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AN EXPLORATORY ANALYSIS ON THE CONTEXTUAL FACTORS THAT INFLUENCE DISRUPTIVE INNOVATION: THE CASE OF UBER

In the last years, management scholars have looked into the phenomenon of disruptive innovation, mostly focusing on the characteristics that identify a disruptive innovation and on the managerial solutions that incumbent firms should adopt to respond to the threat of a disruptive innovation. However, studying the characteristics of the context in which a disruptive innovation unfolds remains an under-researched topic. To fill this gap, this exploratory study examines how the disruptive innovation phenomenon is influenced by a set of variables that shape the context in which it takes place. This is done through a historical analysis of Uber, a widely discussed example of disruptive innovation. The exploratory analysis suggests that the extant regulatory framework plays a key role in influencing the impact that Uber has had on the taxi industry. By doing so, the paper points to the importance – for future researchers – to study disruptive innovation by carefully placing it in the regulatory context in which it takes place, given the importance that this aspect plays in influencing the anatomy of the disruption phenomenon.

Keywords: disruptive innovation, contextual factors, Uber, city.

1. Introduction

In the last years, management scholars have paid great attention to the concept of disruptive innovation, i.e. the process through which an innovation changes the rules of competition in a given industry, bringing newcomers and start-ups to the top ranks of that industry and disrupting the position of incumbents (e.g., Bower and Christensen, 1995; Christensen and Bower, 1996; Christensen, 1997; Christensen and Raynor, 2003; Kostoff et al., 2004; Danneels, 2004; Markides, 2006). This literature has focused mostly on the characteristics of new product, service, or business model innovations that make them disruptive, and on the managerial and organizational approaches that incumbent firms can adopt to respond to the threat of disruptive innovation (e.g., Christensen and Overdorf, 2000; Adner, 2002; Kostoff et al., 2004; Birkinshaw and Gibson, 2004; O'Reilly and Tushman, 2004; O'Connor and DeMartino, 2006). However, little attention has been paid to the contextual factors that influence the extent to which a given innovation disrupts the established position of incumbent firms. This aspect deserves particular attention, if we aim to develop a comprehensive theoretical understanding of the disruption phenomenon (Schumpeter, 1934; Tushman and Anderson, 1986), which takes into account the impact that the characteristics of the market in which a disruptive innovation diffuses have on the extent to which this innovation has a disruptive effect.

In this article, we refer to “external factors”, “contextual factors” and “exogenous factors” as synonymous, to denote the characteristics of the external environment, which captures the industry-, country- and society-level conditions characterizing the context in which innovations take place and diffuse.

The importance of looking at external factors on the disruptive impact of an innovation can be explained considering anecdotic evidence showing that a number of innovations that have had a disruptive impact in some contexts (and, in particular, in some countries), have not had the same disruptive impact in other contexts, due to the presence of a different set of external factors. For instance, Yu and Hang (2010) point out the example of the disruptive impact of the hard disk drive, which changed the rule of competition in the US and not in Japan, because of the different regulatory framework, financing system and cultural factors between the two countries (see, also, Chesbrough, 1999). In another case, the PHSs (or Personal Handphone Systems) did not succeed in Japan, but were a clear example of disruptive innovation in China (Yu and hang, 2010), and these differences can be explained due to the different economic conditions and entrepreneurial culture distinguishing the two countries.

Therefore, considering the two examples mentioned above and many others that can be found in the literature, we argue that the external environment plays a pivotal role in influencing the extent to which an innovation has a disruptive impact on the market. In particular, the examples above suggest that external factors such as the regulatory framework, economic conditions, and the entrepreneurial culture of a country, may all have a strong impact to the extent to which an innovation has a disruptive impact on the market.

Starting from these premises, our exploratory study aims to fill the gap underlined above, by analyzing the case of Uber, a widely discussed example of disruptive innovation, and examining the role that a set of contextual factors have played in influencing the extent to which Uber has had a disruptive impact on the market.

Uber is a taxi-hailing company based in San Francisco, which launched its taxi-hailing service in June 2010. Uber is the first Unicorn tech-company in “The Billion Dollar Start-up Club” ranking released by the Wall Street Journal, i.e. the club of venture-backed private companies valued at least \$ 1 billion by venture capital companies. In December 2016, the value of the company is about \$ 69 billion (Source: “Bloomberg”), with its service currently available in 550 cities in 74 different countries (Source: “Uber”). The nature of Uber as a disruptive innovation has been discussed at length in existing literature, with controversial viewpoints. This stems from the lack of a general agreement on the definition of the concept of disruptive innovation, as noted by many scholars (such as Danneels, 2004; Tellis, 2006), who argue that “what constitutes a real disruptive innovation deserves examination through different lenses, and it is crucial to discuss the definition in any further research on disruptive innovation, as well as clarification of some potential misunderstandings” (Yu and Hang, 2010). On one hand, Uber is recognized as a disruptive innovation, highlighting its capability to exploit digital technology to threaten the traditional taxi industry (Isaac, 2014; Gil, 2014; Stuart, 2014). Others provide support to this view emphasizing that Uber is a clear example of a low-end disruption, due to its ability to move upstream-market starting from downstream-market to attack taxis directly (Moazed and Johnson, 2016). Moreover, in a recent study of The Strategy Group (The Strategy Group, 2016), Uber has been identified as an excellent example of disruptive innovation on the basis of the range of new features – such as the double rating system, the electronic payment, or the use of taximeters based on GPS technology – it is able to offer compared with similar services. On the other hand, some scholars (e.g., McAlon, 2015; Hill, 2015; Christensen et al., 2015) hold that Uber is not “genuinely” a disruptive innovation. They argue that Uber does not come from the low-end of a market, which incumbents have neglected, or created a market where none existed. Conversely, they say that the company is more genuinely disruptive in its attack on the lower end of the limousine market. Moreover, as underlined by McAlon (2015): “Uber just made a more convenient taxi system using your smartphone, going after the taxi companies’ core business right from the start. While Uber does now serve people living in areas often overlooked by taxis, they moved more down-market than up-market – the opposite of a disruptive company like Netflix. Uber is innovative, sure, but not disruptive in the way Christensen used the word.” Although the inner nature of Uber, we recognize that this innovation is disrupting the transportation and, in particular, the taxi industry to a different extent in different countries and in different cities around the world, as highlighted by MacMillan (2016) in a Wall Street Journal article, as well as in the two reports of The Financial Times published in 2014 and 2016, respectively titled “Disrupters bring destruction and opportunity” and “Uber’s total funding nears \$10bn”.

The observations above suggest that the extent to which an innovation has a disruptive impact on established industries, not only depends on its intrinsic features, but is also very likely to be dependent upon the characteristics of the context in which it diffuses. In other words, under the effect of different contextual factors, an innovation may have a higher or weaker disruptive impact into the market.

We provide hereafter a brief discussion of the differences between the business models of Uber and of traditional taxi service providers, as this will be useful to better understand the following analysis.

Uber has a peculiar business model. It cannot be considered as a taxi or a transportation company, since it does not own taxis and has no drivers as employees. Uber is a marketplace and plays the role of matchmaker, matching drivers with customers who access the service through a smartphone app. Uber holds 20% of the fare paid by customers and gives the remaining part to the drivers. The core activity of the company refers to the selection of drivers and the control of the quality of the service. Uber assigns to candidate drivers who pass the selection a smartphone application, which allows them to manage incoming customer requests. The Uber app is one of the core elements of its business model: it is available for smartphone devices and it uses GPS to display the map of all available Uber cars in the area. In addition, the app sends requests from customers to the closest driver, and provide customers with the information about the estimated pick-up time. Moreover, the app handles electronic payments and,

at the end of the service, it requires both customers and drivers to leave a rating. Uber offers five different levels of taxi-hailing service, depending on the different customers' needs (especially in terms of price and quality). In particular: (i) UberLux is the most expensive and luxurious service that the company offers, where drivers have "F-segment" luxury cars (such as Mercedes S-Class, Audi A8, BMW 7 Series); (ii) UberSuv panders to users who require more seats (up to six people). In this case, the service is provided by assigning to users a SUV or a MPV (Multi-Purpose Vehicle); (iii) UberBlack is the original service that Uber offers since the inception of the company. Drivers provide this service through the "E-segment" cars; (iv) UberTaxi allows users residing in cities where Uber signed agreements with local cab companies to request a taxi. Uber handles the transaction through its application by applying the same price of taxi service set by the local regulator; finally, (v) UberX (or UberPop) is the low-cost service and is based on the employment of non-professional drivers (differently from the other four services).

Several differences compared with the business model of traditional taxi service providers emerge, considering that Uber identifies simplicity as its main source of competitive advantage, instead of price. On one hand, it enables the provision of a high-quality service, e.g., by offering a portfolio of five different levels of taxi-hailing services, reducing uncertainty about waiting times, as well as on the typology of vehicle that will arrive at the customer's premises, and through a driver rating system. On the other hand, the ease of use stems from the possibility to leverage on a single app in most major cities or countries around the world (instead of a dedicated taxi phone line in each city or country) and on a simple ordering and payment process (which does not require hailing, phoning, searching and cash payment). Finally, security is a third pillar which differentiates the business model of Uber from traditional taxi services, through (i) the rating system for drivers and customers, (ii) the tracking of each route and (iii) the price transparency (thanks to an accurate fare estimation before the trip).

Table 1 summarizes the main differences between the business models of traditional taxi service providers and Uber

Table 1. The business model of traditional taxi service providers and Uber.

Characteristics of the Business Model	Uber	Traditional Taxi Service Providers
HIRING PROCEDURES	Through app	Through flag/call center/app/ dedicated taxi queue
PAYMENT PROCEDURES	Cashless	Cash/credit card
PRICING STRUCTURE	Flexible	Structured
DRIVERS/PASSENGERS RATING	Available	Not available
CAR	Self	Rented from taxi companies

In this paper we present and discuss the results of an exploratory historical analysis on the diffusion of Uber in different cities around the world, to highlight how the characteristics of the context in which it diffuses have influenced its disruptive impact on the transportation sector and, in particular, on the taxi industry. Our analysis is particularly useful to illuminate the impact that a set of contextual factors, which exist in different countries and cities, has on the disruptive nature of Uber. This represents an important contribution to our current understanding of the disruptive innovation phenomenon and to the development of a comprehensive theoretical understanding of the disruption phenomenon in its whole complexity and of a theory of disruptive innovation that is able to interpret and predict whether, why and how a new product, service, or business model will disrupt an established industry.

The paper is organized as follows. Section 2 provides an overview of the existing literature on the topics of disruptive innovation (Sections 2.1) and on internal and contextual factors affecting disruptive innovation (Sections 2.2 and 2.3). Afterwards, Section 3 summarizes the methodological details, whereas Section 4 provides the results of the historical analysis. The main findings are discussed in Section 5. Finally, conclusions and avenues for future research are outlined in Section 6.

2. Literature Review

2.1 Disruptive Innovation

In the last years, management scholars have paid special attention to the concept of disruptive innovation (Bower and Christensen, 1995; Christensen and Bower, 1996; Christensen, 1997; Veryzer, 1998; Adner, 2002; Christensen and Raynor, 2003; Kostoff et al., 2004; Danneels, 2004; Markides, 2006; Govindarajan and Kopalle, 2006). Disruptive innovation describes the process through which a new product, service or business model deeply changes the nature of competition in a given industry, bringing new companies (newcomers or start-ups) to the top ranks of that industry and seriously challenging the position of incumbent firms. According to Bower and Christensen (1995) and Christensen (1997), many large, profitable companies fail to stay at the top of their industries when disruptive innovations, mainly launched by newcomers, enter established markets. This happens because disruptive innovations offer a very different value proposition compared to existing products, services and business models, characterized by a different set of performance attributes.

In particular: (i) disruptive innovations are typically simpler and cheaper than existing products, services or business models, with worse performance than existing products or services, but with a different value proposition; (ii) they generally promise lower margins, not greater profits, as they have typically lower prices; (iii) disruptive innovations are first commercialized in emerging and small market niches, given that the most profitable customers of established firms are reluctant to purchase disruptive innovations; and, finally, (iv) disruptive innovations are typically developed and launched by start-ups or newcomers, which are not perceived as a challenge to the market position of established firms (Bower and Christensen, 1995; Christensen and Bower, 1996; Christensen, 1997; Christensen and Overdorf, 2000; Christensen and Raynor, 2003).

Table 2 summarizes the main characteristics of disruptive innovations.

Table 2. Main characteristics of disruptive innovations.

Performance	Cost	Target Market	Innovator
Worse than existing products or services, but different value propositions	Lower cost to buy or use the innovation (lower profits for the innovator)	Initially a niche, then expands into the mainstream market	Start-ups / Newcomer

Following these seminal studies, scholars have identified different types of disruptive innovations (Danneels, 2004; Markides, 2006), and tried to capture the disruptive nature of an innovation with “reliable and valid measures” (Govindarajan and Kopalle, 2006). Moreover, literature has long inquired into the strategic and organisational approaches that incumbent firms should adopt to quickly identify disruptive innovations and successfully react to them, such as structural and contextual ambidextrous organisations, acquisitions of new small companies, spin-offs or spin-outs, exploitation of both managerial commitment and internal capabilities through the creation of dedicated teams (Suarez and Utterback, 1995; Bower and Christensen, 1995; Christensen and Bower, 1996; Christensen, 1997; Sull et al., 1997; Tripsas, 1997; Christensen and Overdorf, 2000; Adner, 2002; Kostoff et al., 2004; Birkinshaw and Gibson, 2004; O’Reilly and Tushman, 2004; O’Connor and DeMartino, 2006).

2.2 Internal Factors Influencing Disruptive Innovation

In addition to the characteristics that distinguish a disruptive innovation, and the managerial practices that should be used to deal with disruptive innovations, this stream of research points to the existence of a set of internal factors, which influence the extent to which this innovation will have a disruptive impact on the market. For instance, some scholars (e.g., Christensen, 1997) have pointed to the importance of the phenomenon of technology oversupply and of the existence of asymmetric incentives for existing and disruptive innovations in influencing the speed at which a disruptive innovation impacts the market. Furthermore, King and Tucci (2002) have highlighted the importance of the transformational capabilities of an organization in reorganizing and redirecting its efforts toward the pursuit of a disruptive innovation opportunity. Moreover, Myers (2002) and Denning (2005) have emphasized how a set of relationships with the network of technological suppliers and partners has a relevant impact on the commercialization of a disruptive innovation. Finally, Rothaermel (2001) has underlined how complementary technologies and assets have to be developed prior to, or together with, the development of potential disruptive innovations in order to influence their diffusion on the market.

Interestingly, these studies mostly focus on the role of internal factors on disruptive innovation, i.e. factors that refer to the characteristics of the firm involved in developing and launching the innovation on the market. Surprisingly, there is lack of extensive discussion about the role of external factors, which capture the industry-, country- and society-level conditions, characterizing the context in which disruptive innovations occur (see, e.g., Chesbrough, 1999). This although economics of innovation and industrial economics research stresses the critical role played by this type of factors in shaping the outcome of innovation processes (Tushman and Anderson, 1986; Romanelli and Tushman, 1986; Artoni, 2001; Aghion et al., 2005; Autio et al., 2014; Antonelli, 2014).

Accordingly, further theoretical and empirical research efforts are needed to shed light on the role of these external factors on disruptive innovations. We provide hereafter a brief overview on the contextual factors analyzed in the economics of innovation and industrial economics literature, and discuss in the following how a set of contextual factors stemming from these streams of research may influence the extent to which an innovation has a disruptive impact on the market.

2.3 Contextual Factors Influencing Disruptive Innovation

Several contextual factors have been studied in the fields of economics of innovation and industrial economics, which significantly influence the level of innovation activities and the outcome of innovation processes.

We provide in Table 3 a brief summary of these contextual factors.

Table 3. Contextual factors in the fields of economics of innovation and industrial economics.

Contextual factor	Description
Market concentration	Market concentration indicates the number of firms operating in a given industry and the distribution of their market share (Schumpeter, 1934, 1950; Hirschman, 1945; Herfindahl, 1950; Ross and Scherer, 1990)

7 Level of competition	Level of competition means the intensity of rivalry among existing competitors in a given industry (Porter, 1979). It is usually driven by the numbers of competitors, industry growth, switching costs, capacity and exit barriers.
Level of price of productivity factors	Level of price of productivity factors indicates the weight that productivity factors (such as raw materials and labor) have on a firm's cost structure (Antonelli, 2014)
Growth of demand	Growth of demand indicates the amount of consumption required by the market for a certain product, given a determined level of price (Schmokler, 1966; Antonelli, 2014)
Regulatory framework	Regulatory framework indicates the outcome of the public intervention of an administrative entity, which influences the spontaneous actions and decisions taken by economic actors (Philips, 1971; Ross and Scherer, 1990; Artoni, 2001)
Entry/exit barriers	Entry/exit barriers indicate the barriers present in a given industry deterring the entry or the exit of new or existing competitors (Porter, 1979). Entry barriers are usually driven by economies of scale, availability of substitutive products or services, capital requirements, cost disadvantages, access to distribution channels and government policy. Exit barriers are usually driven by specialized assets and management's loyalty to a particular business.
Cultural factors	Cultural factors indicate the basic values, perceptions, desires and behaviors that a person learns by living in a given country and society (Chesbrough, 1999; Yu and Hang, 2010)
Financing system	Financing system indicates the number of actions, tools and incentives allowed by public and private institutions for the growth of the industrial sector (Chesbrough, 1999)

The aforementioned contextual factors influence in a more or less significant extent the level of the innovation activity and the outcome of innovation processes in a given industry (Porter, 1979; Audretsch, 1995; Chesbrough, 1999; Artoni, 2001; Antonelli, 2014).

However, we focused our attention in this paper on three particular contextual factors within the list identified above, choosing those for which information could be collected through the historical analysis of Uber, i.e. the market concentration, the regulatory framework and the availability of substitutive products or services. The other contextual factors, such as cultural factors or the financing system, although can be useful for understanding the disruptive impact of an innovation (Chesbrough, 1999; Yu and Hang, 2010), are not in the focus of our analysis and are left to future research. This important aspect is further discussed in the "Methodology" section.

A more detailed description of the three external contextual factors on which we focus is provided hereafter:

- Market concentration captures the number of firms operating in a given industry and the distribution of their market share (Schumpeter, 1934, 1950; Hirschman, 1945; Herfindahl, 1950). A market is defined as concentrated if the number of firms in the industry is low, or if more unequal is the distribution of market shares among the firms themselves. Some scholars

have pointed to the existence of a correlation between industry concentration and the diffusion of innovation (Ross and Scherer, 1990; Gayle, 2001; Aghion et al., 2005; Yanbing, 2007). In particular, they have underlined how different concentration levels in a given industry can positively or negatively influence the extent to which innovations diffuse into the markets. This⁸ suggests that this factor should have an impact on the disruptive innovation process as well.

- Regulatory framework captures the outcome of the public intervention of an administrative entity, which influences the spontaneous actions and decisions taken by economic actors (Philips, 1971; Ross and Scherer, 1990; Artoni, 2001). Thus, the regulatory framework can influence competition in a given industry, by shaping the competitive mechanisms, creating entry barriers for new entrants and influencing the scope of innovation activities (Rogge et al., 2011). Again, this explains why the characteristics of the regulatory framework are likely to have a key impact on the outcome of the disruptive innovation process.
- Availability of substitutive products or services in an industry (Porter, 1979) is a peculiar driver of entry barrier and captures the different ways through which customers have access to a similar function (e.g., transportation via taxis) with alternative products or services (e.g., other public transportation systems). Even in this case, a larger or smaller availability of substitutive products or services in a given industry influences the capability of firms to grow, innovate and diffuse their products or services into the market (Hitt et al., 1997; Garcia-Vega, 2006). This is why this factor represents a further contextual element capable of shaping the disruptive innovation process.

Starting from the premises above, this paper addresses the following research question: *“How do the factors characterizing the context in which an innovation diffuses influence the extent to which it has a disruptive impact in the industry?”*

To answer to this research question, we have studied the case of Uber, which is particularly suited to the purposes of this exploratory research for a number of reasons. First, Uber is disrupting the transportation industry and, in particular, the taxi industry to a different extent in different countries and in different cities around the world (MacMillan, 2016). This allows analyzing the impact that different external factors have on the disruptive innovation process in different contexts. Moreover, although the nature of Uber as a disruptive innovation has been questioned by some authors, as we have underlined above, it has a number of characteristics in common with disruptive innovations and for sure it is having an impact on incumbent players. In particular, as pointed out by several scholars (see, e.g., Isaac, 2014; Gil, 2014; Stuart, 2014; Moazed and Johnson, 2016), Uber offers a different value proposition compared to its competitors, characterized by a range of services that can satisfy any kind of customer’s need (The Strategy Group, 2016). Moreover, Uber has heterogeneous prices for its services, thus allowing specific services (such as UberX/UberPop) to have a low price-quality and to be aligned with the typical characteristics of a disruptive innovation (Isaac, 2014; Gil, 2014; Stuart, 2014). Finally, other scholars argue that Uber is a typical example of a disruptive innovation having moved upstream-market starting from down-market to attack the taxi industry (see, e.g., Moazed and Johnson, 2016).

Accordingly, the paper aims to understand how a set of external contextual factors (i.e. the level of market concentration, the characteristics of the regulatory framework and the availability of substitutive products or services) influences the diffusion of Uber in different contexts. To understand how these factors characterizing the context in which Uber diffuses influence the extent to which it has a disruptive impact on the transportation sector and, in particular, on the taxi industry, the study has been conducted by using the city as a unit of analysis, due to the availability of more homogeneous and comparable information compared to those available at country-level. The empirical analysis has focused on four cities (i.e., San Francisco, New Delhi, London, and Milan) in which Uber has had different levels of disruptive impact and for which a significant set of comparable data is available.

The next sections number 3 and 4 provide more details about the methodology and the exploratory empirical analysis that we conducted to answer to the research question outlined above.

3. Methodology

Choosing Historical Analysis

This paper analyzes the diffusion of Uber in different cities by adopting a historical analysis methodology (Gottschalk, 1969). Historical analysis is the process of “assembling, critically examining, and summarizing the records of the past” or, put it differently, “assembling, critically examining, and summarizing the chronological dimension of past events” (Chiesa and Frattini, 2011). This methodology is suitable to analyze phenomena that occurred in the past and evolved over time, as it happens with Uber. In addition, historical analysis implies that information and data are gathered from multiple secondary sources, such as different magazines, reports, and newspapers, allowing cross-comparisons and triangulation of information. Moreover, information and data are assembled when the phenomena occurred for the first time, to avoid post hoc explanations and rationalizations.

Procedure

We collected and analyzed information on the diffusion of Uber gathered from published sources of information. In particular, the research has been conducted through a longitudinal analysis of articles published in the most relevant economic journals such as Bloomberg, Business Insider, Forbes, Il Sole 24 Ore, The Economist, The Financial Times, The Verge, The Wall Street Journal. In addition, publicly available reports, which have studied the evolutionary phases of Uber over time, have been analyzed as well. To search and identify valuable sources of information, we used LexisNexis, a web-based and professional full-text journal database. After having collected articles and reports, we conducted a content analysis (Weber, 1990) built around the key theoretical concepts underlying this research (i.e. Uber, disruptive innovation, external factors, contextual factors, exogenous factors, taxi service, taxi industry).

The analysis of secondary sources of information followed two specific steps:

1. In a first phase, each author conducted independently the content analysis and applied within-case and cross-case explanation procedures. To select and accept the sources of information, each author applied the control criteria for historical analysis suggested by Golder and Tellis (1993), which are (i) competence, (ii) objectivity, (iii) reliability, and (iv) corroboration. The guidelines of Golder and Tellis (1993) for historical analysis were rigorously followed because this methodology “implies a certain unavoidable level of uncertainty, which pushes the researcher to be confronted with complex and sometimes contradictory empirical evidence” (Chiesa and Frattini, 2011). Accordingly, in order to avoid any issues resulting from the use of ambiguous and equivocal data, the same piece of information was accepted only if it was mentioned in at least three different documents.
2. Afterwards, each author contrasted his own interpretation of the phenomenon with the other authors, to reach a shared understanding and interpretation. Therefore, the authors finally triangulated all the accepted information and started to cluster them for easing the data analysis and the following interpretative discussion.

The analysis of secondary sources showed that the recurrent contextual factors were:

- Market concentration, which refers to the number of taxi drivers and their organizational structure to operate within a greater taxi company or as single entities;
- Regulatory framework, which refers to the intervention of policy makers in favor or against the entry into the market of new entrants;
- Availability of substitutive products or services, which refers to the number of different substitutive products or services that consumers could use to satisfy their public transportation needs.

Moreover, we found in the city a reliable unit of analysis to answer to our research question, due to the availability of more homogeneous and comparable information compared to those available at country-level. In particular, the empirical analysis focused on four cities (i.e., San Francisco, New Delhi, London, and Milan) in which Uber has had different levels of disruptive impact and for which a significant set of comparable and accepted data on our set of contextual factors is available.

Finally, a panel of experts in the field of disruptive innovation, economics of innovation, industrial economics and regulatory policies of public transportation services was involved to discuss and corroborate the findings ensuing from the historical analysis. This panel consisted in (i) one Professor of Strategy and Innovation Management of the School of Management of Politecnico di Milano (Italy), (ii) one Consultant active in the field of Digital Innovation, (iii) two managers working for Uber in Italy and (i) one manager of ATM (Azienda Trasporti Milanese S.p.A.) company, which is responsible in one of our city of our sample (i.e. Milan) for offering public transportation service.

With each expert, we conducted personal and direct face-to-face interviews at least twice to both discuss about our data and our empirical analysis. Overall, each meeting lasted on average an hour and half, for a total of over 15 hours of interviews. We triangulated all the information ensuing from the face-to-face interviews, and shared with our panel of experts, with the secondary sources of information we assembled for the historical analysis. In doing so, for each city, we first analyzed the role of each contextual factor in influencing the disruptive impact of Uber. Thereafter, to identify the communalities and differences amongst each city, a cross-case comparison between the four cities of our sample was undertaken. We continuously compared the results of the empirical evidence with the information ensuing from the literature review on the contextual factors in order to enrich, refine and modify the theoretical setting.

The main topics ensuing from the analysis of the historical information and discussed with the panel of experts concerned: (i) the nature of Uber as a disruptive innovation, (ii) the extent to which the characteristics of Uber have been influencing its disruptive impact and diffusion at worldwide level, and finally (iii) the extent to which the contextual factors have influenced the way through which Uber has disrupted the taxi industry in the cities considered in this study.

4. Empirical Analysis

4.1. *The birth and diffusion of Uber*

In March 2009, Travis Kalanick and Garrett Camp founded Uber, a taxi-hailing company based in San Francisco. Uber launched its taxi-hailing service in San Francisco in June 2010 and the service is now available in more than 550 cities in 74 different countries. In addition, the value of the company is about \$ 69 billion, with a potential level of annual revenues of about \$ 5.5 billion in 2016 (Source: “Bloomberg”).

The level of diffusion of Uber in different cities around the world, and therefore its impact on the local transportation and taxi industry, is quite heterogeneous. Fischer (2015) shows how the weight of Uber in several US cities is quite different and rapidly changing over time. For example, in New York City, Uber had the 21% of market-share in 2015 against the 9% of 2014, while in Los Angeles it had the 49% of market-share in 2015 against the 23% of 2014, whereas it covered the 56% of the market in 2015 against the 27% of 2014 in Dallas. In Chicago Uber had the 25% of market-share in 2015 against the 8% of 2014, while in Washington D.C. it had the 49% of market-share in 2015 against the 20% of 2014. Furthermore, Uber had the 41% of the market in 2015 against the 8% of 2014 in Atlanta, whereas in Miami it had the 23% of market-share in 2015 against the 0% of 2014. The diffusion of Uber in other countries is smaller compared with the US. Moreover, a recent report of Palaniappan (2015), the Regional General Manager of Eastern Europe, Middle East & Africa at Uber, anticipated a consistent investment of about \$ 250 million across MENA in order to make Uber available to more people in more cities. On the other hand, Reuters (2015) argued, without providing quantitative estimation, that Uber has experienced a lower expansion in several cities of Western Europe, such as Milan, Berlin, Paris, Bruxelles, as well as in several Australian cities, if compared to US.

This information suggests that an innovation like Uber can have very dissimilar impacts on an industry (i.e. the taxi industry), depending on the contest in which it diffuses. For this reason, the empirical analysis has been conducted in four different cities, i.e. San Francisco, New Delhi, London and Milan, in which Uber has shown different diffusion patterns and for which relevant information is publicly available. In particular, in San Francisco, New Delhi and London, Uber has spread very fast and with a strong impact on the taxi industry. For instance, in San Francisco Uber earned the 71% of market-share in the taxi industry in 2015, against the 58% of 2014 (Fischer, 2015). Similarly, in New Delhi, despite the market-share of official the company is unknown, there are some evidences of the incredible diffusion and impact of Uber in the taxi industry. Indeed, as pointed out by Sharma Punit (2015), from February to November 2015, the company gained over the 5% of weekly registered users, trying to closing the gap with Ola Cab, the market leader of taxi services in India. Moreover, Uber announced on July 2015 that they will be investing more than \$ 1 billion to strengthen their position in India, its potential biggest global market after US (Lien, 2015). In 2016, however, the market share of Uber in the Indian market is around 5%-10%. In London, as reported by the Department for Transport (Statistical Release, 2015), the licensed vehicles that provide the taxi service accounted for a 35% of the all licensed vehicles in England, which are around 242.200. On the other hand, the number of drivers for Uber is growing in London, to arrive to more than 20.000 (Anastasio, 2015). This trend implies an important presence of Uber in the taxi industry

of London, which accounts for over the 20% of the market share. On the other hand, in Milan Uber's diffusion is very limited, with an estimated market share below 10%.

4.2. The influence of the contextual factors on the disruptive impact of Uber

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The influence of the three contextual factors on the impact that Uber has on the local taxi industry in the four selected cities was qualitatively evaluated, due to the substantial lack of quantitative information in the analyzed secondary sources.

Accordingly,

- The level of market concentration is evaluated either “high” or “low” on the basis of the capacity of taxi drivers to organize themselves in a greater taxi company (high concentration) rather than operating as single entities (low concentration);
- The regulatory framework is evaluated either “open” or “closed” on the basis of the willingness of policy makers to enable the entry into the market of new entrants, even with alternative business models, such as Uber;
- The availability of substitutive products or services is evaluated either “high” or “low” on the basis of the number of different substitutive services within each city that consumers can use to satisfy their public transportation needs.

However, according to the scientific contributions dealing with the contextual factors above, which provide criteria with which measure and evaluate them, we tried to adopt a quantitative manner to differentiate in “high” or “low” the level of market concentration and the availability of substitutive products or services.

In particular, we differentiated the level of the market concentration in “high” or “low” on the basis of the number of taxi companies (and the number of required minimum fleet of vehicles for being considered as taxi companies when specified), the number of authorized permits and/or licenses available in our set of cities. Therefore, we associated a “high” level of market concentration to the cities mainly organized in taxi companies, and requiring a minimum number of vehicles to operate with this organizational structure, instead of being organized in taxis that provide the service in an autonomous way. The same procedure was adopted for the availability of substitutive products or services, differentiating them in “high” or “low” on the basis of the number of public transportation services available in our set of cities. Therefore, we associated a “high” availability of substitutive products or services to the cities that were able to offer at least more than two different typologies of public transportation service.

In these cases, we were able to provide a measure of the level of market concentration and of the availability of substitutive products or services following a “threshold” logic, which took into account measurable values.

As far as the case of the regulatory framework is concerned, we differentiated in “open” or “closed” on the basis of the content of the main taxi and transportation industry regulations, which highlighted a more or less favorable environment for local competition due to the entry of new potential players, sometimes with different characteristics and business models, such as in the case of Uber if compared with the taxi service.

In this case, we were able to provide a measure of the propensity or inclination of a particular regulatory framework to allow new entrants to take part in the local competition of taxi and transportation industry.

4.2.1. San Francisco

Regulatory framework

Uber's legal problems in San Francisco started in October 2010, when Uber received a cease-and-desist notice from the Consumer Safety and Protection Division of CPUC (California Public Utilities Commission), followed by a \$ 20.000 fine to unlicensed passenger carriers. Moreover, in December 2014, Uber received a complaint by the Superior Court of California (County of San Francisco), for a misrepresentation regarding background checks, an improper use of the app to measure distance for fare calculation and an unlawful operation at airports. Furthermore, the Public Commission of the State of California does not recognize Uber as a real taxi service, rather, as an Online Enabled Transportation

Service (OETS). OETS, indeed, “use smartphone applications to carry out their operations and essentially act as taxi companies delivering service to customers who require it”. Indeed, the Public Commission of the State of California observed how these OETS operate in a gray area of the existing regulation applying to the taxi industry due to the absence of a compliant taximeter that the law requires for taxis. In particular, OETS use the taximeter included in the smartphone applications (i.e. a GPS-based taximeter) and not the traditional meter required by the existing regulation. Moreover, the Public Commission of the State of California underlined further violations to existing regulations of OETS such as:

1. Absence of an adequate insurance coverage;
2. Absence of a license to deliver service;
3. Non-compliance with the existing regulation on fees;
4. Double rating system;
5. Absence of control on criminal background of drivers;
6. Absence of control of vehicles maintenance status.

However, San Francisco is recently moving toward a greater deregulation of the taxi industry in order to encourage competition and entry of new potential players. In particular, a CPUC’s Consumer Safety and Protection Division act claims that OETS need to be regulated in order to guarantee the safety of customers/passengers.

Market Concentration

The San Francisco Taxi Commission regulates the taxi service in San Francisco. On November 2007, there were 1,431 authorized permits to operate, organized in 34 taxi companies, or “colour schemes”. On May 2015, there were 1,900 authorized permits to operate a taxi, and organized in 28 taxi companies. Taxi drivers do not operate as independent entities with a personal license, but they have to adhere to a “colour scheme”. Moreover, license holders can operate directly as drivers or may lease their permits to a taxi company, who may lease them to other drivers. Currently, the top four “colour schemes” cover more than 60% of the market. However, San Francisco represents for Uber not only the city where the service was born, but it is, with its 16,000 drivers, the second largest city in United States for the number of active drivers, after Los Angeles (21,000 drivers). Moreover, if we compare the numbers of Uber active drivers in the city with those of “taxi -cab driver” there is a ratio of 2.29 in favor of the former. This suggests how Uber has a greater capillarity than the traditional taxi service.

Availability of substitutive products or services

The taxi service in San Francisco is basically standardized and the taxi offering is not diversified such as that of Uber. In addition to the taxi service, San Francisco inhabitants can use two public transportation systems as substitutive services, i.e. BART (Bay Area Rapid Transfer) and MUNI (Municipal Railway). BART enables connections between the city center and key locations of the Bay Area through five metro lines. On the other hand, MUNI is the public transportation system that allows travelling within the city center through ten tram lines (three lines covered by the historic cable car), seventeen trolleybus lines and fifty-four bus lines.

4.2.2. New Delhi

Regulatory framework

On December 2014, the New Delhi police filed a complaint against Uber for fraud and violation of government regulations, accusing the company of not carrying out checks on criminal records of its potential drivers. This temporarily banned Uber services. Nevertheless, Uber tried to improve service’s safety by strengthening the drivers’ selection system. In particular, Uber added an additional layer of screening represented by:

1. An independent background checks on all driver partners plus vehicle documentation reviews;
2. The deactivation of drivers’ account with low users rating;
3. An emergency button as part of its app, which allows users to contact the police.

Moreover, according to the “Terms and conditions for taxi-radio scheme in 2006” of the Transport Department Government of Delhi, other critical aspects of Uber not complying with this scheme refer to:

- a. Absence of a valid license to provide the taxi service;
- b. Absence of checks on the status and on seniority of cars;
- c. Absence of a regular taximeter;

- d. Other issues related to UberX drivers, such as the fact that they do not make driving tests or do not wear the regulatory uniform;
- e. Absence of control on criminal background of drivers.

Although the presence of such aspects, mostly related to single drivers, Uber is currently able to operate because it is assimilated to taxi aggregators, which are companies that do not own vehicles such as Uber, but aggregate taxis inside a brand. This particular category of actors is compliant with the New Delhi transportation regulation.

Market concentration

Currently, there are 53,739 regulated taxis for a population of more than 16 million and the market is growing fast at 20-25% rate per year. The taxi industry is mainly characterized by two typologies of segments with different actors that provide the taxi service:

1. “Regulated market”, which includes three types of players:

“Aggregators”, operators as Uber that aggregate taxis inside their brand, without any direct control on the vehicles. This kind of operator covers about the 0.5% of the market share;

“Affiliators”, operators that aggregate taxis inside their brand and allow the presence of sheds for the maintenance and control of vehicles. This kind of operator covers about the 5% of market share;

“Radio Cabs”, real taxi companies that physically possess the vehicles with which the service is provided. This kind of operator covers about the 4,5% of market share;

2. “Unorganized market”, which includes independent operators who provide the service in many areas of the city, without being aggregated under companies or brand and representing about the 90% of the market share.

The first three kinds of actors represent the regulated and organized market of taxis. In the regulated and organized market, these operators have a minimum fleet of five hundred vehicles, as required by the existing law. One of them (i.e. “Radio Cabs”) holds nearly the 70% of the regulated and organized market.

Availability of substitutive products or services

The taxi service in New Delhi is basically standardized and the taxi offering, if we consider the regulated market, is not diversified. However, in New Delhi inhabitants could also use only one alternative transportation service as a substitute, represented by the six metro lines of the city.

4.2.3. London

Regulatory framework

On July 2014, the local authority for transportation – the “Transport for London” (TfL) – proved the compliance of Uber with the existing Private Hire Vehicles (PHV) Act of 1998, even though the presence of several provisions that Uber is not compliance with:

- a. Any private hire vehicles driver must apply to the Secretary of State for a London PHV operator’s license;
- b. The vehicle must have a private-vehicle license to provide service
- c. Uber does not allow inspecting and testing any vehicle to which a London PHV license relates;
- d. Vehicles have not a disc or plate, to which a London PHV license relates, which identifies that vehicle for which the license is in force;
- e. UberX app can be considered such as a taximeter, and no vehicle to which a London PHV license relates shall be equipped with a taximeter.

Market concentration

Currently the licensed vehicles that provide the taxi service in London are organized in 14 taxi companies. Out of these, five taxi companies cover the most part of the market.

Availability of substitutive products or services

The taxi service in London is basically standardized and the taxi offering, if we consider the regulated market, is not diversified such as that of Uber. However, taxis are not the only transportation systems, indeed there are many substitutive services:

- a) Eleven underground lines;
- b. The Docklands Light Railway (DLR), an automated light rail system serving the Dockland area of east London;
- c. The Tramlink, which is a light rail/tram system in South London;
- d. Twenty-six lines of bus, served by the red double-decker London bus.

4.2.4. Milan

Regulatory framework

On May 2015, Uber was completely blocked by the local court, because with its UberX/UberPop service, the company was performing unfair competition and infringing laws that regulate the taxi service, with particular reference to the role of Uber drivers, which were not qualified to offer the service and without any authorization to operate within the area.

In particular, the service did not conform to the provisions of the Law 21 of January 15, 1992 and subsequent modifications and integrations. This law regulates the taxi and car hire with driver services in Italy and represents the main entry barrier into the Italian taxi industry. According to this law, UberX can be associated to the car hire with driver service, indeed drivers can refuse to provide the service for customers or negotiate directly with them the travel fare. Instead, taxis have to provide the race each time they are called and with tariffs in line with those set by the authority. However, although UberX is considered for its functionalities comparable to the car hire with driver service, it surely violates some aspects underlined in the law:

1. UberX drivers are not registered to the Italian Chamber of Commerce for covering the role of drivers, therefore in accordance with the above-mentioned Law, they cannot provide the service;
2. Uber does not have permission to operate within the Italian municipalities where it has decided to activate the service and does not possess any shed where to repair and maintain the vehicles;
3. Cars used for UberX service do not respect the same regulation of car hire with driver services because they do not exhibit the related identification plates required;
4. UberX drivers do not make back to the shed at the end of the race, but wait for the next call stationing on public land. The existing law allows this option only for drivers who take a regular taxi service and not for those taking a kind of car hire with driver service.

Therefore, differently from what happens in London, the diffusion of the service as a whole has been hampered by the local regulation.

Market concentration

Actually, in Milan there are 4,855 licenses for the taxi service, with a density of 3.7 taxis per 1,000 inhabitants, while in the airport area (which include the routes to Malpensa and Linate airports) the licenses are 5,323 with 2.4 taxis per 1,000 inhabitants. Thus, Milan is the first Italian city in terms of taxi density and the second, after Rome, for the number of licenses issued. However, it is far from cities as Paris that have in their metropolitan area 15,500 licenses, with a density of 6.9 taxis per 1,000 inhabitants. In addition, taxis are not organized in taxi companies, but operate independently.

Availability of substitutive products or services

The taxi service in Milan is basically standardized and the taxi offering is not diversified such as that of Uber. However, considering the transportation industry as a whole, consumers can use many substitutive services. Indeed, Milan is served by four metro lines, by 1,503 buses and by 19 tramlines. These services are provided and managed by the ATM (Azienda Trasporti Milanese S.p.A.) company, which also offers bike- and car-sharing services. In addition, there are also two main railway stations, which connect the city to the rest of the Lombardy through 14 suburban lines.

5. Discussion and Results

In this section, we present and discuss the results of our exploratory analysis on the level of diffusion of Uber in the four sampled cities. The aim of this analysis is to provide evidence of the influence of the three external contextual factors on the diffusion and disruptive impact of Uber in the taxi industry.

Market concentration in the analyzed four cities is rather different. In San Francisco, market concentration is high because taxi drivers must be aggregated within dedicated companies to regularly operate on the market. In London, considering the aggregation of taxis in a number of dedicated companies and the relative market share, the market ends up being highly concentrated. On the other hand, in Milan the largest part of taxi drivers operates independently, and the resulting market concentration is low. The same can be said for New Delhi, where the largest part of taxi drivers operate as single entities.

The regulatory framework in the analyzed metropolitan areas is also quite heterogeneous. In San Francisco, the regulatory framework enables the diffusion of Uber in the taxi industry. Although it seems that Uber operates illegally in the city, local authorities have been willing to change local laws to encourage a greater competition in the market, thus showing an open regulatory system regarding Uber diffusion in the market. The same can be said for New Delhi, in which a new regulation in favor of taxis aggregators is under development. Indeed, in these two cities there are several taxi operators, which act as taxi aggregators such as Uber. Similarly, in London the Uber service is completely considered legal. On the other hand, in Milan the existing laws banned the service, thus strongly hindering its whole diffusion in the city.

Focusing on the taxi industry, and in particular on the regulated-side of this market, the availability of substitutive products or services is generally low in all the four analyzed cities, given also the high standardization of such service. Considering the broader transportation service industry as a whole, it emerges that in Milan, San Francisco and London the availability of substitutive products or services is high, mainly because of the presence of several public transportation options. Instead, in New Delhi the availability of substitutive products or services is much lower, due to the presence of just one competitor, represented by a not well diffused system of metro lines.

Based on this evidence, and considering that in San Francisco, New Delhi and London, Uber has spread very fast and has had a strong impact on the taxi industry (whereas in Milan the diffusion of Uber is very limited), we can argue that the regulatory framework has the most relevant impact on the diffusion of Uber and on its disruptive impact. Indeed, only where the regulatory framework is very closed and severe, such as it happens in Milan, Uber does not have a real disruptive impact in the market and has not represented a serious threat to the established players of this industry.

The role of the other two contextual factors does not seem to be as important as it happens with the regulatory framework. For example, New Delhi shows a very different situation in terms of both market concentration and availability of substitutive products or services compared with San Francisco and London. However, the diffusion of Uber in the three cities can be compared and it has had a strong disruptive impact on incumbent players.

From the empirical evidence above, two critical aspects emerge on the influence that the contextual factors have on the disruptive impact of Uber in the four analyzed cities, with particular reference to the regulatory framework. First, local authorities can erect entry barriers in an established industry, through a new interpretation of the existing regulatory framework in the light of the emergence of an innovation. Therefore, players launching an innovation with a disruptive potential might find particularly complex to understand in advance how policy makers will interpret the existing regulatory framework once they have slipped into the market. In addition, empirical analysis shows that in some cases, as happened in San Francisco, the emergence of an innovation with disruptive potential can even enable an amendment of the existing regulatory framework, definitely more difficult to predict by the newcomer.

This is particularly interesting if compared with the traditional models of economics of innovation and industrial economics, such as the models of Porter (1979) on the contextual factors characterizing the external environment. In particular, the porterian models look into the structure and organization of the competitive arena in a static perspective, i.e. without considering the dynamism of the contextual factors in the light of the emergence of an innovation. Put it differently, the emergence of an innovation with disruptive potential requires the newcomer to look into the competitive arena and on its contextual factors in a dynamic perspective, trying to predict structural and organizational amendments in that arena. The Uber case shows that the regulatory framework in our sample of cities did not initially represent an entry barrier for the company, however the policy makers acted in favor or against the newcomer as soon as it slipped into the market, through a different interpretation of the existing regulatory framework or, in one case, its amendment.

6. Conclusions

The role of contextual factors in determining the impact that a disruptive innovation has in the market is an under-researched topic in the innovation management research. Starting from this premise, this paper represents a first exploratory attempt to understand whether and how a set of contextual factors influences the disruptive impact that an innovation has on the market. In particular, the paper analyzes the effects of three main contextual factors, i.e. market concentration, the characteristics of the regulatory framework and the availability of substitutive products or service, on the extent to which Uber is having a disruptive impact in the local taxi industry.

In particular, the paper explores, using a historical analysis methodology, the case of Uber, a taxi-hailing company based in San Francisco, which launched its taxi-hailing service in June 2010 and is disrupting the taxi industry to a different extent in different countries and in different cities around the world. The paper highlights the influence of the level of market concentration, the characteristics of the regulatory framework and the availability of substitutive products or services on the diffusion of Uber in four different cities (i.e. San Francisco, New Delhi, London, and Milan) in which Uber has experienced different levels of diffusion and disruptive impact.

The results of this article offer interesting insights for disruptive innovation research. In particular, the empirical analysis illuminates the strong impact that the local regulatory framework has on the disruptive nature of Uber. Indeed, from our historical analysis it emerges that the regulatory framework represents the most important contextual factor significantly influencing the extent to which Uber service diffuses on the market. This stems, on one hand, from the fact that, through the regulatory framework, local authorities determine the height of the entry barriers in the industry and establish how many taxi operators, and how, have to compete. On the other hand, a disruptive innovation (i.e. Uber) often causes relevant changes in existing industries (i.e. in the taxi industry) which require a different interpretation or an amendment of existing regulations. The strong interplay between the disruptive innovation and the characteristics of the regulatory framework, which our analysis highlights as a very important aspect, is something that existing literature has not adequately considered. Accordingly, we encourage future theoretical and empirical studies to conceive the disruptive innovation embedded in the regulatory context in which it develops and unfolds over time, because this is fundamental to understand how the phenomenon takes place and impacts established market positions. Put it differently, we suggest researchers should consider how disruptive innovations not only create changes for customers and companies that develop and launch them, but also in the broader regulatory framework that significantly influence the extent to which they diffuse and have a disruptive impact in the market. In other words, if we do not fully consider how policy makers react to the emergence of a disruptive innovation, i.e. assuming a dynamic perspective in analyzing contextual factors, we will not be able to develop a comprehensive understanding of the disruptive innovation phenomenon in its complexity. This represents an important contribution to our current understanding of disruptive innovation, which will hopefully inform research aimed at developing a theory of disruptive innovation capable to interpret and predict whether and why a new product, service, or business model will disrupt an established industry.

Besides these theoretical implications, the exploratory analysis presented in this paper has a number of important limitations that require future research efforts to be filled. First, we have focused on three contextual factors that economics of innovation and diffusion of innovation research suggests as highly important for understanding the outcome of the innovation diffusion process. However, there might be other factors (e.g., innovation adoption behavior, cultural variables, level of technology-intensity, importance of complementary assets and economies of scale in capturing value from innovation) that should be studied to develop a theory of disruptive innovation with a strong external validity. Similarly, we have limited our attention to four cities in which Uber has experienced varied degrees of diffusion in the last years. To enhance the external validity of our analysis it would be useful to consider other geographical areas, which could unearth different contextual factors as important in influencing the diffusion and disruptive impact of an innovation like Uber. Moreover, it should be remembered that our analysis has focused on one particular example of disruptive innovation, Uber, which is a service or business model innovation. Future research is needed to understand whether the weight of different contextual factors changes if we consider disruptive product innovation. It is likely that, for instance, due to the higher fixed costs that product innovations entail, the importance of market concentration on the diffusion of this type of innovation will be higher. Finally, considered the exploratory nature of our study, we have adopted a qualitative methodology, which does not allow for statistical generalizations. Our aim was to enable analytical generalizations about the role of a set of external contextual factors on the diffusion and disruptive impact of Uber. Future confirmatory analyses are needed to test our ideas and contribute to develop a more robust theory of disruptive innovation, which properly accounts for the role of contextual factors on the outcome of this particular type of innovation diffusion process.

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