Served Online, Effective Offline: Investigating the Impact of Consumers’ Adoption of Digital-Only Banks

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Abstract

Emerging digital-only banks without offline branches (i.e., digital banks), such as WeBank, are reshaping the banking industry. However, prior literature mainly investigates traditional banks’ digital channels (e.g., online or mobile banking), with limited research about the impact of consumers’ digital bank adoption. Moreover, despite their higher IT capability and information accessibility as well as lower transaction cost, digital banks are still under policy debate regarding their legality. Thus, this study examines the impact of consumers’ digital bank adoption on (1) their overall transaction behavior and (2) consequent competition between digital and traditional banks, as well as (3) the underlying mechanism behind the observed effects. Leveraging a unique dataset on consumers’ transactions with multiple banks and retailers, we use a difference-in-differences model to suggest that (1) consumers’ digital bank adoption significantly increases transaction frequency and transaction amount, (2) digital banks compete against traditional banks for offline consumption rather than online consumption, and (3) digital banks reduce product-related, time-related, and location-related transaction costs.

Keywords: Digital-only bank, traditional bank, online and offline consumption, difference-in-differences (DID), propensity score matching (PSM)

1. Introduction

A “digital-only bank” or “virtual bank” (hereafter, digital bank) is defined as a bank that primarily delivers retail banking services through electronic channels (e.g., Internet) instead of physical branches. The digital bank is different from an Internet, online, mobile, or digital banking service (hereafter, digital banking service), i.e., a digital channel of traditional banks that still put a strong emphasis on offline branch networks. As reported by IBM, the main difference between digital banks and traditional banks (with digital banking services) is that the former has no physical branches while the latter still handles a considerable amount of transactions and services at offline branches (Wagle & Biswas 2019). As a result, digital banks are excel at reducing operational costs and improving service efficiencies (Son et al. 2020). Furthermore, as they rely heavily on information technologies (IT), digital banks have better IT capability, capturing customers’ behavior more effectively and granularly.

As these features distinguish digital banks from traditional banks, digital banks are flourishing worldwide. The most successful examples are the two giants, WeBank and MYBank, in China. For example, ranking as the top 1 digital bank globally, WeBank deals with more than 574 million transactions on a business day in 2019, comparable to the largest bank worldwide (Marous 2020).
Moreover, MYbank, which mainly targets small and medium-sized enterprises (SMEs), usually approves loan applications within a couple of minutes compared to one month for traditional banks (Limswan (2019)). In addition, the U.S. market also notices the rapid growth of digital banks. Elm (2020) reports that the U.S. market expects doubled digital bank adopters by 2024.

Though a digital bank is an emerging trend in the banking industry, our understanding of its impact is underdeveloped. However, it is significant for regulators to know the impact of digital bank adoption, as they are cautious about adopting it (Kerse & Jenik 2020). Specifically, they are concerned about personal financial stability and the consequent competition between digital banks and traditional banks (Guy 2021), which is also a gap in the literature. While prior literature mainly focuses on the consumers’ financial behaviors after digital banking service adoption, such as financial product acquisition (Xue et al. 2011), we aim to have an overall understanding of the competition between digital banks and traditional banks across categories, including online, and offline categories. Specifically, we aim to provide empirical evidence for the ongoing debate about the following key questions: (1) How does consumers’ overall transaction behavior change after their digital bank adoption? (2) How is this change distributed between their newly adopted digital banks and existing traditional banks? In other words, how do traditional and digital banks compete against one another? and (3) What are the underlying drivers of such a change in consumers’ transaction behavior?

However, the answers are far from clear. On the one hand, digital banks’ greater information accessibility through their superior digital channels would provide them with a competitive advantage over traditional banks in consumers’ online transactions. For example, an online-only feature of digital banks would enable capturing consumers’ online behavior more accurately and granularly (Pather & Bedford 2019), therefore targeting online consumers more precisely. Thus, digital banks would facilitate consumers’ online transactions more effectively than offline transactions. On the other hand, digital banks’ reduced transaction cost would promote offline transactions more effectively than online ones because its role will be more prominent in the offline context where transaction cost is usually higher than the online context (Son et al. 2020; Xue et al. 2011). As a result, digital banks would have a competitive advantage over traditional banks in consumers’ offline transactions. Thus, it remains an empirical question for us to resolve.

To answer these questions, we draw on a unique dataset on more than 100,000 individuals’ every transaction with all their digital and traditional banks over 18 months. Leveraging a difference-in-differences (DID) identification strategy as well as propensity score matching (PSM) as a part of our robustness checks, we find that (1) consumers’ digital bank adoption significantly improves their overall transaction frequency and amount. Specifically, these increased transaction frequencies and amounts mainly come from offline categories, while the online category remains unchanged. (2) Our results about the competition between digital banks and traditional banks also reveal that traditional banks are competing with digital banks for consumers’ offline consumption, while digital banks show a competitive advantage over traditional banks. Specifically, digital bank adopters transfer their offline consumption transactions from traditional banks to digital banks. We further take transaction cost economics as a theoretical lens to detect the underlying mechanisms. Specifically, we focus on three different transaction costs, including product-related transaction costs, time-related transaction costs, and location-related transaction costs. Our results suggest that after the adoption of digital banks, consumers have transactions with a longer time
window, broader product choices, and wider geographical areas. These observed effects provide evidence that consumers experience reduced transaction costs after adopting digital banks.

Our study contributes both to the literature and the practice. Firstly, it contributes to the literature on emerging digital banks in particular and the literature on banking and fintech in general. We contribute to this stream by examining the impact of digital bank adoption on consumer behavior, as well as the consequent competition with traditional banks. Moreover, we also contribute to the literature about consumer financial behavior. We build upon prior literature to extend the overall consumer transaction behavior across categories. For practical implications, our results shed light on digital banks’ role in promoting offline behaviors and their consequent competition against traditional banks for consumers’ offline consumption, adding evidence to the recent policy debate. Our results provide mixed evidence about the pros and cons of digital bank adoption; that is, on the one hand, digital bank adoption facilitates the competition between digital banks and traditional banks regarding offline transactions, which is good for traditional banks to innovate. On the other hand, consumers tend to transact more frequently and spend more after adopting digital banks, suggesting that personal financial stability is a concern. By and large, our results provide empirical evidence for policy debate about digital banks.

2. Research Setting

2.1 Digital Banks in Korea

We focus on the only two licensed digital banks during our observational period, which are KAKAO Bank and K Bank. Both digital banks provide full-range retail banking services, with no offline branches and no face-to-face contact with customers. Specifically, KAKAO Bank was available to the public in July 2017, attracting over 240,000 customers on the first day. Another is the K Bank, which is launched in April 2017. It acquires 3.91 million users till March 2021, with 8.72 trillion KRW (7.73 billion USD) customer deposits.

2.2 Data

MobileResearch (pseudonym) in Korea provides us with unique data on over 100,000 individuals’ financial transactions from January 2018 to June 2019. MobileResearch collects the data from a popular mobile portfolio management app in Korea. The primary function of this app is automatically reading, detecting, and recording SMSs information and mobile alerts (e.g., push messages) from various financial institutions, such as banks and debit/credit card providers. Thus, we have information on (1) detailed transaction information that includes time, amount, categories (i.e., online, offline), and financial institution (e.g., bank, card company) involved in each transaction; (2) consumers’ information (e.g., age, gender, monthly budget, location); (3) retailers’ information (e.g., name, categories, location).

3. Empirical Analysis

3.1 Sample Selection

To create a panel for analyses, we first remove corporate card transactions for the sample selection because our focal interest is individual financial behavior. Second, we only keep active domestic users with at least one transaction per week. Third, we further select those who are between 18 to 70 to ensure that they have financial management abilities. Finally, following Son et al. (2020), we define a consumer’s digital bank adoption as his/her first transaction with a digital bank in our data period. We follow their approach to define the first half-year (January 2018 to June 2018) as...
our pre-treatment period, the second half-year (July 2018 to December 2018) as our treatment period, and the last half-year (Jan 2019 to June 2019) as our post-treatment period. Thus, those who first use digital banks during the treatment period are assigned as the treatment group. Given the definition of the treatment period, our treatment group involves 1,174 digital bank adopters who firstly used a digital bank in the treatment period. To mimic a randomized experimental setup, we then randomly select 1174 non-adopters who have not adopted the digital bank during the whole observational period.

3.2 Model Specification
Taking the same approach with the prior literature (Son et al. 2020; Xue et al. 2011), we use a DID approach with two-way fixed effects to investigate the impact of consumers’ digital bank adoption:

\[ \text{Outcome}_{it} = \beta_1 \text{Treatment}_i + \beta_2 \text{Adoption}_{it} + \beta_3 \text{Treatment}_i \times \text{Adoption}_{it} + \delta_i + \gamma_t + \epsilon_{it}, \]

where \( i \) denotes each consumer, \( t \) indicates each week, \( \delta_i \) and \( \gamma_t \) are consumer and week-fixed effects, \( \text{Treatment}_i \) is a treatment dummy variable; that is, 1 for the digital banking adopters and 0 for the non-adopters, and \( \text{Adoption}_{it} \) is an adoption dummy variable, where 0 for the pre-treatment period and 1 for the post-treatment period. \( \text{Outcome}_{it} \) denotes a vector of dependent variables for consumer \( i \) in week \( t \) with log transformation, including (1) consumers’ overall transaction behavior, including consumers’ weekly consumption frequency and amount (measured in KRW) processed by traditional banks; (2) competition between digital and traditional banks across transaction categories (i.e., online and offline), and (3) consumers’ transaction patterns after their digital bank adoption. Specifically, we measure their weekly number of unique consumption categories, weekly number of unique consumption hour-of-day, weekly number of unique consumption day-of-week, weekly variance of consumption location (e.g., latitude, longitude). The coefficient that we are interested in is \( \beta_3 \) that captures the impact of digital banking adoption on the outcome variables.

4. Results
As shown in the first panel of Table 1, consumers’ digital bank adoption significantly enhances their transaction frequency and increases their transaction amount. The results further demonstrate that such a positive effect mainly comes from offline transactions, instead of those in online transactions. In other words, consumers’ digital bank adoption does not significantly impact their online consumption behavior, but it significantly affects offline consumption behavior. We further detect the distribution of these increased transactions between digital banks and traditional banks. The results shown in the second panel of Table 1 suggest that consumers’ digital bank adoption leads to a significant decrease in their overall consumption frequency and amount processed by traditional banks, which result solely from changes in offline transactions with traditional banks. This implies that consumers’ offline consumption transactions are both transferred from traditional banks to digital banks and additionally generated at digital banks. Thus, our observed effects show that digital banks compete with traditional banks regarding offline transactions.

To further detect the underlying mechanism, we focus on three types of transaction costs, namely product-related transaction costs, time-related transaction costs, and location-related transaction costs. As seen in Table 2, particularly regarding offline consumption transactions, we find that consumers transact with a longer time window for both hour of day and day of week. Moreover,
they have broader product choices after adopting digital banks with wider geographical areas. The results support that consumers’ digital bank adoption significantly decreases these transaction costs, especially for offline transactions.

Table 1. Impact of Digital Bank Adoption on Overall Transaction and Competition

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumption frequency</th>
<th>Consumption amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Online</td>
</tr>
<tr>
<td>Treatment*</td>
<td>0.046***</td>
<td>0.007</td>
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<tr>
<td>Adoption</td>
<td>(0.013)</td>
<td>(0.073)</td>
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<tr>
<td>Fixed Effects</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Consumers</td>
<td>2,348</td>
<td>2,348</td>
</tr>
<tr>
<td>Observations</td>
<td>122,096</td>
<td>122,096</td>
</tr>
<tr>
<td>R2</td>
<td>0.019</td>
<td>0.019</td>
</tr>
</tbody>
</table>

Note: Robust standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table 2. Impact of Digital Bank Adoption on Consumption Pattern

<table>
<thead>
<tr>
<th>Variables</th>
<th>Consumption categories</th>
<th>Unique hour of day</th>
<th>Unique day of week</th>
<th>Latitude variance a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Online</td>
<td>Offline</td>
<td>All</td>
</tr>
<tr>
<td>Treatment*</td>
<td>0.029***</td>
<td>0.007</td>
<td>0.030***</td>
<td>0.019**</td>
</tr>
<tr>
<td>Adoption</td>
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<td>(0.006)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Consumers</td>
<td>2,348</td>
<td>2,348</td>
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<tr>
<td>Observations</td>
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<td>121,732</td>
<td>122,096</td>
<td>122,096</td>
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<tr>
<td>R2</td>
<td>0.019</td>
<td>0.005</td>
<td>0.018</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Note: Robust standard errors are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

a) Due to the page limit, we do not include the results regarding longitude variance.

5. Robustness Checks

5.1 PSM
One major concern of our study is self-selection bias, which means that consumers’ digital bank adoption is endogenously determined by other factors. To mitigate the endogeneity concern, we follow the prior literature (Son et al. 2020) and adopt the PSM approach, creating a matched control group with the most similar observed characteristics with the treatment group. We find that the results are consistent even after adopting the PSM approach.

5.2 Relative Time Model
To formally test the parallel trend assumption in the pre-treatment period, i.e., a fundamental assumption for DID approach, we involve a set of time dummies interacting with the treatment indicator. Our results suggest that all the pre-treatment coefficients are insignificant, demonstrating no systematic time trend in the pretreatment period. In addition, we find that the adoption of a digital bank has an immediate impact on the overall transaction behaviors (i.e., transaction frequency and transaction amount), and these effects last at least 16 weeks.

6. Discussion
This study investigates the impact of consumers’ digital bank adoption on (1) their overall transaction behaviors and (2) competition between digital and traditional banks as well as (3) the
underlying mechanism behind the observed effects. We find that it significantly increases transaction frequency and transaction amount, especially for offline consumption. We also find that digital banks have competitive advantages over traditional banks in terms of offline transactions. Furthermore, we also demonstrate that the underlying mechanism of these observed effects is that digital banks reduce product-related transaction costs, time-related transaction costs, and location-related transaction costs, particularly regarding offline transactions.

Our study contributes to the literature and practice in several ways. First, we are among the first to investigate the impact of consumers’ digital bank adoption on their transaction behaviors and the competition between digital banks and traditional banks. Second, building on the extant literature (Xue et al. 2011), we further contribute to the consumer financial behavior literature by investigating novel consumer behaviors across different categories. We extend extant literature that mainly focuses on consumers’ financial behaviors to detect consumers’ consumption behaviors across online and offline channels. Furthermore, given that governments are cautious about issuing digital bank licenses, our study provides empirical understanding of digital banks’ impact on consumer behavior and competitive dynamics in the banking industry, shedding light on the potential pros and cons of digital banks.

References