinese firms over a 10-year period. Results show: (1) different sub-dimensions of distance have different direct effects on foreign IP acquisition, (2) a positive effect of knowledge distance on IP acquisition interacts with three other forms of distance, (3) the most aggressive foreign IP acquisition strategies are linked to only three forms of distance, and (4) the impact of disaggregated distance depends on IP asset type and whether the acquirer is in manufacturing or services. Results provide new insight into China's technological catch-up and the complex, multi-dimensional nature of international proximity influencing technological catch-up through acquisitions.

1. Introduction

It is well documented how Chinese firms have sought technological catch-up by acquiring intellectual property (IP)-based assets created by firms in other countries (Li and Valentini, 2023; Nepelski and Prato, 2015). Indeed, a growing literature suggests that cross-border merger and acquisition (M&A) activities have been driven by firms seeking favorable IP[1] rights protection (e.g., Alimov and Officer, 2017; Wang et al., 2023). Advanced countries with established national innovation systems and institutions have been a target for late-entrant emerging economy firms traditionally lacking technology advantages (Buckley and Hashai, 2014). Weaker IP regimes have made it more difficult for emerging economy firms to catch up with developed economy firms through imitation (Xiao et al., 2013), leading to catch up through IP acquisition strategies in various industries, including flat panel displays (Yu et al., 2020) and telecommunications (Mu and Lee, 2005). Such strategies are aimed at accelerated learning and capability-building (Malerba and Nelson, 2011), whilst reducing the gap with developed economy incumbents in terms of global market share (Lee and Malerba, 2017).

In the case of China, because *foreign* IP has been vital for the country's technological catch-up, the issue of how cross-national distance has affected the IP acquisition by its firms is important to understand. Catch up scholars have paid limited attention to cross-national distance. Commonly examined has been geographic proximity and technological catch-up (Chen et al., 2012; Griffith et al., 2009; Li and Valentini, 2023). Evidence suggests that cross-border geographic distance has not prevented Chinese entities from acquiring IP rights over inventions created by inventors in distant countries (Nepelski and Prato, 2015). Differences in institutional quality have also been examined; this is seen as a factor behind latecomers' technology transfer from advanced economy firms (Manca, 2010). A wider range of dimensions of proximity, including cognitive, organizational, social, and institutional, have been discussed with respect to innovation, although not on a cross-border basis (Boschma, 2005; Lopolito et al., 2022). As Boschma (2005) notes: "… the importance of geographical proximity cannot be assessed in isolation, but should always be examined in relation to other dimensions of proximity that may provide alternative solutions to the problem of coordination" (p. 61).

Overall, the catch-up literature has stressed how IP acquisitions by

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[1] Intellectual property (IP) refers to the general rights that incorporate patents, copyrights, trademarks, and allied rights (Cornish and Llewelyn, 2003).

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emerging economy firms have been occurring over larger and larger distances. Despite this, the complex nature of cross-national distance, and particularly its disaggregated dimensions, has not been adequately addressed in the technological catch-up literature (Asimakopoulos et al., 2023; Capone, Li and Malerba, 2021; Kashani et al., 2022). Nepelski and Prato (2015) state that "It is worth noting that the notion of distance has been extended over time and ranges from geographic distance to economic, technological or cultural proximity" (p. 14), while limiting their treatment of distance to just the geographic dimension. The catch-up literature does not discuss the broad range of distances that emerging economy firms must overcome as they identify, conduct due diligence, and invest in foreign markets for IP acquisition. Our research question is: *How do the disaggregated dimensions of cross-national distance influence the proclivity of Chinese firms to acquire IP assets in foreign countries?*

We address this by following advances in the international business (IB) field relating to sub-dimensions of cross-border distance. We draw on the work of Berry et al. (2010) and disaggregate the construct of distance into nine sub-dimensions using the established Wharton-defined measurement.[2] Our sample consists of Chinese firms' international M&A deals (the 'deals') completed over ten years between 2006 and 2015 as they acquired target firms possessing varying levels of IP. Results reveal that multidimensional cross-national distances play a significant role in China's technological catch-up through the acquisitive behaviour of its firms. We find: (1) different forms of distance have different effects on China's IP acquisition (including positive effects for knowledge, political, and cultural distances), contradicting the widely held view that cross-national distance deters foreign direct investment (FDI) because of transaction, coordination, and knowledge transfer costs (Berry et al., 2010; Buckley et al., 2023; Hutzschenreuter et al., 2016) and lack of proximity advantages (Capone et al., 2021; Frey et al., 2015; Kashani et al., 2022); (2) that knowledge distance – arguably the most important form of difference when it comes to technological IP acquisition – is moderated by other forms of distance (political, demographic and global connectedness distances), underlining calls to explore the interaction of disaggregated distance measures (Hutzschenreuter et al., 2016); (3) that only three forms of distance (knowledge, political and cultural distances) are relevant to the most aggressive Chinese IP deals, and (4) differential effects of distance according to IP type (patents vs trademarks) and firm type (manufacturing vs services).

Our study makes the following contributions. First and foremost, it brings the multi-dimensional nature of proximity to the fore when we consider the phenomenon of technological catch-up through *international* IP acquisition. Disaggregating cross-national distance is needed when approaching the phenomenon of catch-up for Chinese latecomers. Our study provides a more nuanced understanding of Chinese firms' foreign IP asset seeking behavior through the lens of proximity as a disaggregated, multi-dimensional construct. Second, we reflect on the established Wharton-defined indicators of cross-national distance (Berry et al., 2010) and the general assumption that cross-national distance is a deterrent because of increasing risk and raising transaction and coordination costs for latecomer firms. We find that certain distance dimensions (knowledge, political and cultural distances) are in fact a basis for China's catch-up and should be seen as sources of opportunity rather than as sources of risk. Third, we identify boundary conditions against which various forms of distance apply when it comes to China's foreign IP acquisition. We show how these boundary conditions provide additional complexity as we consider the effect of international proximity on technological catch-up by Chinese firms.

[2] The nine dimensions are: economic, financial, political, administrative, cultural, demographic, knowledge, global connectedness, and geographic distance. In line with Zhou and Guillén (2016) we drop two dimensions in the final modelling that had correlation coefficients over 0.7 with other dimensions (financial distance and geographic distance).

2. Background

2.1. The problem of distance in relation to China's IP asset acquisition

Cross-national distance refers to how different two countries are from one another (Beugelsdijk et al., 2018; Hutzschenreuter, Kleindienst & Lange, 2016). Hutzschenreuter et al. (2016) systematically reviewed distance-related research over the past four decades, finding that distance (1) negatively influences market selection, (2) is associated with lower commitment entry modes, (3) is negatively linked to performance outcomes, and (4) is problematic for cross-national knowledge transfer. However, as the authors report, results have been inconsistent and contested. Indeed, some argue that existing research may overstate the negative effects associated with cross-national distance while understating its beneficial role in cross-border business activities (Stahl et al., 2016). As Hutzschenreuter et al. (2016) point out, managers may be subject to over-estimation problems when considering closer countries, while making better decision-making when considering distant ones. Cross-national differences do bring difficulties, expenses, and risks to firms, but also advantages, opportunities, and benefits. The former are related to miscommunication, agency issues, and discrimination-related costs, while the latter are associated with learning opportunities, creative problem-solving, and incentives for seeking more valuable assets and fostering innovation.

There are two areas of interest as far as China's catch up via IP asset acquisition is concerned. These relate to: (1) whether there is a deterring effect of distance, and (2) that distance is a multidimensional construct. Firstly, the IB literature argues that cross-national differences increase uncertainty and risks associated with cross-border operations (Buckley et al., 2023; Hutzschenreuter et al., 2016). These differences raise transaction costs, coordination issues, and knowledge transfer problems when the host country is institutionally, geographically, and culturally distant from the home country (Johanson and Vahlne, 1977; 2009). These distances are assumed to disrupt information flows between market and firm, creating a liability of foreignness (LOF), i.e., "*all additional costs* a firm operating in a market overseas incurs that a local firm would not incur" (Zaheer, 1995:342–343) (emphasis added). However, when we consider China's catching-up through acquisition of foreign technology, recent research shows that a motive for acquiring IP assets abroad (technologies and brands) has been strategic in nature, for instance, to strengthen Chinese business groups (Shi et al., 2021) or enhancing labor productivity (Li and Valentini, 2023). Case data suggests that Chinese firms are not deterred by distance when undertaking strategic foreign acquisitions. For instance, the case of Geely's acquisition of Volvo (Zheng, Noorderhaven and Du, 2022) shows that Geely recognized and managed external and internal legitimacy deficits associated with distance between China and Sweden.

Secondly, there has been an over-emphasis on only one – or a very few – dimension(s) of cross-national distance in much IB work, such as cultural distance (Drogendijk and Slangen, 2006) or geographic distance (Buckley et al., 2007). Some studies on the benefits of international R&D sourcing for learning and capability development do not control for cross-national distance (Asimakopoulos et al., 2023), or focus on geographic diversity instead of other forms of diversity related to different types of distance (Jacob et al., 2023). This is problematic when considering China's technological catch-up because various types of cross-national distance influence firms as they seek foreign IP assets, especially those related to the institutional environment for knowledge creation (Lee et al., 2013; Manca, 2010). Berry et al. (2010: 1461) note: "Defining and measuring cross-national distance along multiple dimensions is important because different types of distance can affect firm, managerial or individual decisions in different ways, depending on the dimension of distance under examination". Berry et al.'s (2010) multidimensional measures disaggregate the construct of cross-national distance into economic, financial, political, administrative, cultural, demographic, knowledge, global connectedness, and geographic

distance. Their operationalization has been used in research on Chinese firms' internationalization activities (Lu et al., 2014; Zhou and Guillén, 2016), without any meaningful consensus to date. Cross-national distance has clearly mattered to Chinese firms' acquisition decisions, but how the sub-dimensions influence foreign IP asset acquisition has not been addressed in neither IB nor catch-up literature (Li and Valentini, 2023).

2.2. Exploring sub-dimensions of cross-national distance in the context of China's technological catch up

2.2.1. Knowledge distance

Knowledge distance is the difference between countries in terms of their capacity to create knowledge and innovate, captured by differences in patents and scientific production (Berry et al., 2010). From a catch-up perspective, knowledge distance is arguably the most important form of distance as IP assets are intrinsically knowledge based. Technological catch up occurs when there is knowledge distance between two contexts; it is a relative construct (Li and Valentini, 2023). As knowledge distance increases between China and a foreign country, Chinese firms will find a greater abundance of sources for the potential acquisition of IP. Because developed nations have a higher educated workforce and stricter IP protection than emerging nations, IP will more readily be found in the former (Chung and Yeaple, 2008). Scholars note this is important for emerging economy firms as they strive to compete internationally (Child and Rodrigues, 2005; Ciabuschi et al., 2017; Kedia et al., 2012; Luo and Tung, 2007). Xu et al. (2022) find that Chinese manufacturers tend to have more foreign R&D activity in countries where there is a larger knowledge distance from China. Countries that have a greater capacity for creating technological IP are also able to build brand-based IP that becomes well-recognized globally. Examples include IBM personal computers (originally from the US), Land Rover (UK), and Volvo (Sweden), and we note that these were all acquired by emerging economy firms over large knowledge distances.

2.2.2. Political distance

Political distance is the difference in the nature of the political system between countries. Berry et al. (2010) use five indicators: policy-making uncertainty, democracy score, size of the state (government consumption & GDP), world trade agreements (membership in WTO), and regional trade agreements (dyadic membership in the same trade bloc). Zhou and Guillén (2016) note how host country governments can be hostile towards foreign acquirers for political reasons. With a large political distance, the host country's government is more likely to impose rules or regulations to hinder or ban foreign firms' acquisition deals. Citing national security concerns, the American government did not approve the acquisition of 3leaf by Huawei (Zhou and Guillén, 2016). Indeed, political distance may encourage Chinese firms to set up subsidiaries or foreign R&D centers that recruit and employ local talent. This happened in the case of Huawei in the US (Schaefer, 2020; Zhou and Guillén, 2016). Higher political distance from China can indicate a host country with long-established open science policies and a political environment conducive to competition and innovation through open science (Partha and David, 1994), such countries being attractive to IP asset-seeking Chinese firms.

2.2.3. Cultural distance

Cultural distance is the difference between countries regarding cultural values and social norms. It has been the most used indicator of distance in IB research (Hutzschenreuter et al., 2016). A considerable cultural distance between China and the West has long been recognized by national culture scholars (e.g., Hofstede and Bond, 1988; Li and Scullion, 2006). Larger cultural distances may cause conflicts between headquarters and newly established or acquired subsidiaries (Contractor et al., 2014). Indeed, Buckley et al. (2007) find that cultural familiarity (i.e., lower distance) between China and the host country had a significant positive effect on Chinese FDI into the host country in the 1980s and 1990s. However, cultural distance may also facilitate the acquisition of culturally oriented and brand-based IP assets such as trademarks. For example, Shanghai-based Bright Food Group bought Weetabix, a leading British cereal brand, although Bright Food eventually sold it to a US company (Shi et al., 2021). Chinese acquirers such as Haier or Geely have been targeting brand-based IP assets to penetrate the European market and become more internationally competitive in new markets. However, cultural distance can magnify perceived uncertainties and risks regarding how internal routines, procedures, and management practices can be transferred across locations. This could result in Chinese firms seeking to exploit IP assets in the local context rather than in China. Also, cultural distance can impact the later stages of the integration process post-acquisition (Liu and Woywode, 2013). Potential conflicts could arise in the integration and transfer process between the acquirer and target firm when they originate from diverse cultural environments. Chinese firms might be less likely to acquire IP assets when they perceive potential problems at the integration and transfer stage.

2.2.4. Administrative distance

Administrative distance is the difference between countries in terms of common language, legal and religious institutions (Berry et al., 2010). Regarding legal frameworks (e.g., IP rights, company law), scholars suggest that China historically differed greatly from advanced Western countries (Li and Scullion, 2006). But there are other indicators for administrative distance as well: the colonizer-colonized link, common language, and common religion (Berry et al., 2010). These are also likely to differ greatly between China and advanced Western countries containing IP assets. Administrative distance goes beyond national political systems; formal and informal institutional arrangements are not simply a political reflection of the nation-state. When there are close colonizer-colonized links, pre-acquisition and post-integration costs for Chinese firms would be lower. With a lower administrative distance between China and a host country, there may be less cost for firms exploiting acquired IP assets and transferring acquired assets to China. Bresman, Birkinshaw and Nobel (1999) suggest that effective communication – as would be enabled with common language - supports knowledge transfer in international acquisitions. On the other hand, higher administrative distance can increase governance costs, which may mitigate the efficiency of acquired knowledge transfer during international strategic asset-seeking projects (Zhou and Guillén, 2016). Acquiring firms may suffer potential difficulties due to distant religious and legal systems which hinder the transfer of related IP assets.

2.2.5. Demographic distance

Demographic distance refers to the population characteristics of countries and determines consumption behaviour and market processes. Berry et al. (2010) include four indicators: life expectancy, birth rate, population under 14, and population under 65. These indicators are associated with the target country's market attractiveness and growth potential. Emerging economy firms catch up with developed economy rivals through acquisition of foreign brands and trademarks (Frey et al., 2015; Petersen and Seifert, 2014) which are sensitive to demographic characteristics of the country. As demographic distance increases, Chinese firms might be attracted to the acquisition of new types of brand-based assets that can later be developed for marketing in China. While Zhou and Guillén (2016) find a negative link between demographic distance and market seeking activities by Chinese firms, the result for strategic asset seeking projects is not unequivocal. Chinese firms have been keen to catch up by understanding Western consumer behaviours in countries with a high demographic distance from China.

2.2.6. Economic distance

Economic distance relates to differences in consumer purchasing power, macroeconomic stability, and economic openness to outsiders

(Berry et al., 2010). It is usually measured by the income level (i.e., GDP per capita), inflation rates, and trade intensity. These indicators are correlated with consumer purchasing power, macroeconomic stability, and the country's economic openness (Berry et al., 2010). Lu et al. (2014) find that economic distance has a positive effect on Chinese firms' new subsequent entries into countries. Brand-based IP asset-seeking behavior will be correlated with economic distance from China when there is strong consumer purchasing and economic openness in the host country. Chinese firms will seek technology-based asset seeking activities in more economically developed countries with higher levels of economic openness to mitigate latecomer disadvantages in technological leadership (Luo and Tung, 2007; Zheng et al., 2022).

2.2.7. Global connectedness distance

This dimension of distance refers to the difference between one country's connectedness with the rest of the world to that of another country. It reflects residents' and companies' abilities to communicate with other parts of the world. Global connectedness matters for innovation systems and any country's ability to generate and sustain IP assets. It allows the fertile development of industrial clusters for producing IP (Turkina and Van Assche, 2018), which is based on co-inventor interactions with knowledge sources worldwide (Lee, Mudambi and Cano-Kollmann, 2016). Three indicators, including international tourism expenditure (%GDP), international tourism receipts (%GDP) and internet use (per 1000 people), were used by Berry et al. (2010). Lu et al. (2014) find no statistically significant effect of connectedness distance on the propensity of Chinese firms to invest in new subsequent entries in host countries. It is unclear whether a Chinese firm would see a target country as a source for IP acquisition when there is a greater the difference in terms of global connectedness between China and the country containing IP assets for potential acquisition.

2.2.8. Geographic distance

This relates to the great circular distance between the geographic centers of countries (Berry et al., 2010) or capital cities (Hutzschenreuter et al., 2016). The innovation literature has stressed the importance of geographic proximity to learning and capability development for innovation (Amin and Wilkinson, 1999). However, we note that Buckley et al. (2007) find no significant effect of geographic distance on Chinese outward FDI. We also take note of Hutzschenreuter et al.'s (2016) observation that few studies in distance related IB research have used geographic distance. While proximity can enhance the spillover effects and closeness to knowledge sources can determine firms' international catch-up decisions (Berry, 2006; Chen, Li, and Shapiro, 2012; Li and Valentini, 2023), the advanced countries that would matter most to China's technological catch up through IP acquisition are not geographically close. Indeed, Nepelski and Prato (2015) find that Chinese firms choose geographically distant countries for technology-based IP acquisitions, although the geographic distance impedes their technology flow from China to the rest of the world.

2.2.9. Financial distance

Financial distance relates to differences between two countries in terms of the development of their respective financial sectors (Berry et al., 2010). It is measured through items such as private credit, stock market capitalization and listed companies. Berry et al. (2010) find a negative effect of financial distance on foreign market entry by US firms, although this is not significant for firms with prior experience in the host country. Capron and Guillén (2009) find differences in shareholder rights between the acquirer country and the target country to be positively linked to post-acquisition target firm restructuring. Development of financial systems will correlate with the overall economic and institutional development levels of countries, and therefore, we may expect an overlap in this dimension with that of economic and institutional distance.[3] That said, more-developed financial systems in the target country compared to China may allow increased transparency for assessing potential targets containing IP assets and this could be useful for Chinese acquirers.

3. Data and methodology

3.1. Data collection

The time frame for our data was 2006–2015. 2006 was chosen as the start point as this is when the Chinese central government expanded the country's "going out" strategy (zouchuqu, 走出去 in Chinese), with policy to support FDI and cultivate China's private sector firms through cross-border M&As, equity participation, listings, and corporate reorganization. The end point for our analysis was up to and including 2015 because, since 2016, the Chinese government tightened regulations to regulate capital flows, leading to a dramatic fall in FDI outflows for M&A (Textor, 2022).[4] Given these policy shifts relating to the context for acquisitions, we used data on Chinese foreign M&A deals completed between 2006 and 2015.

The Thomson One Banker (TOB) database provides global M&A data and has been widely used by scholars exploring Chinese firms' internationalization (e.g., Nicholson and Salaber, 2013; Tao et al., 2017; Zhang et al., 2011). After we obtained target firms and Chinese acquirers from the TOB database, we matched names in Orbis to capture firm-level details, including target firms' numbers of patents and trademarks at the time of the deal, as well as Chinese acquirers' patent and trademark stock, financial performance, age, and ownership information. Orbis has been widely used in international IP studies due to its global coverage. The final sample was 697 valid observations of Chinese acquisitive deals of foreign firms with IP assets.

3.2. Variables

3.2.1. Dependent variables

Researchers have used different proxies for strategic assets when investigating emerging economy strategic asset seeking. Amighini et al. (2013) used the share of R&D on GDP as a proxy. Ramasamy et al. (2012) used the number of registered patents and the proportion of technology exports to total exports of the host country. Zhou and Guillén (2016) studied the effects of differing distance costs (i.e., different dimensions of cross-national distance) on Chinese listed firms' strategic asset seeking activities. Frey et al. (2015) used the number of trademark applications to measure brand assets sought by emerging economy firms. In this study, we follow literature that captures IP asset seeking through acquisition. Compared with the option of direct technology purchase from sellers in the market, Caviggioli et al. (2017) find that patented technologies via acquisition were of higher technical value, legal resilience, and more aligned with fundamental research. Li and Valentini (2023) report Chinese acquisitions to be associated with enhanced labour productivity. These attributes will matter in the context of China's technological catch up, especially as we know that cross-border M&As can facilitate the transfer of knowledge embodied in these more valuable asset types. As we are interested in the proclivity of a Chinese firm to acquire IP assets over distance, we created a categorical variable named T_IP as the dependent variable for a first set of tests. This takes the value '1' to indicate that the target firm holds both

[3] Berry et al. (2010) find a positive correlation (0.22) between financial and economic distance.

[4] This effect post-2015 is shown clearly in "Chinese FDI swaps M&A for Greenfield": https://www.fdiintelligence.com/content/news/top-10-fdi-charts-of-2023-83317.

patents and trademarks; and '0' otherwise. Given the potential limitation of only using a dichotomous variable, we also conducted additional tests using counts of both patents and trademarks in the target firms, as reported below.

3.2.2. Independent variables

The Mahalanobis index is the most frequently used method to correct for co-variance across distance dimensions (Beugelsdijk et al., 2018). We followed existing literature (e.g., Albino-Pimentel et al., 2022; Bailey and Li, 2015; Zhou and Guillén, 2015, 2016) and adopted Berry et al. (2010)'s distance dimensions as our pool of selection for cross-national distance and specifically utilized their most recent updated longitudinal cross-national distance data published in 2020 by the Wharton School.[5] Following Zhou and Guillén (2016), we utilized the cross-national distance data, which were calculated by using the Mahalanobis method[6] as our main independent variables, including Knowledge distance (Know_dis), Political distance (Pol_dis), Cultural distance (Cul_dis), Administrative distance (Adm_dis), Demographic distance (Dem_dis), Economic distance (Eco_dis), and Global connectedness distance (GCon_dis). Following an initial round of testing, we excluded financial distance (Fin_dis) and geography distance (Geog_dis) because the correlation between these variables was 0.72 and the correlation between financial distance and economic distance was 0.74. This may result in multicollinearity problems in the modelling (Mason and Brown, 1975). Zhou and Guillén (2016) also excluded three distance variables in their modelling due to high inter-correlations. While we report findings without these two variables below, our tests including them showed they were insignificant and the pattern of coefficients for the other variables remained unchanged.

3.2.3. Control variables

We controlled for factors at the firm and industry level. We included the acquirer's age (AGE), measured by the number of years since establishment (Lu et al., 2011; Huang et al., 2017). Longer established firms have a greater propensity to engage in foreign strategic asset seeking activities (Cui, Meyer and Hu, 2014; Xia et al., 2014). We added profit margin (PROFIT) and log-transformed total assets (ASSET) to account for prior performance and size. Lu et al. (2011) argued that emerging economy firms should be equipped with related technological capacities to assimilate foreign technologies to ensure successful foreign strategic asset seeking targets. Acquirer's IP assets, commonly used to reflect the degree of absorptive capacity, could influence propensity for strategic asset deal-making (Makri et al., 2010). We included acquirers' prior stock of patents (ANPAT) and trademarks (ANTRADM), log transformed. Publicly listed status (PUBLIC) was measured as a dummy variable with '1' denoting the acquirer was a listed company, and '0' otherwise. Private ownership (PRIVATE) was similarly measured with a '1'. Foreign experience (FEXPE) in the host country was captured with a '1' if the acquirer already had at least one subsidiary in the host country. We also captured business group affiliation (BGA) using an indicator variable with the value '1' if the firm was affiliated to a business group and '0' otherwise. We used the ownership level of acquirers after M&A deals (OWNTRANS) capturing differences in acquirers' ownership level in foreign IP asset seeking activities. Rosiello and Maleki (2021) find that related variety determines latecomers' catch-up behaviour. Zhu et al. (2021) highlight the importance of technology distance (the difference between firms in terms of technological knowledge domains) to innovation performance. We included an industry unrelatedness variable (INDUN) between target firm and acquirer as a control variable. We used the industry SIC code for acquirer and target firm: '0' indicates both acquirer and target firm have the same four-digit SIC code, 'highly related'; '1' indicates that acquirer and target have the same first three-digit SIC code, 'moderately related'; '2' indicates that the acquirer and target have the same first two-digit SIC code, 'moderately unrelated'; '3' indicates that the acquirer's and target's first digit or first two digits are different, 'highly unrelated. Additionally, we also accounted for acquirers' industry membership, controlling for the manufacturing sector (MANU). Finally, we added the M&A year control variable for

Table 1
Variable measurement and data sources.

Variable label	Definition/Measurement	Data source
T_IP	1 means the target firm has both patent and trademark; and 0 otherwise	ORBIS Database
Know_dis	Knowledge distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
Pol_dis	Political distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
Cul_dis	Cultural distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
Adm_dis	Administrative distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
Dem_dis	Demographic distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
Eco-dis	Economic distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
GCon_dis	Global connectedness distance	https://whartonmgmt.wufoo.com/forms/distance-data-downloads/
AGE	Log (Firm's age)	ORBIS Database
PROFIT	Profit margin%	ORBIS Database
ASSET	Log (Total assets)	ORBIS Database
ANPAT	log (1+Acquirers' number of patents)	ORBIS Database
ANTRADM	log (1+Acquirers' number of trademarks)	ORBIS Database
OWNTRANS	Ownership level (%) after M&A transaction	Thomson One Database
PRIVATE	1 if the acquirer is privately owned, 0 otherwise	ORBIS Database
BGA	1 if the acquirer is affiliated to a business group affiliation, 0 otherwise	Large Corporations of China 2008); China National Knowledge Infrastructure (CNKI); ORBIS Database; Corporate websites
PUBLIC	1 if the acquirer is listed before M&A, 0 otherwise	ORBIS Database
FEXPE	1 if the acquirer has one foreign subsidiary at least, 0 otherwise	ORBIS Database
MANU	1 if the acquirer is in the manufacturing sector, 0 otherwise	ORBIS Database
INDUN	Based on the industry SIC code, 0 if both acquirer and target firm have the same four-digit SIC code, 'highly related'; 1 if acquirer and target have the same first three-digit SIC code, 'moderately related'; 2 if acquirer and target have the same first two-digit SIC code, 'moderately unrelated'; 3 if the acquirer's and target's first digit or first two digits are different, 'highly unrelated'	Thomson One Database

[5] Available from http://lauder.wharton.upenn.edu/ciber/faculty_research.asp.

[6] The Mahalanobis method considers the information included in the variance-covariance matrix and is scale-invariant (for a detailed explanation see Berry et al., 2010) and is considered a better choice than the Euclidean method when measuring distances between countries.

year-fixed effects. Table 1 shows all variable definitions and data sources.

3.3. Estimation model

The level of analysis is firm-country-year. Because not all firms in the sample had M&A deals from the beginning of our study period, an unbalanced panel dataset is established. We used a logistic regression model to test the influence of cross-national distance on Chinese firm acquisition of foreign firms with IP assets (i.e., patents and trademarks). Following prior research (e.g., Choi, Lee and Williams, 2011), we lagged all independent variables by one year to avoid possible endogeneity with the dependent variable in estimations. The equation is expressed as follows:

$$\begin{aligned} y(T\_IP_{it}) = {} & \beta_0 + \beta_1 \times Know\_dis_{i,t-1} + \beta_2 \times Pol\_dis_{i,t-1} + \beta_3 \times Cul\_dis_{i,t-1} \\ & + \beta_4 \times Adm\_dis_{i,t-1} + \beta_5 \times Dem\_dis_{i,t-1} + \beta_6 \times Eco\_dis_{i,t-1} \\ & + \beta_7 \times GCon\_dis_{i,t-1} + \beta_8 \times AGE_{i,t-1} + \beta_9 \times PROFIT_{i,t-1} + \beta_{10} \\ & \times ASSET_{i,t-1} + \beta_{11} \times ANPAT_{i,t-1} + \beta_{12} \times ANTRADM_{i,t-1} \\ & + \beta_{13} \times OWNTRANS_{i,t-1} + \beta_{14} \times BGA_{i,t-1} + \beta_{15} \\ & \times PRIVATE_{i,t-1} + \beta_{16} \times FEXPE_{i,t-1} + \beta_{17} \times PUBLIC_{i,t-1} + \beta_{18} \\ & \times MANU_{i,t-1} + \beta_{19} \times INDUN_{i,t-1} + \beta_{20} \times YEAR\_Control_{i,t-1} + \\ & \in \end{aligned}$$

For robustness, we used alternative measures: the count of patents and trademarks acquired as continuous dependent variables. Because the dependent variable has an excess of zeros in these tests, we followed Da Silva and De Sousa (2023) and ran zero-inflated negative binomial regression models for these robustness tests.

3.4. Additional analysis

As an exploratory extension, we conducted analyses to understand boundary conditions on the direct effects of various forms of distance. We divided the IP assets into patent and trademark assets (e.g., Sutherland et al., 2020) to examine the effect of cross-national distance on target IP asset seeking when considering the location-boundedness of assets. Trademarks have been argued to be more location-bound than patents (Shi et al., 2022), potentially sensitive to disaggregated forms of cross-national distance. We ran zero-inflated negative binomial regression models to test the effects of cross-national distances on these different IP asset classes.

Secondly, we examined the interaction effect between knowledge distance and the other forms of distance and IP asset acquisition. Interacting distance variables with other contingency variables is an approach rarely taken according to Hutzschenreuter et al.'s (2016) review, despite having the potential to provide a more fine-grained and differentiated picture of the effects of distance (Hutzschenreuter et al., 2016: 11). We relied on two-way interactions rather than three-way or four-way interactions or a configurational approach partly because two-way interactions can mitigate overfitting risk and reduce the complexity of the model compared to three- or four-way interactions (Kutner et al., 2004). Selecting which of the nine distances to use for multi-way interactions receive little guidance from extant literature or catch-up theory. The literature does not show whether other forms of distance may encourage or discourage Chinese firms quest for foreign IP assets in countries where there is a larger knowledge distance to China. The reason we used knowledge distance as the base interaction term is because this is arguably the most prominent form of distance from an IP catch-up lens (Child and Rodrigues, 2005; Kedia et al., 2012; Luo and Tung, 2007; Xu et al., 2022). Indeed, the finding for knowledge distance is borne out in direct effects analyses (reported below).

Thirdly, we compared the differences across four partitions of the sample based on patent and trademark acquisitions: in the first group, the number of the target firm's patents were less than the mean for patents and the number of the target firm's trademarks were less than the mean for trademarks; in the second group, the number of target firm's patents were greater than the mean for patents, and the number of target firm's trademarks were less than the mean for trademarks; in the third group, the number of target firm's patents were less than the mean for patents and the number of target firm's trademarks were greater than the mean for trademarks; in the fourth, the number of target firm's patents were greater than the mean for patents, and the number of target firm's trademarks were greater than the mean for trademarks. The fourth partition represents the most aggressive IP acquisitive behaviour for the Chinese firms in our sample; the target firms had the highest number of patents *and* trademarks.

Finally, we split our sample into manufacturing firms and non-manufacturing firms to explore how disaggregated cross-national distances matter for Chinese firms from different sectors seeking foreign IP assets.

4. Findings

Table 2 shows the means, standard deviations, and correlations for the variables captured. The correlations between the dependent variable and explanatory variables are not high, indicating multicollinearity is not likely to be an issue. Following the removal of geographic distance and financial distance due to correlations >0.7, the correlations between the remaining seven cross-national distances are low, which further limits the possible influence of multicollinearity in regression models. We note T_IP to have both positive and negative associations with the various forms of distance with coefficient sizes ranging from −0.10 (GCon_dis) to +0.21 (Know_dis).

Table 3 presents the main logistic regression results with robust standard errors. Model 1 is the baseline model that includes only control variables. Model 2 adds the seven cross-national distances. Model 2 shows that 'Know_dis' and 'Pol_dis' are the most significant determinants of IP asset seeking through acquisition (0.07, $p < 0.001$; 1.36, $p < 0.001$). 'Cul_dis' also has a positive impact on Chinese firms' IP asset seeking (0.07, $p < 0.10$). The other distance measures are not significant. There is a considerable increase in the Pseudo R square after using the time-varying cross-national distance measures. There is also an improvement in the log-likelihood from Model 1 to Model 2. As stated by Ai and Norton (2003), the coefficients of the regression may not necessarily be representative of the actual effects due to the nonlinear nature of logistic functions. We calculated the average marginal effects of each distance variable and report the results in the rightmost column in Table 3. Three distance dimensions are significantly and positively associated with Chinese firms' foreign IP asset seeking behaviors: knowledge distance, political distance, and cultural distance.

The results for the robustness tests using alternative measures that capture target firms' foreign IP assets are shown in Table 4. We used the number of patents and trademarks that the target firms had as a dependent variable in these tests. The effects of 'Know_dis' and 'Pol_dis' are consistent with Table 3; both dimensions of distance are significantly and positively related to volume of technology-based or brand-based assets acquired. We also note a positive effect for 'Adm_dis' for patents but not trademarks and a negative effect for 'Dem_dis' for trademarks but not patents.

The results from additional analysis exploring boundary conditions were informative. Table 5 shows the effect of adding interactions between 'Know_dis' and the other distance dimensions. Models 7–12 show each interaction variable individually and in Model 13 we add all interaction variables together. The best fitting model is Model 13, where we find three cross-national distance measures interacting with the relationship between 'Know_dis' and foreign IP asset seeking. These are the interactions with 'Pol_dis', 'Dem_dis' and 'GCon_dis'.

Figs. 1–3 present marginal plots to visualize the changes in the average marginal effects of knowledge distance when interacting with

Table 2
Pairwise correlations.

No.	Variable	Obs	Mean	Std. dev.	1	2	3	4	5	6	7	8	9
1	T_IP	697	0.15	0.36	1								
2	Know_dis	658	12.1	13.52	0.21[c]	1							
3	Pol_dis	577	9.86	0.86	0.16[c]	−0.28[c]	1						
4	Cul_dis	464	14.3	4.62	0.13[b]	0.35[c]	−0.14[b]	1					
5	Adm_dis	668	60.7	26.91	0.08[a]	0.30[c]	−0.06	−0.06	1				
6	Dem_dis	640	7.23	3.72	0.08[a]	−0.03	0.35[c]	−0.36[c]	0.11[b]	1			
7	Eco_dis	650	10.5	10.11	−0.14[c]	−0.05	−0.12[b]	0.02	−0.24[c]	−0.01	1		
8	GCon_dis	655	3.62	2.74	−0.10[b]	−0.09[a]	−0.24[c]	−0.26[c]	0.02	0.06	0.17[c]	1	
9	AGE	697	2.81	0.54	−0.01	−0.07	−0.16[c]	−0.03	−0.04	−0.01	−0.09[a]	0.10[a]	1
10	PROFIT	662	7.38	22.86	0.09[a]	0.08[a]	0.08[a]	0.018	0.05	0.001	0.01	−0.06	−0.06
11	ASSET	673	21.7	2.24	0.06	−0.12[b]	−0.06	−0.05	0.004	0.03	−0.13[b]	0.09[a]	0.26[c]
12	ANPAT	697	2.29	2.98	0.15[c]	0.03	−0.04	0.04	−0.02	−0.02	−0.10[a]	−0.04	0.13[c]
13	ANTRADM	697	0.55	0.97	0.22[c]	0.13[c]	−0.04	0.19[c]	0.01	−0.03	−0.10[a]	−0.05	0.09[a]
14	OWNTRANS	697	73.9	33.05	0.05	0.09[a]	0.15[c]	0.05	−0.07	0.03	0.01	−0.15[c]	−0.03
15	BGA	697	0.75	0.43	0.09[a]	−0.13[c]	−0.07	−0.06	−0.05	0.01	−0.08[a]	0.08[a]	0.15[c]
16	PRIVATE	697	0.51	0.50	0.09[a]	0.19[c]	0.19[c]	0.15[b]	0.12[b]	−0.01	0.02	−0.20[c]	−0.20[c]
17	FEXPE	697	0.71	0.45	0.04	−0.03	−0.03	0.03	0.03	−0.03	−0.06	0.01	0.12[b]
18	PUBLIC	697	0.56	0.50	−0.03	0.07	0.06	0.11[a]	−0.02	−0.01	0.11[b]	−0.02	−0.18[c]
19	MANU	697	0.54	0.50	0.15[c]	0.06	0.15[c]	0.01	0.10[b]	0.18[c]	−0.05	−0.07	0.01
20	INDUN	697	1.05	1.19	0.01	0.05	0.12[b]	0.10[a]	0.02	−0.01	0.10[a]	−0.09[a]	−0.16[c]

No.	Variable	Obs	Mean	Std. dev.	10	11	12	13	14	15	16	17	18	19	20
10	PROFIT	662	7.39	22.86	1										
11	TASSET	673	21.66	2.24	0.08[a]	1									
12	ANPAT	697	2.29	2.98	0.05	0.47[c]	1								
13	ANTRADM	697	0.55	0.97	0.06	0.31[c]	0.55[c]	1							
14	OWNTRANS	697	73.92	33.05	0.05	−0.15[c]	−0.05	0.02	1						
15	BGA	697	0.75	0.43	−0.01	0.46[c]	0.21[c]	0.14[c]	−0.05	1					
16	PRIVATE	697	0.51	0.50	0.12[b]	−0.45[c]	−0.15[c]	0.04	0.17[c]	−0.48[c]	1				
17	FEXPE	697	0.71	0.45	−0.02	0.29[c]	0.18[c]	0.15[c]	−0.07	0.12[b]	−0.12[b]	1			
18	PUBLIC	697	0.56	0.50	−0.05	0.01	0.05	0.003	0.04	−0.13[c]	0.10[b]	0.16[a]	1		
19	MANU	697	0.54	0.50	0.04	−0.13[b]	−0.02	0.02	0.09[a]	−0.004	0.1100[a]	−0.046	0.03	1	
20	INDUN	697	1.06	1.19	0.10[a]	−0.24[c]	−0.14[c]	−0.01	0.02	−0.10[a]	0.28[c]	−0.02	0.09[a]	0.01	1

[a] $p < 0.05$.
[b] $p < 0.01$.
[c] $p < 0.001$.

'Pol_dis', 'Dem_dis' and 'GCon_dis'. These show the comparison between the marginal coefficients for the two variables in one model.

We divided target firm IP into two kinds of assets: technology-based (i.e., patents) and brand-based (i.e., trademarks) assets, and partitioned them into four groups around their means as described above. Table 6 shows marginal effects of cross-national distances on the four partitioned groups shown. Group 4 represents Chinese firms' most aggressive IP acquisitive behaviours; the volume of acquired patents and trademarks are above their respective means in this group. Results further support earlier findings from Table 3 that three cross-national distances (i.e., 'Know_dis', 'Pol_dis' and 'Cul_dis') drive this most aggressive form of foreign IP asset acquisition.

We split our sample into manufacturing firms and non-manufacturing firms as the final part of our additional exploratory tests (Table 7). The results are robust for acquirers in the manufacturing sector in that 'Know_dis', 'Pol_dis', and 'Cul_dis' are positively and significantly related to foreign IP asset seeking (Model 14). However, in the non-manufacturing firms, we lose the significance for 'Pol_dis' and 'Cul_dis' and we see negative effects for 'Adm_dis' and 'Eco_dis' (Model 15).

Table 8 presents a summary of the findings across the various tests. As far as the overall catch-up picture is concerned, knowledge, political, and cultural distances are the most prominent forms of distance that matter for the sample firms. The other forms of distance all have an effect at one or two places within the range of tests, suggesting that, while they should not be ignored in research or policy, they are less important to the catch-up phenomenon. We also note the majority of these forms of distance have a positive effect on catch-up through IP acquisition, challenging the notion that distance deters cross national acquisitive investment in a context of catch-up.

5. Discussion

The acquisition of foreign IP has been central to Chinese firms' technological catch-up strategies (Li and Valentini, 2023; Wang et al., 2023; Xiao et al., 2013). Given that the acquisition of IP through M&A deals leads to greater technological advantage than direct purchase of patented technology from sellers in the market (Caviggioli et al., 2017), understanding China's technological catch-up through foreign M&A needs to involve a more explicit focus on the effects of cross-national distance. The catch-up literature to date has mainly emphasized other forms of distance, including geographic proximity between firms in the same country (Chen et al., 2012; Griffith et al., 2009), as well as cognitive, organizational, social, institutional proximities (Boschma, 2005; Lopolito et al., 2022). Recent bibliometric analysis of the technological catch-up literature shows the focus has moved to the linkage between latecomer firm internationalization over borders and its technology upgrading (Kashani et al., 2022). A broader view of cross-national distance is therefore necessary when we consider the acquisitive behaviour of Chinese firms as far as IP assets are concerned. We address this by drawing from recent advances in the international business (IB) literature with respect to the disaggregation of cross-national distance into sub-dimensions (Berry et al., 2010; Lu et al., 2014; Zhou and Guillén, 2016) and applying this approach to the phenomenon of China's technological catch-up through foreign M&A deals.

The present study provides robust empirical evidence on how disaggregated cross-national distances have mattered for China's technological catch-up. First, we provide a multi-dimensional lens on cross-national proximity for analyzing technological catch-up via international IP acquisitions by Chinese firms. The inter-relationship between innovation and proximity has been discussed at a territorial level, from the perspective of technology, social interactions, and institutions (Kirat

Table 3
Logistic regression.

Variable	Model 1	Model 2	Average marginal effects
Know_dis		0.07[d] (0.01)	**0.008**[d]
Pol_dis		1.36[d] (0.35)	**0.153**[d]
Cul_dis		0.07[a] (0.04)	**0.008**[b]
Adm_dis		0.00 (0.01)	0.0005
Dem_dis		0.01 (0.05)	0.002
Eco_dis		−0.09 (0.06)	−0.010
GCon_dis		0.01 (0.15)	0.0007
AGE	−0.34 (0.28)	−0.44 (0.36)	
PROFIT	0.01 (0.01)	0.01 (0.01)	
ASSET	0.03 (0.08)	−0.02 (0.12)	
ANPAT	0.08[a] (0.05)	0.11 (0.07)	
ANTRADM	0.30[b] (0.13)	0.16 (0.17)	
OWNTRANS	0.00 (0.00)	0.00 (0.01)	
BGA	0.83[b] (0.36)	0.94[a] (0.49)	
PRIVATE	0.64[b] (0.29)	0.49 (0.40)	
FEXPE	0.11 (0.30)	0.27 (0.40)	
PUBLIC	−0.34 (0.24)	−0.52 (0.34)	
MANU	0.88[d] (0.25)	0.83[b] (0.34)	
INDUN	−0.05 (0.11)	−0.11 (0.15)	
Constant	−3.26 (2.06)	−15.12[c] (5.69)	
Year control	Included	Included	
Observations	662	382	
Wald chi2	65.27[d]	117.44[d]	
Pseudo R2	0.13	0.27	
Log pseudolikelihood	−251.09	−138.52	

Geographic and financial distances - excluded due to high correlations - are insignificant in additional tests; Robust standard errors in parentheses.
[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
[d] $p < 0.001$.

Table 4
Robustness tests using zero-inflated negative binomial regression.

Variable	Model 3	Model 4	Model 5	Model 6
	TNPAT		TNTRADM	
Know_dis		0.17[d] (0.04)		0.13[d] (0.02)
Pol_dis		1.85[b] (0.77)		2.01[d] (0.36)
Cul_dis		0.18 (0.23)		−0.01 (0.06)
Adm_dis		0.07[d] (0.02)		0.00 (0.01)
Dem_dis		0.36 (0.26)		−0.11[b] (0.05)
Eco_dis		−0.06 (0.07)		−0.06 (0.05)
GCon_dis		−0.21 (0.27)		0.22[a] (0.12)
AGE	−1.11[b] (0.50)	0.49 (0.71)	−0.21 (0.27)	−0.31 (0.32)
PROFIT	0.02[c] (0.01)	0.02[a] (0.01)	0.01 (0.01)	0.01 (0.01)
ASSET	−0.09 (0.13)	0.10 (0.17)	0.22[b] (0.10)	−0.07 (0.10)
ANPAT	0.26[c] (0.09)	0.13 (0.14)	0.09 (0.06)	0.25[c] (0.07)
ANTRADM	0.95[c] (0.36)	0.04 (0.26)	0.22 (0.20)	0.17 (0.20)
OWNTRANS	−0.01 (0.01)	−0.01 (0.01)	0.00 (0.00)	0.00 (0.00)
BGA	1.87[c] (0.58)	0.14 (0.86)	0.89[b] (0.39)	0.52 (0.45)
PRIVATE	−1.38[b] (0.54)	−1.85[c] (0.57)	0.70[b] (0.33)	0.23 (0.33)
FEXPE	−0.67 (0.51)	−1.91[c] (0.63)	−0.14 (0.31)	0.43 (0.33)
PUBLIC	−0.20 (0.54)	−0.08 (0.57)	−0.03 (0.31)	0.19 (0.30)
MANU	2.93[d] (0.58)	1.56[a] (0.92)	1.64[d] (0.30)	1.23[d] (0.34)
INDUN	−0.70[c] (0.20)	−0.47[a] (0.28)	−0.17 (0.12)	−0.08 (0.13)
Year control	Included	Included	Included	Included
Constant	5.73 (3.02)	−22.81 (9.36)	−4.33[b] (2.23)	−16.71 (3.77)
Observations	662	382	662	382
Nonzero/Zero obs	161/501	115/267	172/490	115/267
Wald chi2	387.96[d]	550.77[d]	157.06[d]	270.62[d]
Log pseudolikelihood	−1167.455	−803.94	−975.57	−608.82

Robust standard errors in parentheses.
[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
[d] $p < 0.001$.

and Lung, 1999). This perspective emphasizes spatial closeness. Other dimensions of proximity have also been discussed in the catch-up literature, including cognitive, organizational, social, and institutional proximity (Boschma, 2005; Balland et al., 2015). Wang et al. (2014: 2), for instance, find that cultural proximity can be "a special resource to facilitate technology spillovers" for Chinese firms to catch up with foreign MNEs. Our work adds to this literature on proximity and catch-up by advocating that proximity as a disaggregated cross-national construct should be considered a primary determinant of the catch-up phenomenon as it relates to emerging economy firms' foreign IP acquisitions.

Second, we extend the application of Wharton-defined indicators of cross-national distance (Berry et al., 2010) in the context of Chinese international M&As for strategic asset seeking. Recent literature indicates that firms derive learning benefits from international R&D sourcing (Asimakopoulos et al., 2023) but does not consider the impact of cross-national distance. Our study contributes by enriching the understanding of international knowledge acquisitions with an explicit focus on distance. A large base of opinion in the IB literature is that cross-national distance is negatively associated with firms' internationalization because of heightened transaction, coordination, and knowledge transfer costs (Buckley et al., 2023; Zaheer, 1995; Zhou and Guillén, 2016), although there are exceptions and counter-findings also (Hutzschenreuter et al., 2016). The conundrum is that studies have provided empirical evidence showing that latecomer firms are more likely to choose developed economy targets for seeking strategic assets and this comes with larger – not smaller - geographic and institutional differences (Ahsan et al., 2021; Ciabuschi et al., 2017; Elia and Santangelo, 2017; Shi et al., 2022; Zheng et al., 2022). This supports the notion that there are situations in which organizations can benefit from distance (Stahl et al., 2016), and that managers become better decision-makers when they are confronted by distance (Hutzschenreuter et al., 2016). Our findings (note the positive signs in Table 8) fall into this camp. Drawing from Berry et al. (2010), our research contributes to a more nuanced understanding of the role of distance in catch-up and provides a more comprehensive insight into specific dimensions of cross-national distance that determine when organizations seek opportunity from cross-national distance through international M&As. Results suggest a multi-dimensional lens for studying the effects of cross-country distance is necessary as we consider the technological catch-up of emerging economies and their firms.

Third, in our additional analyses we uncover evidence of deeper nuances and boundary conditions against which dimensions of cross-national distance apply as Chinese firms seek foreign IP assets over distance. By dividing the IP assets into patent and trademark classes (Table 4), we show how Chinese firms preferred countries with shorter demographic distance where there were targets for brand-based IP asset acquisitions as opposed to patent-based targets. This is consistent with the social relatedness of brand-based IP (Yang, 2005). We also see administrative distance impacting patent – but not trademark – acquisition. The higher differences in terms of legal frameworks concerning IP

Table 5
Logistic regression with interactions involving knowledge distance.

Variable	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Know_Pol	0.02 (0.02)						0.08[b] (0.03)
Know_Cul		0.004[a] (0.00)					0.00 (0.00)
Know_Adm			−0.002[c] (0.00)				0.00 (0.00)
Know_Dem				−0.01[d] (0.00)			−0.01[b] (0.01)
Know_Eco					0.01 (0.01)		−0.02 (0.02)
Know_GCon						0.00 (0.01)	0.03[b] (0.01)
Know_dis	−0.15 (0.22)	−0.01 (0.05)	0.25[c] (0.07)	0.14[d] (0.03)	0.00 (0.07)	0.06[c] (0.02)	−0.23 (0.43)
Pol_dis	1.30[d] (0.37)	0.98[b] (0.39)	0.74[a] (0.42)	0.44 (0.39)	1.35[d] (0.36)	1.36[d] (0.36)	−0.15 (0.44)
Cul_dis	0.07[a] (0.04)	0.02 (0.04)	0.02 (0.04)	0.06 (0.04)	0.05 (0.04)	0.06[a] (0.04)	0.05 (0.05)
Adm_dis	0.01 (0.01)	0.01 (0.01)	0.03[a] (0.02)	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.01 (0.03)
Dem_dis	0.01 (0.05)	0.09 (0.06)	0.16[b] (0.07)	0.34[c] (0.11)	0.03 (0.06)	0.01 (0.05)	0.41[c] (0.13)
Eco_dis	−0.09 (0.06)	−0.09 (0.06)	−0.19 (0.12)	−0.16 (0.11)	−0.16[b] (0.07)	−0.09 (0.06)	−0.30[b] (0.15)
GCon_dis	0.00 (0.15)	0.00 (0.15)	0.03 (0.19)	0.02 (0.18)	0.05 (0.17)	−0.02 (0.18)	−0.25 (0.28)
AGE	−0.44 (0.36)	−0.47 (0.36)	−0.52 (0.36)	−0.50 (0.36)	−0.47 (0.36)	−0.44 (0.36)	−0.46 (0.37)
PROFIT	0.01 (0.01)	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.01 (0.01)	0.01 (0.01)
ASSET	−0.03 (0.12)	−0.02 (0.12)	−0.01 (0.12)	0.00 (0.12)	−0.02 (0.12)	−0.02 (0.12)	−0.01 (0.12)
ANPAT	0.11 (0.07)	0.11 (0.07)	0.11 (0.07)	0.12[a] (0.07)	0.10 (0.07)	0.10 (0.07)	0.11 (0.07)
ANTRADM	0.16 (0.17)	0.14 (0.18)	0.14 (0.18)	0.11 (0.18)	0.14 (0.18)	0.15 (0.17)	0.13 (0.18)
OWNTRANS	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
BGA	0.96[b] (0.50)	0.89[a] (0.51)	0.88[a] (0.50)	0.84[a] (0.50)	0.97[b] (0.50)	0.96[a] (0.50)	1.04[b] (0.52)
PRIVATE	0.48 (0.40)	0.51 (0.41)	0.43 (0.40)	0.45 (0.41)	0.46 (0.40)	0.49 (0.40)	0.42 (0.41)
FEXPE	0.26 (0.40)	0.30 (0.40)	0.29 (0.39)	0.34 (0.40)	0.29 (0.40)	0.26 (0.40)	0.25 (0.41)
PUBLIC	−0.50 (0.34)	−0.52 (0.34)	−0.52 (0.34)	−0.64[a] (0.35)	−0.51 (0.34)	−0.51 (0.34)	−0.51 (0.34)
MANU	0.84[b] (0.34)	0.80[b] (0.34)	0.80[b] (0.34)	0.75[b] (0.35)	0.81[b] (0.34)	0.82[b] (0.34)	0.73[b] (0.34)
INDUN	−0.10 (0.15)	−0.12 (0.15)	−0.11 (0.15)	−0.11 (0.15)	−0.11 (0.15)	−0.11 (0.15)	−0.16 (0.14)
Constant	−14.25[b] (5.72)	−11.67[b] (5.53)	−10.99[b] (5.43)	−9.56[a] (5.09)	−14.92[b] (5.78)	−15.10[b] (5.87)	−4.60 (4.93)
Year control	Included	Included	Included	Included	Included	Included	Included
Observation	382	382	382	382	382	382	382
Wald chi2	117.31[d]	124.26[d]	104.02[d]	115.49[d]	116.38[d]	115.57[d]	105.32[d]
Pseudo R2	0.27	0.27	0.28	0.29	0.27	0.27	0.31
Log pseudolikelihood	−138.21	−137.38	−135.79	−134.11	−138.02	−138.41	−130.79

Notes: *Robust standard errors in parentheses.*
[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
[d] $p < 0.001$.

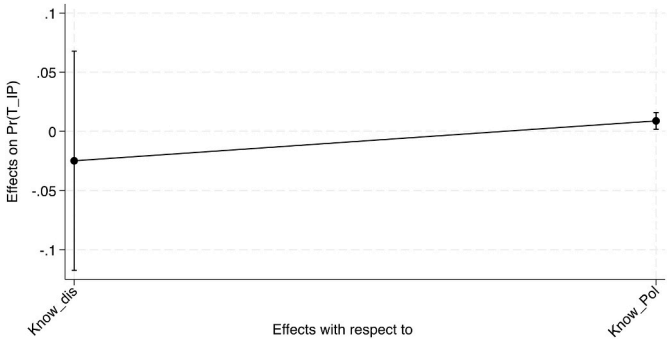

Fig. 1. Change of average marginal effects caused by political distance.

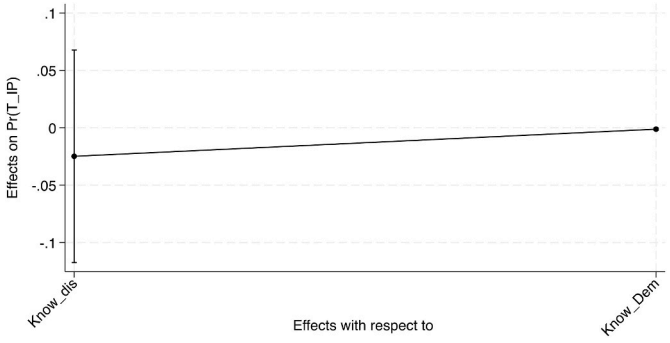

Fig. 2. Change of average marginal effects caused by demographic distance.

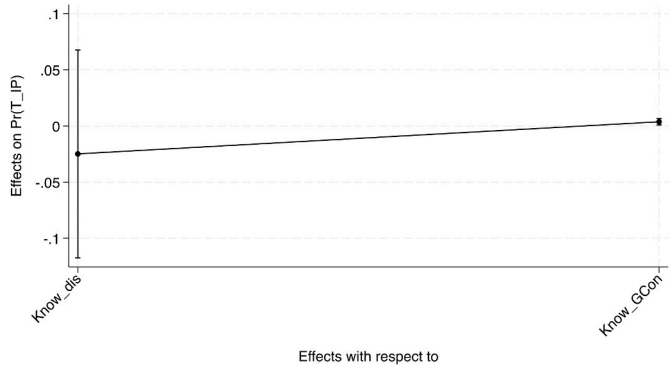

Fig. 3. Change of average marginal effects caused by global connectedness distance.

rights and company law could account for this (Buckley and Hashai, 2014). We also examined moderating effects of knowledge distance (Table 5). Larger differences in terms of global connectedness and political factors magnify the likelihood that Chinese firms will seek IP assets in target countries with larger knowledge distance. The finding that Chinese firms have a stronger inclination towards international knowledge-seeking M&As even when there is a larger political distance between home country and the target country is particularly interesting. Acquisitive firms from China need to pay attention to political distance as they seek to transfer IP and knowledge from target countries back to China. This resonates with Ciabuschi et al. (2017)'s finding that a strong home-country political embeddedness strengthens Chinese state-owned firms' organizational barriers to reverse knowledge transfer from

Table 6
Average marginal effects comparison for most aggressive cases.

Cross-national dimensions	Patents > mean & Trademarks < mean (Group 2)	Patents < mean & Trademarks > mean (Group 3)	Patents > mean & Trademarks > mean (Group 4) (most aggressive)
Know_dis	−0.0001	**0.004**[b]	**0.007**[d]
Pol_dis	0.012	0.043	**0.128**[c]
Cul_dis	0.004	**−0.011**[b]	**0.008**[b]
Adm_dis	0.0001	−0.0005	0.0007
Dem_dis	**0.007**[a]	−0.009	0.003
Eco_dis	−0.004	−0.0007	−0.009
Gcon_dis	−0.005	0.012	0.008

[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
[d] $p < 0.001$.

Table 7
Logistic regression - manufacturing vs. non-manufacturing.

Variable	Model 14	AME	Model 15	AME
	Manufacturing sample		Non-manufacturing sample	
Know_dis	0.08[d] (0.02)	0.011[d]	0.18[c] (0.06)	0.013[c]
Pol_dis	1.99[d] (0.46)	0.269[d]	0.62 (0.49)	0.064
Cul_dis	0.11[b] (0.05)	0.015[b]	−0.13 (0.11)	−0.013[a]
Adm_dis	0.01 (0.02)	0.002	−0.05[c] (0.02)	−0.004[c]
Dem_dis	0.01 (0.08)	0.002	0.02 (0.09)	−0.006
Eco_dis	0.03 (0.04)	0.003	−0.71[c] (0.22)	−0.047[c]
GCon_dis	0.03 (0.22)	0.002	0.43 (0.30)	0.018
AGE	0.22 (0.49)		−1.40[b] (0.68)	
PROFIT	0.00 (0.01)		0.04[b] (0.02)	
ASSET	0.08 (0.16)		−0.28 (0.24)	
ANPAT	0.07 (0.11)		0.23[a] (0.14)	
ANTRADM	0.27 (0.27)		−0.08 (0.38)	
OWNTRANS	0.00 (0.01)		−0.02[a] (0.01)	
BGA	0.34 (0.61)		3.33[b] (1.36)	
PRIVATE	0.22 (0.52)		2.26[b] (1.15)	
FEXPE	−0.11 (0.45)		1.29 (1.15)	
PUBLIC	−0.40 (0.45)		−0.03 (0.86)	
INDUN	−0.14 (0.19)		−0.14 (0.36)	
Year control	Included		Included	
Constant	−39.80[d] (6.84)		4.26 (7.82)	
Wald chi2	486.36[d]		38.56[b]	
Pseudo R2	0.26		0.44	
Log pseudolikelihood	−90.00		−33.89	
Observation	211		162	

Robust standard errors in parentheses.
[a] $p < 0.10$.
[b] $p < 0.05$.
[c] $p < 0.01$.
[d] $p < 0.001$.

developed countries. The boundary conditions identified advance how we think about knowledge transfer related to acquired IP, especially for emerging economy firms. Not all firms from emerging economies face the same types of costs, and these costs may also depend on the specific motivation for seeking new technology or brand assets. We then looked at the partition of data containing the most aggressive deals (Group 4 in Table 6). The results here are entirely consistent with the base model (Table 3) and highlight the importance of knowledge and political distances as opportunities for catch-up via cross-border IP acquisition. Also, by examining the differences between manufacturing and non-manufacturing firms (Table 7), we see two strong negative effects (administrative and economic distances) for non-manufacturing firms that are not present for manufacturing firms (rightmost columns in Table 8). This suggests that, beyond the fundamental role of knowledge distance - our understanding of catch-up through disaggregated distance needs to account for sectoral differences, with service sectors potentially being more vulnerable to distances related to administrative history and economic development than manufacturing sectors. In the latter, catch-up is reinforced through knowledge, political and cultural distance. This echoes extant catch-up literature (e.g., Yu et al., 2020; Mu and Lee, 2005) on showing how specific sectors have upgraded through foreign IP acquisitions while bringing the issue of difficulties in catch-up over distance into sharper focus for some sectors.

Our findings provide guidance for managerial practices and inform public policy for technological catch-up. Managers in Chinese firms considering how foreign IP acquisition through M&As can be used for technological catch-up are affected by costs and opportunities presented by the cross-national distances at play. They need to be aware that these costs and opportunities may be affected in different ways by different sub-dimensions of distance, while knowledge, political and cultural distances will likely present opportunities rather than costs. They should be aware that administrative distance will have a role to play in presenting opportunities for patent-seeking but not trademark-seeking, while demographic distance matters for trademark-seeking but not patent-seeking. Cross-national distances exert influence on governments in terms of information access and financial subsidies when establishing different types of economic, financial, or political relationships with other nations. Government policy makers need to think about potential conflicts in terms of certain cross-national distance and their changes over time. For instance, the government can assist in facilitating international R&D collaboration via the diffusion of information or direct subsidies (Qiu et al., 2013). Policy makers in business ministries and development banks can pay more attention to providing related information access on political and cultural difference to mitigate trade barriers, especially for technologically upgrading domestic manufacturing sectors. As for non-manufacturing sectors, policy makers should provide more information access on administrative and economic proximity to exploit the potential of shared experience in strengthening Chinese firms' IP assets (Table 8). In addition, while addressing larger cross-national differences that matter to foreign IP

Table 8
Summary of results.

Distance	IP assets via acquisition (Table 3)	Robustness Patents (Table 4)	Robustness Trademarks (Table 4)	Interaction with Know_dis (Table 5)	Most aggressive (targets high in patents and trademarks) (Table 6)	IP assets Manufacturing (Table 7)	IP assets Non-manufacturing (Table 7)
Know_dis	+++	+++	+++	n/a	+++	+++	++
Pol_dis	+++	+	+++	+	++	+++	
Cul_dis	+				+	+	–
Adm_dis		+++					–
Dem_dis			–	–			
Eco_dis							–
GCon_dis				+			

Notes: +, ++, +++ denote positive impact with $p < 0.10$, $p < 0.01$, $p < 0.001$ respectively; -, – denote negative impact with $p < 0.10$, $p < 0.01$ respectively. Empty cells denote non-significant result.

assets acquisition, direct subsidy policies should be promoted as well that harness the positive effect of the forms of distance identified in the present study.

This study suffers from several limitations. First, the sample acquirers are from only one country, China. Readers should be cautious when generalizing the implications of our findings to companies from other emerging economies without examining the peculiar characteristics of China in the time frame of our analysis. Future work can consider applying the sub-dimensions of cross-national distance to IP asset acquisition of firms from other emerging economies. Second, while we follow existing literature (e.g., Ahsan et al., 2021; Wang et al., 2023) by only focusing on completed M&As, it must be acknowledged this choice may have caused selection bias. Our data concerns the period up to and including 2015, a period which is highly relevant as far as Chinese catch up is concerned. However, any selection bias may result, for instance, in the underestimation of the impact of knowledge distance if firms that successfully completed foreign M&A deals had greater levels of technological proficiency compared to those that did not or compared to those in earlier or more recent years. Future research could be conducted to address selection bias to include cases following the policy change in 2016 and including a wider range of deals. This may necessitate merging data from different sources and will require careful verification given that different sources may capture and process deal data in different ways. Given recent insights into integrated approaches for technology alliancing and technology-based acquisitions for international knowledge sourcing (Jacob et al., 2023), future research could be directed towards a comparative analysis of the impact of multiple dimensions of cross-country distance on firms' propensity to opt for foreign alliances or mergers and acquisitions (M&As) for international IP asset seeking purposes. Third, although consistent with existing literature, the measures of strategic IP assets are limited to patents and trademarks. Other forms of intellectual capital and technology were not captured and could be used in future. Finally, we did not examine other motives for the internationalization of the Chinese firms in our sample, such as market seeking or diversification strategies. Future research can investigate the impacts of acquisitive IP behavior over various dimensions of cross-national distance on other indicators of latecomer firm performance, including longer-term innovation performance, brand image and non-financial performance. Additionally, future research could follow a configuration approach (e.g., using a more holistic qualitative comparative analysis) to explore how combinations of condition variables (i.e., sub-dimensions of cross-national distance) affect IP asset seeking as an outcome variable. This could be used to identify combinations of distances that matter for different types of catch-up through IP acquisition, such as through patents vs. trademarks.

6. Conclusion

Cross-national distances have impacted China's acquisitions of foreign IP assets during the country's recent "going out" policy period (2006–2015). Contrary to opinion in the IB literature (much of which was based on Western firms), certain dimensions of cross-national distance (knowledge distance and political distance) have robust positive effects on Chinese firms' seeking technology- and brand-based IP assets through foreign acquisitions. The technological catch-up literature can benefit from applying disaggregated cross-national distance into the analysis, especially when considering contexts where government policy has promoted international IP asset-seeking through M&A deals for its private sector.

CRediT authorship contribution statement

Xinwei Shi: Writing – review & editing, Project administration, Methodology, Formal analysis, Data curation. **Christopher Williams:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Conceptualization. **Ke Rong:** Writing – review & editing, Supervision, Resources, Project administration.

Data availability

Data will be made available on request.

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