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Full Length Research Paper

Influencing factors for platform firm's price strategy: Take the bankcard platform as examples in China

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Taking the Bankcard platforms of 14 Chinese commercial banks from 2001 to 2022 as examples, we have developed an influencing factors model for the price strategy of platform enterprises. The results indicate that the cross-network external strength and unit switching cost of the platform enterprise do not have a significant effect on pricing from the consumer side. However, the endogenous value and unit cost of innovation have a significant impact on the pricing of the platform on the consumer side. Furthermore, the cross-network external strength and unit switching cost have significant effects on pricing from the merchant's (seller's) side, while the endogenous value and unit cost of innovation do not have significant effects on pricing from the merchant's (seller's) side. This paper aims to uncover the pricing factors of platform enterprises and proposes an empirical model that can lead to a better understanding of the pricing strategy of platform enterprises.

Key words: Platform enterprise, influencing factors, price strategy.

INTRODUCTION

Earlier research on the pricing strategy of platform enterprises was primarily based on statistical analyses in two-sided markets. This body of literature primarily examined the network external strength, cost allocation, and social efficiency of platform enterprises operating on both sides (Rochet and Tirole, 2006; Armstrong, 2006; Hagiu, 2006). Over time, there has been a growing realization of the pivotal role of information and communication technology in driving modern economic growth (Potts and Mandeville, 2007). During this evolution, dynamic resources, such as knowledge and capabilities, gained attention, superseding static resources like natural resources. Moreover, the concept of value shifted to being viewed as a collaborative process involving both suppliers and consumers, as opposed to being solely created by producers and then transmitted to consumers (Lusch et al., 2008).

This paper aims to introduce an empirical model capable of depicting and explaining the pricing strategy of platform enterprises. The objective of this paper is to identify the influencing factors for the pricing strategy of platform enterprises, a field that previous studies have not extensively analyzed.

RESEARCH HYPOTHESES AND THEORETICAL MODELS

Research hypothesis

Influence of the endogenous value on pricing of platform under dynamic innovation

Huang (2017) demonstrates that the expansion of platform enterprises is propelled by innovation.

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Simultaneously, the potency of platform innovation governs the potential market share that platform enterprises could secure in subsequent stages. His study reveals that within a competitive equilibrium, the endogenous value exhibits a positive correlation with the pricing on this side within the context of dynamic innovation by platform enterprises. Building on the aforementioned analysis, we put forward the following hypothesis:

Hypothesis1: The endogenous value under dynamic innovation has a significant positive impact on the pricing of this side.

Influence of the network external strength on pricing of platform under dynamic innovation

Bourreau and Verdier (2014) demonstrate that in a state of balanced competition, there exists a positive relationship between the pricing of platform enterprises and the cross-network external strength between the two sides. Dou and Wu (2016) illustrate that within a competitive strategy involving the introduction of differentiated product innovation, under balanced competition, the bilateral pricing of platform companies displays a positive correlation with the strength of the external network's cross-network on this side. Huang (2017) establishes that within a competitive equilibrium of dynamic innovation, a positive relationship exists between the cross-network external strength between the two sides and the platform's pricing on this side. Drawing from the aforementioned analyses, we posit the following hypothesis:

Hypothesis 2: The cross-network external strength of the two sides under dynamic innovation has a significant positive impact on the pricing of this side.

Influence of the unit conversion cost on pricing of platform under dynamic innovation

Lin et al. (2011) demonstrate that within the context of competitive equilibrium, there exists a positive relationship between the unit conversion cost of a platform enterprise and its pricing on this side. Dou and Wu (2016) reveal that the bilateral pricing of a platform enterprise maintains a positive correlation with the unit conversion cost on this side under conditions of balanced competition. Huang (2017) establishes that within a scenario of dynamic innovation, the pricing of platform users within the access platform market displays a positive correlation with the unit conversion cost of access users on this side, assuming balanced competition. Drawing upon the analyses provided above, we posit the following hypothesis:

Hypothesis 3: The unit conversion cost of two-sided users under dynamic innovation has a significant positive impact on the pricing of this side.

Influence of the unit cost of innovation on pricing of platform under dynamic innovation

Huang (2017) illustrates that platform growth is propelled by innovation, and the potency of platform innovation dictates the potential market share that a platform enterprise may secure in later stages. His research further indicates that within the context of dynamic innovation, the pricing of platform users exhibits a positive relationship with the unit cost of innovation on this side when competition reaches equilibrium. Building upon the insights presented above, we put forth the following hypothesis:

Hypothesis 4: The unit cost of innovation has a significant positive impact on the pricing of this side.

Theoretical model

Based on the above analysis, we can build the model, in which the pricing of platform enterprise's dynamic innovation is considered as a function of its influencing factors. A multivariate linear regression model is constructed to verify the hypotheses proposed earlier. The specific model is as follows:

$$p_{it}^{B} = f(d_{it}^{B}, c_{it}^{B}, a_{it}^{B}, r_{it}^{B}) \qquad (1)$$

$$p_{it}^{S} = f(d_{it}^{S}, c_{it}^{S}, a_{it}^{S}, r_{it}^{S}) \qquad (2)$$

p_{it}^{B} and p_{it}^{S} represent the pricing of buyer and seller when the platform provides products (services) i at time t under dynamic innovation. And this price is a function of the endogenous value on that side, the unit conversion cost of users on that side, the cross-network external strength between the two sides and the unit cost of platform innovation on that side. d_{it}^{B} and d_{it}^{S} represent the endogenous value of the platform for users when platform provides products (services) i at time t under dynamic innovation. c_{it}^{B} and c_{it}^{S} represent the unit conversion cost of the user when the platform provides product (service) i at time t under dynamic innovation. a_{it}^{B} and a_{it}^{S} indicate the cross-network external strength of the user to the opposite party when the platform provides the product (service) i at time t under dynamic innovation. r_{it}^{B} and r_{it}^{S} represent the unit cost of the innovation provided by the buyer and seller when the platform provides the product (service) i at time t under dynamic innovation. The conceptual model is shown in Figure 1.

VARIABLE MEASUREMENT AND DATA DESCRIPTION

Variable measurement

Dependent variable

The dependent variable is the price of platform enterprise under dynamic innovation. p_{it}^{B} and p_{it}^{S} represent the pricing of consumers (buyers) and merchants (sellers) when the platform provides products (services) i at time t. And $p = R/N$, in which R is income and N is quantity. The source of the original data is the annual data published in the China Financial Yearbook and the annual financial reports published by the 14 Chinese Commercial banks, which are Agricultural Bank of China, Bank of China, China Construction Bank, Bank of Communications, CITIC Industrial Bank, China Everbright Bank, Hua Xia Bank, China Minsheng Bank, China Merchants Bank, Guangdong Development Bank, Shenzhen Development Bank, Shanghai Pudong Development Bank, Industrial Bank Bank. Combined with the actual operation of China's bank card business, we conduct an empirical analysis of the theoretical model. The fourteen banks account for 70-91% and 90-95% of the total number of cards issued by the banking industry and the total number of merchants. The market is relatively large. Therefore, it is suitable to use the actual operation of China's bank cards to conduct empirical analysis on the pricing of platform enterprise under dynamic innovation.

Combined with the actual operation of the bank card, p_{it}^{B} and p_{it}^{S}

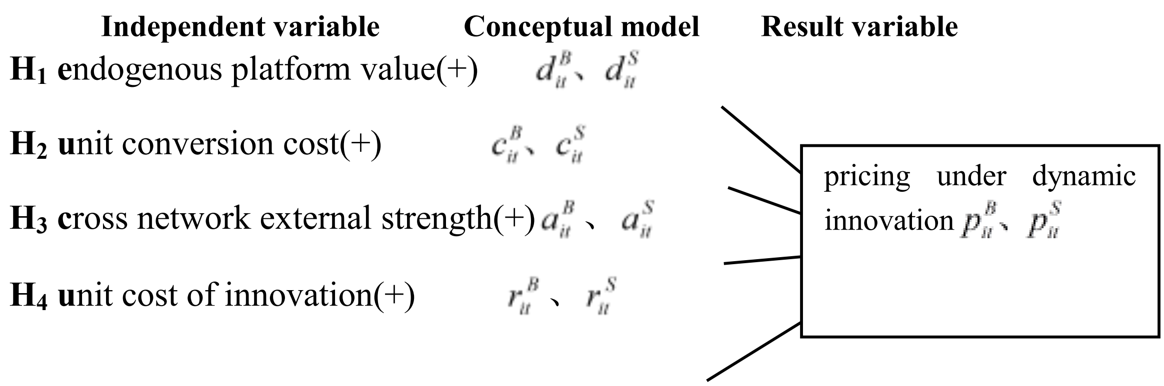

Figure 1. Conceptual model.

represent the credit card fee charged to the consumer (buyer) and the discount fee charged to the merchant (seller) when the platform provides the product (service) i at time t. $p_{it}^B = R_{it} / N_{it}^B$, R_{it} represents the bank card business income and its data comes from the statistical data of the bank card business income of the financial year. N_{it}^B represents the number of consumers (buyers) in different years for each bank. The data comes from the China Financial Yearbook from 2001 to 2006 and the bank card business column in the annual financial reports from 2007 to 2022 for consumers (Buyers), the unit is yuan per sheet. $p_{it}^S = M_{it} / N_{it}^S \times 0.7\%$, M_{it} represents the amount of credit card consumption, the data is derived from the statistical data of the consumption of bank card business in the financial statements. N_{it}^S represents the number of merchants (sellers) in different years. The data comes from the China Financial Yearbook from 2001 to 2006 and the statistical data on merchants (sellers) of the bank card business column of the bank's annual financial report from 2007 to 2022 0.7% represents merchant (seller) discount fee and the ratio is derived from the merchant settlement fee rate given in the "Public Bank of China Union Pay Online Banking Bank Card Interbank Transactions Revenue Distribution Measures" announced by the People's Bank of China on March 1, 2004. It represents the government's monopoly power on the bank card market and the unit is yuan per household.

Independent variables

Endogenous platform value

Huang (2017) believes that the endogenous value of the platform represents the inherent value obtained by any participant in the participation group. According to the connotation of this definition and the definition of the same-edge network effect, we use the same-edge network effect as a measure of the endogenous value of platform enterprise. d_{it}^B and d_{it}^S represent the network external strength in the same side at the buyer's and seller's side when product (service) i is provided at time t. According to the definition of the external network strength, the calculation formula of the external network strength can be obtained as $d_{it}^B = \Delta N_{it}^B / N_{it-1}^B$, ΔN_{it}^B represents the amount of change in consumer size, calculated by subtracting data from the previous year and then dividing the data in the previous year to finally obtain the value of this indicator. The indicator is a ratio without a corresponding statistical unit or considered as a unit of 1. $d_{it}^S = \Delta N_{it}^S / N_{it-1}^S$, ΔN_{it}^S represents the change in the size of the merchant, which is calculated by subtracting the data of the previous year from the next year, and then dividing the data of the previous year to finally obtain the value of the indicator. The indicator is a ratio without a corresponding statistical unit or it is regarded as a unit of 1.

Unit conversion cost

We use c_{it}^B and c_{it}^S to represent the unit conversion cost of the consumer (buyer) and merchant (seller) when the platform provides the product (service) i at time t. $c_{it}^B = C_{it}^B / N_{it}^B$, C_{it}^B represents the fixed cost input of using a bank card by consumers (buyers). The data comes from the statistical data of bank card business expenditure in the financial statements and the relevant financial data published on the bank's web page. N_{it}^B represents the number of consumers (buyers) . The data comes from the China Financial Yearbook from 2001 to 2006 and the statistical data on consumers (buyers) of the bank card business column of the bank's annual financial report from 2007 to 2022. $c_{it}^S = C_{it}^S / N_{it}^S$, in which C_{it}^S represents the fixed cost investment of a merchant (seller) using a bank card. The data comes from the statistical data of bank card business expenditure in the financial statements and the financial data published on the bank's web page. N_{it}^S represents the number of consumers (buyers) . The data comes from the China Financial Yearbook from 2001 to 2006 and the statistical data on merchants (sellers) from 2007 to 2022. The indicator is a ratio without a corresponding statistical unit, or it is regarded as a unit of 1.

Cross network external strength

We use a_{it}^B and a_{it}^S represent the network external strength brought by the consumer (buyer) and merchant (seller) to the opposite side when the platform provides products (services) i at time t. The cross-network external strength generated by the consumer (buyer) to the merchant (seller) is $a_{it}^{B}=\Delta N_{it}^{S}/\Delta N_{it}^{S}$. The cross-network external strength generated by the merchant (seller) to the consumer (buyer) is $a_{it}^{S}=\Delta N_{it}^{B}/\Delta N_{it}^{S}$,where ΔN_{it}^{B} and ΔN_{it}^{S} represent the changes in the number of consumers (buyers) and merchants (sellers), which are calculated by subtracting data from the previous year. The indicator is a ratio without a corresponding statistical unit or it is regarded as a unit of 1.

Unit cost of innovation

We use r_{it}^{B} and r_{it}^{S} represent the unit cost of innovation on the consumer (buyer) and merchant (seller) side of the platform when the platform provides products (services) i at time t. $r_{it}^{B}=R_{it}^{B}/N_{it}^{B}$, $r_{it}^{S}=R_{it}^{S}/N_{it}^{S}$, in which R_{it}^{B} and R_{it}^{S} represent the total investment and development of each sample company at the time t in different years when the consumer (buyer) and merchant (seller) provide products (services) i. N_{it}^{B} and N_{it}^{S} represent the number of consumers (buyers) and merchants (sellers) when products (services) i are provided at time t. The data comes from the China Financial Yearbook from 2001 to 2006 and the statistical data on consumers (buyers) and merchants (sellers) of the annual financial reports of the banks from 2007 to 2022. The indicator is a ratio without a corresponding statistical unit or it is regarded as a unit of 1.

Data description

Sample selection

We have selected commercial bank companies that fulfill the research criteria as our sample companies. The sample data comprises annual information sourced from the China Financial Yearbook and the annual financial reports released by the following 14 banks: Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, Bank of Communications, CITIC Industrial Bank, China Everbright Bank, Hua Xia Bank, China Minsheng Bank, China Merchants Bank, Guangdong Development Bank, Shenzhen Development Bank, Shanghai Pudong Development Bank, and Industrial Bank Bank.

These fourteen banks collectively account for 70-91% and 90-95% of the total number of cards issued by the banking industry and the total number of merchants. This substantial market representation justifies conducting a comprehensive analysis of the pricing strategy of platform enterprises under conditions of dynamic innovation. The breakdown of the sample businesses is outlined in Table 1.

Original data description

The original data was sourced within the time frame of 2001 to 2022 due to limitations in data availability. Considering the inherent time lag, a total of 308 observations were compiled. To ensure data uniformity, we employed Eviews 9.0 to initially standardize the raw data, rendering it dimensionless. The descriptive statistics for the standardized data are detailed in Table 2. We can see that the standard deviation which are the platform endogenous value of consumers and merchants (d_{it}^{B} and d_{it}^{S}), the unit conversion cost of consumers and merchants (c_{it}^{B} and c_{it}^{S}), the cross-network external strength of consumers and merchants (a_{it}^{B} and a_{it}^{S}), the unit cost of consumer and merchant innovation (r_{it}^{B} and r_{it}^{S}) and consumer's credit card fee and merchant discount fee (p_{it}^{B} and p_{it}^{S}) fluctuates around 1, indicating that the difference between them is small, so there is no abnormal fluctuation data, which indicates the data are relatively stable.

EMPIRICAL ANALYSIS AND EXPLANATION

Empirical analysis and explanation on the consumer (buyer) side

Stability test of consumer (buyer) side variables

We employed Eviews 9.0 for conducting unit root tests on panel data, utilizing three main test modes: the time series has only the intercept term, which is represented by I (intercept); the time series has both the intercept term and the trend term, which is represented by T & I (intercept and trend); none of the above is used, which is represented by N (none). Subsequently, we employed the ADF-Fisher method to subject the original sequence and the first-order difference sequence of each variable to unit root tests. This process aided in determining whether each variable represented a stationary sequence, based on the ADF statistics and the corresponding P-value. The outcomes of these tests are detailed in Table 3. The results indicate that the variables on the consumer (buyer) side are all stationary sequences, characterized as 0-order single integer sequences. This suggests that the variables exhibit non-homogeneous single integer properties. As a result, every variable within the consumer (buyer) side panel data is stable, thereby enabling subsequent regression analysis.

Regression analysis on the consumer (buyer) side

F test and Hausman test will be conducted to select and determine the final model of panel data.

F test: The detailed regression results are shown in Table 4. From Table 4, it can be obtained that the sum of squared residuals (Sum squared resid) of the mixed estimation model is 82.62710, which is denoted as SSEr. Next, the individual (fixed effect) model regression is performed on the consumer (buyer) side panel data. The detailed regression results are shown in Table 5.

Similarly, the sum squared resid of the individual fixed

Table 1. List of sample companies.

Coding	Company name	Platform type	Time to market
1	ICBC	Bank card payment platform	2006
2	Agricultural Bank of China	Bank card payment platform	2007
3	Bank of China	Bank card payment platform	2005
4	China Construction Bank	Bank card payment platform	2004
5	Bank of Communications	Bank card payment platform	2007
6	CITIC Industrial Bank	Bank card payment platform	2007
7	China Everbright Bank	Bank card payment platform	2010
8	HSBC Bank	Bank card payment platform	2003
9	China Minsheng Bank	Bank card payment platform	2000
10	China Merchants Bank	Bank card payment platform	2002
11	Guangdong Development Bank	Bank card payment platform	Unlisted
12	Shenzhen Development Bank	Bank card payment platform	1991
13	Shanghai Pudong Development Bank	Bank card payment platform	1999
14	Industrial Bank	Bank card payment platform	2007

Source: Organized by the author.

Table 2. Data descriptive statistics.

	$D^B it$	$A^B it$	$C^B it$	$P^B it$	$R^B it$
Mean	0.009	0.013	-0.024	0.014	0.004
Median	-0.214	0.038	-0.161	-0.076	-0.312
Maximum	2.904	2.796	2.545	1.708	3.156
Minimum	-2.181	-2.941	-2.117	-1.486	-1.827
Std. Dev.	0.993	1.004	0.996	1.007	1.005
	D^S_{it}	A^S_{it}	C^S_{it}	P^S_{it}	R^S_{it}
Mean	0.000	-0.002	-0.016	0.000	0.021
Median	-0.288	-0.161	0.075	-0.120	-0.277
Maximum	3.162	3.162	2.732	2.611	3.159
Minimum	-2.264	-3.159	-2.405	-1.817	-2.111
Std. Dev.	1.001	1.003	1.001	1.003	1.001

Table 3. ADF statistics and P-value results for the unit root test of consumer (buyer) panel data.

	Level			1st diff.			Conclusion
	I	I&T	N	I	I&T	N	
D^B_{it}	103.114(0.000)	73.883(0.000)	162.320(0.998)	143.317(0.000)	106.734(0.000)	219.915(0.000)	Steady
A^B_{it}	55.517(0.002)	90.787(0.000)	111.650(0.000)	159.206(0.000)	96.187(0.000)	210.890(0.000)	Steady
C^B_{it}	29.943(0.366)	31.422(0.499)	75.404(0.000)	89.385(0.000)	82.800(0.000)	145.780(0.000)	Steady
P^B_{it}	1.892(1.000)	16.309(0.961)	50.135(0.548)	129.595(0.289)	98.017(0.000)	26.324(0.000)	Steady
R^B_{it}	63.687(0.000)	58.123(0.001)	72.745(0.000)	100.498(0.000)	65.524(0.000)	141.089(0.000)	Steady

effect model obtained from Table 5 is 28.63926, which is denoted as SSEu. And the F statistic is calculated according to the formula $F = [(SSE_r - SSE_u)/(N-1)] / [SSE_u/(NT-N-K)]$, T is the number of time periods, K is the number of explanatory variables and N is the number of individuals. Finally, the F statistic is 19.7210, which is greater than $F_{0.05}$ (N-1, NT-NK) = $F_{0.05}$ (13,252) and eject the null hypothesis, so this

Table 4. Regression results of consumer (buyer) edge mixed estimation model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.016558	0.060031	0.275831	0.7831
DBIT?	-0.510792	0.064429	-7.927970	0.0000
ABIT?	0.412572	0.061218	6.739433	0.0000
MBIT?	0.176231	0.062859	2.803580	0.0057
RBIT?	0.079077	0.061338	1.289187	0.1993
R-squared	0.467520			
Adjusted R-squared	0.453226			
Sum squared resid	82.62710			
F-statistic	32.70574			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	0.932428			

Table 5. Regression results of the fixed effect model of consumers (buyer).

Fixed effects (Cross)	Effects	Fixed effects (Cross)	Specification
_1-C	-0.013625	_8-C	-0.013611
_2-C	0.035344	_9-C	-0.013606
_3-C	0.001233	_10-C	0.143813
_4-C	-0.022706	_11-C	-0.013611
_5-C	-0.049485	_12-C	-0.016062
_6-C	-0.013977	_13-C	-0.028718
_7-C	-0.013612	_14-C	0.018624
Cross-section fixed	dummy variables		
R-squared	0.815438		
Adjusted R-squared	0.663834		
Sum squared resid	28.63926		
F-statistic	5.378721		
Prob (F-statistic)	0.000000		
Durbin-Watson stat	1.753299		

Source: The author obtained the analysis results through eviews 9.0.

panel data should establish an individual fixed effect model.

Hausman test: We use Eviews9.0 to perform random effect model regression on the panel data of consumers (buyers), and perform Hausman test directly in the regression result window. According to the test results in Table 6, the chi-square statistic is 0.203101 and the corresponding P value is 0.9952. The null hypothesis is accepted at the 0.5% significance level, it means the panel data on the consumer (buyer) side is suitable for random effect model estimation.

Regression results: We perform F-test and Hausman test on the panel data of the consumer (buyer), and finally determines that the panel data of the consumer (buyer) side should be estimated using a random effect model. The regression results are shown in Table 7. From the regression results of the consumer (buyer) edge shown in Table 7, the model's determination coefficient is 0.983510, and the corrected determination coefficient is 0.976170, indicating that all independent variables have a 97.62% explanatory degree to the dependent variable, which explains that the overall fit of the model is better. In addition, the F statistic of the model is 243.3358 and F_a (k, n-k-1) = $F_{0.05}$ (4, 9) = 6.42 under the condition of significance level a = 0.05, which is less than the F value of the model. At the same time, the corresponding P value of the F test is 0.034735, which passed the F test at a significance level of 1%, indicating that the

Table 6. Hausman test results on the consumer (buyer) side.

Test summary	Chi-Sq. statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.203101	4	0.9952

Table 7. Regression results of consumer (buyer) side panel data.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.013499	0.102352	0.131883	0.0000
DBIT?	-0.021711	0.026604	-2.816088	0.0415
ABIT?	0.022224	0.026678	0.979976	0.3287
CBIT?	-0.000690	0.021173	-0.032482	0.9741
RBIT?	0.005532	0.020065	2.725688	0.0327
R-squared	0.983510			
F-statistic	243.3358			
Prob (F-statistic)	0.034735			
Adjusted R-squared	0.976170			
Sum squared resid	85.12376			
Durbin-Watson stat	1.895860			

explanatory variables of the model as a whole have a higher significance. Finally, the DW value of the model is 1.895860, which indicates that the model does not have a large spatial auto correlation problem. Based on the above analysis, the final regression equation of the consumer (buyer) side is as follows:

$$p_{it}^{B} = 0.013499C_{i} - 0.021711d_{it}^{B} + 0.022224a_{it}^{B} - 0.000690c_{it}^{B} + 0.005532r_{it}^{B}$$
$$(-2.816088) \quad (0.979976) \quad (-0.032482) \quad (2.725688)$$
$$(i = 1,2,...,14; t = 1,2,...,11) \tag{3}$$

The values in parentheses below represent the t-test values of the corresponding coefficients. Given a significance level of a = 0.05, the critical value $t_{a/2}(n-k-1) = t_{0.025}(9) = 2.626$. From the regression results of the equation of consumer (buyer) side, only the endogenous value d_{it}^{B} of the platform and the unit cost r_{it}^{B} of the innovation correspond to $|t| > t_{0.025}(9)$. At the same time, the corresponding P values of these two variables are 0.0415 and 0.0327, indicating that these variables have a significant impact on the pricing of the consumer (buyer) side of platform enterprise under dynamic innovation. While the cross-network external strength a_{it}^{B} and unit conversion cost c_{it}^{B} correspond to $|t| < t_{0.025}(9)$. At the same time, the corresponding P values of these two variables are 0.3287 and 0.9741, indicating that these variables have no significant impact on the pricing of the consumer (buyer) side of the platform enterprise under dynamic innovation.

Empirical analysis and explanation on the merchant (seller) side

Stability test of merchant (seller) side variables

We employed Eviews 9.0 to conduct unit root tests on the assembled panel data, utilizing three primary test models: One is that the time series only has the intercept term, expressed by I (intercept), the second is that the time series has both the intercept term and the trend term, expressed by T & I (intercept and trend). And the third is that there is no above, expressed by N (none). Subsequently, we employed the ADF-Fisher method to subject both the original sequence and the first-order difference sequence of each variable to unit root tests. This process facilitated the determination of whether each variable exhibited a stationary sequence, as assessed through the ADF statistics and the specific significance level of the corresponding P-value. The outcomes of these unit root tests are presented in Table 8.

The results of the unit root tests conducted for the merchant (seller) side variables reveal that all variables on the merchant (seller) side are characterized as stationary sequences, manifesting as 0-order single integer sequences. This implies that the variables display non-homogeneous single integer characteristics. Consequently, each variable within the panel data pertaining to the merchant (seller) side is considered stable, thereby enabling the subsequent execution of regression analysis.

Table 8. ADF statistics and P-value results for the unit root test of merchant (seller) panel data.

	Level			1st diff.			Conclusion
	I	I&T	N	I	I&T	N	
D^S_{it}	95.9633(0.0000)	93.1858(0.0000)	146.497(0.0000)	123.932(0.0000)	96.3931(0.0000)	207.979(0.0000)	Steady
A^S_{it}	97.0042(0.0000)	77.1202(0.0000)	155.736(0.0000)	150.969(0.0000)	129.411(0.0000)	228.975(0.0000)	Steady
C^S_{it}	45.7088(0.0187)	54.9722(0.0017)	99.9190(0.0000)	111.644(0.0000)	67.8703(0.0000)	165.641(0.0000)	Steady
P^S_{it}	39.6566(0.0709)	43.8759(0.0286)	106.636(0.0000)	97.7184(0.0000)	85.1161(0.0000)	149.152(0.0000)	Steady
R^S_{it}	74.1457(0.0000)	62.0889(0.0002)	142.820(0.0000)	115.736(0.0000)	92.0168(0.0000)	187.111(0.0000)	Steady

Source: The author obtained the analysis results through eviews 9.0.

Table 9. Regression results of merchant (seller) edge mixed estimation model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002543	0.080507	0.031588	0.9748
DSIT?	-0.074751	0.083525	-0.894956	0.3723
ASIT?	-0.07920	0.083208	-0.952913	0.3422
CSIT?	0.125773	0.082510	1.524339	0.1295
RSIT?	-0.015793	0.081438	-0.193927	0.8465
R-squared	0.035886			
F-statistic	1.386490			
Prob(F-statistic)	0.241356			
Durbin-Watson stat	1.171905			
Adjusted R-squared	0.010003			
Log likelihood	-215.7748			

Regression analysis on the merchant (seller) side

F test and Hausman test will be conducted to select and determine the final model of panel data.

F test: The detailed results of the regression analysis are presented in Table 9. From the table, we observe that the sum of squared residuals (Sum squared resid) for the mixed estimation model is 148.6130, denoted as SSEr. Subsequently, we conduct regression using the individual (fixed effect) model on the merchant (seller) side panel data. The results of this regression are outlined in Table 10. Similarly, the sum of squared residuals for the individual fixed effect model, as obtained from Table 10, is 57.57381, indicated as SSEu. The F statistic is computed using the following formula:

$$F = \left[(SSE_r - SSE_u)/(N-1)\right] / \left[SSE_u/(NT-N-K)\right],$$

Here, T represents the number of time periods, K signifies the number of explanatory variables, and N denotes the number of individuals. Upon calculation, the F statistic is determined to be 16.5424, which exceeds the critical value F0.05 (N-1, NT-NK) = F0.05 (13,252). As a result, the null hypothesis is rejected, indicating that this

Table 10. Regression results of the fixed effect model of merchant (seller).

Fixed effects (cross)	Effects	Fixed effects (cross)	Specification
_1-C	0.093880	_8-C	-0.005968
_2-C	0.051223	_9-C	-0.020114
_3-C	-0.005562	_10-C	-0.011554
_4-C	0.006506	_11-C	-0.000765
_5-C	-0.005646	_12-C	-0.005567
_6-C	-0.007734	_13-C	-0.053118
_7-C	-0.005567	_14-C	-0.030014
Cross-section fixed	Dummy variables		
R-squared	0.626495		
F-statistic	2.041976		
Prob(F-statistic)	0.000942		
Durbin-Watson stat	1.914773		
Adjusted R-squared	0.319687		

Table 11. Hausman test results on the consumer (buyer) side.

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.004521	4	1.0000

Table 12. Regression results of merchant (seller) side panel data.

Variable	Coefficient	Std. error	t-Statistic	Prob.
C	0.002099	0.127727	0.016436	0.0369
DSIT?	-0.036460	0.083972	-0.434195	0.6648
ASIT?	-0.089124	0.081129	-2.98501	0.0273
CSIT?	0.099246	0.079569	2.729524	0.0214
RSIT?	-0.016929	0.078746	-0.214977	0.8301
R-squared	0.975702	Adjusted R-squared	0.956654	
F-statistic	254.79499	Durbin-Watson stat	1.204003	
Prob(F-statistic)	0.042315	Sum squared resid	134.0755	

panel data is better suited for establishing an individual fixed effect model.

Hausman test: Based on the findings presented in Table 11, the chi-square statistic is calculated as 0.004521, with the corresponding P-value being 1.0000. At the 0.5% significance level, the null hypothesis is accepted. This outcome implies that the panel data concerning the merchant (seller) side is indeed suitable for estimation using a random effects model.

Regression results: From the regression results of the merchant (seller) edge shown in Table 12, it can be seen that the model's determination coefficient is 0.975702, and the corrected determination coefficient is 0.956654, indicating that all independent variables have a 95.66% explanatory degree to the dependent variable, which explains that the overall fit of the model is better. In addition, the F statistic of the model is 254.79499 and F_a (k, n-k-1) = $F_{0.05}$ (4, 9) = 6.42 under the condition of significance level a = 0.05, which is less than the F value of the model. At the same time, the corresponding P value of the F test is 0.042315, which passed the F test at a significance level of 1%, indicating that the explanatory variables of the model as a whole have a higher significance. Finally, the DW value of the model is 1.204003, which indicates that the model does not have a large spatial auto correlation problem. Based on the

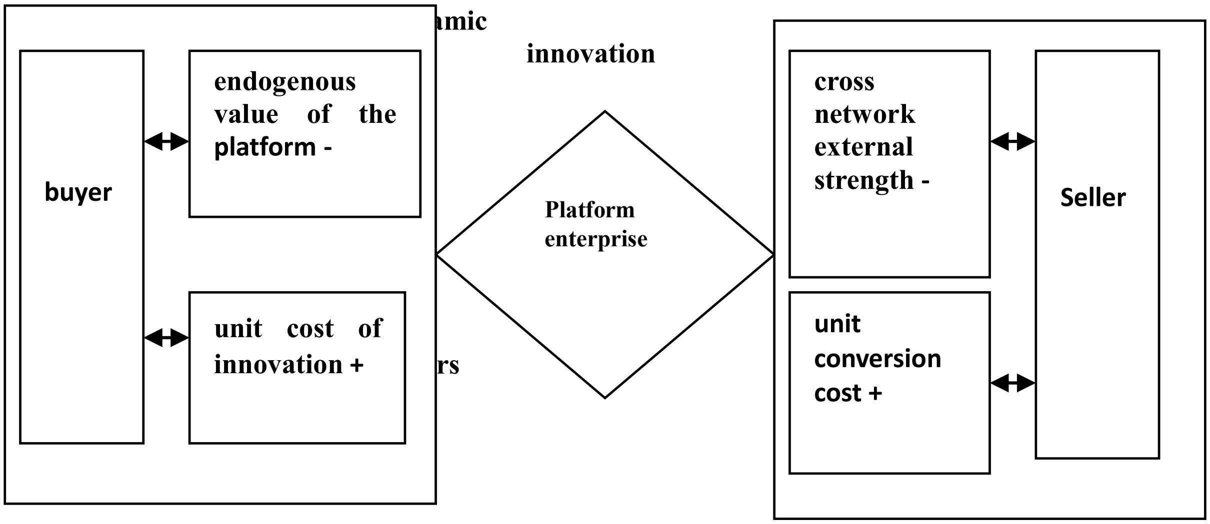

Figure 2. Influencing factors of pricing of platform enterprises under dynamic innovation.

above analysis, the final regression equation of the merchant (seller) side is as follows:

$$p_{it}^{S} = 0.002099C_i - 0.036460d_{it}^{S} - 0.089124a_{it}^{S} + 0.099246c_{it}^{S} - 0.016929r_{it}^{S}$$
$$(-0.434195) \quad (-2.98501) \quad (2.729524) \quad (-0.214977)$$
$$(i = 1,2,\ldots,14; t = 1,2,\ldots,11) \qquad (4)$$

The values in parentheses below represent the t-test values of the corresponding coefficients. Given a significance level of a = 0.05, the critical value $t_{a/2}(n-k-1) = t_{0.025}(9) = 2.626$. From the regression results of the equation of the merchant (seller) side, only the cross-network external strength a_{it}^{S} and the unit conversion cost c_{it}^{S} correspond to $|t| > t_{0.025}(9)$. At the same time, the corresponding P values of these two variables are 0.0273 and 0.0214, indicating that these variables have a significant impact on the pricing of the merchant (seller) side of platform-based enterprises under dynamic innovation. While the Endogenous value of the platform a_{it}^{B} and the innovation cost of the platform r_{it}^{S} correspond to $|t| < t_{0.025}(9)$. At the same time, the corresponding P values of these two variables are 0.6648 and 0.8301, indicating that these variables have no significant impact on the pricing of the merchant (seller) side of the platform-based enterprise under dynamic innovation. From the former analysis, the influencing factors of pricing of platform enterprises under dynamic innovation can be seen in Figure 2.

Conclusions

In summary, the distinct influencing factors on pricing for buyers and sellers under dynamic innovation highlight the necessity for platform enterprises to adopt different strategies to optimize profits from these two sides. On the buyer's side, the unit cost of innovation exerts a significantly positive influence on pricing. Conversely, the unit conversion cost stands out as the primary determinant of pricing on the seller's side when employing the dynamic innovation approach. The endogenous value of the platform and the cross-network external strength exert noteworthy negative impacts on pricing for both buyers and sellers under dynamic innovation strategy. As a result, when implementing dynamic innovation, a platform enterprise can tailor pricing strategies and methods for the consumer (buyer) and merchant (seller) sides. To enhance profitability on the buyer's side, it could consider increasing the unit cost of innovation while judiciously reducing the endogenous value of the platform. For the seller's side, potential profit augmentation could involve elevating the unit conversion cost and reducing the cross-network external strength. It is worth noting that the unit conversion cost for buyers, cross-network external strength for sellers, as well as the endogenous value of the platform and the unit cost of innovation for sellers, do not significantly impact the pricing levels of platform enterprises under dynamic innovation. These insights collectively emphasize the importance of segment-specific pricing strategies in dynamic innovation scenarios, thereby enabling platform enterprises to effectively navigate the nuances of buyer and seller dynamics and optimize their overall profitability.

There are several potential avenues for further research in the realm of platform innovation, building upon the initial insights presented in this study. Firstly, exploring the perspective of dynamic innovation within the framework of two-sided market theory could yield valuable insights. Given that innovation choices play a pivotal role in shaping platform capabilities and pricing strategies, it would be intriguing for platform enterprise researchers to delve into how dynamic innovation influences pricing decisions. The empirical model proposed in this study could serve as a foundational point for deeper investigations in this direction.

Additionally, investigating the evolution of design rules within platform enterprises presents an interesting avenue for researchers. Our findings highlight the significant negative impact of the endogenous value of the platform on pricing from the buyer side, as well as the negative effect of cross-network external strength on pricing from the seller side. This suggests that alterations to the platform's architecture can lead to shifts in essential task and design structures, thereby influencing subsequent operational development and innovation trajectories. While the adaptability of dynamic innovation is a familiar subject for innovation scholars, comprehensive insights into the intricate design modifications and their subsequent trajectories remain ripe for theoretical exploration, making them a promising area for future research endeavors.

In conclusion, our methodology underscores the practicality of monitoring platform innovation through a focus on two-sided components. Consequently, dynamic innovation becomes intertwined with inquiries into platform strategy. By incorporating metrics associated with dynamic innovation, it becomes possible to extract valuable insights into the landscape of platform innovation. As a closing remark, we anticipate that despite the preliminary nature of this study, it underscores the potential value of empirical analysis for individuals seeking to comprehend pricing dynamics within the context of dynamic innovation within platform enterprises. Our initial findings have shed light on the factors influencing pricing strategies for platform enterprises, thereby laying the foundation for essential theories guiding platform enterprise strategies. Through this work, we have begun to uncover the intricate interplay between pricing and dynamic innovation, paving the way for further exploration in this captivating field.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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