Routledge
Taylor & Francis Group

Global Economic Review

Perspectives on East Asian Economies and Industries

ISSN: 1226-508X (Print) 1744-3873 (Online) Journal homepage: http://www.tandfonline.com/loi/rger20

Effects of Credit Market Freedom on the Convergence of Chinese Banks' Profits

Woon Kan Yap, Siong Hook Law & N.A.M. Naseem

To cite this article: Woon Kan Yap, Siong Hook Law & N.A.M. Naseem (2018): Effects of Credit Market Freedom on the Convergence of Chinese Banks' Profits, Global Economic Review, DOI: 10.1080/1226508X.2018.1436460

To link to this article: https://doi.org/10.1080/1226508X.2018.1436460

Global Economic Review, 2018
https://doi.org/10.1080/1226508X.2018.1436460

Effects of Credit Market Freedom on the Convergence of Chinese Banks' Profits

WOON KAN YAP, SIONG HOOK LAW & N.A.M. NASEEM
Department of Economics, Universiti Putra Malaysia, Serdang, Malaysia

ABSTRACT *Using an unbalanced panel of 96 banks that operate in the Chinese banking sector from 2007 to 2014, we first seek to uncover the relation between credit market freedom and bank profit. Thereafter, we further analyse the freedom effects on the convergence of bank profit so as to explain the prevailing persistent fall in the profit growth of Chinese banks. Two types of convergence are considered in this study: beta-convergence and sigma-convergence, which are estimated by using dynamic panel data estimator. Our results suggest that beta-convergence does not take place for all ownership structures until discrepancies on their traits and structural parameters are conditioned out, suggesting that it is the conditional beta-convergence rather than the absolute beta-convergence that transpires in China's banking sector. While freedom is found to reduce profit growth significantly, its negative impact on the speed of beta-convergence is arguably negligible. This alludes that China has done reasonably well in balancing its liberalization initiatives with stabilization measures so that the fall in profits instigated by freedom does not significantly overshoot its long-run equilibrium path. Credit market freedom is also found to be a significant catalyst for sigma-convergence for all ownership structures but state-owned commercial banks and foreign banks.*

KEY WORDS: Economic freedom; beta-convergence; sigma-convergence; system GMM

JEL CLASSIFICATION: G21, G28

1. Introduction

The persistent fall in profit growth rate among the Chinese banks in recent years has concerned many economists about the stability of China's banking system, which is often considered as the Achilles' heel of the economy. Given its banking asset to GDP has breached 250% as in 2015, any unwarranted shock to the system will instigate pervasive systemic effect to the real economy. Since China has emerged as the main trading partner to most of the Asian economies, an untimely collapse of the Chinese economy will put the whole region at risk.

Figure 1 reinforces such sentiments of anxiety. Although profit level has been increasing, it does so at a decreasing rate. Indeed, the fall in the growth rate of

Correspondence Address: Department of Economics, Universiti Putra Malaysia, Serdang 43400, Malaysia. Email: woonkan06@gmail.com
This article was originally published with errors. This version has been corrected. Please see Corrigendum (http://dx.doi.org/10.1080/1226508X.2018.1440955).

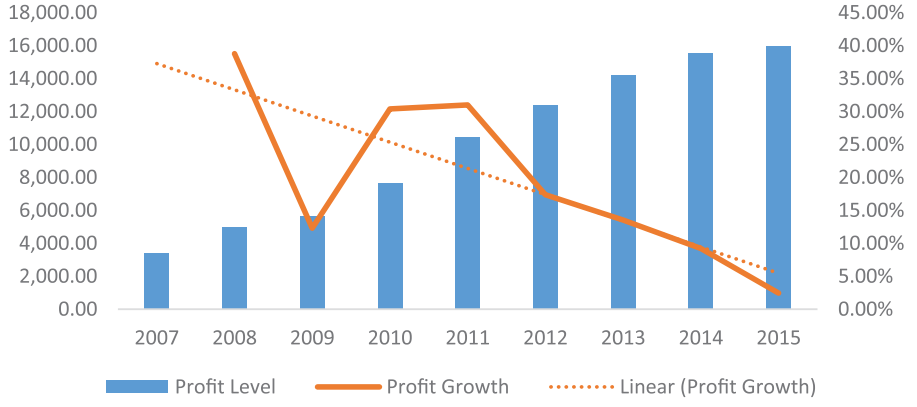

Figure 1. Profits trend in China's banking sector.
Source: CBRC Report 2015.

the Chinese banks' profits has been unbreakable since 2011. One plausible cause that leads to the stalled profit growth is the progressive liberalization of interest rate controls by the China Banking Regulatory Commission (CBRC). Prior to the removal of lending rate floor (lower limit) and the deposit rate ceiling (upper limit) in 2013 and 2015, respectively, the difference between the two limits bequeaths a sort of protected margin to the banks. However, the safe margin gradually ebbed as the range between the two limits had progressively increased since 2006 until their subsequent removal.

Economists, at least those from the classical or neo-classical school, concede that the maximization of social welfare is built on two fundamentals: (1) private ownership and (2) perfectly competitive market. The latter requires allowance of full freedom to the economic agents so that they can compete equitably in their course to generate wealth. However, Kwong (2011) asserts that the prevailing market principles, which have been imbued in the Chinese banking sector since post-WTO reform, are largely mitigated by the extensive state-ownership in the four largest banks in China. As a result, a large amount of credit is allocated in a suboptimal manner through the state directives. From another perspective, hasty and unplanned deregulation of the credit market will arguably bring forth instability. This is particularly true for China, where liberalization of interest rate is seen to jeopardize bank profit performance.

Therefore, the first objective of this study is to provide empirical evidence that freedom in the credit market explains the fall of profit growth rates among the Chinese banks. Thereafter, for the second objective, we undertake to show that the prevailing falling profits are a necessary path of correction that the Chinese banks need to undergo so that their profits equalized at the normal level, which is the long-run steady-state that is predicted by the neo-classical theory. By that, we seek to uncover the impact that credit market freedom has on the convergence properties of bank profit.

To achieve the second objective, we borrow the notion of convergence from the growth literature that was extensively expounded by Barro and Sala-i-Martin (1992).

While conventional growth literature attributes the law of diminishing marginal productivity of capital as the source of converging growth rates between developing and developed countries, the hypothesized convergence of bank profits in this study is underpinned by the propensity for the bank profits to equalize, which is a characteristic of the neo-classical's notion of competition. As freedom proliferates in the Chinese credit market following deregulation, banks are expected to compete on a more level-playing field. Resultantly, any remnants of monopoly rents will be exterminated in due time. This consecutively instigates the Chinese banking sector's trajectory towards normal profit.

Two forms of convergence are considered in this study: beta-convergence and sigma-convergence. Although these two forms of convergence similarly predict a uniform growth in profits across all banks in the long run, they differ in the manner of convergence. Beta-convergence predicts more profitable banks to grow at a lower rate than those that are less profitable. As a result, profit levels of all banks are expected to tend towards the normal level as the market tends towards perfect competition. On the other hand, sigma-convergence measures the reduction in the dispersion of profit levels from the mean.

This study is motivated to contribute to a critical component in the literature of bank profit dynamics, which is currently so deprived from its deceiving attention that it is almost non-existent. Since the introduction of persistent profit hypothesis by Mueller (1986), measuring the persistent rate of profit has become the key objective for many empirical studies on the dynamics of bank profit. In contrast, based on our survey, the number of studies that delved into the convergence of bank profit is merely two. Although persistence and convergence are dichotomously related, the latter offers an extra bit of insights into the properties of long-run equilibrium such as the speed of convergence and the long-run mean.

On the other hand, the bulk of the literature that examines convergence of banks' performance delves into the convergence of bank efficiency instead of their profits in level (among others, see Kasman and Kasman, 2013; Casu and Girardone, 2010; Weill, 2009 and Mamatzakis *et al.*, 2008). Since bank efficiency is often measured as the divergence of an individual bank's performance from either a deterministic or stochastic frontier, the dissimilarities between banks' efficiency and profit level are not trivial. While bank efficiency constitutes a measure of performance relative to the most efficient bank that lies on the frontier, profit level is a measure of absolute performance.

Despite the fact that an increase in profit efficiency does imply the banks' enhanced ability to maximize profits, it does not necessarily contribute to an increase in the profit level and vice versa. This can be illustrated by a situation, where in spite of an increase in efficiency, the profit level of an incumbent bank could still have decreased, if the magnitude of its decrease is relatively smaller than the fall in profit level of the most efficient bank. When all is said and done, it is primarily the profit level that builds up the banks' resilience against external shocks and provides signalling to the market watchers. Thus, in view of the discernible gap in the literature, the relevance of this study cannot be emphasized enough.

Along the same vein, extant literature on the dynamics of bank profitability is suffused with empirical studies that use various indices of profitability as dependent variables such as return on average assets (ROAA), return on equity (ROE) and net

interest margin (NIM). In contrast, we enter the banks' profits level as the dependent variable in this study so as to uncover the convergence properties of a more relevant representation to the Chinese banks' performance in order to draw references to their persistent fall in the profit growth. Hence, we opine that the relevance and representativeness of this study will set it apart from past studies. However, as absolute profit level is known to be size biased, the choice of control variables that are entered into the estimation model is critical to avoid inefficient estimates due to heteroscedasticity.[1]

Apart from that, this study measures the convergence rates of bank profit by ownership structures to facilitate more granular discernments on the speed of convergence that are peculiar to the type of ownership. This is a particularly helpful feature to analyse the banking data from China due to its widely disparate commercial banking system that comprises at least five distinctive structures of ownership: state-owned commercial banks (SOCB), joint-stock commercial banks (JSCB), city commercial banks (CCB), rural commercial banks (RCB) and foreign banks. While each ownership structure is unique in many aspects such as geographical presence, type of customers, sources of financing and many others, the primary discrimination rests on the share of state-ownership. In accordance to a survey conducted by Hsiao *et al*. (2015), as in 2012, the average state-ownership share for SOCB is at 70.24%, while JSCB's and CCB's average state-ownership are at 35.16% and 26.95%, respectively. On the other hand, the state has the lowest ownership in RCB, which averages at merely 10.71%.

To account for the banks' individual effects, we estimate these convergence models by using a generalized method of moment (GMM)-type of estimator. Our estimation results suggest that beta-convergence does not take place until the banks' differences in traits and structural parameters are conditioned out. Besides hindering the growth of bank profit, proliferation of freedom in the credit market is also found to reduce the speed of conditional beta-convergence, albeit, the reduction is arguably negligible. This is resoundingly good news as it indicates that CBRC has successfully avoided excessive shocks to the banking system as they pursue interest rate liberalization, which otherwise may cause the bank profit to overshoot its long-run equilibrium path due to the dismantling of the mechanism that propped up the banks' profit in the system. Despite the uncovered evidence in support of freedom-induced beta-convergence across all ownership structures, freedom in the credit market only facilitates sigma-converge in JSCB, CCB and RCB after accounting for their structural differences. This indicates that the banking landscape of China stands to be polarized in years to come with banks that are sigma-convergent to be primarily driven by market forces, leaving SOCB to operate out of national interest, while foreign banks are to serve only the niche market.

The rest of the article is arranged in six sections. Section 2 presents the theoretical framework that underlies beta-convergence and sigma-convergence so as to provide a basis for reviewing the related empirical literature in Section 3. Section 4 describes the estimation model and strategy, while Section 5 illustrates the sample and control variables selected. Section 6 reports and discusses the empirical findings. Lastly, Section 7 concludes.

2. Theoretical Framework

2.1. Absolute and Conditional Beta-convergence

Beta-convergence constitutes one of the stylized features of the neo-classical growth theory. In the context of bank performance, beta-convergence predicts a catch-up window between the less profitable banks and the more profitable ones as the latter is hypothesized to grow at a slower rate than the former. Therefore, as long as they are equal in their long-run parameters, banks of diverged initial performances are expected to converge to a common steady-state at the normal level as predicted by the neo-classical theory.

However, the prospect for absolute beta-convergence is as idealistic in the growth literature based on Sala-i Martin (2002) as in the profit-structure context of the banking industry. This is due to the strict requirement of absolute beta-convergence, which calls for homogeneity in the banks' long-run parameters. By such assumption, it disregards the structural endowments or innate traits of each bank in the sample. Consequently, following Sala-i-Martin (2002), one of the alternatives is to hold constant a set of control variables as proxy for the steady-states. Therefore, these bank-specific control variables ought to typify the banks' structural parameters and traits.

Then again, the resulting conditional beta-convergence should not be misconstrued that the profit series converges to an unconditioned steady-state. Instead, it converges to a steady-state, which is conditioned by the long-run structural parameters that are represented by the control variables. As a result, it is considered to be the weaker case of beta-convergence in comparison to the absolute convergence by Young *et al*. (2008).

2.2. Sigma-convergence

Parallel to the notion of beta-convergence is sigma-convergence, which Friedman (1992) and Quah (1993) credit to be of more pertinent interest as it unequivocally measures shrinkage in the deviation of the profit series from its mean over time. If the prediction of neo-classical growth theory holds, then deviations from profit mean should tend towards zero or close to zero in the long run as excess profits are eliminated. Apart from that, Young *et al*. (2008) proves that beta-convergence is a necessary but not a sufficient condition for sigma-convergence as the latter also takes into consideration the elements of uncertainties and statistical noises. Thus, it is befitting to consider sigma-convergence as a stricter reification of the neo-classical growth theory's prediction.

3. Review of Empirical Literature

As aforementioned, when evaluating the dynamics of bank profit, empirical researchers frequently measure and explain its persistence rather than its tendency to converge. Indeed, out of the many empirical studies that we have surveyed on the dynamics of bank profit, only two are found to delve into bank profit convergence. The key objective of these studies on profit convergence is to test for equitability in the profit distribution, which is a congenital property of a perfectly competitive market. Thus, bank

profit convergence is often considered within the context of regional economic integration and deregulation.

As such, both Evans *et al.* (2008) and subsequently Goddard *et al.* (2013) examine the extent of bank profit convergence resulting from greater integration of European Union (EU). Both studies affirm that opening and integration of EU members' financial markets promotes faster rate of bank profit convergence through more intense competition. However, Evans *et al.* (2008) conclude that while convergence of key profitability indicators such as ROA and ROE is apparent, such convergence does not materialize in the banks' asset–liability practice.

Since studies that examine the convergence of bank profit are limited, we are also inspired to draw references from studies that consider its persistence, which is dichotomously related to convergence. These studies include Amidu and Harvey (2016), Sinha and Sharma (2016), Pervan *et al.* (2015), Agostino *et al.* (2005), Goddard *et al.* (2011) and Berger *et al.* (2000).

Within the literature of persistent profit, most empirical studies are country-specific except for Goddard *et al.* (2011) which attempts to evaluate the determinants of profit persistence in 65 national banking industries. Upon estimating the individual country's level of profit persistence, Goddard *et al.* (2011) then determine the correlates that explain the profit persistence in these banking industries through a second-stage regression analysis. Intuitively, banking sectors of developing economies should have a higher profit persistence due to protectionism policies that purportedly stifles competition during the budding stage of their development cycles. In contrast, developed banking industries should be at the opposite spectrum with mediocre or negligible rate of profit persistence as competition abounds due to the absence of state coercion. However, Goddard *et al.* (2011) find that the profit persistence rate for both the USA and the UK is measured at 0.68, which is much higher than the average of 0.43.

This suggests that besides competition, there are other imperative factors that determine profit persistence. Indeed, in their second-stage regression analysis, Goddard *et al.* (2011) found that overall freedom in the financial sector has no significant explanatory power on the degree of persistence. However, contestability whether in the form of foreign or domestic entry does. Other significant determinants include market concentration as measured by Herfindahl-Hirscham Index (HHI) and level of competition as denoted by the Panzaar and Rosse H-statistic.

While the study of Goddard *et al.* (2011) is comprehensive, it aggregates banking sectors from economies that are widely disparate by their stages of development. Breaking it down by economic development, empirical studies that examine bank profit persistence in advanced economies such as Chronopoulos *et al.* (2015), Berger *et al.* (2000) and Agostino *et al.* (2005) reach a consensus that competition impairs profit persistence through the elimination of abnormal profits in the long run. However, the effects of geographical deregulation on profit persistence are ambiguous. While Chronopoulous *et al.* (2015) find that deregulations on interstate banking leads to a greater level of competition and henceforth reduces the degree of persistence in the US banking sector, Berger *et al.* (2000) maintain that the impact of geographical restriction on profit persistence is minimal. Instead, Berger *et al.* (2000) suggest

market power accrued either due to impediments to product market competition or due to informational opacity is a more critical contributing factor to bank profit persistence. In addition, Chronopoulous *et al*. (2015) note that when banks are accorded with higher freedom to diversify into different business segments, their profits tend to be persistent. This plausibly explains the proliferation of asset securitization business in the US banking sector, prior to the Global Financial Crisis (GFC) in 2007. In the Italian banking sector, Agostino *et al*. (2005) use an intriguing approach to measure profit persistence as the time-invariant component of ROA and ROE. Resultantly, they find a significant positive correlation between profit persistence and ownership concentration.

Empirical studies on bank profit persistence in developing economies are generally less insightful than those conducted for advanced economies. While the latter has progressed to explain the driving forces behind profit persistence, in general, the former merely measures the extent of profit persistence as the incidental product when ascertaining the determinants of bank profitability. This resulted in a gap in the literature between a mere measure of persistency and the revelation of its underlying motivating factors in the developing economies.

By way of examining the causes of prevailing low profitability in the Chinese banking sector during the period of 1997 to 2004, García-Herrero *et al*. (2009) found that the degree of bank profit persistence is 0.38, which if compared to Goddard *et al*. (2011) is surprisingly much lower than the USA and UK. The Indian banking sector is also found to be in the same league as China when Sinha and Sharma (2016) measure the degree of profit persistence in the Indian banking sector at 0.34. In contrast to most previous studies, Bektas (2007) rejects the unit root hypothesis and lends support to the non-persistent bank profit of the Turkish banking sector. This is further supported by the near-zero intercept of the AR(1) process, which alludes zero profit mean in the long run. Therefore, conclusion is drawn by Bektas (2007) that the market forces in the Turkish banking sector are working effectively to keep the banks in check by eradicating any excess profit.

By using Markov chain stochastic process method, which computes the probability of a bank switching from one profit class to another, Amidu and Harvey (2016) found that NIM as the proxy of profitability in the African banking sector is strongly persistent. When the proxy of profitability is alternated with ROE, the persistence has weakened considerably as compared to that of NIM, even though it is still high. Nonetheless, the result of strong persistence in NIM is not necessarily peculiar to the African banking sector as NIM is highly correlated with policy interest rate, which is generally intended to be stable over time.

Similarly, Pervan *et al*. (2015) use Markov chain method and yield some interesting and insightful findings on the persistence of profitability in the Croatian banking sector: banks that are saddled with low profitability has a higher degree of persistence, while the opposite is true for banks with high profitability. The asymmetric profit persistence indicates that banks with lower profitability face greater opposition to move up to higher-profitability class, while banks that are highly profitable have higher probability to slip and transit to a class of lower-profitability.

4. Model Specification and Estimation Strategy

Prior to evaluating the impact of credit market freedom on the convergence of bank profits, we undertake to estimate the beta-convergence rates as specified below:

$$\Delta \ln y_{it} = \alpha + \beta_{k,0} \ln y_{i,t-1} + \sum_{l} \beta_{k,l} \ln y_{i,t-1} \mathrm{Dum_l} + \sum_{m=1}^{5} \delta_{k,m} x_{m,it} + \emptyset \mathrm{CMRI}_t + \varepsilon_{it}, \quad (1)$$

y_{it} denotes bank ith profit before tax (PBT) at t time period, while $\mathrm{Dum_l}$ are the dummy variables that indicate the banks' type of ownership, where l represents SOCB, JSCB, CCB or RCB (note that to avoid dummy variable trap, dummy for foreign banks is dropped). CMRI_t is the credit market regulation index that measures the extent of freedom in the credit market. ε_{it} is the random error term and lastly, $x_{m,it}$ comprises control variables to account for the structural endowments and traits that are peculiar to the banks and the prevailing macroeconomic conditions. The choice of control variables is further expounded in Sections 5.1 and 5.2. $\beta_{k,0}$ in Eq. (1) denotes the convergence rate for foreign banks ($\beta_{k,l=\mathrm{foreign}}$), while the convergence rates for the remaining ownership structures are given as $\beta_{k,l} = \beta_{k,0} + \beta_{k,l}$. The theoretical value of $\beta_{k,l}$ ranges from zero to minus unity (inclusive). The larger the absolute value, the faster is its speed to converge. For the purpose of significance testing, the standard errors of the beta-convergence rates for ownerships other than foreign banks are recovered as following:

$$s.e.(\beta_{k,l}) = \sqrt{s.e.(\beta_{\mathrm{k},0}) + s.e.(\beta_{\mathrm{k},l}) + \mathrm{cov}(\beta_{\mathrm{k},0}, \beta_{\mathrm{k},l})}. \quad (2)$$

We estimate the beta-convergence rates in three models ($k = 3$). In the first model, we estimate Eq. (1) by restricting the control variables $x_{m,it}$ and the freedom variable CMRI_t. Effectively, it reduces the model to that of the absolute beta-convergence. Thus, the estimated beta coefficient of the first model ($\beta_{1,l}$) measures the convergence rates for each ownership structure in absolute terms without being subjected to any conditioning assumption. In the second stage, we enter the selected control variables and what follows is a model that exemplifies the notion of conditional beta-convergence. The resulting beta coefficient ($\beta_{2,l}$) measures the rate of convergence to a steady-state that is conditioned on the control variables being constant. The third model includes the freedom variable. In order to ascertain the impact of freedom on the speed of convergence, the beta coefficient estimates of the third model ($\beta_{3,l}$) are compared to $\beta_{2,l}$ of the second model. Consequently, a negative difference indicates that credit market freedom increases the speed of banks' profits convergence, while the opposite is true if the difference is found to be positive.

In order to test for sigma-convergence, we just need to replace $\Delta \ln y_{it}$ and $\ln y_{i,t-1}$ in Eq. (1) with ΔE_{it} and $E_{i,t-1}$, respectively, as shown below:

$$E_{it} = \alpha + \sigma_{k,0} E_{i,t-1} + \sum_{l} \sigma_{k,l} E_{i,t-1} \mathrm{Dum}_l + \sum_{m=1}^{2} \delta_m x_{m,it} + \emptyset \mathrm{CMRI}_t + \varepsilon_{it}, \quad (3)$$

where $E_{it} = \ln y_{it} - \ln \overline{y_i}$ and $E_{i,t-1} = \ln y_{it-1} - \ln \bar{y}_{i,t-1}$; $\bar{y}_t$ and $\bar{y}_{t-1}$ denote the cross-section mean profit at time t and $t-1$, respectively. Similarly, the rate of sigma-convergence for foreign banks ($\sigma_{k,l=\text{foreign}}$) is given by the coefficient $\sigma_{k,0}$, while the coefficients for other ownership structures are recovered as $\sigma_{k,l} = \sigma_{k,0} + \sigma_{k,l}$. Likewise, $\sigma_{k,l}$ is expected to take on a regular value between zero and minus unity with a higher absolute value indicates a higher speed of convergence. The standard errors of the sigma-convergence rates are recovered following the same procedure as Eq. (2).

Not unlike beta-convergence, we measure the effect of freedom on sigma-convergence in a two-step approach. In the first step, we estimate Eq. (3) by restricting only the freedom variable. The resultant estimates of sigma-convergence rates ($\sigma_{1,l}$) are then compared to the estimates obtained after accounting for the freedom variable ($\sigma_{2,l}$). In regard to the selected control variable for Eq. (3), they differ from those for Eq. (1). For the former, we only control for the structural heterogeneities among the banks, i.e. bank size and capitalization.

4.1. Choice of Estimator

Estimation of any panel dataset requires appropriate treatment of the heterogenous individual effects. The usual static panel estimator such as fixed effect estimator that transform Eq. (1) through either first-differencing or demeaning to sweep out the time-invariant individual effect is not applicable in this context, as it will render the transformed error term to be correlated with the transformed $\log y_{i,t-1}$. Applying the random effect estimator does not fare any better as shoving the time-invariant individual effects to the error term will again violate the assumption of exogeneity as $\log y_{i,t-1}$ is expected to be correlated with the time-invariant individual effect.

As such, Eq. (1) is estimated by using system GMM, which was proposed by Blundell and Bond (1998) as an improvised version to the original difference GMM by Arellano and Bond (1991). Difference GMM, as the name aptly suggests, involves taking the first-difference of Eq. (1) to expunge the individual effects. Thereafter, in order to circumvent the problem of endogeneity, difference GMM exploits the orthogonality restrictions that exist between the lags of endogenous variables in levels and the first-difference error terms of different order to derive the moment conditions. The parameters are then estimated by minimizing the quadratic distance function of these moment conditions so that they can satisfy the orthogonality restrictions as close as possible. The minimization can either be carried out in a one-step or two-step approach. The latter provides robust standard errors in the presence of heteroscedasticity.

However, difference GMM is undermined by two drawbacks. Firstly, taking the first-difference of an equation may accentuate the prevailing gaps in an unbalanced panel dataset. To better handle the missing data, we follow Arellano and Bover (1995) that uses an alternative transformation known as forward orthogonal deviation (FOD). Instead of taking the first-difference, FOD subtracts the average of all future available observations from the variable's contemporaneous observation. This ingeniously achieves the objective of purging the specific effects without accentuating the problem of missing data.

Then again, difference GMM is also saddled with acute problem of weak instruments for persistent series, which was uncovered by later literature such as Arellano

and Bover (1995) and Blundell and Bond (1998). They conclude that lag levels are weak instruments to the first-difference if the series is proven to be near persistent with autoregressive parameter at 0.8 and above. This is because movement of a near persistent series along the time path is mostly random. Therefore, new instruments in the form of first-difference were proposed by Arellano and Bover (1995) to instrument the endogenous variables in levels. Blundell and Bond (1998) then supplement these new instruments to the initial level instruments to compose a system of estimator, which is known as system GMM that effectively compensates for any finite sample bias and asymptotic imprecision due to persistency in the series. In brief, system GMM comprises two equations: the first-differenced equation which is instrumented by lags in level and the level equation, which is instrumented by lags in first-difference. Since profit levels are usually persistent especially for state-managed or state-connected banks, we employ the system GMM instead of difference GMM in this study. The former is also known to be more robust as the parameters are estimated with larger set of instruments.

5. Data and Selection of Control Variables

Our datasets are collected from *Bankscope* database, which includes an unbalanced panel data of 96 commercial banks from 2007 to 2014. To ensure data completeness, out of the eight years of sample period, data of all variables have to be available for at least five years. The final sample consists of 4 SOCB, 47 CCB, 22 foreign banks, 9 JSCB and the remaining as RCB. All in all, our analysis comprises 651 bank year observations.

The control variables that are entered into Eqs. (1) and (3) have direct implication on not only the magnitude but also consistency of the measured convergence rates. Hence, the selected control variables comprise two kinds: (1) bank-specific control variables to account for the heterogenous traits and structural differences across the banks and (2) macroeconomic variables to control for the effects of prevailing economic conditions. The bank-specific control variables are made up of standard bank profit determinants based on their plausible impact on profit convergence.

5.1. Bank-specific Control Variables

Credit risk is known to be one of the critical determinants of bank profits. As such, banks that are able to manage their credit risk well are expected to operate on a different level of profits than those that are not. When credit risk is considered in bank profit model, it is often represented by the ratio of loan loss provision to term loan (see Sufian, 2009 and Sinha and Sharma, 2016). However, as this study involves the properties of bank profit convergence that are of long-run nature, we opine that it is more appropriate to account for the banks' credit risk through the use of balance sheet variables to accentuate the cumulative effect over time. Hence, consistent with Heffernan and Fu (2010), we use the loan loss reserve to gross loan ratio (LLRGL) as the proxy for credit risk. While Heffernan and Fu (2010) noted significant correlations between LLRGL and most of the main indicators of profitability such as economic value added

(EVA), ROAA and NIM, the uncovered correlations are surprisingly positive ones. This brings out the ambiguity that LLRGL has on profitability. While a higher ratio of LLRGL indicates prospect of large write-off due to the banks' undertaking of risky assets, it could also indicate the amount of prudence put forth in managing their assets. Furthermore, if risk-pricing is practiced by the banks, it may lead to higher interest margin accordingly.

Since we enter absolute profit levels as the dependent variable instead of size-normalized profit ratio, it is imperative that our models account for the size effect so as to avoid biased estimates. Apart from that, bank size is also a good control for scale efficiency. Combing through the literature, the ambiguity surrounding the effect of bank size on profitability is pronounced. While Ben Naceur and Goaied (2008) and Sufian and Habibullah (2009) find evidence of a negative correlation, Kosmidou (2008) and Sufian and Noor Mohamad Noor (2012) suggest a positive one instead. The paradox was explained away by Chronopoulos *et al*. (2015) and Eichengreen and Gibson (2001) by positing a non-linear relationship between bank size and profitability. Keeping to the literature, we use the natural logarithm of total assets (LNTA) as proxy for bank size.

Banks' capitalization too is expected to be one of the significant control variables that need to be accounted for so that conditional beta-convergence materializes. Gambacorta and Mistrulli (2004) find that well-capitalized banks are better poised against monetary as well as GDP shocks. Consequently, these banks are better equipped to withstand business cyclical corrections, which then render their performances more persistent than those with lower capitalization. In the same vein, Berger (1995) postulates the expected bankruptcy cost (EBC) hypothesis to rationalize the positive correlation that is found between capitalization and profitability in the US banking sector. Expected bankruptcy cost is computed as the product of the banks' probability of failure and its associated liquidation cost, which creditors are obliged to absorb. Since well-capitalized banks have lower expected bankruptcy costs, interest rate demanded by creditors on the uninsured debts are expected to be lower. As a result, EBC hypothesis predicts banks with large capitalization to yield a higher level of profits than others. Consistent with most empirical studies, capitalization is measured as the quotient between total equity and total assets (EQASS) in this study.

The last control variable to be considered is the cost to income ratio (CI), which is computed as the quotient between total operating cost and total operating income. It measures the banks' operational efficiency that is driven by an assortment of factors such as technology, managerial efficiency and the level of motivation. A larger value of CI indicates a higher level of inefficiency. Drawing insights from the literature of efficient structure hypothesis (ESH), more efficient banking firms as indicated by lower CI tend to get larger shares of profits than those that are inefficient and subsequently outlive them. As these efficient banks thrive over the inefficient ones, we expect their profit levels to persist as the banking sector becomes more concentrated. Thus, expectedly, Goddard *et al*. (2011) reveal a significant negative relationship between CI and the degree of profit persistence, while Chan and Karim (2010) uncover a significant negative correlation between cost inefficiency and market concentration.

5.2. Macroeconomic Variables and Freedom Variable

Macroeconomic variables are included in the convergence model of this study to control for the prevailing economic conditions. By doing so, the estimated convergence rates are independent of economic performances. The two macroeconomic variables that are commonly controlled for are gross domestic product in logarithm (LGDP) that measures a country's gross productivity and inflation rate (IF), which is a common measure of price stability in the economy.

In regard to freedom, there are two authoritative indices that are available as proxies: Economic Freedom for the World (EFW) database by Fraser Institute and the Index of Economic Freedom (IEF) by Heritage Foundation. Since our primary concern is on the extent of freedom in the credit market, we deem Credit Market Regulation Index (CMRI), which is compiled under the EFW database more suited for the purpose of this study. CMRI measures the extent of regulation in the credit market from three perspectives: (1) bank ownership, (2) private sector credit and (3) interest rate control, which are the three key areas that China strives to improve in its banking sector.

5.3. Regularity of Control Variables

As severe multicollinearity saps the precision of the estimates by exacerbating their variances, Table 1 shows the pairwise correlation matrix of the independent variables.

Table 1 shows that the degree of correlation between the one period lag of profit before tax in logarithm ($\ln y_{t-1}$) and bank size (LNTA) is too high to be disregarded without any redress or justification. Conventionally, one of these variables needs to be dropped to avoid the problem of multicollinearity. However, in this empirical study, we cannot afford to drop either. $\ln y_{t-1}$ is required to examine the dynamics of profit series, while empirical literature alludes LNTA as a significant condition that need to be controlled for to allow for convergence to take place. It is simply not sensible to assume the profit level of larger banks to converge at the same level as small banks.

In addition, it should be noted that the objective of this empirical study is not to examine the determinants of profit growth but to measure its convergence rate by realistically conditioning the representation of the steady-state. To this objective, the choice of control variables is important and LNTA is indispensable. In addition, it should be noted that multicollinearity does not implicate consistency of the estimates.

Table 1. Pairwise correlation matrix.

	$\ln y_{t-1}$	LNTA	LLRGL	CI	EQTA	IF	LGDP	CMRI
$\ln y_{t-1}$	1.00							
LNTA	0.96	1.00						
LLRGL	0.17	0.13	1.00					
CI	−0.16	−0.08	−0.11	1.00				
EQTA	−0.36	−0.42	−0.21	0.06	1.00			
IF	−0.08	−0.12	−0.02	−0.02	−0.02	1.00		
LGDP	0.20	0.24	0.08	−0.01	−0.05	−0.45	1.00	
CMRI	0.11	0.14	0.09	0.05	−0.03	−0.39	0.52	1.00

Instead, it moderates their efficiency. Even so, the convergence rates as measured by the coefficients associated with the lagged variables are still significant. Thus, we come to the decision to make no adjustment to the model. Instead, we shall exercise caution when interpreting the estimated coefficient of LNTA.

Lastly, a summary of descriptive statistics of all variables that are used in this analysis is provided in Table 2.

6. Empirical Results and Discussion

Table 3 displays the rates of absolute and conditional beta-convergence of the Chinese banking sector broken down by the types of ownership structure. As shown, while all the estimated absolute convergence rates satisfy the regularity condition by taking on the value between zero and minus unity, none of them is of significance at any conventional level. Hence, we conclude that absolute convergence does not take place.

In contrast, once the convergence of bank profit growth is constrained by holding the macroeconomic and bank-specific structural as well as traits variables constant, the regular rates of convergence display significance at the level of 1% for all ownership types. In addition, these estimated convergence rates are also reasonably uniform with the average speed of convergence estimated to be marginally over two years. Thus, the Chinese banks are expected to tend towards their long-run steady-state that is conditioned on the control variables in a relatively short period of two years.

Thereafter, the profit growth model is further augmented with freedom variable (CMRI) in model 3a, which resultantly suggests a negative relationship between CMRI and profit growth that is statistically significant at the 1% level. The coefficient associated with CMRI alludes that for every 1% of freedom that the state allows in the credit market, the bank profit growth rate will reduce significantly by 243 percentage points. The negative effect that freedom has on bank profit is realized through the conduit of competition. It is conjectured that the biggest impact is instigated by the deregulation of lending rate and deposit rate limits since 2003, which is often attributed as the underlying cause for the banks' profit margin compression.

Upon noting the negative impact of credit market freedom on banks' profit growth, a natural progression in our investigation is to examine whether freedom in the credit market furthers or hinders the banks' propensity to tend towards their conditional long-run equilibrium as predicted by the neo-classical theories. To this end, we

Table 2. Descriptive statistics.

Variable Name	Abbreviation	Mean	Std.	Min	Max
Profit growth rate	$\Delta \ln y$	0.17	0.37	−5.47	1.28
Profit level	$\ln y$	5.74	1.68	−0.94	11.10
Inflation rate	IF	2.98	1.56	1.26	6.58
Capitalization Ratio	EQTA	9.02	6.27	−6.42	59.06
Total Assets	LNTA	9.76	1.80	5.68	15.03
Loan loss reserve to gross loan ratio	LLRGL	2.31	1.38	0.05	22.02
Cost to Income ratio	CI	58.43	40.49	−130.40	845.55
Credit market regulation index	CMRI	1.95	0.03	1.91	1.98

Table 3. Beta-convergence (absolute and conditional).

$$\Delta \ln y_{it} = \alpha + \beta_{k,0} \ln y_{i,t-1} + \sum_{l} \beta_{k,l} \ln y_{i,t-1} \mathrm{Dum}_l + \sum_{m=1}^{5} \delta_m x_{m,it} + \emptyset \mathrm{CMRI}_t + \varepsilon_{it}$$

	Model 1a: Absolute Convergence				Model 2a: Conditional Convergence (without CMRI)				Model 3a: Conditional Convergence (with CMRI)				
	Coeff (a)	Corr. Std Error (b)	*z*-value (c)	Speed of conditional convergence (years) (d) = 1/(a)	Coeff (g)	Corr. Std Error (h)	*z*-value (i)	Speed of conditional convergence (years) (j) = 1/(g)	Coeff (k)	Corr. Std Error (l)	z-value (m)	Speed of conditional convergence (years) (n) = 1/(k)	Effect of freedom (months)
FOREIGN ($\beta_{k,0}$)	−0.02	0.04	−0.64	44.04	−0.47	0.16	−3.02***	2.13	−0.43	0.13	−3.38***	2.35	2.7
SOCB ($\beta_{k,0} + \beta_{k,\mathrm{SOCB}}$)	−0.02	0.04	−0.37	61.06	−0.47	0.14	−3.34***	2.14	−0.41	0.11	−3.75***	2.43	3.4
JSCB ($\beta_{k,0} + \beta_{k,\mathrm{JSCB}}$)	−0.08	0.06	−1.37	13.05	−0.48	0.09	−5.38***	2.09	−0.44	0.08	−5.29***	2.29	2.4
CCB ($\beta_{k,0} + \beta_{k,\mathrm{CCB}}$)	−0.03	0.03	−1.23	31.83	−0.46	0.08	−5.65***	2.19	−0.41	0.07	−5.72***	2.46	3.2
RCB ($\beta_{k,0} + \beta_{k,\mathrm{RCB}}$)	−0.02	0.03	−0.84	40.25	−0.48	0.04	−13.30***	2.08	−0.43	0.04	−10.23***	2.32	2.9
LNTA	0.36	0.19	1.91**		0.47	0.14	3.36***		0.42	0.11	4.01***		
EQTA	−0.12	0.06	−2.13**		0.03	0.01	2.64***		0.02	0.01	2.19**		
LLRGL					−0.06	0.15	−0.42		−0.07	0.15	−0.48		
CI					0.00	0.00	−0.66		0.00	0.00	−0.62		
yeardum					−0.07	0.08	−0.94		0.03	0.08	0.43		
IF					0.04	0.02	2.34**		0.02	0.02	0.93		
LGDP					−0.17	0.13	−1.30		0.09	0.13	0.65		
_cons					−0.46	0.74	−0.62		2.27	1.87	1.21		
CMRI									−2.43	1.19	−2.03**		
No of Instruments	72.00					64.00				65.00			
No of Groups		96.00				93.00				93.00			

Hansen test *p*-value	0.65	0.30	0.50
Difference-in-Hansen *p*-value	0.89	0.13	0.50
AB(1) test *p*-value	0.00	0.00	0.00
AB(2) test *p*-value	0.27	0.33	0.34

Note: The dependent variable is the profit growth rate, which is measured as $\Delta \log y_{it}$. Above results are estimated by using two-step system GMM. The corrected standard error presented is as per Windmeijer (2005). *,** and *** indicate significance at the 10%, 5% and 1% level, respectively. $\beta_{k,l} = \beta_{k,0} + \beta_{k,l}$ is the beta-convergence rate, where k indicates the type of models and l indicates the respective ownership structure. AB(1) and AB(2) refer to the Arellano-Bond tests for first-order and second-order serial correlation respectively. Hansen is a test on the validity of the over-identified instruments, while difference-in-Hansen extents the test of validity to the subset of instruments used in system GMM.

compare the estimated convergence rates between the freedom-restricted models 2a and 3a, which have accounted for the effect of freedom. The last column in Table 3 reveals that despite average pace of profit convergence has reduced upon controlling for the effect of freedom, the magnitude of reduction is arguably negligible with the average time taken to converge increases by three months. Despite the freedom-attributed decline in the speed of profit convergence is minimal, it is found to be robust to various model re-specification.

In reference to the experiences of Eastern Europe's economic transition during the early 1990s, prices were seen to overshoot its long-run equilibrium at the onset of liberalization due to the prior strongly repressed inflation (Balcerowic and Gelb, 1994). Given the prolonged history of holding up profits through interest rate control in the Chinese banking sector, likewise, it is reasonable to expect the freedom-induced fall in the profit growth among the Chinese banks to overshoot its long-run path to equilibrium as well. Resultantly, by overshooting its equilibrium path, the time taken to converge will increase. Since our results show that the ensuing reduction in the speed of convergence after controlling for the effect of freedom is hardly material, it suggests that China has skilfully balanced the liberalization initiatives with stabilization measures to ameliorate the prevalence of market forces in order to avoid excessive shocks.

Incidentally, out of the four bank-specific control variables that are considered in the growth model, only two structural variables, capitalization ratio (EQTA) and bank size (LNTA), are found to be of significance in determining the bank profit growth rates. The positive sign associated with the coefficient of EQTA indicates that banks with higher capitalization ratio are rewarded with higher profit growth rates. Nonetheless, the noted positive relationship between LNTA and profit growth is counter-intuitive as larger banks normally have a lower growth rate than the smaller ones. This is plausibly the consequence of multicollinearity due to the high correlation between LNTA and the lagged dependent variable as illustrated in Table 1. Apart from that, on the macroeconomic control variables, only inflation rate is found to have any significance at the level of 5%. However, the effect of inflation has turned insignificant upon entering the CMRI variable.

In regard to sigma-convergence, column (a) of Table 4 displays the sigma-convergence rates before controlling for the freedom variable. As shown, the estimated sigma-convergence rates ($\sigma_{1,l}$) for all ownership structures satisfy the regularity condition by taking on values between 0 and −1. However, these convergence rates are found to be statistically not significant. Meanwhile the control variables EQTA and LNTA are statistically significant at 1% and 10% levels, respectively.

Upon including CMRI_t into the model, the resulting sigma-convergence rates ($\sigma_{2,l}$) are revealed in column (d) of Table 4. Apart from taking on theoretically consistent values, convergence rates of all ownership structures, save for SOCB's and foreign banks', have turned statistically significant at the minimum of 10% level. Thus, freedom in the credit market can be deemed as the catalyst for sigma-convergence for all ownership structures other than SOCB and foreign banks, which is intuitive as both represent the two extrema in the distribution of Chinese bank profits.

This suggests that even upon accounting for the effect of freedom in the credit market, profit levels of SOCB and foreign banks are not equitable to other banks of different types of ownership in the long run due to the nature of their ownership

Table 4. Sigma-convergence.

$$E_{it} = \alpha + \sigma_{k,0}E_{i,t-1} + \sum_{l} \sigma_{k,l}E_{i,t-1}\mathrm{Dum}_l + \sum_{m=1}^{2} \delta_{k,m}x_{m,it} + \emptyset\mathrm{CMRI}_t + \varepsilon_{it}$$

	Model 1b: Sigma-convergence (w/o CMRI)			Model 2b: Sigma-convergence (with CMRI)			
	Coeff (a)	Corrected Std Error (b)	t-value (c)	Coeff (d)	Corrected Std Error (e)	t-value (f)	Speed of sigma convergence (years) (g) = −1/(d)
FOREIGN ($\sigma_{k,0}$)	0.05	0.14	0.38	−0.10	0.11	−0.87	10.08
SOCB ($\sigma_{k,0} + \sigma_{k,\mathrm{SOCB}}$)	0.18	0.22	0.82	−0.07	0.15	−0.47	13.78
JSCB ($\sigma_{k,0} + \sigma_{k,\mathrm{JSCB}}$)	−0.09	0.35	−0.24	−0.30	0.15	−2.08**	3.29
CCB ($\sigma_{k,0} + \sigma_{k,\mathrm{CCB}}$)	−0.06	0.21	−0.28	−0.21	0.12	−1.76*	4.67
RCB ($\sigma_{k,0} + \sigma_{k,\mathrm{RCB}}$)	−0.07	0.11	−0.67	−0.24	0.14	−1.74*	4.12
yeardum	−0.08	0.10	−0.79	0.14	0.09	1.62	
LNTA	−0.14	0.08	−1.67*	0.17	0.12	1.43	
EQTA	−0.03	0.01	−2.74***	0.00	0.01	−0.32	
_cons	1.61	1.15	1.40	4.48	0.84	5.30***	
CMRI				−3.31	0.74	−4.44***	
No of Instruments		47.00			48.00		
No of Groups		96.00			96.00		
Hansen test *p*-value		0.16			0.48		
Difference-in-Hansen *p*-value		0.44			0.11		
AB(1) test *p*-value		0.00			0.00		
AB(2) test *p*-value		0.20			0.21		

Note: The dependent variable is E_{it}, which is given as $\ln y_{it} - \ln \bar{y}_t$, where $\bar{y}_t$ is the cross-sectional mean at time t. Above results are estimated by using two-step system GMM. The corrected standard error presented is as per Windmeijer (2005). *,** and *** indicate significance at the 10%, 5% and 1% level, respectively. $\sigma_{k,l} = \sigma_{k,0} + \sigma_{k,l}$ is the sigma-convergence rate, where k indicates the type of model and l indicates the respective ownership structure. AB(1) and AB(2) refer to the Arellano-Bond tests for first-order and second-order serial correlation respectively. Hansen is a test on the validity of the over-identified instruments, while difference-in-Hansen extents the test of validity to the subset of instruments used in system GMM.

structures. Given the substantial state ownership of up to 70%, unless it is cut back, SOCB are foreseeably bound to prioritize national interests over market-oriented practices. As argued by Kwong (2011), the maximizing behaviour of SOCB is still very much constrained by the state directives.

On the other hand, the extent of ongoing liberalization in the credit market does not seem to be sufficient to allow the foreign banks to operate in the same scale and manner relative to the remaining local banks (JSCB, CCB and RCB). This indicates that despite the demise of explicit restrictions on foreign banks by Chinese authority upon becoming a member of WTO, foreign banks still face soft limitations on their operation such as cultural differences, access to political network and scale of their operation. Meanwhile, the average speed of convergence for those converging ownership structures is approximately 4 years.

In passing, CMRI is uncovered to have a negative correlation with the change of bank profits dispersion that is significant at the 1% level. The sign and size of the coefficient suggest that an increase of 1% freedom in the credit market is expected to reduce profit dispersion by 362 percentage points. Apart from that, inclusion of CMRI has also rendered the otherwise significant control variables insignificant.

7. Conclusion

In this study, we have considered five models to analyse the convergence properties of bank profit in the Chinese banking sector. The first three of the five models are of the beta-convergence form, while the remaining two models display convergence of bank profit in the sense of mean deviation (sigma-convergence). As China has been undergoing a prolonged phase of managed transition, further market reforms are expected to be pushed out to further rescind the state's domination in the economy. Therefore, this study undertakes to evaluate the impact of credit market freedom on the beta- and sigma-convergence of banks' profits.

Our analysis on beta-convergence revealed that convergence to a common unconditioned steady-state (absolute convergence) does not take place at all. However, once the trait and structural disparities across bank units are accounted for, all ownership structures are found to tend significantly and speedily towards a steady-state conditioned by the control variables (conditional convergence). When freedom variable is entered to make up the fully unrestricted model, it is found to be negatively correlated with profit growth. The uncovered negative correlation gives a lot of weight to the interest rate liberalization as a plausible underlying cause for the recent declining growth in bank profits. As the banks' protected margin wanes in consequence to the state's progressive removal of interest rate controls, banks find themselves engaged in a price war, which subsequently drives down their margin.

While cheaper price of credit coupled with deregulation in private sector lending provides an alternative economic stimulus to the abating state-driven investment, such structural rebalancing causes the systemic risk to exacerbate. On one hand, banks' immunity to shocks weakens as their profitability falls due to excessive competition, while on the other hand, the linkage between the financial sector and real sector becomes more pronounced through the proliferation of private sector credit. These conjoining factors do not only render the banks vulnerable but also facilitate the transmission of shocks from the banking sector to the real sector.

In this regard, we find evidence that the CBRC has been doing a reasonably great job in ameliorating market reform-induced shocks to its sacrosanct banking system. Since profitability of the Chinese banks has a long history of being "artificially" propped up by the state's interest rate control, we expect efforts to liberalize interest rate will bring forth not only a declining trend in the profit growth but also a falling momentum, which is so great that causes the profit growth to fall excessively beyond its long-run equilibrium path. On the contrary, our results show that the effect of overshooting due to freedom is arguably negligible.

Delving into the sigma-convergence of bank profit we find that prior to accounting for the effect of freedom, deviations from mean profit are persistent over time for all ownership structures. However, once freedom in the credit market is controlled for, the profit level distribution of all ownership structures except for SOCB and foreign banks are found to be converging. Arising from this are two key takeaways: (1) despite the prevailing freedom in the credit market, market-oriented practices come second for SOCB with the first being public or national interest and (2) liberalization of the credit market does little to enable foreign banks to operate in a more equitable scale, reach and manner relative to the local banks. However, it should be noted that this study samples from 2007 to 2014 and the last milestone of interest rate liberalization was only completed at the end of 2015. Thus, the impact of freedom on the convergence of bank profit can move one notch higher when interest rate is fully liberalized.

Those ownership structures whose profit distribution are seen to be converging, i.e. JSCB, CCB and RCB, will find their profit levels equitable in approximately four years after accounting for structural heterogeneities such as bank size and capitalization. Thus, any form of excess profit will be exterminated by competition in these three ownership structures. Therefore, moving forward, it is important for these banks to consider a Schumpeterian-type of growth framework, which is built on innovations and inventions. While any Schumpeterian-rent accrued to one innovation could quickly dissipate when the innovation is disseminated throughout the banking sector, Roberts (2001) argues that such imitative pressure from peers is only applicable on the product or innovation per se but not on the firm itself. Thus, by overturning the misconstrued idea that a firm is tied to a single-innovation, then the firm's persistent profit at the excess level could be explained by the firm's multi-innovations or multi-products that are spread out across different stages of the competitive-cycle.

Even though returns of one innovation may trail off after a spike at the initial stage, the firm's profitability may not follow the same course if the creative destruction process is maintained with subsequent innovations by the incumbent firm. In the long run, the cycle of innovation and destruction will likely cause the franchise value of the incumbent firm to surpass its imitators. Moreover, the incumbent firm has an edge to continue innovating, given the spurts of excess returns since its first innovation.

Note

1. The two-step approach of system GMM estimation employed in this study further safeguards the estimates from the impact of heteroscedasticity.

ORCID

Woon Kan Yap http://orcid.org/0000-0002-3730-4628

References

Agostino, M., Leonida, L. and Trivieri, F. (2005) Profits persistence and ownership: evidence from the Italian banking sector, *Applied Economics*, 37(14), pp. 1615–1621.

Amidu, M. and Harvey, S.K. (2016) The persistence of profits of banks in Africa, *Review of Quantitative Finance and Accounting*, 47(1), pp. 83–108.

Arellano, M. and Bond, S. (1991) Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, *The Review of Economic Studies*, 58(2), pp. 277–297.

Arellano, M. and Bover, O. (1995) Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics*, 68(1), pp. 29–51.

Balcerowic, L. and Gelb, A. (1994) Macropolicies in transition to a market economy: a three-year perspective, *The World Bank Economic Review*, 8(suppl 1), pp. 21–44.

Barro, R.J. and Sala-i-Martin, X. (1992) Convergence, *Journal of Political Economy*, 100(2), pp. 223–251.

Bektas, E. (2007) The persistence of profits in the Turkish banking system, *Applied Economics Letters*, 14(3), pp. 187–190.

Ben Naceur, S., and Goaied, M. (2008) The determinants of commercial bank interest margin and profitability: evidence from Tunisia, *Frontiers in Finance and Economics*, 5(1), pp. 106–130.

Berger, A.N. (1995) The relationship between capital and earnings in banking, *Journal of Money, Credit and Banking*, 27(2), pp. 432–456.

Berger, A.N., Bonime, S.D., Covitz, D.M. and Hancock, D. (2000) Why are bank profits so persistent? The roles of product market competition, informational opacity, and regional/macroeconomic shocks, *Journal of Banking & Finance*, 24(7), pp. 1203–1235.

Blundell, R. and Bond, S. (1998) Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, 87(1), pp. 115–143.

Casu, B. and Girardone, C., 2010. Integration and efficiency convergence in EU banking markets, *Omega*, 38(5), pp. 260–267.

Chan, S.G. and Karim, M.Z.A. (2010) Bank efficiency and macro-economic factors: the case of developing countries, *Global Economic Review*, 39(3), pp. 269–289.

Chronopoulos, D.K., Liu, H., McMillan, F.J. and Wilson, J.O. (2015) The dynamics of US bank profitability, *The European Journal of Finance*, 21(5), pp. 426–443.

Eichengreen, B. and Gibson, H. D. (2001) Greek banking at the dawn of the new millennium, in: R. C. Bryant, N. C. Garganas and G. S. Tavlas (Eds) *Greece's Economic Performance and Prospects* (Athens and Washington D.C: Bank of Greece, Brookings Institution).

Evans, P., Hasan, I. and Lozano-Vivas, A. (2008) Deregulation and convergence of banking: the EU experience. *Finnish Economic Papers*, 21(2), pp. 104–117.

Friedman, Milton (1992) Do old fallacies ever die? *Journal of Economic Literature*, 30(4), 2129–2132.

Gambacorta, L. and Mistrulli, P.E. (2004) Does bank capital affect lending behavior? *Journal of Financial Intermediation*, 13(4), pp. 436–457.

García-Herrero, A., Gavilá, S. and Santabárbara, D. (2009) What explains the low profitability of Chinese banks? *Journal of Banking & Finance*, 33(11), pp. 2080–2092.

Goddard, J., Liu, H., Molyneux, P. and Wilson, J.O. (2011) The persistence of bank profit, *Journal of Banking & Finance*, 35(11), pp. 2881–2890.

Goddard, J., Liu, H., Molyneux, P. and Wilson, J.O. (2013) Do bank profits converge? *European Financial Management*, 19(2), pp. 345–365.

Heffernan, S.A. and Fu, X. (2010) Determinants of financial performance in Chinese banking, *Applied Financial Economics*, 20(20), pp. 1585–1600.

Hsiao, C., Yan, S.H.E.N. and Wenlong, B.I.A.N. (2015) Evaluating the effectiveness of China's financial reform—the efficiency of China's domestic banks. *China Economic Review*, 35, pp. 70–82.

Kasman, A. and Kasman, S. (2013) Efficiency convergence in All EU member and candidate countries' banking markets: a dynamic panel data analysis, *Eastern European Economics*, 51(3), pp. 50–70.

Kosmidou, K. (2008) The determinants of banks' profits in Greece during the period of EU financial integration, *Managerial Finance*, 34(3), pp. 146–159.

Kwong, C.C. (2011) China's banking reform: the remaining agenda, *Global Economic Review*, 40(2), pp. 161–178.

Mamatzakis, E., Staikouras, C. and Koutsomanoli-Filippaki, A. (2008) Bank efficiency in the new European union member states: is there convergence? *International Review of Financial Analysis*, 17(5), pp. 1156–1172.

Mueller, D.C. (1986) *Profits in the Long run* (Cambridge, United Kingdom: Cambridge University Press).

Pervan, M., Pelivan, I. and Arnerić, J. (2015) Profit persistence and determinants of bank profitability in Croatia, *Ekonomska Istraživanja*, 28(1), pp. 284–298.

Quah, D. (1993) Galton's fallacy and tests of the convergence hypothesis, *The Scandinavian Journal of Economics*, 95, pp. 427–443.

Roberts, P.W. (2001) Innovation and firm-level persistent profitability: a Schumpeterian framework, *Managerial and Decision Economics*, 22(4–5), pp. 239–250.

Sala-i-Martin, Xavier (2002) 15 Years of New Growth Economics: what Have We Learnt? UPF Economics and Business Working Paper No. 620.

Sinha, P. and Sharma, S. (2016) Determinants of bank profits and its persistence in Indian banks: a study in a dynamic panel data framework. *International Journal of System Assurance Engineering and Management*, 7(1), pp. 35–46.

Sufian, F. (2009) Determinants of bank profitability in a developing economy: empirical evidence from the China banking sector, *Journal of Asia-Pacific Business*, 10(4), pp. 281–307.

Sufian, F. and Habibullah, M.S. (2009) Bank specific and macroeconomic determinants of bank profitability: empirical evidence from the China banking sector, *Frontiers of Economics in China*, 4(2), pp. 274–291.

Sufian, F. and Noor Mohamad Noor, M.A. (2012) Determinants of bank performance in a developing economy: does bank origins matters? *Global Business Review*, 13(1), pp. 1–23.

Weill, L. (2009) Convergence in banking efficiency across European countries, *Journal of International Financial Markets, Institutions and Money*, 19(5), pp. 818–833.

Windmeijer, F. (2005) A finite sample correction for the variance of linear efficient two-step GMM estimators, *Journal of Econometrics*, 126(1), pp. 25–51.

Young, A.T., Higgins, M.J. and Levy, D. (2008) Sigma convergence versus beta convergence: evidence from US county-level data, *Journal of Money, Credit and Banking*, 40(5), pp. 1083–1093.