

# Capabilities Development to attract complementation in ecosystems based on digital platforms

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## ABSTRACT

Ecosystems based on digital platforms are considered as a source of dynamism and innovation for many technologies, products and services. To deal with multilateral relationships in the ecosystem based on digital platforms and attract complementation, the platform leaders are required to develop platform capabilities to enable creation and capture of value in the ecosystem. The present work sought to answer how do platform leaders develop capabilities to attract complementation allowing the evolution of platforms from internal to external to create the so-called ecosystems based on digital platforms. The research focus is the discussion of the capabilities related to the relationship between platform leaders and complement providers. A multiple case study was conducted on leaders of digital platforms and complement providers. A tentative theoretical framework was proposed, indicating that, to open platforms (in the supply chain or to create platform-based ecosystems - those considered as different degrees of overture and control of the platform), the platform leaders develop a set of capabilities (linked to the relationship with complement providers), according to the degree of overture and control of the platform. In this context, the study also suggests that complement providers acquire different capabilities depending on the type of platform they adopt.

**Keywords:** Ecosystems based on digital platforms; Platform Capabilities; Innovation; Platform Leaders, Complement providers

## I. Introduction

A very recent debate has focused on discussing ecosystems based on digital platforms as a source of dynamism and innovation for many technologies, products and services and moreover about the need for platform leaders develop platform capabilities to enable creation and capture of value in the ecosystem (Gawer, 2014; Teece, 2018; Helfat and Raubitschek, 2018). Amazon, Apple, Facebook, Google, Microsoft and SAP are some examples of companies whose platforms have inspired many other companies to develop complementary products and services.

But for some time now the role of product and service platforms within companies and in mediating the activities of business conglomerates or ecosystems has been widely recognized as being of great importance to manage processes of new businesses, in the development of new products, and in innovation (Meyer and Lehnerd, 1997; Baldwin and Woodard, 2009).

The platform approaches have evolved from an internal to external perspective (Facin et al., 2016). The early studies (Wheelwright and Clark, 1992; Sanderson and Uzumeri, 1995; Meyer and Lehnerd, 1997; Robertson and Ulrich, 1998) discussed mainly the concept and the benefits related to the use of platforms by the companies to improve

the efficiency of their product development, with the main theoretical basis being the literature on engineering design, which conceptualizes the platform as a modular technological architecture (Gawer, 2014). More recent studies (Evans, Hagiu and Schmanlensee, 2006; Gawer and Henderson, 2007; Boudreau and Lakhani, 2009; Gawer, 2009; Piezunka 2011; Gawer, 2014) show the evolution of the role of product and service platforms as mediators of cluster activities or ecosystems of firms, these are classified as supply chain or ecosystem (or industry platforms, following Gawer's (2009) classification) platforms.

As the internal or supply chain platforms, ecosystem platforms are designed and managed strategically, to increase the competitive advantage of the platform leader. However, there are important differences, in particular, for those leaders of ecosystem platforms who need to develop capabilities to exploit the innovative capabilities of outside firms, which are not necessarily part of their supply chain (Gawer and Cusumano, 2013).

Faced with this important aspect in the use of ecosystem platforms, recent researches highlight the importance of deepening studies for detailing the specific types of capabilities required of the platform leaders and how these capabilities can enable those companies open their platforms to both create and capture value in ecosystems based in digital platforms (Helfat and Raubitschek, 2018; Teece, 2018).

In this context, our objective was understanding how do platform leaders develop capabilities to attract complementation allowing the evolution of platforms from internal to external to create the so-called ecosystems based on digital platforms. The research focus is the discussion of the capabilities related to the relationship between platform leaders and complement providers.

Aiming to achieve this goal, a literature review was performed to provide a conceptual framework that served as a theoretical foundation for a multiple case study that was conducted on leaders of digital platforms and complement providers.

To present our research, this paper was structured into five sections. In section II, the platform evolution and the platform capabilities theories are presented. In section III, the details of the multiple case study are presented. In section IV, the main results are presented and discussed. Section V brings the main findings of the research, followed by the interpretation of the main results. Lastly, the contribution to theory and to practice, as well as the limitations of this research is presented.

## **II. A discussion on the emergence of platform-based ecosystems and on the platform capabilities literature**

As highlighted in Facin et al. (2016) the platform approaches have evolved from an internal to external perspective. When considering the external perspective (platforms as mediators of cluster activities or corporate ecosystems), Gawer (2009) classified external platforms as supply-chain or industry platforms.

Gawer (2009) defines the supply chain platform as "a set of subsystems and interfaces that form a common framework through which a series of derivative products can be efficiently developed and produced by partners along the supply chain." This author also defines the industry platform as "building blocks (which may be products, technologies or services) that act as a basis upon which a set of companies (sometimes called a corporate or business ecosystem) can develop products, technologies or complementary services. "

According to Gawer (2009), while platforms are becoming increasingly widespread and promising research is ongoing, there are still important issues that have not yet been

answered. One of these questions is about understanding under what conditions an industry platform emerges and develops. To answer this question, Gawer (2009) proposes a classification for platforms, organizing them into three categories: internal, supply chain and industry. From this classification is suggested an evolutionary hypothesis for emergence of platforms, which establishes their emergence within companies as internal platforms, and can evolve to supply chain platforms and finally to industry platforms.

Gawer (2009) also proposed some distinctive features that differentiate the three platform categories, including context, participants, objectives, architecture rules, and end use of the product, service or technology, and also some key questions answered in the literature related to each category.

In terms of context and participants, an internal platform is developed within a company and its subunits, the supply chain platform is developed within the supply chain by an assembler and its suppliers, an industry platform is developed by the leader of the platform (which does not necessarily have a contractual relationship but has products / services that should work together as part of a technology system).

With respect to the objectives, architecture rules and key issues examined in the literature, these characteristics are the same for the supply chain and internal platforms; specifically, they relate to the production of variety with low cost and the obtaining of the mass customization through the reutilization of modular components, and of the stability of the system architecture. With respect to industry platforms objectives, their aim is to stimulate and capture the value of complementary external innovations (from the platform owner's point of view) and enable companies to benefit from the platform's installed base and the direct and indirect effects of the innovation network (from the point of view of complementors).

For industry platforms, the interfaces set the architecture rules to allow add-ons to be coupled to the platform to innovate. As Gawer (2009) emphasized, although the end use of the product, service or technology is known and is previously defined in the context of internal platforms and the supply chain, there are a variety of uses and purposes for the products, services or technologies provided by the platform owner and its complementors, and these uses may not be previously known in the case of industry platforms.

Research questions related to industry platforms focus on how the platform owner can stimulate complementary innovation while benefiting from it, and how the incentives to create complementary innovations can be incorporated into the platform design.

Gawer and Cusumano (2008) discussed these issues in detail and focused on the strategies that the industry platform leaders must employ to address the technological and business challenges related to the positioning of their platforms as a leader in an industrial sector.

In particular, they discuss technological challenges that relate to the design of an appropriate architecture, the appropriate design of interfaces and connectors, and the selective way in which intellectual property is shared; all these factors are intended to facilitate the provision of add-ons by third parties. On the other hand, business challenges refer to decisions about producing the key add-ins internally or introducing incentives for third parties to create the complementary innovations needed to build a market at the right time and beat the competition.

Since the external platforms are not developed by a single company, but by a set of companies, and in this sense the evolution of the platform does not depend only on the

platform leader, this makes it very relevant to understand how the platform leaders build capabilities to care for, monitor, manage the relationship with the actors in the ecosystem or the supply chain that forms around their platforms (Jansen and Cusumano, 2013). Managing a platform-based ecosystem is not only about building a network of partners, it is also about building coordination processes to engage key partners, which will influence the participation of other ecosystem partners (Isckia and Lescop, 2015).

According to Gawer and Cusumano (2002), companies that decide to open their platforms - transforming them into supply chain platforms or industry platforms - need to develop capabilities to manage and encourage the participation of external companies in platform development. It is also important to understand how and to what extent the platform leaders should use their organizational structure and internal processes to ensure partners and complementors that they are working for the overall good of the ecosystem.

Gawer and Cusumano (2002) developed the concept of platform-based ecosystems and emphasized the role of platforms in ecosystems. In the ecosystem literature, many researchers argue that the existence of the platform could be seen as a key feature of business and innovation ecosystems, notably the work of Iansiti and Levien (2004), who noted the strategic side of the business ecosystem, and discussed the role of the firm that owns the platform (keystone), the different strategies according to the type of ecosystem, measures for ecosystem performance, risks and opportunities for the platform owner (keystone firm) and the role of the platform in this context.

Gawer (2014) argues that the literature on platforms is divided into two separate perspectives: innovation (technological) and competition (economic). The ecosystem concept also covers two sides of management: innovation, which refers to value creation, and business, which predominantly involves value capture. Ritala et al. (2013, p.5) defined value creation as "collaborative processes and value creation activities for clients and other stakeholders", while "value capture" refers to the realization of individual company profits; that is, how companies eventually seek to achieve their own competitive advantage and reap the related profits." In this sense, platform leaders must proactively manage the platform, creating attractive business models, making it clear how the platform can create value and how partners and complement providers would be able to capture value from the platform. For this, the platform leaders must act to coordinate the evolution of their own capabilities, as well as their partners and complementors.

Additionally, recent works show the relevance of the discussions about the relationship between platform leaders and complementors to develop a healthy ecosystem around platforms. Adner and Kapoor (2010) argue that complex innovations tend to involve a range of actors, and require the participation not only of those actors who are confined in the supply chain. Boudreau (2017), for example, points out that the most successful companies in leading platform-based ecosystems are those that can open their platforms to collaborate with external developers and maintain coordination and control of the whole system. In turn, Parker, Van Alstyne and Jiang (2017) discuss that those companies have chosen to innovate through external relationship, and that value creation is changing from the inside out. Teece (2018) argues that creating and capturing value requires from platform leader a mix of openness to attract the complementors and a degree of control to keep users satisfied. Work has also emerged that reinforces the need for a deepening in the identification of so-called platform capabilities (Teece, 2018; Helfat and Raubitschek, 2018).

Previous work has already highlighted the importance of understanding the capabilities needed in the development of platform-based products and services. Kude, Dibbern and Heinzl (2012), for example, studied some capabilities developed by

companies, that produce and are leaders of ERP software platform, to attract the participation of complementors of its network of partners. These capabilities would relate to the technological capital, commercial capital and social capital of these companies. Capabilities to provide integrated systems and to innovate the architecture of the system are classified as technological capital, the capability to provide access to a large market is classified as commercial capital, in turn the qualification to bring good reputation is considered as a social capital. Vickery, Koufteros, and Droge (2013) sought to understand how capabilities for integrating a supply chain can impact the performance of a company developing new products based on a product platform strategy. Ceccagnoli et al. (2012) examined whether participation in a platform-centric ecosystem improves the business performance of small independent software vendors (ISVs) that develop enterprise management software, and found that the positive impacts are greater when small businesses have intellectual property rights or when they have very specialized downstream capabilities that are not dominated by the platform owner.

### III. Methodology

The research used a qualitative approach proposed by Eisenhardt (1989), which describes how theory may be built and extended from empirical data. A multiple case study analysis was conducted to develop the research problem. Empirical studies were conducted on leaders of digital platforms and companies that develop products and/or services that complement the platforms (complement providers). A conceptual framework (Figure 1) guided the empirical research.

The case study was conducted through interviews and information gathering in 6 platform leaders (1 internal, 2 supply chain and 3 ecosystem platforms), and at least two companies that develop add-ons for the platform (total of 16 complement providers). Some interviews were conducted in person and others were conducted by telephone or audio conference, for a total of 42 interviews (approximately 50 hours). The websites of the companies were consulted before and after the interviews to complement the data collection, as well as the material provided or indicated by the respondents, during the interviews, was analyzed. All the interviews carried out in each case were transcribed and analyzed using Nvivo software. The main findings emerge through within-case and cross-case analysis.

### IV. Results

In this section, an analysis of the main findings in the field work is presented.

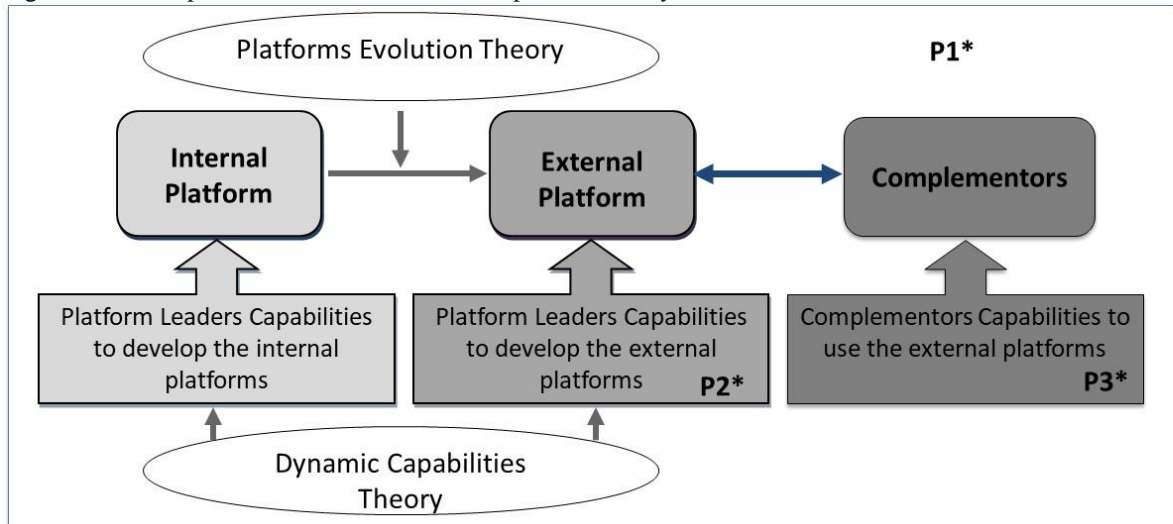
To assist in the response to the research question, three propositions were established for the multiple case study, based on the conceptual framework (Figure 1) that emerged from the literature review.

*Proposition P1 (P1\*) - There are different types of platforms that a company can adopt to develop its products and services: internal, supply chain and ecosystem. In order to evolve from an internal platform to an external platform, platform capabilities related to the relationship between the platforms leaders and complementors are developed* (Facin et al., 2016; Gawer, 2009; Gawer, 2014; Gawer and Cusumano, 2014; Helfat and Raubitschek, 2018; Thomas, Autio and Gann, 2014; Teece, Pisano and Shuen, 1997; Teece, 2007; Teece, 2018).

*Proposition P2 (P2\*) - The companies that own platforms develop certain capabilities according to the type of platform adopted (Gawer, 2014; Kude, Dibbern and Heinzl, 2012; Teece, 2007; Vickery, Koufteros and Droge, 2013).*

*Proposition P3 (P3\*) - The companies that participate in the complementation of external platforms also develop capabilities to adapt to the type of platform when adopting it (Ceccagnoli et al, 2012; Kude, Dibbern and Heinzl, 2012; Huang et al., 2013).*

Figure 1 – Conceptual Framework for the Multiple Case Study



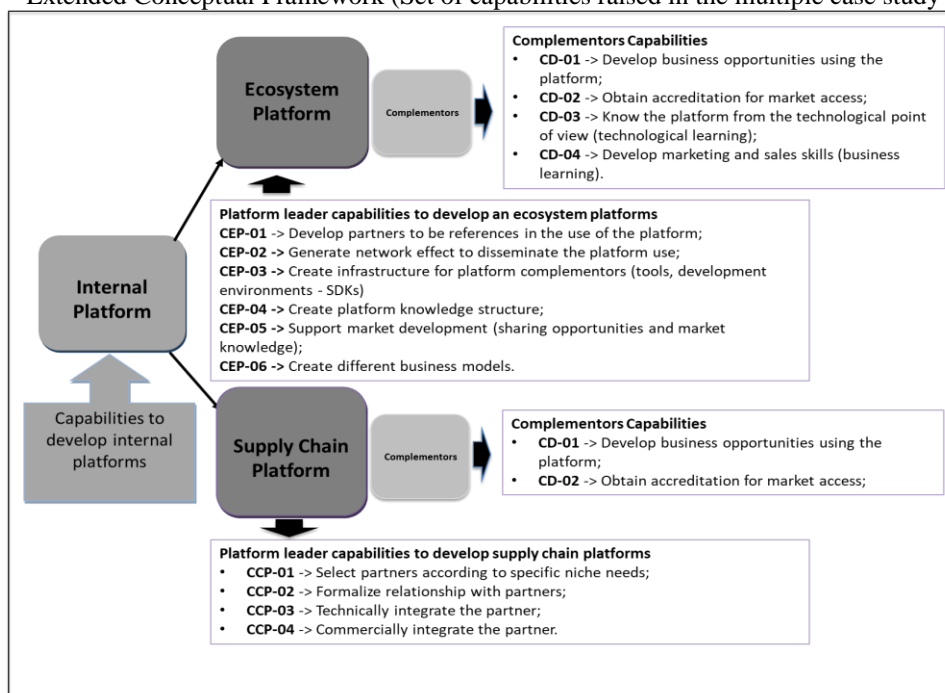
Source: Developed by the authors.

From the multiple case data analysis raised a set of capabilities showed in Figure 2, which shows the confirmation of the propositions P2 and P3.

Proposition P2 could be confirmed by the identified set of capabilities (CEP-01 to CEP-06) for the ecosystem platforms leaders and by the identified set of capabilities (CCP-01 to CCP-04) for the supply chain platforms leaders. Therefore, it could be affirmed that there are capabilities that the platform leaders develop according to the type of platform adopted.

Proposition P3 could be confirmed by the identified set of capabilities (CD-01 to CD-04) for the complementors. In Figure 2, it is possible to see how additional capabilities were raised for the adoption of ecosystem platforms, in comparison with the adoption of supply chain platforms. This could mean that different capabilities are developed by complementors to adapt themselves to the chosen type of platform.

Figura 2 – Extended Conceptual Framework (Set of capabilities raised in the multiple case study analysis)



Source: Developed by the authors.

Based on the conceptual framework developed for the multiple case study (Figure 1), and in the results of this study, an extended theoretical framework (Figure 2) is proposed to evidence the confirmation of the proposition P1.

This tentative theoretical framework complements the theory of platform evolution proposed by Gawer (2009), when proposing that, in order to evolve from an internal platform to an external platform, platform leaders develop a set of capabilities linked to the relationship with platform complementors. The extended framework also searches to complement the platform capabilities theory (Helfat and Raubitschek, 2018; Teece, 2007; Teece, 2018).

It was noticed that capabilities related to the evolution of ecosystem platforms are aimed at reducing barriers to the adoption of the platform (with emphasis on CEP-02, CEP-03 and CEP-04), and to develop attractive business models whose objective is maximize the permanence of complementors in the ecosystem (with emphasis on CEP-01, CEP-05 and CEP-06). This is in line with what has been discussed by Gawer (2009), which indicates that ecosystem platforms aim to stimulate and capture the value of complementary external innovations (from the platform owner's point of view) and enable companies to benefit from the installed base of the platform and the direct and indirect effects of the complementary innovation network (from the point of view of complementors).

They also largely reflect business challenges, as pointed out by Gawer and Cusumano (2008), when they refer to the kind of incentives that are introduced for third parties to create the complementary innovations needed to build a market. In this case, the capabilities CEP-01 and CEP-05 can be highlighted, on which it is possible to notice a closer proximity between the platform leader and some kind of complementors, to make possible the creation of references that will be examples of the successful use of the platform.

In the case of supply chain platforms, the capabilities reflect, as discussed by Popp and Meyer (2010), a need for the platform leaders mitigating risks in the relationship with

complementors, since they incorporate the complements in an integrated solution and take responsibility by providing an integrated solution to the customer. This model was also mentioned by Boudreau and Lakhani (2009) as the integrative platform in which the platform leaders integrate the innovations developed by external innovators and sell them combined with their final products to the customers. As assessed in this study, in the context of supply chain platforms formal contracts are used with complementors (Gawer, 2014), and also it seems to be necessary for the platform leader, to develop capabilities to take care of the relationship with complementors. It was also realized that when the platform leader offers a supply chain platform, which is based on adding new features to specific business niches, the platform leaders tend to involve fewer complementors and establish a more formal relationship because is a way they believe they will have more control over their intellectual capital.

While the ecosystem platform leaders invest in capability building to attract as many complementors as possible to develop on the platform, disseminating as much knowledge about the platform, the supply chain platforms leaders only disclose this knowledge in the supply chain and therefore invest very little in this type of capability, or rather, invest in capabilities to exercise greater control over what is being developed on the platform, and also have a strong focus on acquiring expertise on the business niches developed by the complementors.

These findings reflect what was discussed by Gawer (2014) and Rong et al. (2013), who argue that the supply chain concept assumes a determined and stable interaction between companies. Their governance is also determined, implying an established and stable arrangement for value creation, in which each of complementors has a well-defined role.

The supply chain approach attempts to increase control over performance by considering complementors as actors that can be managed by contracts and managerial approaches. The ecosystem concept, closely related to the ecosystem platform, considers that companies can make efforts to manage (directly and indirectly controlling) regulators, media, innovative completers, and other actors. Of course, part or most of the environment still remains outside the influence of firms (Adner and Kapoor, 2010).

With regard to the capabilities of the complementors, the CD-01 capability depends on the type of platform to be adopted. When it comes to an ecosystem platform the leader encourages competition among complementors, in this case more innovative solutions may have greater success in the competition that exists in the ecosystem that forms around the platform. Solutions that solve very specific problems, not yet covered by solutions offered by the supply chain platform leader, may be more successful. Another interesting issue concerns adherence to the partnership programs offered by both ecosystem and supply chain platform leaders, in which most complementors have reported that it is a way of acquiring CD-02 capability, which enables access to markets where, without the accreditation offered by the platform leaders, they would have no chance to enter. It is also worth mentioning the capability regarding market intelligence and commercial learning (CD-04), which in the case of supply chain platforms is controlled by the platform leader, and therefore is not well developed among those complementors who adopt this type of platforms, compared to complementors who adopt ecosystem platforms, which in their turn relate directly to their end customers without the leader interference. In this context, it has been reported that CD-04 capability is essential for their market survival.



## V. Conclusions

This exploratory research identified and characterized the capabilities linked to the relationship between platform leaders and complementors as a means to understand how platforms evolve from internal to external in the context of digital platforms developed by multinational and national companies, and offered in the Brazilian market. The results were presented and discussed based on a conceptual framework that integrates the platforms evolution theory (Gawer, 2009; Gawer, 2014) and platform capabilities theory (Helfat and Raubitschek, 2018; Teece, 2007; Teece, 2018). Using this conceptual framework in the study of six cases, it was possible to identify and classify capabilities by platform type, both from the perspective of the platform leader, and from the complementors that use the platforms as a basis for new products and services.

Platform-type capabilities sets identified in the empirical study contribute to the platform theory by complementing Gawer's (2009) theory of platform evolution, composing a tentative extended theoretical framework that indicates that to evolve from an internal platform to an external platform, platform leaders develop a set of capabilities to turn possible the relationship with complementors and to attract them to develop on the platform. The study also suggests that complementors acquire different capabilities depending on the type of platform they adopt. By considering, the perspective of complementors in the identification of capabilities, this study also contributed to narrow the research gap that address the capabilities that are developed by companies that complement platforms (Ceccagnoli et al., 2012; Kude, Dibbern and Heinzl, 2012; Huang et al, 2013), helping to expand the focus of platform research given primarily to companies that own platforms (Piezunka, 2011).

In addition to these theoretical contributions, this research presents some ideas for managers about some practical implications. As platforms are closely related to business performance, capabilities analysis and development can help managers and practitioners understand that the use of platforms can affect innovation in different ways (e.g., by attracting outside innovation), and that according to with the type of platform adopted (supply chain or ecosystem platform) there are considerable and specific managerial challenges. Managers should consider when designing an external platform, how to define the appropriate incentives to attract complementors as a way to evolve the platform. In this context, establishing the most appropriate set of capabilities may allow a company to orchestrate its complementors to promote the achievement of sustainable competitiveness.

Moreover, this work also highlights the challenges related to the evolution of the platforms, carried out to develop and commercialize technological innovations. In this context, platform owners must proactively manage the platform by creating compelling business models, making it clear how the platform can create value and how companies would be able to capture value from the platform. In addition, platform owners must act to coordinate the renewal of their own capabilities, as well as of their complementors.

The fact that the study considered only 2 cases of supply chain platforms e 3 cases of ecosystem platforms can be considered a limitation to this research, which does not allow generalizing the results observed, or the conclusions. To progress this research and to increase the generalization of results, it will be important to include more cases of supply chain and ecosystem platforms to enable comparisons between cases and to enrich the discussion on this topic and mostly to test the theoretical framework proposed. It is also interesting to apply our theoretical and empirical model to other sectors.

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