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# Market Trajectory and Catching-up Evidences from China

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## Abstract

The traditional technological paradigm and trajectory framework illustrates the rationale of technological advancement, and implies how latecomer companies can seize the windows of opportunity while technological trajectory is transitioning. Yet, evidences from emerging market companies have shown that industrial entry barriers are widely exist, and sometime even insurmountable for latecomers while following the technological trajectory, as they are often restrained by limited technological resources and foundations. This study proposes market-based innovation paradigm and trajectories as an alternative and complementary approach for the technological dimension of trajectory theories. Evidences from Chinese firms' catching-up are shown to illustrate how latecomers can utilize market trajectory to continuously create value for the evolutionary consumer preferences and achieve catch up. Besides practical catching-up implications for latecomer firms from emerging markets, this study also contributes to literature on trajectory, disruptive innovation, innovation ecosystem, and reverse innovation.

## Keywords

Market trajectory, catch up, innovation paradigm, emerging markets

## 1. Introduction

The well-established framework of technological paradigm and technological trajectories (Dosi, 1982; Teece, 2008), sheds light on how companies should follow technological trajectories to arrange their incremental innovation activities in order to sustain their competitive advantages; or seize the innovation opportunities brought by disruptive technologies (Christensen, 1996) that lead to new technological trajectories and paradigms, which further leads to catching up or leapfrogging. Extant literature have given explanations and suggested various recipes for latecomers from the technological innovation perspective (Perez & Soete, 1988; Lee & Lim, 2001; Lee et al., 2005; Li & Dai, 2002; Chen & Li, 2011). These studies share a consensus that latecomers, especially companies from science-based sectors, do enjoy lower entry barriers and opportunities

for catching up when new technological trajectory emerges, i.e. the opening of “windows of opportunity”. Yet, whether technological trajectory and associated technological innovation strategies for catching up are valid under the emerging economy contexts, are challenged these years based on practical evidences and researches suggesting alternative catching-up solutions.

On the one hand, based on evidences from emerging economies, catching up through applying the technological trajectory framework is questioned. New technological trajectories and associated windows of opportunities are rather scarce, especially in mature industries (Utterback, 1994). Even when such window of opportunities does emerge, latecomers may still find it very difficult to seize such opportunity as restricted by weak technical accumulateness, inappropriate organizational structure and process, poor learning capability, lack of complementary assets, disadvantageous market positions, and unsupportive institutional environment (Hobday, 1995; Gao, 2003; Amsden, 1989; Kim, 1997, Cusumano, 1985). As more and more latecomer firms have succeeded in catching-up and leapfrog in the past decade, and abundant evidences have shown that emerging economies are not constrained to technological catching-up (Li, 2007), we couldn't help wonder whether the technological trajectory framework can provide sound guidance for latecomer firms from developing economies. Since innovation itself is much more extensive than technological innovation (Schumpeter, 1934), thus theoretical development on alternative catching-up strategies complement to the technological solutions is highly needed.

On the other hand, the supply side and demand side approaches, also known as “technology push” and “market pull” modes (Rogers, 1995), are well accepted as two sides of a coin for understanding and explaining the origination and management of innovation for long. However, most studies within the innovation management and strategic management domains espouse a supply-based perspective, i.e. focusing on the technological dynamism and factors, while assuming market and consumer preferences are exogenous, homogeneous and static (Tripsas, 2008; Priem & Swink 2012). While some scholars have noticed that demand heterogeneity and the interplay between demand side factors in market segments and technological trajectories are fundamentals and essentials for explaining technological dynamism, formulating value adding strategies,

and sustaining competitive advantages (Adner 2002; Adner, 2004; Adner and Snow, 2010; Tripsas, 2008), and therefore call for the demand-side investigation to innovation and strategic management research (Priem & Swink 2012; Priem, et al., 2012).

Inspired by previous trajectory literature and catching up evidences from emerging economies, especially China, and reflect upon the theoretical gap of demand-side research focuses, “market trajectory” and “market-based innovation paradigm” are proposed as alternative guidance for innovation strategies and solutions for latecomer firms from emerging economies.

In the next section, technological trajectory framework and related literature on catching-up opportunities will be critically reviewed. By identifying major limitations of existing theoretical propositions on innovation opportunities based on technological trajectory, we argue that traditional trajectory literature present a rather incomplete interpretation of innovation activities, and limited guidance on catching-up opportunities and strategies for latecomer firms as shown in a large number of cases from empirical economies. In fact, the richness of alternative innovation strategies provides us a much broader view on catching up, and thus adopting a market-based perspective and leveraging market resources shall bring forward some new propositions on the evolution of innovation and catching-up strategies. Hence we suggest to extend the traditional trajectory theory by shifting the focus from technology-based to market and demand-based perspectives and paradigms.

Based on the fundamental assumption that market demand and consumer preferences are heterogeneous and evolutionary, we propose a new theoretical framework to illustrate the innovation evolution principles from the market perspective in Section 3. Informed by Dosi’s definition on technological paradigm (Dosi, 1982), we understand “*market-based innovation paradigm*” as an epistemological outlook, and define it broadly as relevant market and demand-based problems, associated knowledge and theories for understanding market development and growth, a set of problem solving methods and business models that are regarded as legitimate. Then we introduce the core concept of this paper, “*market trajectory*”, as the direction and evolutionary advances within the proposed market-based innovation paradigms. We deductively describe the forming mechanism of market trajectory, as inspired by relevant theories and concepts such as

technological trajectory (Dosi, 1982, 1988), new market evolution (Geroski, 2003), product life cycle (Klepper, 1996), disruptive innovation (Christensen, 2003), and innovation diffusion (Rogers, 1995). Illustrative evidences from Chinese latecomer firms are shown to discuss the rationale and evolution of market trajectories, and more importantly, latecomer firms' strategic decisions to break through industrial barriers by adopting market-based innovation are discussed.

In Section 4, we explore and discuss innovation opportunities derived from market trajectory, and argue that the traditional 'windows of opportunity' have been significantly broadened for latecomer firms following the logic of new trajectory model. Representative case evidences showing how Chinese latecomer firms, by utilizing market trajectory principles, break through barriers and achieve catching-up, are provided to illustrate and support the proposed market trajectory framework.

In Section 5, we suggest our theoretical contributions and underlying practical implications of innovation strategies for catching up in a broader and complex business environment, as well as further research directions to deepen and extend the trajectory theory. This paper does not aspire to provide a generic theory of rules of innovation activity. It attempts to investigate research questions such as: why do some latecomer firms use market-based innovation, other than technology-based, to successfully catch up? Are there any alternative trajectories, and how to harness the related principles to break the barriers and seize the innovation opportunities derived from technological trajectory? Our answers are to some extent tentative, yet can be served as a spur to motivate further researches on market trajectory and the interactions between technological and market trajectories. Our model could be regarded in itself as a new perspective to contribute to fulfill the huge gap exists between catching-up evidences and traditional trajectory theories, i.e. technological trajectory framework can hardly provide comprehensive strategic implications for latecomer firms to broaden and acquire "windows of opportunity" and effectively get rid of disadvantages in global innovation landscape.

## **2. Technological trajectory, catch-up and demand-side perspective**

Trajectory as a core concept in innovation studies has been widely adopted to illustrate technological change, process and innovation. Nelson and Winter (1982)

initiated the concept of “natural trajectory” to describe the accumulative and evolutionary nature of industrial technical progress, which can be applied to exploiting latent economies of scale and coping with the mechanization trend of operations. Inspired by the concepts of natural trajectory (Nelson & Winter, 1982) and scientific paradigms (Kuhn, 1962), Dosi (1982, 1988) proposes technological paradigms and technological trajectory to provide a neoclassical view on the regularities of technical advances and development process (Teece, 2008), explaining the development characteristic and rule of technology, as the track of technology progress restricted by technological regime. According to Dosi (1982, 2000), a technological paradigm can be broadly understood as “a set of procedures, a definition of the relevant problems and of the specific knowledge related to their solution”; and in line with such “outlook” or “pattern”, technological trajectory is the “direction of advance within a technological paradigm” (Dosi, 1982, pp.148), or say a series of path dependent normal problem solving activities and experiences determined by a paradigm (Dosi, 1982; Dierickx & Cool, 1989).

The concepts of technological paradigm and trajectories further triggered a series of crucial arguments and discussions on innovation studies, strategic management and dynamic capabilities, public policy, as well as latecomers’ catch-up. Perez and Soete (1988) apply technological trajectory to analyze the entry barriers and entry costs for lagging countries’ technological catch-up. They examined the entry barriers through four entry costs components, i.e. fixed investment (the basic cost), the cost of closing the knowledge gap, the cost of closing the experience and skill gaps, and the cost of compensating for lack of externalities. With the analysis of product and technology life cycles, they propose “windows of opportunity” to describe when and where latecomer firms have possibilities to achieve industrial entry in their technological catching-up process. This implies that for lagging countries during periods of paradigm transitions, there exist favorable conditions for catching up as to the relatively lower entry costs; while the advanced countries tend to follow the old technological trajectories due to the large amount of resources they have invested. These findings are strengthened in subsequent researches (Brezis & Krugman, 1993; Hobday, 1995; Freeman & Soete, 1997). For instance, representative industrial evolution cases such as DRAM, automobile, mobile phone, consume electronics, digital TV industries show how Korean firms

achieve leapfrogging and significant catching-up performances when new technological trajectories appear (Lee and Lim, 2001, 2005; Hobday et al., 2004; Hongwu, 2010). Some case studies on Chinese firms also suggest that indigenous firms do have lower entry barriers and better catch-up opportunities in emerging industries (Li and Dai, 2002; Liu, 2008).

Generally speaking, new trajectory may arise from: technological breakthroughs emerged in existing industry or introduced from other industries (e.g. introduction of new information technology brings growth of new network powers); change of market culture and norms (e.g. consensus on environment protection favors some low-carbon-output firms and sectors); or change of political regulations or economic trends (i.e. the influence of energy crisis on auto industry supports the rising of Japanese auto sector and new energy vehicles recently). However, according to the notion of evolutionary economics, catching-up is not merely the process of lagging countries' imitation of advanced technologies from leading countries, but needs creative learning and adjustment under indigenous conditions. Successful catching-up includes the co-evolution of firms, industry, market, institutions and technology (Malerba, 2006), in particular, market factor constructs our research focus in this article. Hence, the aforementioned viewpoints on the "window of opportunities" introduced by technological trajectories can be challenged, as technological trajectory framework can hardly explain all innovation modes and strategies especially when facing some evidences from emerging economies such as China.

On the one hand, current technological trajectory related researches and suggestions seem to excessively emphasize the technology-driven innovation and its evolution, and suggest continuous improvements along the current technological trajectory or exploring innovation opportunities when trajectory transition takes place. This definitely comes to the existed conclusion of limited catching-up opportunities. Besides, not only new technological trajectory becomes much scarce as mentioned before, but also it is very difficult for latecomer firms to catch those opportunities because of the "latecomer disadvantage" (Gao, 2003). Moreover, the technological trajectory framework ignores many crucial economic factors when explaining catching-up and innovation opportunities. For instance, the existence and importance of huge opportunities from finding new and

emerging markets begin to get widely accepted (Hobday, 2000; Xie and Wu, 2003; Mu and Lee, 2005; Lee & Lim, 2005; Christensen, 2003; Zeng & Williamson, 2007). Undoubtedly, catching-up modes and strategies shall be more diversified than single-dimensioned as suggested by existing trajectory theory.

On the other hand, when tracing back to Schumpeter (1934), who clearly defined innovation as new combinations of existing resources and pointed out five different types: new product, new sources of supply, the exploitation of new market and new ways to organize business, the message is clear that innovation paradigms and trajectories shouldn't be restricted on the technological dimension as innovation is much more extensive than technological innovation. Current technological paradigm and trajectory framework are mainly used to interpret the mechanism and routine of technology change and selection procedures, and compared to this technology dimension, some other important models provide different perspectives, such as "architectural innovation" (Henderson and Clark, 1990) and "(new market) disruptive innovation" (Christensen, 1997). Following the discussion on the limits of technology S-curve (Foster, 1986) and technological trajectory, Christensen (1997, 2003) analyzes multiple industrial cases (e.g. disk drive industry) to explain why leading firms are defeated by new entrants and conclude two types of disruptive innovations: low-end disruption and new market disruption, which is a market-based thinking and is in line with Schumpeter's "the exploitation of new market".

In fact, the forming of a technological trajectory is effected both by technology supply and market demand (Dosi, 1982; Mowery and Rosenberg, 1979), while the importance of market demand as well as demand-based factors, as vital determinants which direct industrial progress and innovation, is largely neglected (Li & Dai, 2002; Tripsas, 2008; Ye, et al., 2012). Hence there is a pressing necessity to broaden the boundary of existing technological trajectory and build a more generalized trajectory theory.

Some scholars have noticed the theoretical gap, and have tried to elaborate on the demand-side researches on innovation and strategic management, which shifts the research focus from focal firm and upstream producers to downstream product markets and consumers (Priem et al., 2012). Consumer demands and preferences are in nature

heterogeneous as well as evolutionary (Tripsas, 2008), thus the preference change may lead to market and technology transition. Tripsas (2008) identifies the phenomenon of preference discontinuities, which triggered by budget constraints changes, shift in social-political environments, the changes of consumer composition over time, shifts in performance bottlenecks, etc. (Adner & Snow, 2010; Tripsas, 2008), is the fundamental force that triggers industrial technological transition. She further proposes preference trajectory which refers to “cycles of incremental and discontinuous change in preferences” (Tripsas, 2008, pp: 79), to illustrate the evolutionary trend of preferences. Similarly, Adner (2002) proposes that due to the decreasing marginal utility of functionalities, consumers’ valuations on performances and performance improvements, as well as the general demand conditions may change, which enables technology disruption to take place. Based on analyzing demand heterogeneity, incumbent firms holding old technologies can adopt “retreat” and “relocation” strategies instead of directly racing with the new technology in existing market. Some scholars challenge the resource-based view as a producer-centric perspective which ignores the rationale that value of resources are revealed in their uses by consumers, and suggest that competitive advantages can be gained even if the firm holds limited resources based on exploiting demand heterogeneity (Priem et al, 2012; Priem & Swink, 2012). Yet, demand-side researches are still scarce, and how to further the trajectory theory from the demand-side remains ambiguous.

To sum up, as technological paradigms are devoted to answer questions like “why certain innovation emerges instead of others within a certain time period” and “which factors and how these factors direct the progress of innovation”, we can claim that exploiting the essence of innovation paradigms is of extreme importance. Furthermore, innovation paradigms determine whether there are critical factors of achieving catching-up opportunities and industry breakthroughs (Liu, 2008). Market-related economic factors are the comparative advantage for Chinese firms, and enables Chinese firms to leverage indigenous innovation through tremendous market resources and power. Since Chinese market is highly layered, for instance, low-end market, latent market and even incipient market are greatly in existence and needed to be explored deeply. Consequently, following the previous suggestion of building a tentative conceptual model, to better understand and seize new innovation opportunities emerged from trajectories, this paper

is to construct a new theoretical framework of innovation paradigms and innovation trajectory, focusing on market perspective. Therefore, the theoretical ambiguities and incompleteness of technological paradigms and technological trajectory seem inevitably reflected in determinants of innovation opportunities.

### **3. Market-based innovation paradigm and market trajectory**

#### **3.1 Market-based innovation paradigms**

Economic theory usually represents market as a spontaneous mechanism, rule or architecture, as a public resource, for exchange between buyers and sellers (Smith, 1972; Samuelson, 1996). Arrow (1974) argues “although we are not usually explicit about it, we really postulate that when a market could be created, it would be”, which implies that as a fundamental term, “market” is easier to argue about than to define, just like “mass” in physics, or “life” in biology (Coase, 1988). In classical or neo-classical economics, markets are assumed as exogenously rooted in individual’s rational choice at micro level, and advanced following the principle of Pareto Optimality at the macro level. From the supply side, a market, can be defined as a product or service that firms are willing to supply. While from the demand-side perspective, we can define a market as the demand for a good/service from “the set of actual and potential buyers of a product” (Kotler, 2010). Buyers constitute the market by being willing to pay for a good/service based on own preferences for a certain combination of attributes that the particular good/service provides (Lancaster, 1971). In order to better facilitate the research objective of this paper, i.e. understanding innovation paradigms, and exploring alternative trajectories, we define market as a combination of: heterogeneous consumer demands which are dynamic and evolutionary, resources with potential value to be realized, business models and mechanisms that facilitate value realization, as well as associated market know-how and experiences.

From a supply-push perspective, new markets open up and new consumer values reveals because of introduction of new technologies or products (Adner & Snow, 2010; Bala and Goyal, 1994). Or say, emergence of new markets is caused by populations of firms engaged in the adaptive choices of exploration and exploitation within a changing technological and institutional landscapes. According to technological trajectory

framework, moving along any particular technological trajectory, or switching to a new technological trajectory will lead to either incremental improvements of current products/services, or radical product/service innovations, and the sum of these products and services represent the evolution of current market or form the basis of new markets (Geroski, 2003). While from the demand-pull perspective, demand is the fundamental driver of innovation activities, and new markets emerge due to the evolution of demands from inchoate to specific, the accumulation of consumers that pursuing certain new combination of attributes, and even major preference change, i.e. preference discontinuities (Tripsas, 2008). According to Abernathy-Utterback Model (1978), product and process transition curves imply three phases in terms of rates of innovation, from fluid phase, to transitional phase and finally to specific phase. In particular, the emergence of dominant design shows the markets (or mainstream products or demands) are inclined to be stabilized. Correspondingly, according to innovation diffusion curve theory (Rogers, 1995), users and consumers ranging from innovators and early adopters, to early majority, late majority, and laggards. It is the consumers and users determines which innovation to adopt and the speed of adoption, which further determines the evolution of a market from embryo to maturity.

Although supply-push perspective argues that most new product categories result from technology change that is pushed-up by advances in S&T (Geroski, 2003), innovation is not necessarily all about new technology, it in nature about value creation and meeting demands that are not currently met (Doyle, 1989). By applying the Kuhn's paradigm in technology change, Dosi (1982) highlights how innovation process generates its own knowledge, which is broadly understood in terms of know-how, artifacts and practices. Similarly, combined with Schumpeter's (1934) definition of market innovation (the exploitation of a new market), we propose "market-based innovation paradigms" as a parallel term, in analogy with Kuhn's and Dosi's definition of "scientific paradigms" and "technological paradigms".

Market-based innovation paradigm, as an epistemological outlook, can be broadly understood as a set of market-relevant problems, procedures and models, and market-specific experiences and problem-solving knowledge dealing with the identification of

demand heterogeneity and value realization. Different market paradigms determines the main

Over time, the weight of relevant arguments on the nature of innovation paradigms has shifted away from emphasizing on the difficulties incumbents face in mastering new fields of technological know-how (Utterback, 1994), to dealing with the emergence of new markets (Christensen, 1997). Even some scholars argue that the traditional science-push models of innovation were untenable in a policy climate that now regards support for research as wasteful subsidies that expands an already bloated state, the new emphasis on demand-pull models of innovation seems to be the only option (Tunzelmann, Malerba et al., 2008). Thus, as mindsets that guide market exploitation (improving within the existing market) and exploration (finding and developing new markets) activities, market-based innovation paradigm can serve as references for business managers and policy makers to prioritize relevant problems, establish legitimate procedures and methods, and condition expectations.

### **3.2 Market trajectory: definition, evolution and transition**

Following the proposition of market-based innovation paradigm, a crucial issue is the forming mechanism and evolutionary rationale of market-based innovations, which can be referred to as “market trajectory”. As mentioned previously, the proposition of “market trajectory” is based on two basic assumptions on consumer demands/preferences: *heterogeneity* and *evolvability*.

Demands, or say consumers’ willingness to pay for a specific product/service attribute/or a combination of attributes varies a lot among the population, which is contingent on economic, social-cultural, and institutional factors. That is to say, sub-groups of consumers may have very different preferences, shown on the variation of consumer groups’ valuation (willingness to pay) on different product/service attributes and level of an attribute’s performance. Consumer preferences are not only heterogeneous, but also evolves or discontinuous due to changes of the abovementioned factors, as well as producers’ and institutions’ purposeful moves on guiding popular and legitimate behaviors and mindsets. For instance, financial crisis or a mass unemployment will influence consumers’ budget constraints and therefore lead to the purchase of cheaper products/services with lower or basic attribute performances. The increasing

awareness of environmental protection as well as the impose of related regulations and policies, will lead the consumer preferences lean on products that have environmental-friendly attributes such as being renewable, recyclable, and green. Sharing economy, which redefines transaction from transferring ownership to collaborative consumption, has become a commonly accepted concept. Thus new business models and market-based innovations are developed by companies such as Airbnb and Uber, to support the emerging demands of optimizing idle resources without harming the ownership structure, as well as echoing the concern of environmental protection.

The above example of sharing economy and the corresponding emerging market, can be seen as following a market paradigm that is fundamentally different from traditional transaction and consumption modes. Under a specific market paradigm, a series of market-based innovations and the associated applications of accumulatively increased market know-how may follow one another to continuously facilitate consumer demands, which can be referred to as “market trajectory”. It is worth noting that the development and evolution of a market trajectory, and the disruption of one market trajectory over the other, may not necessarily involve technological breakthroughs, or say the relevant technologies remain constant. Previous researches has shown that preference discontinuities may not always echo the evolution or disruption of technological trajectories (Tripsas, 2008), and thus the emergence of a new market is not always due to the relying technology reaches the natural end of its life cycle. Take iRobot as an example, it strategically relocated its core technical competence, i.e. robotic technology, from supporting government with military or research purposes to home appliance sectors. They observed that there is a potential demand for smarter vacuum cleaners that can free consumers’ hands while maintain the cleaning performance, and developed a series of products to continuously providing smarter ways of cleaning for families. This strategic relocation opens a window of opportunity for cleaning robotics market for followers, and as the market scale increases, the traditional market structure of cleaning machines is reshaped.

In Figure 1, we attempt to depict a market trajectory. As consumer preferences shifts or new demands discovered, pioneering market-based innovation explorations occur. The initial attempts may bring forward various possibilities that are highly random, uncertain

and non-directional, which can be seen as the ambiguous fuzzy front. Based on consumer choices, a market paradigm that better create value for consumers emerges from the ambiguous fuzzy front as a commonly accepted pattern that companies refer to. Under such market paradigm (shown in dotted line), a series of market-based exploitations will evolve towards a certain direction, as the fundamental problem and value propositions, preference/or combinations of preferences to be met, basic concerns regarding legitimacy are defined and settled. According to Nelson and Winter (1977, pp: 229), “advances seem to follow advances in a way that appears somewhat inevitable”, which illustrates the feature of a technological trajectory. Applying this cognitive perspective to observe market-based innovation, a market-based innovation is not simply a random incident but follows previous innovations, and will lead to further improvements in the future, this can be referred to as the evolution of a market trajectory.

Along a major market trajectory, consumer preferences are heterogeneous and dynamic, which opens up various exploitation options, marked as the 1<sup>st</sup> and 2<sup>nd</sup> branch in Figure 1. For instance, companies can choose to focus on serving the high-end or low-end sub-markets under the same market paradigm and trajectory, as the marginal benefits for the increase of attributes performances are perceived differently among consumers. Similarly, as one market trajectory usually aims to achieve a combination of product/service attributes, companies may strategically focus on improving some selected attributes prioritized by a sub-consumer group. For example, within the watch market trajectory, some consumers favours attributes such as mechanicalness and archaism, while others are inclined to accuracy and aesthetic fashion. As the existence of sub-consumer groups, a major market trajectory may always include several sub-trajectories that serve sub-markets or niche markets. While as each niche or sub-market trajectory is only based on part of the general knowledge basis of the major market trajectory, the continuous exploitation along a sub trajectory may lead to a direction that even deviates the major market trajectory.

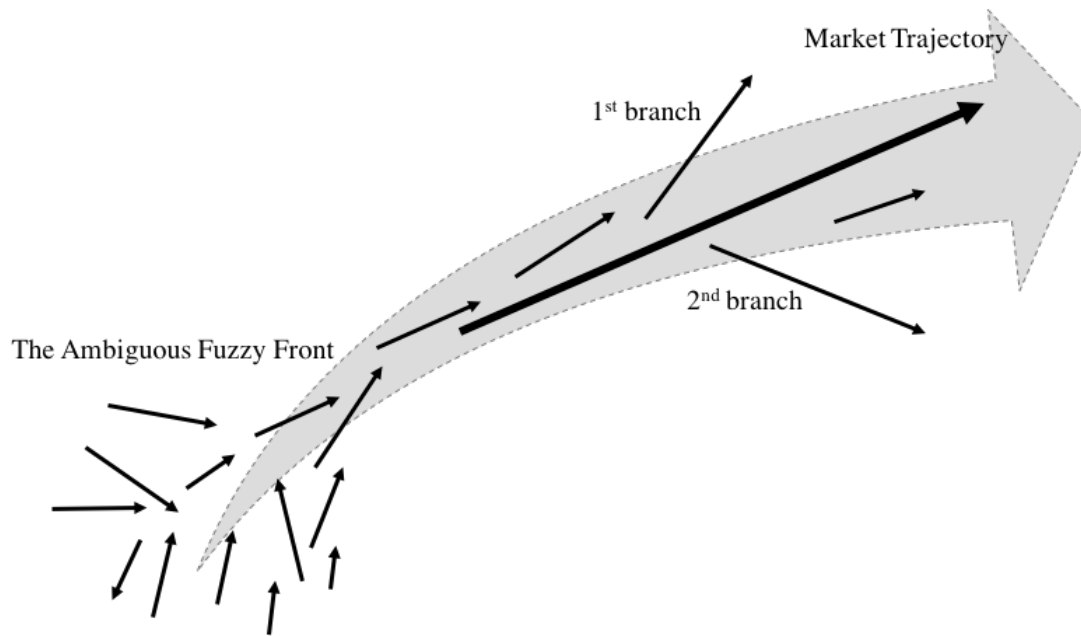


Figure 1: Market trajectory

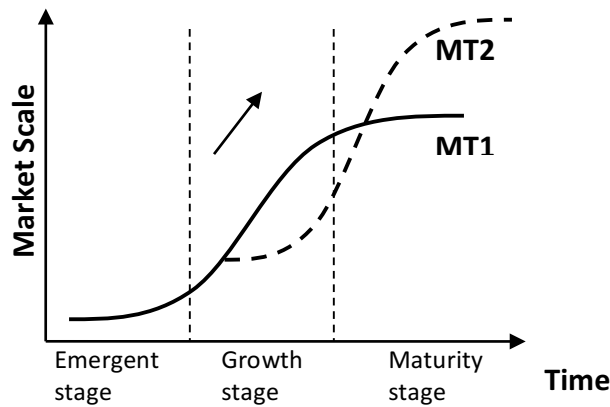
Many prior scholars cited the technology S-curve model (Foster, 1986) to illustrate the evolutionary trend of a technological trajectory (Preze & Soete, 1988; Christensen, 1997, 2003), and inspired by this, we illustrate the evolution and transition of market trajectories in Figure 2. The vertical axis represents the volume of a market. Similar to a technological trajectory, the evolution of a market trajectory includes process-based phases according to its underlying market-based innovation paradigm. At the emergent stage of a market trajectory (MT1), the associated market paradigm is still undergoing a trial-error stage and the market base stays volatile, thus the rate of growth in terms of market volume is relatively slow. As experiences accumulated and knowledge basis extended, and market-based innovations are diffused to more and more consumers, a market trajectory enters its growth stage with an accelerated progress rate, usually shown as a boom or a fashion. While every market trajectory has its natural restraints of the maximum market volume, due to the consumer population size and factors determining market size. Therefore, the growth rate eventually slows down and the market volume is relatively stabilized.

As mentioned previously, a group of consumers' preferences is dynamic and radical shifts may occur due to economic, social-political, cultural, technological and

environmental factors. When consumer preferences discontinuous or radically shifts, new market-based innovation attempts will come up, which are radical and exploratory rather than exploitative, and further defines a new market paradigm. The new market paradigm emergence is often accompanied by a tremendous rush of consumers into a newly founded market, due to the increasing and significant marginal utility when trying something new. Thus the new market as well as the following market trajectory (MT2) complements, co-evolves, reshapes, or even substitute the current market trajectory, which gives opportunities for latecomers' catching-up or even leapfrogging. However, as incumbent leaders strive to preserve their market shares, and consumers are path dependent, a complete substitution will be an extreme case.

Here, we notify that a new market trajectory can emerge from the current market trajectory as a niche firstly (see Figure 2), and then gradually gains market shares or even breaks the market volume limits of the old paradigm. For example, a market-based innovation that involves the rural, low-income consumers, or similar latent segment will extend the current market scope. As the new market-based innovation may offer similar product/services that are cheaper, improves performances of certain attributes, or brings in a new fashion, consumers from the incumbent markets may shift their preferences, and the new market trajectory gradually "takes over" consumers from the previous trajectory, and hence replaces the old market trajectory.

To sum up, the evolution of market-based innovation paradigms results in sequentially incremental market innovations and those market innovations gradually formulate a trajectory, i.e. a market trajectory. Moreover, the transition from the old market trajectory to a new one occurs when radical changes of market-based innovation paradigms appear.



**Figure 2: Evolution and Transition of Market Trajectory**

#### **4. Market Trajectory and Catching-up: Illustrative Evidences from China**

So far, we proposed a conceptual framework of market trajectory directed by alternative market-based innovation paradigms as compared to technological paradigm. In this section, illustrative evidences from Chinese latecomer firms will be presented to better understand market trajectory, and strategic issues on how to identify and seize innovation opportunities derived from market trajectories to catch up will be discussed.

##### **4.1 Alibaba**

Alibaba group, a well-known Chinese e-commerce company, provides customer-to-customer, business-to-customer, and business-to-business retail transaction platforms and services. Founded in 1999 and started as a latecomer in e-commerce, Alibaba group now is the largest e-commerce company in China, and also one of the world's most influential. Alibaba group has been firmly established its leading position in B2B (Alibaba), B2C (Tmall), and C2C (Taobao) among all Chinese e-commerce companies<sup>1</sup>, outcompeted foreign competitors such as Ebay which closed down its Chinese websites in 2006, as well as domestic competitors such as 360Buy. While investigating Alibaba's growth, we argue that rather than relying on technological trajectory framework or continuously pursuing the leading ICT technology, a market trajectory and market-based innovation paradigm can be clearly traced.

<sup>1</sup> China's E-commerce market report 2015: [http://www.100ec.cn/zt/upload\\_data/2015scsj.pdf](http://www.100ec.cn/zt/upload_data/2015scsj.pdf)

The global e-commerce companies arise in the 1990s, represented by e-bay, Amazon and Dell, focusing on B2C or C2C markets. Back then, internet was not popularized in China, especially among individual consumers; and individual credit system which was a prerequisite for foreign e-commerce companies. Yet, many SMEs were established at that time due to globalization and the entrepreneurial trend of “Xiahai” (do business), and they urged to connect to business opportunities located in distant areas and even globally. Facing the specific situation and huge potential of Chinese market, Jack Ma founded Alibaba. Com, and strategically focused on B2B as compared to foreign companies, and helping SMEs, rather than incumbent leaders to connect to the world. As Alibaba is developing, further B2C and C2C services are developed (such as Taobao for B2C and C2C, and Tmall for B2C).

As shown in Table 1, connecting sellers and buyers, and facilitate the success of transactions, and continuously lowering transaction costs through web portal, has always been the fundamental pursuit of Alibaba group. Sellers and buyers have different demands which are also evolutionary. Sellers such as SMEs’ requirements have been evolved from merely finding more buyers and selling more, to getting supports for business expansion and entrepreneurial attempts. Regarding buyers, getting desired products/services at a reasonable price is always the requirement. Yet, as more and more suppliers provide homogenous products online and some products’ information are exaggerated or even deceitful, the transaction costs for buyers in terms of searching and selecting are increased and are in need of lowering. In order to solve these market-based problems and meet the emerging demands, a series of innovations are introduced by Alibaba, such as Alipay for solving the trust issues, integrity rating system for reducing opportunistic behaviors, internet and micro finance for SMEs’ entrepreneurship, big data and cloud computing for better providing information for buyers and sellers, and collaborating with logistics industry to improve the delivery.

Start as a latecomer, Alibaba is the undouble leader in e-commerce now. During its development, we can definitely see IT based technological improvements, however Alibaba’s leading position is technological, and the fundamental driver is market-based paradigm and market trajectory. Alibaba’s market-based innovation around e-commerce is based on a distinctive paradigm as compared to traditional marketplace, and its growth

and a series of innovations can be seen as following a market trajectory that continuously lowers transaction costs between buyers and sellers, and creates different levels of values for sellers and buyers.

The e-commerce trajectory and its evolution shows several insights. First, the success of Alibaba and the e-commerce market trajectory that Alibaba applies inspired many Chinese domestic followers, each may focus on a specific niche, such as JD, and Suning focuses on B2C market of electronics and home appliances. Each follower's growth can be seen as following a sub trajectory within the e-commerce trajectory, and improves value creation for buyers and sellers. For example, JD, which ranks 2<sup>nd</sup> at the B2C area, is recognized by its own logistics system that delivers products to consumers at the shortest possible time. VIPSHOP, which ranks 3<sup>rd</sup> at the B2C area, focuses on providing discount brand products to younger consumers. Second, along with Alibaba's growth, suppliers, even companies enjoy significant market shares and owns matured sales networks under traditional market transactions, start to join in Alibaba's platform and the e-commerce trend to expand their businesses. That is to say, the e-commerce market trajectory lead by Alibaba starts to interact with the traditional market trajectory. As more and more consumers shift to online purchase, and incumbent companies' offline sales are significantly shrined, the traditional market trajectory is declined due to the erosion of new market trajectory, and in an extreme case the old market trajectory could be fully replaced/disrupted. Third, as e-commerce-based market paradigm is established and the market trajectory is evolving, complementary industries such as logistics, finance, IT services, and consultancy, are developed and innovated to better facilitate e-commerce, or say the trajectories of complementary markets are interacting and co-evolving with the e-commerce market trajectory. This is also in line with the innovation ecosystem framework (Adner, 2006; Moore, 1993).

Value Propositions	Market situation	Sellers' demands (SMEs, individuals, etc.)	Buyers' demands (SMEs, individuals, etc.)	Innovations for value realization	Transaction Costs
1 <sup>st</sup> Level	Entrepreneurial trend in late 1980s and early 1990s in China. SMEs want to expand business opportunities. Consumers located in distant areas have difficulties get what they need through traditional channels.	Connect to/find buyers in China and worldwide and consumers, while lacking sales channels and resources.	Finding suppliers and broader range of commodities	Online retail transaction websites (Alibaba for B2B in 1999 & Taobao B2C & C2C in 2003; Tmall for B2C in 2008).	<div>High</div> <div>↓</div> <div>Low</div>
2 <sup>nd</sup> Level	Buyers and sellers are far apart, and requiring frequent communications.	Ease the communication, better understanding customer/consumer requirements	Better grasp information on commodity features, delivery, etc.	Instant messengers such as Alitalk in 2003, and TaobaoWangWang in 2004, and further integrated into AliWangWang in 2011. Also differentiated by-products for buyers and sellers.	
3 <sup>rd</sup> Level	Lack of individual credit system, and low-levels of trust.	Receive money safely and timely	Receive purchased commodities according to agreement and sellers' descriptions.	Alipay as a payment instrument innovation.	
4 <sup>th</sup> Level	More and more sellers and buyers on platform, fraudulent behaviors.	Attracting more customers/consumers, and avoid vicious competition.	Purchasing genuine goods with reasonable price, avoid fraudulent transactions and sellers.	Integrity system based on multi-dimensional rating on both sellers and buyers.	
5 <sup>th</sup> Level	Business ecosystem and complementary industries' growth, e.g. logistics, finance, & IT.	Expanding current businesses, enhancing efficiencies, and entrepreneurial pursuits.	Receiving goods faster, and finding goods that best suits own preferences efficiently and effectively.	Cross-industrial collaboration such as logistics; financial innovation/micro finance for entrepreneurs; cloud computing and big data.	

Table 1. Evolution and Innovation of Alibaba Group

#### **4.2 Latecomer strategies via market trajectory**

The Alibaba case shows that when facing an emerging market like China, market trajectory mindset plays an extremely significant role, as a distinctive feature of such a market is that the indigenous demands huge in volume, broad in scope, as well as diversified in content. The “demand pool” of China has not yet been exploited enough by incumbents or foreign giants, and such demand condition hence is quite beneficial for indigenous firms with local know-how to explore market-based innovation opportunities and leapfrogging possibilities from market trajectory evolution. Though indigenous firms, especially start-ups, have resource constraints in terms of technological competence and brand image compared to leading multinational giants, they have comparative advantages over foreign firms in terms of understanding local consumers’ preferences and evolution of preferences, as well as market-based experiences. The predominance of indigenous experiences enables the latecomers better explore innovation opportunities in regional or segmental markets. Accordingly, we believe the “windows of opportunity” for latecomer firms in market trajectory have opened to a greater extent than ever before, and such insights can be also generalized to other emerging economies.

Doyle (1989) defines innovation in terms of needs or markets, rather than products and clearly distinguishes three types of markets, or synonymously, needs. These three are labeled as “existing markets”, “latent markets” and also “incipient markets”. This classification implies that innovation basically is not necessarily about new technology or inventions, but about meeting needs that are not currently met. This could require technological breakthroughs, but it may simply be a new way of thinking about innovation and business. For instance, Qihoo 360, a Chinese software company offers free antivirus services for consumers, redefines the paradigm in terms of profit models for the antivirus software market, and quickly leapfrog domestic and foreign competitors that follows the traditional trajectory.

The authors, in the past years, conducted a large scale of in-depth interviews and secondary data collection, in order to research on Chinese firms’ catching-up strategies and indigenous innovations. Following the proposed market trajectory framework, in this section, we will focus on how latecomer firms can seize catching-up opportunities based

on market paradigm and market trajectory framework, and evidences from Chinese firms are shown in Table 2.

As shown in Table 2, three Chinese latecomers from distinctive industries, i.e. Chery Auto, Comba Telecom, and Focus Media, have chosen different market-trajectory based strategic approaches to accommodate industrial entry barriers, and then achieved catching-up. A new market trajectory could start with complementing the main market trajectory by satisfying the low-end market (see Chery Auto), or fulfilling some extreme requirements (see Comba Telecom). Alternatively, latecomers can investigate and predict the preference trends, and explore the respective incipient market (see Focus Media).

Firstly, starting from satisfying low-end market demands within a given market paradigm has been recognized as an effective and pragmatic strategy for latecomer firms, especially those with limited resources such as technological knowledge, brand recognition, and distribution channels. With a total population of 1.4 billion, 40% of which are rural residence, the huge low-end market of China will persist for a long time. Yet, most leading incumbents focuses merely on developing highly value-adding products for urban consumers or the emerging middle class. The low-end demands, including the bottom of the pyramid, has incredible consumer base and opens feasible “windows of opportunities” especially in some matured industries. Besides, positioning on low-end market helps most Chinese firms avoid direct competition with foreign entrants with worldwide brand recognition. The Chinese automotive industry has fierce competition involving world leading automotive manufacturers. As a latecomer with neither technological advantages nor strong market foundations, Chery Auto entered the automotive industry by initiating a rather “ambidextrous” strategy that supplies economical car models with luxurious features. For example, the QQ model, whose price ranges from 4000 to 6000 USD, is equipped with double airbags, ABS systems, integrated body frame design, etc. This indicates that Chery’s market entry is represented by redefining the concept of economical car that are low in performance and rough in design. Similarly, market-based innovations such as group purchase, emulational mobile phone, and budget airlines are all based on developing a low-end market trajectory within the current market paradigm. Second, besides being not interested in low-end market, leading incumbents usually tend to ignore the extreme requirements in regards to product

or service performances, as the corresponding market size is rather small and uncertain. This existing while yet unsatisfied consumer demands create windows of opportunities for latecomers. As illustrated by the Comba Telecom case, rather than directly competing with incumbent giants, it chooses to start with providing solutions for “all around and all day” signal coverage. This market-based strategy triggered further technological innovations, and helped Comba Telecom to gradually capture market shares from the incumbents.

The above two catching-up strategies, i.e. seizing the low-end market and exploiting latent segmentation by satisfying ignored extreme demands, are usually following the current market paradigm, or say take the existing market trajectory as a starting point and then complement to it. While as shown in Figure 2, the branches evolving from a main market trajectory indicates that innovation possibilities may breakthrough the existing paradigm and formulates new market trajectories with distinctive value propositions and business models. By exploring a new continent that existing market players including both suppliers and consumers are unaware of, i.e. an incipient market, a latecomer can quickly gain first-mover advantage by raising relevant new market problem, setting up appropriate/legitimate problem solution modes and defining standards and evolution direction of the new market trajectory. Consumers may not even realize the hidden needs until radical products and services are developed for such incipient market. As shown in the Focus Media case, elevator lobbies are reevaluated and are innovatively regarded as valuable and scarce resources for value creation, and thus new advertisement services that connects brands and white-collar consumers are initiated. The first mover actions which lead to a new market trajectory, allow visionary companies such as Focus Media to grow rapidly and enjoy the leading position in a new market, and hence prevent imitation from competitors.

Illustrative Case	Company profile	Demands/preferences to be exploited	Old market trajectory features	Market trajectory-based catching-up strategy
Chery Auto	Founded in 1997 in Anhui, China, with very weak economic, institutional and technological foundation, now Cherry Auto is one of the most influential Chinese homegrown car brand and the largest car exporter. Intendent design and indigenous innovation have always been Cherry's strategy.	Majority Chinese consumers want economic vehicles with relatively low price while integrate practicality and luxury. Yet, economic cars are usually associated with lower performances and are roughly equipped.	Fierce competition. Profit margin of low-end niche is limited; incumbent automobile manufactures focus on improving performances and particular luxuries experiences for high-end markets or the middle-class consumers.	<i>Seizing low-end market by redefining attributes combination of products.</i> Break the industrial entry barriers by launching "Fengyun" Sedan, whose price is 1/3 lower than comparable models. Then launch independent designed models such as QQ, Oriental Son and Qiyun. The QQ series ranked No. 1 in domestic car sales of that time, and Cherry was then known to the consumers. Cherry redefined the concept of economical car by adding luxurious features.
Comba Telecom	A wireless solution provider in telecom industry. Founded in 1997 in Guangdong, China, had difficulties collaborating with giant downstream customers such as China Mobile and China Unicom. Now Comba is the No.1 intergrated wireless solution and sub-system provider with over 25% market share in China.	Under the contexts of economic prosperity of Guangdong province, local companies require employees' mobile phones to stay round-the-clock. Yet, base stations cannot cover closed areas such as base rooms or elevators.	Leading incumbents focus on providing stable and fast signals at open areas for mainstream preferences, and ignore the "extreme" requirements and the unattractive market segment.	<i>Exploiting latent segments by satisfying ignored extreme performance requirements.</i> Break the industrial entry barriers from providing "repeater station" to cover in-building mobile signals, continued with a series of products applied in wireless networks such as CDMA and WCDMA, and then expand services areas globally.
Focus Media	Focus Media pioneered the concept of providing advertisements at elevator lobbies of premium buildings to white collars through a network of flat-panel displays. Now has steady annual growth and has established strategic partnerships with domestic and global leading brands, and the daily	Brands want advertisement to be received by targeted white collar workers or premium building residence; while these people are drowning in information.	Advertising agent companies fight for clients within the traditional advertising market which is at the matured stage with low profit margin. Companies/brands are skeptical about the coverage of their advertisements.	<i>Exploring incipient market by anticipating unrealized preferences.</i> Focus media recognizes elevator lobbies as a scarce resource that has huge value creation potential while not explored, as every white collar may stay in an elevator lobby for an undisturbed period. Thus utilizing

	advertisement coverage reaches more than 50 million people.			this incipient market as an entry opportunity and then initiated a new market paradigm and trajectory.
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Table 2. Market trajectory-based catching-up strategies.

## 5. Discussion and Conclusion

This study proposes market-based paradigm and market trajectories as alternative frameworks compared to traditional technological paradigms and trajectories. Evidences from emerging market firms, i.e. Chinese latecomers, are provided to show the rationale and evolution of market trajectories, and catching-up strategies based on the proposed market trajectory frameworks such as seizing low-end market by redefining the attributes combination of a product/service, exploiting latent segments by satisfying ignored extreme requirements, and exploring incipient market and defining a new market paradigm and the relevant trajectory. The proposed market trajectory framework has practical implications for latecomers' catching-up, and theoretical contributions that complement traditional technological trajectories, and echoes literature on disruptive innovation (Christensen, 2003), innovation ecosystems (Adner, 2006), and reverse innovation (Govindarajan and Ramamurti, 2011).

The notion of market trajectory not only enriches previous trajectory theory, but also lead to reflection and rethinking on the nature of "market innovation" (Schumpeter, 1934) under an evolutionary trajectory perspective. The search for market innovation opportunities is not random, but rather delimited by market paradigm which defines the key market-related problem to be solved or preferences to be met, appropriate problem solving mode, and relevant knowledge and experiences, etc. Moreover, one market innovation may lead to a series of follow-up innovations that continuously tracking and satisfying consumer preference evolution, which formulates what we call market trajectory. As consumer preferences are evolving, the respective market innovations will tend to follow an evolutionary trend incrementally. Yet, sometimes a market trajectory may break through a given market paradigm, and therefore formulates a new market paradigm and trajectory. This may be caused by: a radical shift in consumer preferences triggered by political, social, and economic factors; or prediction of future preferences and exploring an incipient market.

The proposed market trajectory framework nicely accounts for the rationale of underlying catching up evidences of emerging market companies. Make thorough use of market trajectory to overcome industrial entry barriers has been one of the most important strategies for latecomer firms, especially small and medium-sized companies,

that are usually lacking of technological capabilities and resources. In some cases, seizing the innovation opportunities from market trajectory help latecomer firms to differentiate themselves from incumbent leaders that have dedicated large amount of investment in their existing markets, this will further create first mover and then competitive advantages for latecomer firms. This is also in line with existing literature on reverse innovation, which criticize the commonly accepted “glocalization” strategies adopted by multinational corporation from developed countries and suggest that product/service development at emerging markets requires fundamental mind-set shifts as consumer preferences are widely divergent (Govindarajan and Ramamurti, 2011). That is to say, the fundamental issues and value propositions related to the emerging markets are different, therefore paradigms followed in developed countries can hardly be feasible at emerging markets. Firms from emerging markets, though are disadvantageous from the technological perspective, enjoys natural intimacy with local consumers, and may actually own advantages over world leading incumbents. Hence the proposed market trajectory framework enriches the concept of reverse innovation.

Furthermore, as discussed in the Alibaba case, the evolution of one market trajectory may trigger the development of complementary industries and markets, such as e-commerce and logistics industry. Hence, several interdependent market trajectories representing different market paradigms and industries may co-evolve together to create value for consumers. This is in line with the innovation ecosystem framework, however this study highlights the co-evolution of different market trajectories rather than merely ecosystem actors.

It is worth noting that even though the study put forward market trajectory as a key guiding framework for latecomers to catch up. We are aware that the more traditional technological trajectory framework still plays an important role. For example, new consumer preferences may be revealed by technological breakthroughs, and market based innovation may need technological innovations to accomplish. That is to say, the interactions between market and technological trajectories open up future research possibilities. Today’s business environment becomes much more open and flat than ever before and the globalization of innovation has become an inevitable trend. More and more MNCs shift their strategic focus from matured markets to emerging markets and at

the same time, many ambitious emerging economy firms begin to expand globally. The fierce ever global competition increases the difficulties of overcoming “latecomer disadvantage” (Gao et al., 2007) for firms from emerging markets. Yet, the notion of market trajectory provides an alternative and effective solution for seizing “windows of opportunity” and initiating indigenous innovations for Chinese and emerging market firms.

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