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Association between Global Financial competitiveness and FinTech Consumer experience; FinTech Ecosystem; FinTech Firms

Dr. Thomas Wai Kee YUEN (presenter), Hong Kong Shue Yan University, wkyuen@hksyu.edu

Mr. Alpha Tin Hei YUEN, The University of Hong Kong

Abstract

This paper investigates the association between international financial competitiveness and three important FinTech aspects: FinTech Consumer experience, FinTech Ecosystem, and FinTech firms in Asia, Western and American cities. FinTech Consumer experiences represent the demand side, FinTech firms represent the supply side, and FinTech Ecosystem represents the government policy. Improvement in the three FinTech aspects is expected to enhance FinTech development and improve international financial competitiveness. Indicators for the three FinTech aspects are extracted from the Global FinTech Hub report 2020; the proxy for the financial competitiveness comes from the Global Financial Centres Index 28 on Sep 2020. Data from 34 cities across 20 countries globally are analyzed using maximum likelihood estimation with Newton-Raphson/Marquardt steps with the assumption of Poisson distribution as the data generation process. It is usually believed that there is a high positive association between international financial competitiveness and the three FinTech aspects. However, the empirical result in this paper shows that only the FinTech ecosystem is essential in enhancing global financial competitiveness. The effects of FinTech Consumer experience and FinTech industry in enhancing global financial competitiveness are insignificant in Western and America and are negatively significant in Asia.

Keywords FinTech; Financial competitiveness; FinTech Consumer experience; FinTech Ecosystem, FinTech startups

JEL classifications G10, G21, G29

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Introduction

The global Fintech market has been mounting rapidly and reshaped the global financial competitiveness in the last decades. The term – "Fintech" is defined by the Financial Stability Board as "technologically enabled innovation in financial services that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions and the provision of financial services" (Financial Stability Board, 2017). Arner et al. (2016) described the recent evolution in the financial technology industry as FinTech 3.0. After the 2008 financial crisis, the public lost their trust in traditional financial institutions. The government has imposed strict regulations on bank compliance. Knewton & Rosenbaum (2020) identified three relationships, "Complement, Displace and Market Creation", between FinTech firms and traditional financial services. However, conventional financial institutions kept losing their market customers to Fintech firms in the last decade. Innovative technology firms outside the formal financial sectors tend to lead the development of FinTech. Creative digital services such as digital payment, credit granting, cryptocurrency and robot advisers can enhance the consumer experience. It seems that displace and market creation from FinTech firms dominate the development of FinTech. Countries have put huge efforts in improving the FinTech ecosystem to catch up with the FinTech trend. The three elements, FinTech firms, FinTech ecosystem and FinTech consumer experience, will reshape the global financial competitiveness.

This paper investigates the association between financial competitiveness and the three crucial FinTech aspects: FinTech Consumer experience, FinTech Ecosystem, and FinTech firms in Asia, Western and American cities. It is usually believed that there is a high correlation between international financial competitiveness and the three FinTech aspects. Improvement in the three FinTech aspects is expected to enhance global financial completeness. The rest of the paper is organized as follows: Section two identifies the three active stakeholders in the FinTech sector. Section three describes the data and methodology. Section four is the empirical result and discussion. The last section layout the conclusion.

Active stakeholders in the FinTech sector

There are three active stakeholders in the FinTech sector: FinTech customers, FinTech firms and FinTech regulators. FinTech customers belong to the demand side, FinTech firms are on the supply side, and the government manipulates the FinTech ecosystem.

FinTech consumers now demand a frictionless FinTech consumer experience with instant, low-cost, interactive digital financial service. FinTech consumers have commonly recognized the limitation of the traditional banking system and established a distrust of the conventional financial structures, particularly the banking system, owing to the 2008 financial crisis. (Arner et al., 2015; Saksonova & Kuzmina-Merlino, 2017). The general public is usually more willing to trust technology firms like Tencent and Alibaba than banks perceived as untrustworthy and risky. With the popularity of the mobile device, the digital generation has extended beyond the young generation to different age groups. The extension of the digital era and the untrust of

traditional financial institutions provide FinTech firms with an excellent opportunity to penetrate the conventional financial market. FinTech firms that can offer innovative digital financial services to fit the demand of the digital generation can attract a huge amount of FinTech customers and expand in a short period. Enhancing the FinTech consumer experience has been an essential element in the demand side of FinTech development.

Tanda-Schena (2019) suggested that FinTech industrial involves three types of firms: TechFin, disruptive FinTech startups and traditional financial institutions. TechFin is an active technology firm entering the financial market. Technology giants like Alibaba have layout the pathway of TechFin. Alibaba established Fintech companies like Ant Financial to create mobile wallets for clients to keep and transfer their money. The main advantage for TechFins is that those big technology firms usually hold a competitive advantage over traditional financial institutions from the customer base and technological and data analytical perspective (Acar & Çıtak, 2019). For instance, Alibaba's Ant Financial grants credit to businesses by using historical and real-time sales data and customer ratings on the Taobao platform (Stulz, 2019; Hau et al., 2018). TechFins have fastened the credit granting procedure by automating the process with the help of machine learning technologies (Stulz, 2019). In addition, for the provision of payment services, big technology firms such as Apple and Alibaba have also held a technological edge over banks, so they can enjoy a technical-economic of scale by providing similar payment services at a relatively cheaper cost and better FinTech consumer experiences (Bofondi & Gobbi, 2017).

FinTech startups are disruptive innovators that enter the financial market and challenge incumbents (Breidbach et al., 2020). While strict regulations have been implemented on banks worldwide owing to the severity of the 2008 financial crisis, the fintech startups which do not belong to the traditional financial sector benefit from the regulatory relaxation and encounter lower capital requirements compared to conventional banks (Iman, 2019; Lee & Shin, 2018; Stulz, 2019; Krasnyuk et al., 2021). These FinTech startups tend to focus on frictionless FinTech consumer experience and new horizons of financial inclusion service (Saleem et al., 2021). In fact, before the emergence of TechFins, Fintech startups with small size and limited equity were the powerhouse for FinTech development (Saksonova & Kuzmina-Merlino, 2017). The disruptive nature of FinTech startups tends to focus on attracting the digital generation by offering FinTech services at low cost and in an interactive mode using technology (Berg et al., 2020). Both TechFin and FinTech startups are a vital driving force from the supply side in the development of FinTech.

In the early stage of FinTech development, traditional financial institutions did not consider fintech startups a significant threat due to the bank's enormous client base and financial power (Desai, 2015). Additionally, the tight regulation on traditional financial institutions has limited innovation, and the development of Fintech as financial institutions are forced to stay precautionary to avoid violating the regulations (Sironi, 2016; Dietz et al., 2016). The enormous legacy costs of banks have also delayed their adoption of innovative technologies, setting a barrier to the development of Fintech (Bofondi & Gobbi, 2017). In recent years, because of the coronavirus pandemic, the growing fintech trend worldwide and the challenge from TechFin and FinTech startups, catching up with the fintech trend has become a common phenomenon among traditional financial institutions like banks. To survive against the rising threat from TechFins and combine the advantages of banks and Fintech companies, the partnership between Fintech startups and the traditional financial institution has

become the new trend of fintech development (Acar & Çıtak, 2019). Consequently, according to the Global FinTech Report 2017, 82% of financial institutions anticipate a rise in fintech partnerships in three to five years (Yazdani & Weber, 2017).

Countries are now actively attracting FinTech industry by improving the FinTech Ecosystem to cultivate the competitiveness of the financial sector. For example, Russia provides tax credits for innovative enterprises and regulatory sandboxes to attract FinTech startups (Baba et al., 2020; Dorfleitner et al., 2017). Egypt has accelerated the digital regulatory reform program for transformation into an innovative and inclusive digital society (Egypt digital economy country assessment, 2020). The Financial Sector Development Program under Saudi Arabia Vision 2030 motivate FinTech startups to stimulate innovation and competition (Mansour & Sara 2021).

Recently, the FinTech Ecosystem has been changing; financial regulators began to worry about the risk of financial stability associated with the rapid displacing and market creation effect of FinTech firms, especially those giant TechFin firms. Xu & Xu (2020) reported that in 2015, China's regulation authorities' attitude toward FinTech development shifted from tolerant regulatory policies to strict regulatory implementation, starting with the well-known "China FinTech Regulatory Storm". The lenient regulation on Fintech startups and TechFin has significantly raised the financial system's risk since these Fintech firms are performing the function of banks while sidestepping the strict regulation implemented on banks. One prominent example is the bankruptcy of China's P2P-lending company Ezubao, which is considered a significant scandal in Fintech's history (Saksonova & Kuzmina-Merlino, 2017). The development of Fintech has always been linked to several vital risks, for instance, the risk of money laundering due to difficult identification of beneficiaries in the transaction and the use of cryptocurrency or unregulated currency; the risk of Fintech applications illegally using consumer data; the risk of data security and leaking of financial information due to insufficient security measure in cloud service (Kang, 2018; Brown, 2016; Mishra et al., 2020).

To enhance the competitiveness of the financial sector, the FinTech Ecosystem needs to balance the development of FinTech and the risk of financial stability associated. The current trend is to promote Fintech within the financial ecosystem by partnerships between banks and fintech companies. The risk of fintech development to the financial system could be minimized under the well-structured financial regulation. Ahn & Cho (2019) point out that the significant issues relating to FinTech development in Korea are separating the financial institution and the FinTech industry. One possible solution is integrating FinTech development into the traditional, highly regulated financial institutions. Kashyap et al. (2017) reported that around 70% of conventional financial institutions in Germany have various cooperation, including mergers and acquisitions, with FinTech startups. Loboda & Demianyk (2020) reported that the trend of partnerships between banks and fintech companies is significantly transforming the business models of global financial institutions.

Global financial competitiveness is reshaping following the development of the three FinTech aspects: FinTech Consumer experience, FinTech Ecosystem and FinTech Firms. It is usually believed that enhancing the three FinTech aspects can improve global financial competitiveness.

Data and Methodology

This paper investigates the association between global financial competitiveness and three important FinTech aspects: FinTech Consumer experience, FinTech Ecosystem, and FinTech firms. Data from financial competitiveness comes from the ranking of financial centres in the global financial centre index 28 (GFCI 28) 2020. The GFCI 28 researched 121 financial centres using five broad areas (Business Environment, Human Capital, Infrastructure, Financial Sector Development, and Reputation) as instrumental factors for competitiveness (Hugh et al. 2020). Data from FinTech aspects (FinTech firms, FinTech Consumer Experience and FinTech Ecosystem) comes from the ranking of the global FinTech hub Index (GFHI) 2020 (*The Global FinTech Hub Report 2020*), which research 40 cities globally.

Table 1: Global Financial Centres Index (GFCI) and Global FinTech Hub Index (GFHI)

City	Country	GFHI Ranking	FinTech Industry Ranking	FinTech Consumer Experience Ranking	FinTech Ecosystem Ranking	GFCI Ranking
Beijing	China	1	1	5	3	7
San Francisco	US	2	2	16	4	8
New York	US	3	3	32	2	1
Shanghai	China	4	4	4	7	3
London	UK	5	5	18	1	2
Shenzhen	China	6	7	2	6	9
Hangzhou	China	6	6	1	14	109
Chicago	US	8	8	41	11	20
Singapore	Singapore	9	12	20	8	6
Sydney	Australia	10	13	23	12	32
Tokyo	Japan	11	14	53	5	4
Paris	France	13	11	51	13	18
Guangzhou	China	14	29	3	19	21
Hong Kong	China	15	10	36	20	5
Melbourne	Australia	16	19	28	15	27
Stockholm	Sweden	18	20	27	18	23
Nanjing	China	19	28	6	22	89
Mumbai	India	20	22	12	27	35
Zurich	Switzerland	21	17	19	28	10
Boston	US	22	27	38	10	15
Seoul	Korea	23	25	30	16	25
Toronto	Canada	24	23	37	17	31
Amsterdam	Netherlands	25	18	22	36	22
Dublin	Ireland	27	31	21	21	34
Chengdu	China	29	32	8	30	43
Sao Paulo	Brazil	30	24	25	37	80
Los Angeles	US	31	26	40	24	11
Tel Aviv	Israel	33	30	44	26	45
Cape Town	South Africa	34	40	9	38	67
Mexico City	Mexico	35	37	17	41	70
Moscow	Russia	36	42	11	42	62
New Delhi	India	37	39	14	35	49
Jakarta	Indonesia	39	34	45	39	81

Geneva	Switzerland	40	45	31	23	14
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The FinTech industry is a proxy for the aspect FinTech firm, which includes numbers of digitization of product/service from the city's financial service provider, listed and unlisted FinTech companies. The FinTech consumer experience reflects the FinTech adoption rate, which measures the percentage of FinTech consumers in the population. The FinTech ecosystem includes five FinTech aspects: economic foundation, FinTech sector foundation, digital infrastructure, research capacity, and FinTech policy environment. After mapping the two sets of data, the data used in this paper covers 34 cities and 20 countries.

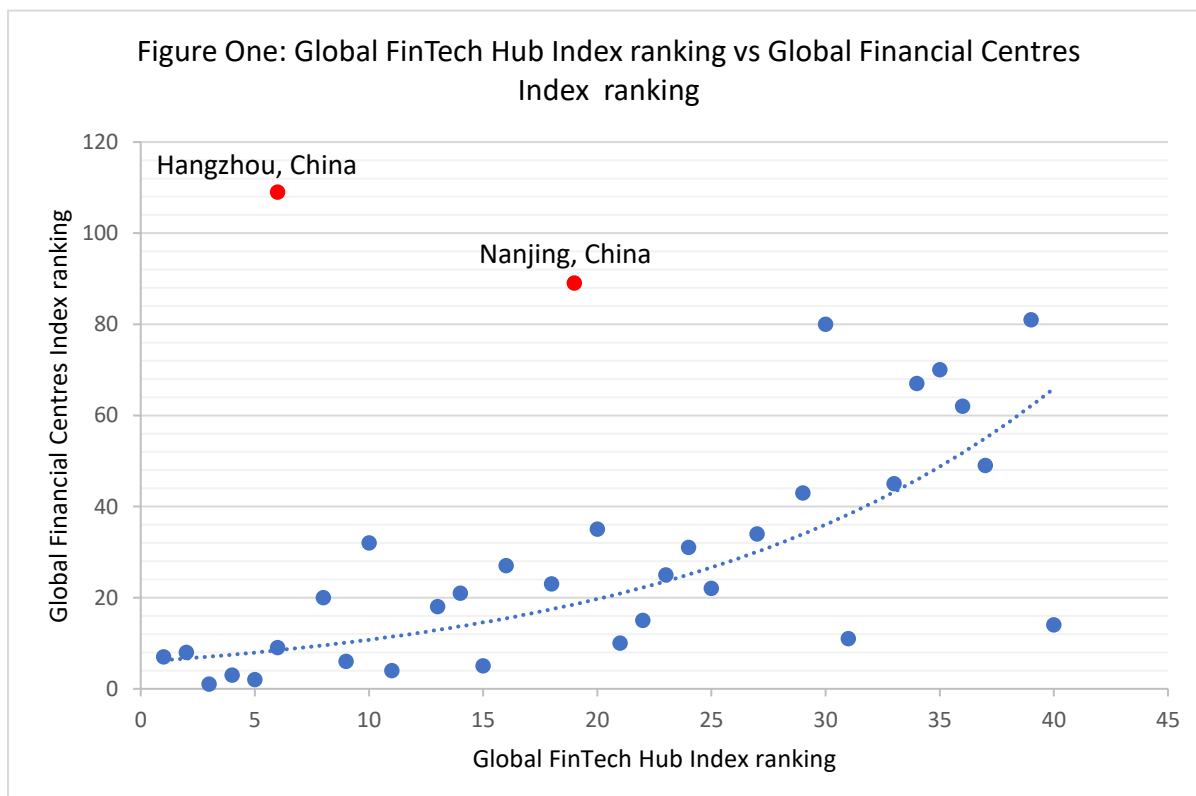
The relative importance of each FinTech aspect in the Global FinTech Hub Index (GFHI) can be found in least-square result in Table 2. The FinTech industry takes the highest weight, over 57% in the GFHI. Consumer experience takes the lowest weight, around 15%.

Table 2: Global FinTech Hub Index (GFHI)

Variable	Coefficient	Std. Error	Prob.
C	-3.650	1.1285	0.0030
FinTech Consumer Experience	0.1545**	0.0302	0.0000
FinTech Ecosystem	0.3889**	0.0595	0.0000
FinTech Industry	0.5789**	0.0578	0.0000
R-squared	0.9587	Adjusted R-squared	0.9546

**Significant at 5%

Figure one shows that a high global financial centres index is usually associated with a high global FinTech hub index. The trend line displays a certain degree of non-linearity in the



relationship, and the R-squared is 0.219. The positive correlation implies that FinTech development can enhance the financial competitiveness of a city.

The figure shows at least two outliers, Hangzhou and Nanjing in China. These two cities got a high ranking in the global FinTech hub index but a relatively low ranking in the global financial centre index. Take Hangzhou as an example, the global FinTech hub index ranked the city the 6th FinTech hub, but the global financial centre index only ranked the city 109th financial centre. Indeed, Hangzhou leads the world in terms of fintech consumption experience, with over 91% of the city's population using fintech services. The city has achieved a value-added fintech industry of over \$17.4 billion and launched the FinTech sandbox trial by 2022. However, Hangzhou is far from a world-class financial centre in terms of financial infrastructure and scales of international financial service.

This paper investigates the association between financial competitiveness and three important FinTech aspects: FinTech Consumer experience, FinTech Ecosystem, and FinTech industry. Equation 1a estimates the linear model, while equation 1b uses the FinTech Ecosystem square to capture the variables' non-linear relationship.

$$GFCI_i = \beta_0 + \beta_1 \text{Consumer experience}_i + \beta_2 \text{Industry}_i + \beta_3 \text{Ecosystem}_i + \varepsilon \quad \dots (1a)$$

$$GFCI_i = \beta_0 + \beta_1 \text{Consumer experience}_i + \beta_2 \text{Industry}_i + \beta_3 (\text{Ecosystem}_i)^2 + \varepsilon \quad \dots (1b)$$

where i represents the cities, ε is the error term.

The FinTech ranking data are non-negative integers that fit the Poisson distribution with intrinsically integer characteristics. This paper uses the Maximum likelihood estimation with Newton-Raphson/Marquardt steps to estimate the equations under the assumption that the data generation process follows the Poisson distribution.

A positive and significant coefficient between financial competitiveness and the FinTech aspects indicated a high level of partnership between FinTech firms and the traditional financial sector in enhancing financial competitiveness. An insignificant negative coefficient pointed out that potential benefits from the development of the FinTech aspects have not been realized for strengthening financial competitiveness. These aspects will be the direction of future development in FinTech areas.

Empirical results and discussion

Table 3: Empirical result (Global data with 34 cities)
Dependent Variable: Global Financial Centres Index (GFCI)

Variable	Equation 1a		
	Coefficient	Std. Error	Prob.
Constant	2.7378**	0.0932	0.0000
FinTech Consumer Experience	-0.0132**	0.0023	0.0000
FinTech Industry	-0.0002	0.0039	0.9544
FinTech Ecosystem	0.0437**	0.0039	0.0000
R-squared	0.3932	Adjusted R-squared	0.3325

Equation 1b			
Variable	Coefficient	Std. Error	Prob.
Constant	3.047**	0.0866	0.0000
FinTech Consumer Experience	-0.0127**	0.0023	0.0000
FinTech Industry	0.0102**	0.0036	0.0050
Square of FinTech Ecosystem	0.0006**	7.59E-05	0.0000
R-squared	0.3591	Adjusted R-squared	0.2951

**Significant at 5%

Table 3 shows the empirical results using the entire data set with 34 cities. In equation 1a, coefficients for consumer experience and ecosystem are significant at a 5% level, and the adjusted R-squared is 0.3325. The coefficient for FinTech industry is insignificant. The global financial centre index is positively associated with FinTech Ecosystem. However, the FinTech industry and FinTech consumer experience are negatively related to the global financial centre index. In equation 1b, all coefficients are significant at a 5% level, and the adjusted R-squared is 0.295. The global financial centre index is positively associated with the FinTech industry and FinTech Ecosystem. FinTech consumer experiences are negatively associated with the global financial centre index. It seems that equation 1b performs better than 1a in capturing the dynamic relationship of the variables.

The positive association between the global financial centre index and FinTech Ecosystem implies that the afford of the monetary authority to build up the FinTech environment can promote the financial competitiveness of a city. The positive association between the global financial centre index and FinTech industry aspects implies that more FinTech firms and digitalized products/services, not limited to just a few large TechFin, can enhance the financial competitiveness of a city. The negative association between the global financial centre index and FinTech consumer experience implies that enhancing FinTech consumer experience cannot improve the international competitiveness of a city. Most of the innovative FinTech products/services target local customers. The enhancement of the domestic FinTech adoption rate causes financial institutions to put more effort into developing the local FinTech market. The result is a negative impact on global financial competitiveness.

Table 4: Empirical result (Asian cities with 14 cities)
Dependent Variable: Global Financial Centres Index (GFCI)

Equation 1a			
Variable	Coefficient	Std. Error	Prob.
Constant	2.6955**	0.1120	0.0000
FinTech Consumer Experience	-0.0276**	0.0038	0.0000
FinTech Industry	-0.0390**	0.0083	0.0000
FinTech Ecosystem	0.0995**	0.0105	0.0000
R-squared	0.3395	Adjusted R-squared	0.1413

Equation 1b			
Variable	Coefficient	Std. Error	Prob.
Constant	3.3782**	0.106273	0.0000
FinTech Consumer Experience	-0.0276**	0.004030	0.0000
FinTech Industry	-0.0135*	0.007448	0.0687
Square of FinTech Ecosystem	0.0015**	0.000211	0.0000

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R-squared	0.2635	Adjusted R-squared	0.0426
Cities include Beijing, Tokyo, Chengdu, Singapore, Guangzhou, Hangzhou, Hong Kong, Seoul, Mumbai, Nanjing, New Delhi, Jakarta, Shanghai, Shenzhen.			
*Significant at 10%			
**Significant at 5%			

Table 4 shows the empirical results using the data from 14 Asia cities, including Beijing, Tokyo, Chengdu, Singapore, Guangzhou, Hangzhou, Hong Kong, Seoul, Mumbai, Nanjing, New Delhi, Jakarta, Shanghai, Shenzhen. All the variables are significant at traditional significant levels. The coefficients for consumer experience and industry are negative. The coefficients for the ecosystem and square of the ecosystem are positive. The adjusted R-squared for Equations 1a and 1b are 0.1413 and 0.0426. The positive coefficient between the global financial centre index and FinTech Ecosystem implies improving the FinTech environment in Asia cities can enhance the global financial competitiveness. The negative coefficient between consumer experience and financial competitiveness suggests that increasing the FinTech consumer adoption rate reduces financial competitiveness. The FinTech development in Asia cities, such as digital payment and personal to personal lending, mainly focuses on the domestic market, thus shifting the financial market's development from international to domestic. This shift reduces the global competitiveness of the cities. The shift in the financial market development from international to domestic market also explains the negative coefficient for the FinTech industry. Although there is an increase in FinTech firms and products, the focus is on the domestic market.

Table 5: Empirical result (Western and American cities with 18 cities)
Dependent Variable: Global Financial Centres Index (GFCI)

Equation 1a			
Variable	Coefficient	Std. Error	Prob.
Constant	1.9673**	0.2571	0.0000
FinTech Consumer Experience	0.0038	0.0058	0.5055
FinTech Industry	0.0053	0.0050	0.2914
FinTech Ecosystem	0.0460**	0.0056	0.0000
R-squared	0.6199	Adjusted R-squared	0.5385
Equation 1b			
Variable	Coefficient	Std. Error	Prob.
Constant	2.1622**	0.2379	0.0000
FinTech Consumer Experience	0.0098	0.0061	0.1093
FinTech Industry	0.0088*	0.0049	0.0726
Square of FinTech Ecosystem	0.0009**	0.0001	0.0000
R-squared	0.6340	Adjusted R-squared	0.5556
Cities include New York, London, San Francisco, Zurich, Los Angeles, Geneva, Boston, Paris, Chicago, Amsterdam, Stockholm, Melbourne, Toronto, Sydney, Dublin, Moscow, Mexico City, Sao Paulo.			
*Significant at 10%			
**Significant at 5%			

Table 5 shows the empirical result using the data from 18 Western and American cities, including New York, London, San Francisco, Zurich, Los Angeles, Geneva, Boston, Paris,

Chicago, Amsterdam, Stockholm, Melbourne, Toronto, Sydney, Dublin, Moscow, Mexico City, Sao Paulo. In equation 1a, the coefficient for the FinTech ecosystem is significant, but the other two aspects are not significant. All coefficients are positive, and the adjusted R-squared is 0.5385. In equation 1b, the FinTech ecosystem and industry coefficient are significant at a conventional significance level. All coefficients are positive, and the adjusted R-squared is 0.5556. It seems that the dynamic model, equation 1b, performs better. FinTech consumer experience is insignificant in the case of Western and American cities, meaning that FinTech consumer experience does not affect the international financial competitiveness in those cities. The high adjusted R-squared and the significance of the variables FinTech Ecosystem and FinTech industry imply the significant effect of FinTech policies and the positive impact of the FinTech firms in enhancing international competitiveness.

Conclusion

FinTech Consumer experience, FinTech Ecosystem and FinTech industry are three essential aspects in the development of FinTech. It is usually believed that enhancing these three FinTech aspects is critical for improving international financial centre competitiveness. The empirical result from global data in table 3, equation 1b, shows that all three aspects are significant. The coefficients for the FinTech industry and FinTech ecosystem are positive, but the coefficient is negative for the case of FinTech consumer experience. Thus, it implies that enhancing the FinTech consumer experience reduces international competitiveness.

Consider the empirical results in Asian cities and Western and American Asia cities. The adjusted R-squared in Western and America is much larger than in Asia cities. The explanation power of the models is higher in Western and America than in Asia. However, FinTech consumer experience and FinTech industry are insignificant at 5% in the Western and American cities. It shows that the government FinTech policy is the most crucial FinTech aspect in enhancing those cities' international financial competitiveness. The finTech ecosystem is the only positive significant aspect among the three FinTech aspects in Asian cities. The other two aspects are negatively significant. It implies that enhancing the FinTech consumer experience and FinTech industry reduces a financial centre's international competitiveness.

FinTech development is still in the early stage of the product life cycle. FinTech consumer experience and industry mainly serve the local market instead of the international financial market in Western and American cities. Therefore, the two aspects do not affect global financial competitiveness. In Asia, the increase in domestic FinTech consumer experience provided by local FinTech startups shifts the focus of financial service to the domestic market. This shift of resource and business model to domestic development reduces international financial competitiveness. The empirical result shows that government policy supporting the FinTech ecosystem is the most critical aspect in enhancing global financial competitiveness.

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