

# Navigating windows of opportunity: The role of international experience

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## Abstract

**Research Summary:** Scholars have noted that pronounced changes in consumer demand and technology often offer firms temporary opportunities to strengthen their performance vis-à-vis rivals. This article contributes to the literature on windows of opportunity from an organizational learning perspective. It investigates whether the *depth* and *breadth* of a firm's international experience with pronounced changes in demand conditions (demand windows) and technologies (technological windows) affect its ability to take advantage of such changes within a country to increase its market share. The results, based on a sample of 615 telecommunication companies competing in 124 countries, suggest that mainly two out of four dimensions of international experience help firms to exploit windows of opportunity in a country.

**Managerial Summary:** What can help multinational companies (MNCs) to navigate periods of marked changes in demand and technology? When an MNC encounters a marked change in demand or technology in a country, it may have already experienced in the past many or just a few of these events, depending on its international footprint, and this serves to assess the MNC's international experience with such changes.

All authors have contributed equally to this paper.

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Using data on telecommunication companies, we show that both (a) an MNC's repeated exposure to a certain type of change over time (*depth* of international experience) and (b) the variety of changes an MNC has been exposed to (*breadth* of international experience) in international markets may help the MNC to obtain market share advantages when such changes occur in a country.

#### KEYWORDS

demand window, international experience, learning, market share, technological window

## 1 | INTRODUCTION

“Students of management have marveled at how hard it is for firms to repeat their success when technology or markets change” (Christensen & Bower, 1996, p. 197).

“Latecomers must be ready to respond to the opening of a window for catch up and they should not waste this opportunity” (Lee & Malerba, 2017, p. 350).

“I believe that this technological evolution offers us significant growth opportunities and Vodafone is very well positioned to take advantage of these opportunities due to its global footprint” (Ian Charter MacLaurin, Chairman of Vodafone Group in 2004, Vodafone Group, 2004, p. 4).

A considerable amount of research has shown that industries, sooner or later, are shocked by pronounced changes in demand conditions and technologies (Christensen & Bower, 1996; Tushman & Anderson, 1986). By altering the knowledge required to meet the consumer demand or develop new products, these changes, often referred to as discontinuities, open “windows of opportunity” for firms to challenge the market share of rivals that are not capable of adapting to these changes in a timely manner (Lee & Malerba, 2017). “Technological windows” (TWs) are related to changes in technology, while “demand windows” (DWs) are related to changes in demand conditions and business cycles. Both of these changes represent transition processes in the way in which firms respectively innovate and respond to consumers, offering “temporary” opportunities, that is, between the opening and the closing of windows (Miao, Song, Lee, & Jin, 2018; Park & Lee, 2006; Perez & Soete, 1988). For example, when a technological innovation is introduced and progressively displaces the existing technology, some firms tend to stick to the existing technology because their capabilities and investments are related to such technology. However, this situation is likely to penalize their performance with respect to those rivals that are willing to bet on the new technology in a timelier manner. Similarly, when an opportunity is provided by a major shake-up in demand, firms may not respond to this new demand if they are successful with their existing customers; however, if the new demand grows

rapidly, firms that are quicker to serve the emerging consumer segment during such a transient change are more likely to obtain performance gains with respect to their laggard rivals.

Despite a long tradition of research into windows of opportunity, studies have focused almost entirely on the changing environmental conditions within an industry as a whole or within single countries (for a review, see Ansari & Krop, 2012) and thus have overlooked the experience with windows of opportunity that a multinational company (MNC) may have accumulated over time. In fact, for firms that compete in multiple countries, specific changes in demand conditions or technologies are not likely to occur at the same time. Firms might suddenly have to cope with rapid demand growth or technological discontinuity in a country after having navigated these changes elsewhere. Others might observe those changes for the first time. Anecdotal evidence has also suggested that international experience (IE) with windows of opportunity is noteworthy, as explained in the above quote by the former Chairman of the Vodafone Group in 2004, in which he remarked on the importance of having IE with transitions from 2G to 3G standards in order to facilitate the firm growth. Thus, is a firm's IE with DWs and TWs likely to affect its ability to exploit windows of opportunity in a focal country to increase its market share in that country?

Drawing on the organizational learning literature (Cohen & Levinthal, 1990; Levitt & March, 1988), various studies in the field of international business have demonstrated that learning-curve effects appear as a firm increases its IE with certain characteristics of the countries in which it has operated, like demographic, cultural, administrative, and economic differences (e.g., Zhou & Guillén, 2015), because it is better able to adapt to environmental conditions that it has already experienced in other countries (e.g., Barkema, Bell, & Pennings, 1996; Perkins, 2014). This literature has mainly examined two components of a firm's IE, specifically its *depth* and its *breadth*, capturing, respectively, a firm's learning obtained from its *repeated* exposure to certain foreign-country-level characteristics, and a firm's learning obtained from its exposure to a *variety* of foreign-country-level characteristics (Casillas & Moreno-Menéndez, 2014; Clarke, Tamaschke, & Liesch, 2013). The results of these studies suggest that firms' repeated exposure to given contextual factors in foreign countries (i.e., experience depth) and the heterogeneity of the contextual factors firms have been exposed to in foreign countries (i.e., experience breadth) are likely to affect their entry decisions (e.g., Delios & Henisz, 2003; Zhou & Guillén, 2015), the speed of internationalization (Casillas & Moreno-Menéndez, 2014), the number of product innovations (Un, 2011), the richness of decision makers' mental models (Maitland & Sammartino, 2015), and the firms' performance in foreign countries (e.g., Barkema et al., 1996; Berry & Sakakibara, 2008; Perkins, 2014).

Taken together, these studies have greatly enriched our understanding of how IE may help firms to navigate international markets. However, the focus of these prior studies has been on examining the performance and strategy outcomes of IE mainly in terms of firms' time length of operations abroad and country–portfolio heterogeneity along cultural, demographic, political, administrative (e.g., Zhou & Guillén, 2015), and regulatory dimensions (e.g., Perkins, 2014), while they have provided limited insights into the usefulness of IE with the transition processes in technology and consumer demand that represent a temporary opportunity (“window”) for firms to increase their performance vis-à-vis their rivals in a country. By combining the insights from the organizational learning and international business literature with those from studies of windows of opportunity, we theorize on how the *depth* and *breadth* of a firm's IE with DWs and TWs can help the firm to exploit the opportunities offered by windows opening in a country and to increase its sales vis-à-vis its country rivals.

The results, based on a sample of 615 telecommunication companies competing in 124 countries from 2000 to 2015, suggest that mainly an MNC's breadth of IE with TWs and an MNC's depth of IE with DWs help the MNC to increase its market share when such windows in a country open. In so doing, we contribute to the literature in two ways. First, we complement previous organizational learning studies on the benefits of an MNC's IE depth and breadth (Perkins, 2014; Zhou & Guillén, 2015) by examining experience in terms of two country-level overlooked components, that is, transition processes in consumer demand and technology. In fact, contrarily to the static country-level dimensions of IE considered by previous studies, windows of opportunity are, by definition, transient marked changes in a firm's external environment (Lee & Malerba, 2017). Therefore, to give an explanation as to why a firm's IE with windows of opportunity may serve the firm to better navigate such events when they occur in a country, the development of ad hoc theoretical mechanisms and empirical analyses are necessary. Second, we extend the extant windows of opportunity literature (Christensen & Bower, 1996; Lee & Malerba, 2017; Tushman & Anderson, 1986) by responding to recent calls to explore firm-level contingencies helping firms to exploit such windows (e.g., Miao et al., 2018), which usually open in multiple countries at different points in time. By focusing on the competition among MNCs, we are the first in theorizing on how an MNC's IE with DWs and TWs can help it to increase its market share in a country when these windows of opportunity in that country open.

## 2 | THEORETICAL BACKGROUND AND HYPOTHESES

### 2.1 | Demand and technological windows of opportunity

Lee and Malerba (2017) referred to windows of opportunity as “discontinuities in the dynamics of a sectoral system” (p. 339) that may offer the potential for firms in an industry to increase their market share. DWs are understood as “a new type of demand, a major shake-up in local demand or a business cycle” (Lee & Malerba, 2017, p. 339), often resulting in an upsurge of consumer demand for a product category in an industry. TWs have been described as situations in which a new technology appears on the market, progressively rendering the previous dominant technology obsolete due to its lower technical performance (e.g., Tushman & Anderson, 1986). Both DWs and TWs require firms to develop new resources and abilities or to change their strategic behavior to exploit their potential.

DWs offer firms two main opportunities to increase their sales with respect to their rivals. First, studies in industrial organization have shown that rival firms, particularly larger competitors, are less likely to react aggressively to market share erosion as long as their sales are growing at a satisfactory rate (Porter, 2008). This represents an opportunity for firms to expand their customer base without incurring dangerous retaliation (Caves & Porter, 1978). Second, the literature on windows of opportunity has suggested that, when the demand in a country grows rapidly, consumer preferences usually change accordingly and that, in this uncertain scenario, some firms might be unwilling or unable to renew their resources to meet the new demand. Although some firms might not respond to this new demand because they are successful within their existing customer base, others will adapt quickly to marked changes in the demand conditions and thus progressively strengthen their sales performance vis-à-vis their competitors (e.g., Figueiredo & Cohen, 2019; Giachetti & Marchi, 2017; Li, Capone, & Malerba, 2019).

TWs can help firms to make market share gains in two main ways. First, such changes are likely to destroy the value of the knowledge and competences accumulated by rival firms through the life cycle of the old technology (Dosi, 1982), resulting in a situation in which every firm, the largest rivals included, is a “beginner” with the new technology (Park & Lee, 2006; Perez & Soete, 1988). This often weakens the competitive position of those firms that continue to rely heavily on the old technology, despite the new technology clearly showing superior performance. Second, incumbents in the old technology may fall into the so-called “competency trap”, experiencing difficulties in changing organizational routines and developing the capabilities necessary to exploit the advantages of the emerging technology (Leonard-Barton, 1992) along with reluctance to nullify the profits from the existing products (Reinganum, 1983).

## 2.2 | IE and windows of opportunity

Experience is regarded as a prime source of learning in organizations (Huber, 1991; Levitt & March, 1988). Firms are likely to improve their learning by cultivating experience in different environments, such as multiple countries or industries. The importance of experience for international operations was initially realized by Johanson and Vahlne (1977) in their Uppsala model of international expansion. The authors described international expansion as an incremental process fostered by the progressive knowledge accumulated by firms through their experience abroad. Many other scholars have similarly emphasized the importance of experiential learning in firms' international expansion strategy (e.g., Barkema et al., 1996; Maitland & Sammartino, 2015; Perkins, 2014; Zhou & Guillén, 2015). Authors have suggested that a lack of experience with the environment of a foreign country (e.g., its culture, its consumer behavior, the pace of the technological evolution, and the functioning of its institutions) triggers uncertainty about the likely outcome of strategic actions (Kim, Delios, & Xu, 2010) and constrains firms' innovation capabilities (Mitchell, Shaver, & Yeung, 1992), slowing down their strategic decision making and threatening their survival (Delios & Beamish, 2001; Luo & Peng, 1999).

We investigate whether a firm's opportunity to increase its market share in a given geographic market with DWs or TWs is facilitated by its experience with such windows in other countries. In particular, we elaborate on two well-documented dimensions of experience, namely *depth* and *breadth* (e.g., Maitland & Sammartino, 2015; Perkins, 2014).

## 2.3 | A firm's depth of IE with windows of opportunity (H1)

Experience depth refers to the repeated exposure of a firm to a certain type of challenge over time, in our case the accumulated exposure to a specific type of window (i.e., either a DW or a TW). Organizational learning studies have argued that longer prior experience with a certain challenge is associated with richer challenge representations (e.g., Cohen & Levinthal, 1990; Zollo & Winter, 2002), giving a firm a greater ability to understand its activities and reducing the uncertainty that it may have about the paths that lead to successful performance (e.g., Ethiraj, Kale, Krishnan, & Singh, 2005).

In the international business literature, the depth of IE refers to the firm's repeated exposure to specific contextual factors in international markets. Some authors have conceptualized depth of IE in terms of a firm's time-based experience (Luo, 1999), which is usually measured with the number of years that the firm has been operating in a particular geographic market

(e.g., Brouthers, Brouthers, & Werner, 2003) or internationally (e.g., Zhou & Guillén, 2015). Other studies have measured depth of IE in terms of the frequency with which a firm has encountered a given contextual factor in international markets (Perkins, 2014). Others have measured a firm's depth of IE in terms of the firm's accumulated number of investments or entry modes in a host country or group of host countries (Berry & Sakakibara, 2008; Casillas & Moreno-Menéndez, 2014). The greater the depth of the firm's IE, the greater its opportunity to collect knowledge and develop routines, and thus accumulate experiential learning necessary to reduce the uncertainty in its host countries (e.g., Barkema et al., 1996; Johanson & Vahlne, 2009). Organizational routines developed by replicating prior experience of the same type (experience with a given type of window of opportunity, in our case) in multiple countries are what Perkins (2014) has defined "experience-based capabilities." For example, Perkins (2014) noted that if an MNC acquires experience-based capabilities while navigating a certain type of regulatory market structure in multiple countries over time, that specific capabilities could be reused in another host country to navigate similar regulatory market structures. Such experiential learning derived by accumulated experience-based capabilities may help a firm to increase its performance in the host country.

Drawing on previous organizational learning research on MNC (Perkins, 2014; Zhou & Guillén, 2015), we define the concept of a firm's depth of IE with a specific type of window of opportunity as the combination of countries, including the home country, in which it has accumulated operational experience with that type of window until a given point in time. Therefore, we propose the *time length* of operation in each country when a given type of window is open (i.e., accumulated exposure to a given type of window in international markets) as the key component of IE depth.

### 2.3.1 | A firm's depth of IE with DWs (H1a)

Previous studies in the international business literature have noted that MNCs competing in countries characterized by environmental dynamism, like rapidly changing transition economies, cannot easily predict the outcome of their investment decisions, and, if they lack adequate knowledge on how to serve fast-changing environments, they are likely to make investment mistakes, inevitably constraining their sales growth (Luo, 1998; Luo & Peng, 1999; Shan, 1991). Since markets with DWs are by definition more dynamic and uncertain than low-growth markets, we expect that more experience in countries with particularly fast-growing demand can allow MNCs to cope better with this uncertainty. The logic is that firms that have operated for a long time in countries with fast-growing demand, have accumulated more experience-based capabilities (Perkins, 2014) in scanning demand conditions, analyzing changes, and seizing opportunities than their rivals. In turn, such deep IE is likely to contribute more to the growth of these firms when a DW in a country opens.

In the context of telecommunication companies—that is, firms that provide telecommunication services, such as telephony and data communication access, and that often also own the network infrastructure necessary to produce and deliver such services—their past experience with DWs (e.g., rapidly growing consumer demand) in multiple countries may enable them to make, for example, more prudent but effective investments in new retail outlets (physical stores where mobile phones and telecom services are sold to consumers), cell towers (a key part of the physical network to make the telecom services work), and mobile phone applications to serve the rapidly growing number of consumers in a country.



For example, one of the reasons for the international success of the UK-based Vodafone has been described as its rapid internationalization in the 1990s, which allowed it to accumulate a huge amount of experience with the evolution of consumer demand in several countries. Over the 1990s and 2000s, it had to navigate the uncertainty triggered by rapid growth in the demand for mobile phone services in dozens of countries in Africa, the Americas, Asia, Europe, the Middle East, and Oceania. As noted by Arun Sarin, Chief Executive of Vodafone in 2004 (Vodafone Group, 2004, p. 5), “Vodafone can draw from resources across all our markets and respond competitively,” and by César Alierta, Chairman of Telefónica SA in 2010 (Pérez, 2010), “to be [global] in the telecommunications sector helps a lot, because you see the trends earlier.” Based on these arguments, we propose the following hypothesis:

**Hypothesis (H1a).** *The greater a firm's depth of international experience with demand windows, the greater that firm's market share in a country during demand windows.*

### 2.3.2 | A firm's depth of IE with TWs (H1b)

Research conducted in markets that are experiencing marked technological changes has shown that firms that accumulate technological knowledge will be more successful with their new products and technologies (Dosi, 1982; Figueiredo & Cohen, 2019; Nerkar & Roberts, 2004; Un, 2011). In fact, when the pace of technological evolution in an industry is fast, firms cannot easily predict the likely outcome of their innovation decisions since technological uncertainty often requires the development of new resources and capabilities. Moreover, during a period of technological change, it is more difficult for firms to identify the right partners along the supply chain as technological components and downstream activities evolve rapidly (Adner & Kapoor, 2010). As a result, repeated exposure over time (experience depth) with changes in the technological environment can help firms to calibrate better the risks and rewards related to its innovations and the choice of supply chain actors with which to innovate. If the technological experience comes from the implementation of a new technology in other countries, we expect firms to be less likely to make mistakes in strategic decisions related to the adoption of an emerging technology during a period of technological change in a host country. This in turn should strengthen their performance vis-à-vis host country rivals with less deep IE with TWs.

In the context of the telecommunication industry, greater depth of IE with TWs can help a telecom carrier to assess better the risks and opportunities related to the introduction of a new wireless mobile telecommunication technology in a country and in turn to introduce better-performing innovations related to such a standard and manufacture these innovations by means of more efficient production technologies. Greater depth of IE with TWs can also help a carrier to gain a better understanding of how to select suppliers of telecom equipment components, and help technology adopters to understand the features of new telecom standard. Hence, we posit:

**Hypothesis (H1b).** *The greater a firm's depth of international experience with technological windows, the greater that firm's market share in a country during technological windows.*

## 2.4 | A firm's breadth of IE with windows of opportunity (H2)

Breadth of experience refers to the variety of experience and represents the diversity of knowledge that a firm has to tackle a certain type of challenge. Organizational learning theorists have argued that diversity of experience gives a firm a more robust ability to learn how to tackle multiple and heterogeneous forms of a given type of challenge (Cohen & Levinthal, 1990; Haunschild & Sullivan, 2002). Previous studies have also shown that this broader knowledge base unleashes creativity and provides a firm with increased adaptability to environmental changes (Sidhu, Commandeur, & Volberda, 2007; Taylor & Greve, 2006).

Organizational learning research in the international business field has shown that MNCs do not only learn—and then strengthen their experience-base capabilities—from expanding repeatedly into countries with similar contextual factors; they also benefit from exposing themselves to a *diversity* of foreign environments (Perkins, 2014). For example, Perkins (2014, p. 173), in her study of MNC competing in multiple institutional environments, noted that “experience-based learning-curve effects can also be achieved across heterogeneous institutional environments.” Breadth of IE has the main benefit of reducing an MNC's risk of possessing knowledge about foreign markets that is unrelated with the knowledge required to navigate a new host country's environment. The logic is that the more diverse a firm's prior foreign experience, the greater the number of search paths and routines that it can draw on to solve new problems and tackle new challenges in a host country (Casillas & Moreno-Menéndez, 2014). An MNC with past exposure to a heterogeneous range of country conditions can recombine its varied knowledge to generate distinct experience-base capabilities to reduce the liabilities of newness and facilitate its entry and survival into new countries (Perkins, 2014; Zahra, Ireland, & Hitt, 2000).

### 2.4.1 | A firm's breadth of IE with DWs (H2a)

DWs may present marked differences. For example, Eggers, Grajek, and Kretschmer (2020) and Rietveld and Eggers (2018) noted that the profiles of a product's early adopters, who constitute a small share of the market when the product is not yet distributed, and its late adopters, which represent a larger share of the market, known as “mass market consumers,” can be very different in terms of willingness to pay, knowledge about product features and prices, choice of distribution channel, and product usage intensity (Klepper, 1997). This results in user groups with very different needs and purchasing behaviors. At a given point in time, firms may have to deal with diverse consumer groups, depending on the country in which they are operating. At the same time, authors have noted that marked changes in the consumer demand, such as rapid growth in the demand for a certain product category, can be found both in the initial stages of an industry's evolution, when the product category is not yet distributed among consumers (and when early adopters prevail), and in the later stages, when the product is more widespread and is targeted at the mass market (Rogers, 1995). Given the different profiles of early and late adopters of a technology, the knowledge necessary to serve a rapid increase in early adopters is different from that required to accommodate a rapid increase in late adopters (e.g., Eggers et al., 2020; Klepper, 1996). From an MNC perspective, at a given point in time, an industry may be at different stages of its demand evolution depending on the country under consideration: some countries may experience fast growth of early adopters while others may experience fast growth of mass market consumers, which we conventionally call “classes” of DWs. A firm's



breadth of IE with DWs therefore pertains to the degree of variety in its IE with the different classes of DWs.

Previous organizational learning studies have shown that the variety of knowledge that a firm has about “changes in customer preferences [...] is likely to sharpen awareness and knowledge about the needs and preferences of current as well as potential customers” (Sidhu et al., 2007, p. 25). Firms that have navigated changes in the demand in multiple countries are more likely to possess such a varied knowledge pool, which helps them in selecting more precise and innovative market segments, product differentiation, and improving its marketing channels and corporate image in a country (Day, 1994), especially, we expect, when a DW opens. Therefore, building on Perkins' (2014) argument on the benefits of an MNC's variety of experience-based capabilities, we expect that, when a given class of DWs opens in an MNC's host country, a well-diversified pool of experience-based capabilities with DWs will give the MNC a better chance of possessing knowledge about DWs that can be utilize effectively in that host country.

Exposure to a rapidly expanding demand for mobile phone services by different types of handset users can give a telecom carrier a more balanced understanding of the appropriate tariff plans that it should design to attract early or late adopters, the advertising strategies that it should invest in to target such different types of users, and the number of retail outlets that it should open to reach the expanding consumer base better and earlier than its rivals. Based on these arguments, we expect that the greater the variety of IE that a firm has accumulated about DWs, the more this knowledge will help it to increase its market share in a country where a DW is opened. Hence:

**Hypothesis (H2a).** *The greater a firm's breadth of international experience with demand windows, the greater that firm's market share in a country during demand windows.*

#### 2.4.2 | A firm's breadth of IE with TWs (H2b)

TWs may present marked differences. For example, the mobile phone industry has undergone two main technological discontinuities: the transition from analog to digital phones and the transition from feature phones to a new generation of smartphone devices (Giachetti & Marchi, 2017). Similarly, the telecommunication industry has experienced several technological discontinuities, each one conventionally demarcated by the introduction of a new generation of technical equipment and services for the functioning of handsets, that is, 1G, 2G, 3G, 4G, and so on (Li et al., 2019). In both the mobile phone and the telecommunication industry, each of these technological discontinuities required new competences from firms. In this situation, owning heterogeneous knowledge about different TWs can hamper a firm's breadth of experience. From an MNC perspective, at a given point in time, an industry may be at different stages of its technological evolution depending on the country under consideration; that is, technological discontinuities occur earlier in some countries than in others. In this vein, a firm's breadth of IE with TWs pertains to the variety of its experience with the various technological changes in an industry in multiple countries, which we conventionally call “classes” of TWs.

Organizational learning scholars have noted that experience in heterogeneous technological challenges increases the likelihood that incoming information about a new technology will be

connected to what is already known by the firm (Zahra & George, 2002), enabling it to observe and learn from a larger set of actors within the supply chain (Eggers et al., 2020) and thereby make competitive decisions and select business models in a more accurate way than less experienced competitors (Miller & Chen, 1996). We would then expect that a firm that has IE with different classes of TWs has learnt about the differences between technology user groups and component supplier groups in different countries and how they may call for differentiated strategies to target these supply chain actors successfully. Therefore, when a TW opens in an MNC's host country, the MNC's breadth of IE with TWs should reduce the risk the MNC finds itself with knowledge that is unrelated with the one required to navigate the TW in that host country, and that thereby cannot be utilize effectively to exploit its related opportunities.

In the context of telecommunication companies, breadth of IE with TWs could derive from a telecom carrier's IE with transitions from multiple generations of wireless mobile telecommunication technology (e.g., from 2G to 3G and from 3G to 4G), each requiring knowledge to solve different technological challenges. With such varied knowledge on different technological transitions in multiple countries, a telecom carrier can use multiple comparison points to judge the speed with which a standard will gradually be substituted by another, the way in which the technology adopters of a new standard coexist with those of the previous standard, and the best divesting and investing strategies to manage different technological discontinuities in the most effective and efficient way. All these arguments lead to the following hypothesis:

**Hypothesis (H2b).** *The greater a firm's breadth of international experience with technological windows, the greater that firm's market share in a country during technological windows.*

### 3 | METHODS

#### 3.1 | Data and sample

As our research setting, we used the worldwide mobile telecommunication industry from 2000 to 2015, which included 615 firms operating in 124 countries. This industry is an accurate context in which to test our hypotheses for several reasons. First, the industry's worldwide penetration rate was 12.16% at the beginning of 2000, and it grew to 96.94% in 2015, facing periods with DWs as a consequence of high demand growth especially in the central part of the period under analysis (2004–2012). However, it should be noted that the industry's evolution was relatively heterogeneous across countries. If we compare the penetration rate of the technology in 2015 among geographic regions, we find that Europe had the most developed market, with a penetration rate of 131.57%, whereas the rate in countries in Eastern and Middle Africa did not reach 60% (GSMA, 2016).<sup>1</sup> According to the different evolutions in the industry life cycle across countries, we find heterogeneity in terms of the type of consumers who demand the services. During our observation period, there were DWs both in contexts of low penetration rates, in which early adopters demanded basic telecom services (e.g., voice and message services), and in

<sup>1</sup>Penetration rates are calculated as connections (SIM cards) over the total population. As there are users with more than one mobile phone and organizations (firms, institutions, etc.) with associated SIM cards, penetration rates can be higher than 100%.

contexts of high penetration rates, in which late adopters required more complex services (e.g., data services, high-speed connections, etc.), meaning that the skills to cope with customer preferences differ across these two types of DWs.

Second, the mobile communication industry has evolved with the introduction of generational technological changes (Li et al., 2019), which have affected penetration rates and competition across markets. Generational changes are related to technological advances within a technological paradigm (Lawless & Anderson, 1996), requiring firms to build new competences to exploit the opportunities offered by such changes. There were two main TWs in the period under analysis: the change from 2G to 3G technology and the change from 3G to 4G technology. The change from 2G to 3G technology, at the beginning of the 2000s, allowed the use of data services in mobile devices. This meant a transition from voice services and text messaging as the key mobile services for data exchange, which reconfigured the value network of the industry by including computing and content activities (Tilson & Lyytinen, 2006). The change from 3G to 4G, which increased efficiency in the use of the radio spectrum, was another great shift (Clarke, 2014).

Third, a great internationalization process took place within the industry during the 2000s. After the early international expansion of European operators (e.g., Telefónica and France Telecom), big international players from other regions, especially Asian-Pacific countries (e.g., Hutchison Group) and Latin America (e.g., América Móvil), entered the industry and increased the global competition. MNCs often own part of the equity of national operators. In our sample, 341 of the 615 firms (55% of the sample) were the majority-owned subsidiaries of 68 MNCs at some point in time from 2000 to 2015. Our logic is that these operators can benefit from the IE of their owner MNCs in facing DWs and TWs in the countries in which they operate. Instead, 274 firms were single-country operators throughout the whole observation period, since they competed only in their domestic country, and could then rely only on the experience with windows accumulated domestically.

We found high variability in the IE of telecom carriers in three dimensions: (a) years of being MNCs; (b) scope of countries where they are present; and (c) different stages of the industry life cycle that they have experienced in terms of DWs and TWs. In fact, there are MNCs with a high degree of internationalization (such as Orange and América Móvil, with a presence in more than 20 countries at the end of the period under analysis) and MNCs with a lower degree of internationalization (such as Proximus and Elisa, with a presence in just one country other than the home country). This situation allowed us to identify firms with different degrees of IE.

We collected data from the GSMA (2016) to test our hypotheses. This publication specializes in mobile communications and gathers information per country and quarter about the market share of each company. These data allowed us to compute the quarterly evolution of the market share of the whole population of operators in the countries included in our study. As a result, our final sample includes 615 firms competing in 124 countries from 2000 to 2015, resulting in an unbalanced panel of 26,862 quarterly observations.<sup>2</sup> The GSMA dataset also includes information about other market variables, such as the growth in demand, the technological changes, and the mobile phone penetration in a country. The database further offers information about the percentage of equity of each operator belonging to each international group during our

<sup>2</sup>Not all firms have quarterly observations from 2000 to 2015 for two main reasons: (a) there are firms that started operating after the first quarter of 2000 or disappeared before the last quarter of 2015; and (b) there are firms operating as a monopolist in countries at the beginning of the 2000s, but, as our focus of attention is the evolution of firms' market share, observations that corresponded to a monopoly were dropped from the sample.

observation period. We integrated this data with company and industry reports, as well as the World Bank Indicators, to include various country-level controls.

## 3.2 | Variables

### 3.2.1 | Dependent variable

Our dependent variable is a firm's *market share*, calculated as its number of active mobile cellular connections over the total number of active mobile connections in a country, according to the GSMA (2016). The market share is an appropriate measure for our analysis because it captures a firm's sales relative to its rivals (Chen, Katila, McDonald, & Eisenhardt, 2010; Ferrier, Smith, & Grimm, 1999) and is consistent with prior studies that have examined firm performance in changing technological environments (e.g., Adner & Kapoor, 2010).<sup>3</sup>

### 3.2.2 | Windows of opportunity

#### *Demand window*

Lee and Malerba (2017) defined a DWs as a pronounced change in demand conditions, such as the emergence of a new type of demand or a major shake-up in the local demand. To identify pronounced changes in demand, we first calculated the demand growth in each country as the percentage change in the number of mobile cellular connections from period  $t - 1$  to period  $t$  in country  $k$  (GSMA, 2016). We then calculated the worldwide average demand growth from 2000 to 2015, which was 4.16%.<sup>4</sup> Third, we considered country  $k$  in each quarter  $t$  to have experienced a DW if, in that period, the country experienced demand growth higher than the worldwide mean. Our variable *DW* is therefore a dummy that takes the value 1 when a DW is open in country  $k$  in that quarter and 0 otherwise.

#### *Technological window*

Lee and Malerba (2017) defined a TW as the introduction of a new technology in an industry that requires new knowledge for firms to be able to exploit its potential. Building on prior studies (e.g., Gomez, Lanzolla, & Maicas, 2016), this variable was calculated through a dummy that takes the value 1 during the first year after the introduction of a technological change in country  $k$  and 0 otherwise. We set the length of TWs at 1 year because, as noted by previous studies, in high-tech industries the chance a firm has to gain an advantage with a new technology is in the first months after its introduction, while the more evident the superiority of the new technology becomes in the eyes of rivals, the lesser the likelihood the firm will have to obtain an advantage over laggards (e.g., Christensen & Bower, 1996). Consistent with other studies of the telecommunication industry, we defined technological changes as the shifts from the 2G to the 3G standard and from the 3G to the 4G standard (Li et al., 2019).

<sup>3</sup>Following Adner and Kapoor (2010) and Ferrier et al. (1999), the market share is introduced into the main estimation after the natural logarithm transformation (ln).

<sup>4</sup>We followed other studies that used the threshold of the mean value to classify a variable into high (low) levels (e.g., Kim, Hwang, & Burgers, 1989; Stern, Dukerich, & Zajac, 2014).

### 3.2.3 | IE with windows of opportunity

#### *IE with DWs (depth)*

As discussed in the hypothesis section, consistent with previous studies (Zhou & Guillén, 2015), the key component of IE depth used in our study is the time length of a firm's operation in each country when a given type of window was open, since we assumed that the knowledge that a firm acquires when internationalizing accumulates over time (e.g., Berry, 2006a; Luo, 1999; Vermeulen & Barkema, 2002). The depth of IE with DWs was therefore measured for each quarter as the cumulative number of quarters in which a firm has been operating in countries with DWs from January 2000, including the home country. We believe the inclusion of experience with windows in a firm's home country is important because, as noted in recent studies (Zhou & Guillén, 2015), what a firm has learnt about challenges abroad can be fruitfully recombined with what it has learnt domestically, since home country learning and host country learning are usually heterogeneous.<sup>5</sup> To build this variable, we first calculated the cumulative number of quarters for which each of the 68 existing MNCs had been the majority owner of firms located in countries (home country included) where the variable *DW* takes the value 1. Next, the value of the IE of the owner group was allocated to the firm that was majority owned by that group. For purely domestic firms, the depth of IE with DWs considers only the experience with high demand growth accumulated in the home country. This variable is 0 when the firm does not have any accumulative experience with DWs in prior quarters. It is positive when the firm has experience in countries with DWs. In this vein, consistent with previous studies (e.g., Perkins, 2014; Zhou & Guillén, 2015), this variable is higher the longer the firm has operated in a given set of countries where a DW was open.

#### *IE with TWs (depth)*

Similar to our approach to the IE with DWs variable, depth of IE with TWs was measured, for each quarter, as the cumulative number of TWs, beginning in 2000, that the international group owner of the firm (if any) experienced in the countries in which it operated. The TWs are the technological changes from 2G to 3G or from 3G to 4G. An MNC was considered as experiencing a TW in country *k* if it was operative in that country in the quarter *t* in which the TW was open. The cumulative number of technological changes experienced by the MNC from 2000 was allocated to each one of the majority-owned subsidiaries. For purely domestic firms, the depth of IE with TWs considers only the experience with technological discontinuities accumulated in the home country. Thus, for the whole sample, the variable *IE with TWs (depth)* is 0 when the firm has not experienced any TWs. It is positive when the firm have experienced prior technological changes.

#### *IE with DWs (breadth)*

Previous studies have measured the breadth of IE with indicators capturing the extent to which a firm's prior experience is diversified across heterogeneous dimensions of the international environment (e.g., Perkins, 2014). Drawing on these studies, our measure of the breadth of IE of a firm with DWs therefore aims to capture the diversity of DWs that firms have experienced

<sup>5</sup>All our IE variables were computed considering also a firm's experience with windows in its home country, regardless of whether the firm was an MNC or a purely domestic operator. This is consistent with measures proposed in recent studies (e.g., Zhou & Guillén, 2015). However, as shown in the online Appendix, results did not change when we set at "0" the IE of purely domestic firms.

across countries up to a certain point in time. To capture the diversity component of a firm's experience with consumer demand, as previously discussed in the hypothesis section, the extant literature has suggested that we can distinguish two types of adopters, early adopters (in the first stages of the industry life cycle) and late adopters (in the last stages of the cycle), under the premise that they present different characteristics and require different knowledge from firms to cope with their demands (Eggers et al., 2020; Rietveld & Eggers, 2018). After identifying the existence of a DW (i.e., if, at time  $t$ , the country experiences demand growth that is higher than the worldwide average demand growth), we categorized it as one of two classes, DW  $A$  and DW  $B$ , depending on the stage of the industry evolution, this being a function of the mobile phone penetration rate in a country (Klepper, 1996, 1997).  $A$  refers to the scenario in which the market penetration rate is lower than 50%, and  $B$  refers to the scenario in which the market penetration rate is equal to or higher than 50%. In the case of  $A$ , we expect a scenario in which the majority of users are early adopters, and, in the case of  $B$ , we expect a scenario in which a relevant share of users are late adopters (or "mass market consumers"). To build this variable, we calculated the cumulative number of DWs,  $A$  and  $B$ , that each firm (single-country firm or MNC) experienced from 2000. As the breadth dimension measures the degree of diversity in IE, we used a traditional heterogeneity measure, Blau's index, consistent with previous studies (Dimov & Martin de Holan, 2010). Blau's index is calculated by subtracting the sum of the squared shares of each class from one, and it ranges from 0 to  $1 - 1/n$ , where  $n$  is the number of classes (i.e., the two classes of DWs in our case):

$$IE \text{ with DWs (breadth)}_t = 1 - p_A^2 - p_B^2$$

where  $p_A$  and  $p_B$  represent the proportion of DWs that the firm has experienced until  $t$  in  $A$  and  $B$ , respectively. As for the other measures of IE, in case of an MNC, the IE value of the owner group was allocated to the firm owned by that group. For purely domestic firms, the breadth of IE with DWs considers only the experience with different classes of DWs that a firm has accumulated in its home country. This variable ranges from 0, if the IE is completely homogeneous (and then the breadth is minimum), to 0.5, if the firm possesses identical amounts of IE with DWs  $A$  and  $B$ .

#### *IE with TWs (breadth)*

The breadth of IE with TWs refers to the diversity in TWs that firms experience across countries. In this case, we calculated the cumulative number of TWs that each firm experienced from 2000 until  $t$  by differentiating between two classes of TWs: TW  $A$  for technological changes from 2G to 3G and TW  $B$  for changes from 3G to 4G. For purely domestic firms, the breadth of IE with TWs considers only the experience with different classes of TWs that a firm has accumulated in its home country. We used Blau's index again and followed a similar procedure to that for *IE with DWs (breadth)*. This variable therefore ranges from 0, if the firm does not possess IE or this IE refers to just one class of technological change, to 0.5, if the owner MNC possesses identical amounts of IE with TWs  $A$  and  $B$ .

### 3.2.4 | Control variables

Our longitudinal analysis controlled for the effects of firm-, industry-, and country-level characteristics at the end of each quarter  $t$ . We controlled at the firm level for the resource availability



of firms as larger firms can be in a better position to access key resources, such as financial or human assets. We included a control for a firm's size and age, as discussed in the competitive dynamics literature, as firm-level characteristics that affect a firm's competitive aggressiveness and retaliatory power (e.g., Miller & Chen, 1996). We measured firm size in the focal country through the millions of mobile connections in that country (*Firm size*) as well as a control for the MNC size when the firm belongs to a group that operates in more than one country, calculated as the thousand million connections of the majority owner MNC (*MNC size*). We also included the interactions of MNC size with DWs and TWs as control variables to isolate the effect of the “MNC experience with windows” from the firm size. Additionally, we controlled for a firm's age in a focal country using a variable that measures the number of years from the entry of the firm into that country (*Age*).

With regard to the industry-level controls, we first controlled for the level of *industry concentration* through the Herfindahl index (Ferrier et al., 1999), which varies with the number of firms and the market share differences between competitors. Additionally, the level of competitive intensity in a country was captured by including a dummy variable, *New competitors*, that takes the value 1 when new competitors enter a focal country in a given quarter and 0 otherwise (Galbraith & Stiles, 1983).<sup>6</sup> We also controlled for periods of *demand decline* through a dummy that takes the value 1 when the demand decreases (i.e., negative growth rate) from period  $t - 1$  to period  $t$  and 0 otherwise. With the aim of controlling for the effect of the uncertainty surrounding windows of opportunity on market shares, we included two additional dummies. *Period before window* takes the value 1 in period (quarter)  $t$  when in period  $t$  there are no windows open and in period  $t + 1$  a DW or TW is opened, while it takes the value 0 otherwise. *Period after window* takes the value 1 in period  $t$  when in period  $t$  there are no windows open and in period  $t - 1$  a DW or TW is opened, while it takes the value 0 otherwise. Finally, we included the *penetration rate* of mobile communications in each country, measured as the total number of active connections over the population (Gomez et al., 2016). All these industry variables were calculated with data collected from the GSMA (2016).

We included variables capturing the economic, social, and regulatory conditions for the country-level controls. *GDP per capita*, in constant \$2005 (in thousands), and *GDP growth*, as the yearly increase in the GDP, represent the level of country wealth. *Population*, as the millions of inhabitants per country, controls for the size of the country. Both the GDP and the population were obtained from the World Bank (2016). We controlled for regulatory conditions through the *Institutional quality* variable, which approaches the degree to which the institutional framework of the market—political, economic, and social—supports the effectiveness of economic exchanges and, in this sense, helps newcomers to enter a country and promotes competition (Fuentelsaz, Garrido, & Maicas, 2015). Consistent with previous studies, this index was calculated based on the yearly Worldwide Governance Index provided by the World Bank, which has six dimensions that vary from  $-2.5$  to  $2.5$ : voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption (Kaufmann, Kraay, & Zoido-Lobaton, 1999). We performed an exploratory factor analysis for each period and reduced the six dimensions to one factor following previous studies (Dikova & Van Witteloostuijn, 2007). Table 1 presents descriptive statistics and correlations.

<sup>6</sup>In our sample, when this variable is equal to 1, in 99% of cases it corresponds to just one new competitor entering, while in 1% of cases it corresponds to two new competitors entering.

TABLE 1 Descriptive statistics ( $N = 26,862$  observations)

Variable	Mean	SD	Min.	Max.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1. Market share (ln) <sup>a</sup>	-1.96	1.64	-9.21	0.00	1.00																				
2. DW	0.43	0.50	0.00	1.00	0.01	1.00																			
3. TW	0.13	0.33	0.00	1.00	-0.05	-0.07	1.00																		
4. IE with demand windows (depth) (in hundreds)	0.85	1.25	0.00	5.87	0.24	-0.09	0.04	1.00																	
5. IE with technological windows (depth) (in hundreds)	0.05	0.07	0.00	0.42	0.21	-0.27	0.08	0.79	1.00																
6. IE with demand windows (breadth)	0.24	0.21	0.00	0.50	0.17	-0.35	0.06	0.31	0.48	1.00															
7. IE with technological windows (breadth)	0.11	0.19	0.00	0.50	0.09	-0.34	0.17	0.26	0.53	0.36	1.00														
8. Firm size (in millions)	4.45	8.98	0.00	148.56	0.24	-0.20	0.02	0.15	0.21	0.23	0.23	1.00													
9. MNC size (in thousand millions)	0.04	0.07	0.00	0.43	0.21	-0.20	0.04	0.59	0.78	0.44	0.37	0.25	1.00												
10. Age	9.61	6.40	0.00	35.75	0.35	-0.37	0.05	0.25	0.37	0.36	0.44	0.40	0.29	1.00											
11. Industry concentration <sup>a</sup>	0.39	0.11	0.18	1.00	0.12	0.30	-0.06	-0.07	-0.16	-0.19	-0.22	-0.16	-0.11	-0.19	1.00										
12. New competitor	0.05	0.22	0.00	1.00	-0.08	0.10	0.09	-0.02	-0.04	-0.08	-0.04	-0.03	-0.03	-0.10	0.07	1.00									
13. Demand decline	0.10	0.30	0.00	1.00	0.02	-0.29	0.03	0.06	0.18	0.14	0.22	0.06	0.13	0.15	-0.11	-0.06	1.00								
14. Period before window	0.07	0.25	0.00	1.00	0.00	-0.23	-0.10	0.04	0.02	0.05	-0.02	0.00	0.02	0.01	0.00	-0.03	0.06	1.00							
15. Period after window	0.08	0.27	0.00	1.00	-0.01	-0.26	-0.11	0.04	0.02	0.07	0.02	0.01	0.02	0.00	-0.02	-0.04	0.05	0.23	1.00						
16. Penetration rate	0.76	0.49	0.00	2.95	-0.01	-0.66	0.09	0.08	0.31	0.45	0.40	0.20	0.22	0.43	-0.39	-0.10	0.25	0.03	0.05	1.00					
17. GDP per capita (in thousands)	11.94	17.46	0.10	113.73	0.06	-0.42	0.02	-0.08	0.09	0.14	0.11	0.06	0.05	0.30	-0.19	-0.06	0.11	-0.04	-0.04	0.55	1.00				
18. GDP growth	0.04	0.05	-0.36	0.54	-0.04	0.28	0.01	-0.02	-0.10	-0.12	-0.10	-0.08	-0.08	-0.15	0.09	0.05	-0.14	0.02	0.02	-0.23	-0.21	1.00			
19. Population (in millions)	32.70	46.19	0.28	259.07	-0.25	0.05	0.01	-0.03	-0.04	-0.03	0.06	0.47	0.01	0.03	-0.17	0.04	-0.04	-0.01	0.00	-0.15	-0.16	0.04	1.00		
20. Institutional quality	-0.02	1.07	-2.02	2.15	0.12	-0.41	0.02	-0.10	0.09	0.19	0.06	0.05	0.08	0.28	-0.15	-0.07	0.10	-0.03	-0.03	0.54	0.78	-0.22	-0.22	1.00	
21. Fixed-telecom incumbent	0.22	0.42	0.00	1.00	0.22	-0.03	-0.01	-0.09	-0.04	0.03	-0.03	-0.03	0.15	-0.02	0.36	0.09	-0.03	0.01	0.00	0.03	0.06	-0.03	-0.07	0.11	

Note: The descriptive statistics are based on unstandardized variables.

Abbreviations: DW, demand window; IE, international experience; TW, technological window.

<sup>a</sup>As the observations correspond to firms in competitive markets, the maximum value of *market share* is 99.97% (-0.0003 in natural logarithm, rounded to 0) and the maximum value of *industry concentration* measured as the Herfindahl Index is 0.9994 (rounded to 1.00).

## 4 | RESULTS

### 4.1 | Hypothesis tests

As we had a quarterly panel of 615 firms from 2000 to 2015 in 124 countries, panel data analysis seemed to be appropriate. The Breusch–Pagan test (Breusch & Pagan, 1979) rejected the null hypothesis of no heteroscedasticity ( $p = .000$ ), suggesting that there are firm effects and that a panel method is suitable. We conducted a Hausman test to compare the differences between including fixed- and including random-effects. The results of the test rejected the null hypothesis of no systematic differences between the two effects ( $p = .000$ ), advocating the use of fixed-effects rather than random-effects. As the model includes various sources of unobserved heterogeneity, the high-dimensional fixed-effects (HDFEs) estimator was used (Correia, 2014). This estimator allows the introduction of firm, country, and year fixed-effects by absorbing the HDFEs instead of computing them as dummy variables directly in the regression, which reduces the degrees of freedom. This methodology has been used in other studies with a similar data structure (e.g., Banalieva, Cuervo-Cazurra, & Sarathy, 2018). As our observations belong to both domestic firms and MNCs, for MNCs we clustered the standard errors (*SEs*) at the MNC-level and not at the subsidiary-level, as subsidiary-level observations are not independent within the same MNC.

Table 2 provides the results of our hypothesis tests. Model 1 contains all the independent and control variables. The interactions between windows and IE were tested separately from Model 2 to Model 5. This table reports the within and overall *R*-squared as well as the *F*-test to assess the model fit with respect to Model 1. The mean and maximum values of the variance inflation factor (VIF) are also reported, showing that multicollinearity does not bias our estimations as the values are below the recommended thresholds of 2.5 (e.g., Johnston, Jones, & Manley, 2018; O'Brien, 2007).<sup>7</sup> In Table 2, we also added Model 6, which includes all interactions. However, the coefficients in this model were not used to test our hypotheses because the mean VIF is above the recommended threshold of 2.5, and the several interaction terms are likely to confound the results (Johnston et al., 2018). Table 3 shows the value of the average marginal effects of windows of opportunity on the market share at different levels of IE with windows: 1 *SD* below the mean (low), the mean, and 1 *SD* above the mean (high).

As shown in all the models (Table 2), the main effects of DWs and TWs on a firm's market share are negative. As the dependent variable is the market share and all the players are included, these results are not surprising since, as suggested by previous studies, when pronounced demand or technological changes take place in a market, only some firms are able to exploit the opportunities generated within these uncertain environments (Ansari & Krop, 2012).

Regarding the interaction terms, in Model 2, we observed a positive moderating effect from the depth of IE on DWs ( $\beta = .043$ ;  $p = .009$ ). This finding supports H1a. As shown in Table 3, the negative marginal effect of DWs is reduced by 42% (from  $-0.088$  to  $-0.051$ ) when the value

<sup>7</sup>As a firm in the focal country that was the state-owned incumbent in fixed telecommunications might possess additional knowledge to navigate windows of opportunity, we replicated the estimations by using the random-effects GSL regression estimator and including as a control variable a time-invariant dummy variable that takes the value 1 when the firm was the state-owned incumbent in the country and 0 otherwise. As can be seen in the online Appendix, the results remained similar to those obtained from the HDFE estimation.

TABLE 2 Estimates of market shares ( $N = 26,862$ )

<i>Dependent variable</i> <i>Market share (ln)</i>	<b>Model 1</b> <b>HDFE</b>	<b>Model 2</b> <b>HDFE</b>	<b>Model 3</b> <b>HDFE</b>	<b>Model 4</b> <b>HDFE</b>	<b>Model 5</b> <b>HDFE</b>	<b>Model 6</b> <b>HDFE</b>
DW	-0.069 (0.027) [.010]	-0.093 (0.029) [.001]	-0.069 (0.027) [.010]	-0.077 (0.036) [.032]	-0.068 (0.027) [.012]	-0.101 (0.038) [.009]
TW	-0.102 (0.027) [.000]	-0.102 (0.027) [.000]	-0.113 (0.028) [.000]	-0.103 (0.027) [.000]	-0.124 (0.031) [.000]	-0.129 (0.031) [.000]
IE with DWs (depth)	0.057 (0.023) [.012]	0.040 (0.020) [.048]	0.057 (0.023) [.012]	0.057 (0.023) [.013]	0.056 (0.023) [.013]	0.039 (0.020) [.056]
IE with TWs (depth)	-0.305 (0.416) [.463]	-0.200 (0.407) [.623]	-0.363 (0.415) [.381]	-0.299 (0.414) [.471]	-0.273 (0.418) [.514]	-0.197 (0.413) [.633]
IE with DWs (breadth)	-0.019 (0.109) [.858]	-0.024 (0.108) [.824]	-0.019 (0.109) [.861]	-0.037 (0.132) [.776]	-0.021 (0.109) [.846]	-0.044 (0.131) [.736]
IE with TWs (breadth)	-0.037 (0.118) [.751]	-0.043 (0.119) [.718]	-0.037 (0.118) [.755]	-0.036 (0.119) [.760]	-0.080 (0.123) [.515]	-0.080 (0.125) [.519]
DW × IE with DWs (depth)		0.043 (0.016) [.009]				0.044 (0.016) [.007]
TW × IE with TWs (depth)			0.392 (0.233) [.093]			0.233 (0.248) [.348]
DW × IE with DWs (breadth)				0.032 (0.104) [.763]		0.033 (0.106) [.757]
TW × IE with TWs (breadth)					0.164 (0.069) [.018]	0.151 (0.076) [.047]
Firm size	0.019 (0.006) [.001]	0.019 (0.006) [.001]	0.019 (0.006) [.001]	0.019 (0.006) [.001]	0.019 (0.006) [.001]	0.019 (0.006) [.001]
MNC size	-0.118 (0.243) [.626]	-0.017 (0.270) [.950]	-0.073 (0.243) [.763]	-0.109 (0.247) [.659]	-0.099 (0.246) [.689]	0.040 (0.279) [.886]
DW × MNC size	0.602 (0.276) [.030]	0.121 (0.298) [.684]	0.601 (0.278) [.031]	0.572 (0.295) [.053]	0.611 (0.279) [.029]	0.090 (0.301) [.766]
TW × MNC size	0.544 (0.155) [.001]	0.536 (0.156) [.001]	0.234 (0.218) [.284]	0.544 (0.155) [.001]	0.402 (0.137) [.004]	0.220 (0.212) [.299]
Age	-0.009 (0.017) [.608]	-0.009 (0.017) [.583]	-0.009 (0.017) [.610]	-0.009 (0.017) [.603]	-0.008 (0.017) [.629]	-0.009 (0.017) [.597]
Industry concentration	0.359 (0.233) [.123]	0.365 (0.233) [.117]	0.360 (0.232) [.122]	0.359 (0.232) [.123]	0.359 (0.232) [.123]	0.365 (0.232) [.117]
New competitor	-0.189 (0.026) [.000]	-0.188 (0.026) [.000]	-0.188 (0.026) [.000]	-0.188 (0.026) [.000]	-0.188 (0.026) [.000]	-0.187 (0.026) [.000]
Demand decline	0.026 (0.015) [.079]	0.026 (0.015) [.087]	0.027 (0.015) [.075]	0.026 (0.015) [.078]	0.027 (0.015) [.072]	0.027 (0.015) [.077]
Period before window	-0.038 (0.013) [.005]	-0.037 (0.013) [.007]	-0.038 (0.013) [.005]	-0.038 (0.013) [.003]	-0.037 (0.013) [.006]	-0.037 (0.013) [.004]
Period after window	-0.048 (0.014) [.001]	-0.047 (0.014) [.001]	-0.047 (0.014) [.001]	-0.048 (0.013) [.000]	-0.046 (0.014) [.001]	-0.046 (0.013) [.001]

TABLE 2 (Continued)

<i>Dependent variable</i> <i>Market share (ln)</i>	<b>Model 1</b> <b>HDFE</b>	<b>Model 2</b> <b>HDFE</b>	<b>Model 3</b> <b>HDFE</b>	<b>Model 4</b> <b>HDFE</b>	<b>Model 5</b> <b>HDFE</b>	<b>Model 6</b> <b>HDFE</b>
Penetration rate	-0.260 (0.101) [.010]	-0.257 (0.101) [.011]	-0.260 (0.101) [.010]	-0.260 (0.100) [.010]	-0.261 (0.101) [.010]	-0.257 (0.100) [.011]
GDP per capita	0.007 (0.003) [.023]	0.007 (0.003) [.022]	0.007 (0.003) [.023]	0.007 (0.003) [.023]	0.006 (0.003) [.025]	0.007 (0.003) [.025]
GDP growth	-0.084 (0.161) [.605]	-0.069 (0.162) [.670]	-0.083 (0.161) [.609]	-0.083 (0.161) [.605]	-0.079 (0.162) [.626]	-0.063 (0.162) [.696]
Population	-0.026 (0.008) [.003]	-0.026 (0.008) [.003]	-0.026 (0.008) [.003]	-0.026 (0.009) [.003]	-0.025 (0.009) [.003]	-0.026 (0.009) [.003]
Institutional wuality	0.155 (0.112) [.166]	0.154 (0.112) [.168]	0.154 (0.112) [.169]	0.155 (0.112) [.166]	0.156 (0.112) [.163]	0.155 (0.112) [.166]
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES	YES
Constant	-1.112 (0.339) [.001]	-1.103 (0.338) [.001]	-1.113 (0.339) [.001]	-1.104 (0.341) [.001]	-1.114 (0.340) [.001]	-1.098 (0.341) [.001]
<i>R</i> -squared (overall)	.9160	.9161	.9160	.9160	.9161	.9162
<i>R</i> -squared (within)	.0476	.0491	.0478	.0477	.0482	.0497
<i>F</i> -test vs. Model 1		6.87 [.009]	2.83 [.093]	0.09 [.763]	5.68 [.018]	3.33 [.010]
<i>F</i> -test vs. Model 2						2.90 [.035]
<i>F</i> -test vs. Model 3						3.25 [.022]
<i>F</i> -test vs. Model 4						4.19 [.006]
<i>F</i> -test vs. Model 5						3.06 [.028]
Mean VIF	2.11	2.28	2.39	2.29	2.16	2.74
Max. VIF	6.56	6.72	7.01	6.58	6.61	7.39

Note: SEs in parentheses; *p*-values in square brackets. All the independent and control variables are lagged by one period. The models are estimated using robust SEs clustered at the MNC level. All the models include firm, country, and year fixed-effects. The total number of quarterly observations (26,862) corresponds to 615 firms in 124 countries, with an average of 44 observations per firm. The variables IE with demand windows (depth) and IE with technological windows (depth) are expressed in hundreds of windows.

Abbreviations: DW, demand window; IE, international experience; TW, technological window; VIF, variance inflation factor.

TABLE 3 Marginal effect of the moderator variables and windows of opportunity on market shares

Moderator variable	Level of moderator	Value of moderator	Average marginal effect of windows of opportunity
IE with DW (depth)	Low	0.00	−0.088 [.002]
	Mean	0.85	−0.051 [.025]
	High	2.10	0.002 [.944]
IE with TW (depth)	Low	0.00	−0.104 [.000]
	Mean	0.05	−0.085 [.000]
	High	0.12	−0.056 [.029]
IE with DW (breadth)	Low	0.03	−0.054 [.107]
	Mean	0.24	−0.047 [.037]
	High	0.44	−0.041 [.160]
IE with TW (breadth)	Low	0.00	−0.109 [.000]
	Mean	0.11	−0.091 [.000]
	High	0.30	−0.060 [.004]

Note: *p*-values reported in square brackets. For each moderator, the low (high) value is 1 *SD* below (above) its mean. We took “0” as the low value of the moderator when the value of 1 *SD* below the mean is negative for experience. The values of the depth of IE are expressed in hundreds.

Abbreviations: DW, demand window; IE, international experience; TW, technological window.

of experience moves from low to the mean until it becomes not significant (i.e., with a *p*-value greater than .1) as the IE with DWs increases.

Model 3 shows that the coefficient of the interaction between the TWs and the depth of IE with TWs is also positive, though marginally significant ( $\beta = .392$ ;  $p = .093$ ), thus providing some support for H1b. Table 3 shows that, as the IE moves from low to high values, the negative marginal effect of TWs is reduced by 46% (from −0.104 to −0.056).

However, Model 4 shows that the interaction of DWs with the breadth of the IE with DWs is not significant ( $\beta = .032$ ;  $p = .763$ ), not supporting H2a. This lack of significance can be observed in Table 3 as the marginal effect of DWs is maintained at different levels of IE.

Finally, the interaction between the occurrence of TWs and the breadth of IE with TWs in Model 5 is positive ( $\beta = .164$ ;  $p = .018$ ), supporting H2b. When the IE moves from the low to the high level, the negative marginal effect of TWs decreases by 45% (from −0.109 to −0.060). This means that the greater the heterogeneity in a firm's experience with TWs, the more it can benefit from such changes (or the less it is damaged by such changes).

## 4.2 | Robustness tests and supplemental analyses

To provide a more nuanced picture of our findings, we provide a set of robustness tests and supplemental analyses, synthesized as follows. First, we attempted to dig deeper into our results about depth and breadth of IE with DWs and TWs by drawing on previous studies about a firm's IE unrelatedness with the knowledge necessary to navigate a host country environment (Perkins, 2014). More specifically, we run a supplemental analysis based on the two pairs of classes respectively of DWs and TWs we used to compute each IE breadth variable—that is,



demand growth in early- versus late-stage markets; 2G–3G versus 3G–4G discontinuities—to test if, all else being equal, IE with a class of a given type window helps navigating the other class of the same type of window. With regard to DWs, we tested whether IE with high demand growth in early-stage markets really matters to navigate high demand growth in late-stage markets, and vice versa; while for TWs we tested whether IE with 2G–3G technological discontinuities really matters to navigate 3G–4G discontinuities, and vice versa. Results show that only one out of four interactions is positive with a  $p$ -value lower than .1, meaning that IE with a class of a given type of window is not sufficient to obtain a performance advantage when another (different) class of the same type of window opens in a country. On the one hand, results of this supplemental analysis suggest that the positive moderating effects of depth of IE with DWs and TWs we presented in Table 2 (which supported our two hypotheses about IE depth) should be read with caution, since it emerges that an MNC's learning obtained from repeated exposure (IE depth) with a class of a given type of window does not help to obtain better performance if used in isolation to navigate a different class of that window. Such findings are thus consistent with previous evidence of “dissimilar experience as a learning hindrance” (Perkins, 2014, p. 174). On the other hand, results of this analysis complement our logic (and findings in Table 2) that it is important for an MNC to have a well-diversified pool of experience-base capabilities with a window (i.e., experience breadth) to obtain performance advantages vis-à-vis rivals when that window opens in a country, since such varied pool of knowledge gives a firm a better chance to possess capabilities related to the specific challenge (i.e., class of window) opening in the host country. Our results are thus consistent with previous evidence that, thanks to the breadth of IE, “organizations that expand into new and uncertain markets have the advantage of a greater knowledge pool” (Perkins, 2014, p. 152).

Second, in a set of other additional analyses we found that (a) DWs and TWs in the global telecommunications industry were not opened simultaneously, (b) during DWs and TWs, as opposed to periods of stability in demand and technology, firms are subject to greater market share instability, and (c) MNCs are more likely to enter a new country during DWs than TWs. Third, we found that results remain consistent when we test our models for different thresholds of DWs (i.e., different cut off points to distinguish between high vs. low demand growth) and different estimation techniques. Fourth, we found that the performance implications of IE with windows of opportunity is contingent on the institutional quality of the countries in which such windows opened and on the market power of the focal firm in a country, distinguishing between market leaders and challengers. Finally, in another set of analyses we tested (a) the effect of IE with non-window periods and (b) alternative measures of a firm's IE. We found that the *IE with windows* of opportunity has a stronger (positive) moderating effect on the relationship between windows and a firm's market share in a country than the *IE with non-window periods*, and that three out of four hypotheses remain supported (as in Table 2) if we set IE at zero for purely domestic firms. All these results are available in the online Appendix for this article.

## 5 | DISCUSSION

### 5.1 | Implications for theory

Understanding how firms are able to increase their market share during marked changes in the business environment is a central issue in industry evolution studies (e.g., Ansari & Krop, 2012;

Christensen & Bower, 1996; Tushman & Anderson, 1986). Recent studies drawing from the technological change literature have shown that, over an industry's evolution, firms' chance to increase their market share is related to "windows of opportunity" (e.g., Figueiredo & Cohen, 2019; Giachetti & Marchi, 2017; Lee & Malerba, 2017), that is, temporary changes in firms' external environment that require them to find new ways to compete. In this article, by bringing learning theories from international business (Johanson & Vahlne, 1977), particularly those centered on the role of the depth and breadth of a firm's IE (Perkins, 2014; Zhou & Guillén, 2015), into the windows of opportunity literature, we theorized about how the effect of the DWs and TWs in a country on a firm's market share in that country is moderated by the firm's IE with such windows. We contended that firms can gain experience-based capabilities (Perkins, 2014) to navigate DWs and TWs in two different ways: first by accumulating IE with a specific type of window of opportunity over time, which we called depth of IE with a window of opportunity, and second by experiencing different classes of a specific type of window, that is, increasing the variety of its experience-base capability pool related to demand conditions or in the technological environment, thus determining the variety of a firm's IE with a specific window, which we called the breadth of IE with a window of opportunity.

We found support for the positive moderating effect of three out of four types of IE, despite one of these three effects was only marginally supported. More specifically, with regard to IE with TWs, we found support mainly for the positive moderating effect of IE breadth, while depth of IE with TWs was only marginally significant (though, as reported in the online Appendix, the *p*-value of this moderator decreases to .049 if we set at zero the IE of purely domestic firms). With regard to IE with DWs, we found support only in the case of the depth dimension of IE. The positive moderating effects of depth of IE with TWs and DWs are consistent with our argument that such experiences help a firm to assess better the risks and rewards of environments characterized by high technological and demand uncertainty and transform this uncertainty into performance opportunities, which in turn result in market share advantages. In other words, the "time" (or "cumulative amount") component of IE with marked changes in demand and technological conditions is important to help a firm to increase its market share in a country. However, an MNC's depth of IE with TWs is less effective than an MNC's depth of IE with DWs to navigate the uncertainty triggered by such transient changes when they occur in a host country.

The positive moderating effect of breadth of IE with TWs, instead, is consistent with our argument that such experience helps a firm to adapt better to rapid changes in heterogeneous technological environments. However, we were unable to find definite evidence about whether the breadth of IE with DWs helps a firm to exploit DWs in a country better than its country rivals and to obtain market share advantages. Theoretically, overall, these results about breadth of IE with DWs would suggest that such experience does not allow a firm to combine heterogeneous knowledge about the changes in preferences of different types of consumers easily and thus does not enable it to find appropriate solutions with which to navigate marked changes in the demand conditions. Ex post, a possible explanation lies in the complexity of managing knowledge about heterogeneous consumers that is not easily transferable across different countries. In fact, although knowledge about how early and late adopters change their preferences differently over the product diffusion cycle can be a precious resource (e.g., Rietveld & Eggers, 2018), not all firms may have sufficient capabilities to turn this knowledge into action in the various countries where they compete. A firm can have a varied knowledge pool about changes in consumer attitudes toward telecom services, but, if it does not do anything with it—that is, if it is incapable of executing and then transforming that knowledge into meaningful

strategic decisions—then there is a risk that this varied knowledge will be of little help for its growth (Berry, 2006b).

Overall, our theory and results extend the extant literature mainly in two ways. First, we respond to the recent call from the windows of opportunity literature to investigate which firm-level characteristics may help a firm to exploit windows of opportunity to increase its market share (Lee & Malerba, 2017; Miao et al., 2018), particularly in international markets. Drawing on the organizational learning literature, we focused on an MNC's IE with windows of opportunity, an overlooked contingency by studies examining how firms navigate windows of opportunity. Second, in our theory, the “object” of IE is different from the one examined in previous studies, which have looked at the role played by a firm's depth and breadth of IE in terms of the firm's learning obtained from the (a) *time* of operation (or *repeated exposure* to contextual factors) in host countries (IE depth) and (b) *variety* of regulatory, cultural, demographic, political, and administrative characteristics of (IE breadth) the countries in which the firm has operated (e.g., Casillas & Moreno-Menéndez, 2014; Perkins, 2014; Zhou & Guillén, 2015). In fact, our theory is not focused on an MNC's IE with static country-level characteristics, but on an MNC's IE with periods of marked changes in the demand and technological environment (i.e., DWs and TWs).

## 5.2 | Limitations and avenues for future research

As is often the case with empirical studies, this article has some limitations that may represent avenues for future research. First, we considered DWs and TWs as key factors that may generate opportunities for firms to increase their market share. However, the analysis of the environment could be explained further by considering such factors as the evolution of the institutional environment (North, 1990), influenced, for example, by local regulations (Lee & Malerba, 2017). In fact, other than exploring whether depth and breadth of IE with windows of opportunity may help a firm to exploit such windows better in countries with different levels of institutional quality, future studies could theorize about and test the main effect of regulatory windows on a firm's market share and determine how this relationship is moderated by a firm's IE with regulatory windows. Moreover, it is worth noting that regulatory windows of opportunity in the telecommunications industry have taken the form also of government interventions to limit the monopoly power of incumbents. In fact, despite liberalization and privatization initiatives, telecommunications companies in some countries operate in a sort of natural monopoly, meaning that high infrastructure costs and other barriers to entry give early entrants a marked advantage. For example, the costs for installing a cable system or building telecom towers can be huge, and first movers often own the physical infrastructure that late entrants cannot easily reproduce and thus prefer renting from incumbents. That is where many governments came in by regulating the network, forcing the companies that built it to lease out parts of it to rivals, and thus creating opportunities to catch up. Therefore, a firm's (depth and breadth of) IE with regulatory interventions of this type is another interesting contingency that future studies could consider.

Second, our results refer to a single industry, mobile telecommunications, which may possess some distinctive features, especially with respect to other industries that are not technology intensive (Kano, 2000). For these reasons, although our research has provided relatively consistent findings for a wide sample of countries and throughout a long observation period, it would be interesting to test our theory in other industries to corroborate the findings.

Third, although, when presenting our theory, we described various mechanisms that represent possible explanations for the causal relationships that we hypothesized, these mechanisms were not measured with our data. Testing these mechanisms would require primary data, collected for example by means of questionnaires or in-depth interviews with top managers, which would be very difficult to obtain given our longitudinal, multicountry panel. Therefore, we hope that future research will test our theory with alternative research methods.

Finally, as we acknowledged in the robustness tests section, the *unrelatedness* of an MNC's IE with the knowledge required to navigate a host country environment (Perkins, 2014) may affect our results. Therefore, future research could dig deeper into this further dimension of a firm's IE with windows of opportunity.

### 5.3 | Conclusions

Previous literature has described the effect that DWs and TWs may have on firms' performance, yet how MNCs navigate such transient processes in international markets remained unclear. In fact, when a window of opportunity opens in a country, firms in that country usually do not have the same experience with such window, because some firms may have already encountered it before in other countries. Drawing on the organizational learning and international business literature, our study sheds light on this issue, by showing that an MNC's depth and breadth of IE with DWs and TWs may play a crucial role in helping an MNC to obtain market share advantages vis-a-vis rivals in a country. Particularly, we found that an MNC's depth of IE with DWs and breadth of IE with TWs have a stronger effect in helping an MNCs to navigate these changes. We hope that future research will continue to investigate the role played by a firm's IE with windows of opportunity.

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### DATA AVAILABILITY STATEMENT

Research data are not shared.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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