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Creative Destruction: Online Platform, Data and Digital Transformation

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With the rise of AI technologies, online platform companies, such as Booking and Google, have created successful business models to monetize data accumulated through their online platforms. As data companies, online platforms are physical-asset-light but have grown fast and deeply disrupted many industries. The disruption will be on a massive scale as the world is entering the era of the fifth generation of mobile network (5G) and the Internet of Things (IoT). The new digital infrastructure and technologies can stimulate the creation of new business models and generate explosive growth of real-time data including both consumer and non-consumer data. That is, in the digitally and physically inter-connected world, territorial and industry boundaries are becoming increasingly more blurred and the resulting disruptions are going to be significant.

However, despite the great advances in digital technologies, economists could not find their positive impacts on the productivity growth and have seen the productivity growth slowed down in major economies, the widely-known productivity puzzle. After exploring all possible reasons, Brynjolfsson et al. (2017) conclude that there is a significant lag, could be as long as 10-30 years, between the rapid advances in technologies due to the rise of new general purpose technologies and their impacts on an economy's productivity growth. The lag can be due to the fact that firms need to invest in a complementary organizational capital to assimilate new advanced technologies. Indeed, studies on the history of technologies have shown that productivity growth might be hindered by the limited reorientation and reinvention of business models by firms after their adoption of new technologies, as shown in the case of adopting electric motors in the U.S. manufacturing (Velu, 2019; David, 1990; Devine, 1983).

The significant productivity lag during the period of rapid technology advances increases the difficulties of making right policy recommendations in the era of 5G and big data. What gets measured gets managed. If we cannot obtain informative information from the current estimated economic productivity trend due to the lag, a way to understand the creative destruction process of new technologies will be important for policy making. In particular, as the entry of online

platform companies in various industries, what are their creative destruction to existing firms? How to measure the impacts and the process?

To understand the creative destruction process of online platforms, we develop a model to examine how the entry of an online platform company in an industry affects an existing firm's market value, investment behavior in intangibles, and performance. The empirical analysis covers the financial, the hospitality, and the transportation industries, three industries that lead the adoption of digitization than the rest of the economy. In addition, we study both Japan and the United States, two countries that have different regulations on online platforms and consumption behaviors. Our data sources cover Compustat, Nikkei Financial Quest, NYSE, NASDAQ, and the Tokyo Stock Exchange. The data cover the period of 2002 and 2018.

Our preliminary findings are as below. Online platforms have intensive data-driven organizational capital. Existing incumbents with a higher degree of digital transformation, which involves re-orienting or re-inventing their business models, will have a higher degree of organizational intensity and accumulate a higher stock of intangibles. That is, when there is an introduction of online platform shock in an industry, while we do not observe an immediate impact on firm-level output or employment, we empirically find that rather than total factor productivity, the effect of the introduction of online platform operates through the depreciation of organizational capital. Existing incumbents with a lower degree of digital transformation will have higher depreciation rates of organizational capital. As a result, we observe an immediate effect in a firm's investment rates of organizational capital and its market value. In particular, we empirically show that when there is a statistically significant causality effect on the stock price of a firm due to the entry of an online platform in an industry, we also find a consistent directional movement in the depreciation rate of organizational capital. As the trend of 5G and the IoT is rising rapidly and can disrupt many industries at a larger scale, this paper provides a new methodology to measure the creative destruction process caused by online platforms and advanced digital technologies. Moreover, our empirical measurement results can not only enhance our understanding of the impacts of online platform and new digital technologies but also provide important policy implications for innovation, investment, and growth.