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Institutional and economic factors affecting the development of the Chinese cloud computing industry and market

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ABSTRACT

Due to the Chinese government's mobilization of massive resources and entrepreneurial activities of foreign and local firms, the Chinese cloud computing industry and market are growing rapidly. A number of contradictory, conflicting, and paradoxical forces are shaping the Chinese cloud computing industry and market. This paper seeks to analyze these forces. It examines the importance of various economic linkages as well as formal and informal institutions in the development and utilization of the cloud in China and the emergence of country's cloud providers as global players.

1. Introduction

China's cloud computing (hereinafter: cloud) market is a result of a number of contradictory and conflicting forces. On the one hand, the Chinese government has viewed the cloud as a strategic industry and mobilized massive resources to develop the country's cloud industry and market (Johnson, 2014).

The 12th Five-Year Plan (2011–2015) targeted to spend US$ 308 billion for the telecommunications infrastructures. There are tax, subsidies and other incentives for investments in the cloud industry (Hille, 2010). A key issue, in light of China's strict censorship policies, is whether the Chinese government is willing to loosen some of the cyber-control mechanisms in order to encourage the development of the cloud industry and market. On this front, some encouraging signs have emerged. For instance, in 2011, China announced an investment of US$154 million to develop a cloud center for high-tech and start-up firms in Chongqing. It was announced that the cloud computing Special Administrative Region (SAR) would be free from censorship (Russell, 2011).

On the downside, thanks to strong cyber-control measures, most foreign cloud service providers (CSPs) have located their servers in neighboring countries. Requiring foreign-originated traffic to pass through China's firewall often leads to long loading times for Chinese businesses and consumers. A study of the content delivery network provider, CDNetworks indicated that China's firewall leads to an increase in the load time by 450 ms or more for an object hosted on a server outside China. For a typical website hosted in Asian cities such as Hong Kong, Singapore, or Tokyo, the firewall adds 10–15 s. The average time to load an object from a Hong Kong data center is 50% longer than in China. Websites hosted in the U.S. take 20–40 s to load (Kim, 2013). Thus, accessing cloud services provided by foreign CSPs such as Google Docs and Dropbox, is difficult or impossible. An upshot of the slow Internet speed is also that it has discouraged the relocation of foreign talents

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in China (Denyer, 2015). Foreign businesses often complain that their workers waste substantial amount of time just clicking to access email (Clover, 2015). Moreover, if a CSP's contents are on a server that also hosts contents that are objectionable to the Chinese government, they might be blocked (Kshetri, 2014; MacKinnon, 2012).

In the Asia Cloud Computing Association's (2014) (ACCI) Cloud Readiness Index 2014, China ranked 11th out of the 15 economies analyzed. According to the ACCI, while factors such as increased telecommunications spending during the 12th Five Year Plan and the establishment of the Chongqing cloud computing special zone have been major positive steps, data sovereignty, stability and quality of power grid and green energy and freedom of information access have been issues of major concern for the cloud's development (Johnson, 2014).

In addition to the apparently paradoxical policy position of the Chinese government, the development of the Chinese cloud industry and market also needs to be looked in the context of contradictory economic dynamics. For instance, in 2013, China overtook Japan to become the world's second largest IT market (Thibodeau, 2013), which suggests a strong demand of cloud services in the country. Despite the potential attractiveness of China's cloud market, Chinese firms have exhibited a lower propensity to adopt the cloud compared to their counterparts in industrialized countries. For instance, according to the market research firm, International Data Corporation (IDC), only about 4% of companies in China were using the cloud in 2009 compared with 16% in Singapore (Arnold, 2010). Likewise, by 2013, only 5% of Chinese SMEs had used hosted servers (Yu, 2013). In the same vein, according to a July 2014 report of the McKinsey Global Institute (MGI), only about a fifth of Chinese firms were using the cloud, compared to three-fifths in the U.S. The report also noted that Chinese businesses in the average spend only 2% of revenues on IT, which is half as much as the global average (economist.com, 2014). Slow and unstable broadband network speeds and poor customer services have also hindered the diffusion of the cloud in China. For instance, whereas download speeds averaged 17.4 megabits per second (Mbps) in developed countries in 2013, it was only 4 Mbps in China (Carlson, 2013).

Firms in the Chinese ICT industry are expected to accomplish multiple goals on the political, economic and social fronts (Xia, 2012). A key goal of the Chinese Communist Party (CCP) is to maintain the party's power monopoly. The CCP is thus interested in using the cloud as a tool for maintaining its political dominance and preventing the opposition from challenging the dominance. It is also important to note that the base of the CCP's legitimacy has shifted from Marx-Leninism to economic growth and prosperity (Zhao, 2000). The economic and commercial success of Chinese firms, especially state-owned enterprises (SOEs), is likely to support the CCP's political ideology (Kshetri, 2007; Xia, 2012).

In order to understand the above dynamics, it is important to consider the relevant institutional and economic factors. Institutional theorists have emphasized the importance of formal and informal institutions in shaping the developmental patterns industries and markets (e.g., North, 1990; Scott, 1995). The idea here is that various policies, rules, laws (formal institutions), as well as cloud providers' and cloud users' norms of behavior, mental maps and codes of conduct (informal institutions) are tightly linked to the diffusion pattern of the cloud. Moreover, prior researchers have suggested that the developmental pattern of an industry is tightly linked to the forward linkages (demand), backward linkages (supply) and horizontal or inter-sectoral linkages (Markusen & Venables, 1999). This means that cloud industries and markets are embedded in the broader economy and thus their development should not be viewed as a self-contained phenomenon with self-contained solutions.

In light of the above observations, the goal of this paper is modest and simply aimed at deepening our understanding of the contradictory, conflicting, and paradoxical forces that are shaping the Chinese cloud computing industry and market. To achieve this goal, the importance of economic linkages as well as formal and informal institutions in the development and utilization of the cloud in China and the emergence of country's cloud providers as global players are examined.

Before proceeding, some clarifying definitions are offered. Cloud computing involves hosting applications on servers and delivering software and services via the Internet. In the cloud computing model, companies can access computing power and resources on the “cloud” and pay for services based on usage. Cloud industry is defined as the set of sellers/providers of cloud related products and services. Cloud providers deliver value to users through offerings such as software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). SaaS is a software distribution model, in which applications are hosted by a vendor and made available to customers over a network. It is the most mature type of cloud computing. In addition to global cloud players, local companies such as the online merchant, Alibaba offer SaaS-based solutions. In PaaS, applications are developed and executed through platforms provided by vendors. Some PaaS vendors include global CSPs such as Salesforce.com (Force.com) and Microsoft (Windows Azure platform) as well as local companies such as the search engine provider, Baidu. For instance, as is the case of the Apple Store, Baidu Yi platform allows third-party developers to create and sell apps. IaaS consists of, inter-alia, server, operating system, disk storage and database. Global CSPs such as IBM, Vmware and HP and local companies such as Huawei offer IaaS.

The paper is structured as follows. It proceeds by first providing a review of cloud diffusion in China and related entrepreneurial activities. Next, the facilitators and inhibitors of the cloud industry in China are analyzed. It is followed by a section on discussion and implications. The final section provides concluding comments.

2. A review of cloud computing diffusion and associated entrepreneurial activities

Before proceeding further, a brief discussion of data and statistics used in this paper is provided, which are from secondary sources. Major constraints related to the use of any international secondary data include accuracy, age, reliability, lumping and comparability (Kotabe, 2002). Regarding accuracy, which is defined as a measured quantity's systematic