Does Basel III-Compliant Bank Efficiency Enhance Industry Growth in Developing Countries?

By

Ali Mirzaei[a] and Tomoe Moore[b*]

[a] Finance Department, School of Business Administration,
American University of Sharjah, PO Box 26666,
Sharjah, United Arab Emirates, Tel: + 97 165154645, amirzaei@aus.edu

[b] Department of Economics and Finance, Brunel University London,
Uxbridge, Middlesex, UB8 3PH, UK.
Tel: + 44 1895274000, Fax: +44 1895269770
*Corresponding author: tomoe.moore@brunel.ac.uk

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In this article, we propose an efficiency model by specifying the new structural liquidity indicator of Basel III using bank level data. We find that compliance with Basel III increases bank efficiency for 52 developing countries. Using the estimated Basel III-compliant efficiency, we then analyze its effect on the growth of 28 manufacturing sectors during 2001-2009. The result reveals that such risk-adjusted bank efficiency is positively associated with the growth of those industries that are financially more vulnerable during the pre-crisis period. However, during the recent financial crisis, bank efficiency has an overall positive impact on all industries regardless of the degree of external-finance dependence. This implies that Basel III regulations may mitigate the adverse impact of financial crises on the real sector. The result also highlights that quality finance is more important than quantity finance.

Key words: Basel III; bank efficiency; financially vulnerable industries; industry growth

JEL Classification: G01, G21, G28, L6

1. Introduction

An extensive literature has analyzed the influence of finance on economic growth. However, a new strand of literature reports a vanishing effect of quantity finance where there is a non-monotonic relationship between financial depth and growth (Beck et al. 2014; Law and Sing, 2014; Arcand et al. 2015). In addition, a number of other parallel studies suggest that quantity effects alone may be insufficient to spark growth. The empirical work on quality effects is borne out of criticism of the quantity effect (Lucchetti et al. 2001; Hasan et al. 2009a; Hasan et al. 2009b). Furthermore, financial crises can adversely affect the finance-growth relationship. For instance, many studies have documented the adverse effect of the recent global banking crisis on economic growth (Klapper and Love, 2011; Laeven and Valencia, 2013). Bank-specific shocks dampen economic growth through decreasing capital-allocation efficiency (Fernández et al. 2013a) and through cutting down of lending (Kroszner et al. 2007; Dell' Ariccia et al. 2008). The severe adverse impact of the financial crisis on the real economy has urged policy makers to set new financial stability policies in order to maintain the role of financial systems for sustainable economic growth. One such policy is a new structural liquidity framework of Basel III, namely, Net Stable Funding Ratio (NSFR).

This paper advances previous work on the quality of finance and growth from three aspects: Firstly, we propose a measure of bank efficiency at a bank level as a proxy for quality finance by taking into account the role of compliance with Basel III, i.e. the effect of new structural liquidity, NSFR. Secondly, we investigate the effect of such bank risk-adjusted efficiency[1] on output growth of manufacturing sectors in developing countries. Thirdly, we examine whether the impact of bank risk-adjusted efficiency on economic growth is maintained during financial crises. Specifically, we address the two questions: i) does bank efficiency that is compliant with Basel III improve economic growth? and ii) does such risk-adjusted bank efficiency assist in mitigating the adverse impact of financial crises on the real economy?

We derive a measure for the intermediation quality at the individual bank level and test how banks' efficiency converts resources into industry performance. Hence, we first estimate an efficiency model, where we specify an indicator for new bank structural-liquidity by using a

[1] We use the term 'risk-adjusted' when bank efficiency is estimated by incorporating the new structural- liquidity.

large bank-level dataset for 52 developing countries over the period 2001-2009. By incorporating these risk-adjusted bank-efficiency scores into an industry-level database, we then analyse the impact of efficiency on output growth for 28 manufacturing sectors before and during the financial crisis periods, respectively.

Conventional wisdom suggests that a departure from bank efficiency may introduce inefficiencies into the allocation of resources in the credit market. An efficient banking sector contributes to the growth of firms through several channels, for example, by increasing credit supply, by reducing cost of capital, by effectively monitoring borrowers and/or by establishing more lending relationships with borrowers. Hence, efficiency seems to capture the allocative function of banks better than other measures, such as the amount of credit granted to firms, in that the ability to use the available technology and to optimally combine the inputs into the production process can be considered a necessary condition for the optimal allocation of resources. Thus, one would expect that well-functioning financial intermediaries channel scarce resources into qualitative financial products and services that produce growth. Empirically, however, there are a few studies that examine the association between bank efficiency, as a proxy for quality finance, and economic growth (Hassan et al. 2009a and 2009b, Koetter and Wedow 2010, among others).

However, financial crises, especially, the recent sub-prime related crisis, have underscored the importance of a healthy banking sector in allocating financial resources across non-financial firms. In order to acquire a prudential-functioning of the banking system, international regulatory standards such as Basel III have been proposed. Basel III sets new capital target ratios and new standards for short-term and long-term funding. One important component of Basel III that addresses long-term funding is a new structural liquidity, i.e. NSFR, which stipulates a minimum amount of stable-source funding at a bank relative to the maturity profile of its assets. It is argued that compliance with this new liquidity requirement of Basel III may affect bank performance (e.g. bank efficiency) and consequently the real sector (e.g. see Demirgüç-Kunt and Huizinga, 2011; Kapan and Mioiu, 2013; Ayadi et al. 2016). For example, Kapan and Mioiu (2013) point out that a major concern regarding compliance with new rules is that it may dampen bank performance and curb banks' ability to extend credit.

To the best of our knowledge, Mirzaei and Moore (forthcoming) is the only study, which examined the impact of bank efficiency on industrial growth in advanced and emerging economies. We extend their study by estimating the risk-adjusted bank efficiency, taking the impact of compliance to Basel III with the focus on developing countries. Note that some papers (Lucchetti et al. 2001; Hasan et al. 2009b; Koetter and Wedow, 2010) studied the impact of bank efficiency on growth, but for aggregate economic growth.

The contribution of our paper is four-fold. First, as an innovation to the existing literature on estimating bank efficiency, we incorporate the effect of Net Stable Funding Ratio (NSFR) on bank efficiency. This would help policymakers in implementing policies aimed at ensuring financial stability, since Basel III is to be adopted in different phases over time with complete implementation in 2018. We are the first to provide an insight into the likely effects of NSFR on bank efficiency and of how such impact would be channelled to real-sector performance if it had been implemented during our sample period. Second, unlike the studies of Lucchetti et al. (2001), Hasan et al. (2009b) and Koetter and Wedow (2010) who use country-level data, we use industry data. This enables us to overcome the endogeneity problem that exists in the finance – growth nexus. Specifically, we take account of the varying degrees of external financial-dependence across industrial sectors by adopting the method developed by Rajan and Zingales (1998). Industries differ amongst each other in terms of their relative dependence on external sources of finance. It is hypothesized that those financially vulnerable industries may benefit more from an efficient banking system than those with a low dependence on external sources of finance. This methodology has been widely applied in literature (e.g. Cetorelli and Gambera 2001, Claessens and Laeven 2003; Claessens and Laeven 2005; Hsu et al. 2014).

Third, we use data for 52 developing countries where industrialization is in progress and hence understanding determinants of industrial growth could provide useful policy implications[2].

[2] As an economy develops, the need for industrial products gradually declines, whereas demand for services starts increasing, making services more important as a share of GDP. For low-income developing economies, industrial growth is still a necessary condition for economic growth. Hence, our focus is on industrial sectors in analysing the effect of financial development. Note also that producing services tends to require relatively less physical capital but more human capital than producing industrial goods, implying less need for finance in service sectors. This may also justify our exclusion of service sectors.

In addition, in contrast to industrialized economies where there are often complex and high risk projects that require sophisticated financial products, standard financial products are more required to finance lower risk projects in developing countries (Demirgüç-Kunt et al. 2013; Arcand et al. 2015). Thus, it is likely that the services provided by an efficient banking sector play a crucial role for the bank-based financial system in developing economies. Fourthly and finally, we study both the periods prior to and during the recent financial-crisis. This provides a useful insight for Basel regulators: Although the new Basel III requirements are aimed at safeguarding financial stability, it is possible that they may cause deterioration in the real sector.

Turning to our main results, we find that compliance with Basel III increases bank efficiency in developing countries, and such risk-adjusted efficiency is positively associated with the growth of industries that are financially more vulnerable. Bank efficiency has an economically sizeable impact: it alone explains around 34% of the observed growth in industrial growth and this is evident during the pre-crisis period. During the recent financial crisis period, bank efficiency has an overall positive impact on all industries regardless of the degree of external-finance dependence. A valid impact of bank efficiency on financially vulnerable industries is constrained in countries with a relatively high level of financial development during the crisis. These results suggest that potentially costly banking regulations improve the quality of finance, increase real sector growth and further enhance the resilience of economies to external shocks.

Our findings, however, cannot exactly define the concept of efficiency by which 'quality' translates into corporate sector growth, whilst in theory and surely in practice, measures of efficiency may be closely correlated with competitiveness. Hence, as a further robustness test, we examined the growth impact of the degree of bank competition as a potential complementary channel to industry growth. It is found that there is little evidence of a competition effect on growth and this seems to suggest that bank efficiency is the appropriate approximation for the quality of finance.

The remainder of the paper is organised as follows. Section 2 provides a literature review and discusses the hypotheses. Section 3 contains the illustration of the models including the estimation of the risk-adjusted efficiency measures and industry performance. The data set is explained in this section. The empirical results are presented in Section 4 together with some

robustness tests. The results during the financial crisis are reported in Section 5 and Section 6 concludes.

2. Literature Review and Hypotheses

2.1. Related Literature

Our paper offers a new insight into the real effects of financial development and is related to four streams of literature. First, it contributes to the general literature on the finance and growth nexus. Empirical evidence linking finance and growth has shown that quantity finance, measured in terms of size and depth of financial markets, positively affects an economy's future growth in per capita real income, entrepreneurship, employment and output (e.g. Bekaert et al, 2005). King and Levine (1993) and Levine and Zervos (1998) established the empirical link at the aggregate level, whilst Beck et al. (2000) decompose the effect into the responses of total factor productivity and capital accumulation. In disaggregated data, Rajan and Zingales (1998) show that financial development affects growth more in industries that rely heavily on external finance. However, recent empirical literature suggests that quantity effects alone may be insufficient to spark growth. For example, Arcand et al. (2015) find that the finance and growth relationship turns negative for high-income countries. Law and Singh (2014) also documents that the impact of finance on growth increases up to a threshold level of financial development and beyond that finance negatively affects growth. Furthermore, the financial sector has gradually extended its scope beyond the traditional activity of intermediation towards modern (non-intermediation) financial activities. As a result, the usual measures of intermediation services have become less and less congruent with the reality of modern financial systems. Beck et al. (2014), who examine the impact of the size of the financial system (as proxied by value-added) and the degree of intermediation (as proxied by private credit) on real sector output, find that size of a financial sector does not increase economic growth in the long-run. Overall, the above studies raise questions on the perpetual benefits of finance, and as a result, recent works either focus on the non-monotonic relationship between finance and growth or investigate the impact of quality finance on economic growth.

Second, our paper is related to the latter case, analyzing the influence of quality finance on economic growth. The related studies can be separated into the impact of bank corporate

governance (Morck et al. 2011; Taboada, 2011), bank market structure and competition (Cetorelli and Gamberra, 2001; Claessens and Laeven, 2005), bank efficiency (Hasan et al. 2009b; Koetter and Wedow, 2010), and banking stability and financial crises (Kroszner et al. 2007; Fernández et al. 2016). The existing literature on the quality of banking finance tends to focus on structural aspects of the banking system, i.e. bank concentration and competition (e.g. Cetorelli and Gambera 2001, Cetorelli, 2004; Claessens and Laeven 2005). Competition can drive banks to reduce their lending costs to borrowers and so increase demand for bank funds to support business and growth. This view has been supported by Angelini et al. (2015) in their study of Italian banks for their lending costs to Italian corporate borrowers (see also Berlin and Mester 1999). Beck et al (2004) find that more concentration or market power in banking sectors increases financial obstacles to smaller firms' access to finance for their growth[3]. Cetorelli and Strahan (2006) find that small US firms face less difficulty in gaining access to credit if they operate in a less concentrated market of banks (see also Claessens and Laeven in 2005). On the basis of a panel of manufacturing industries in 29 OECD countries, Cetorelli (2004) finds evidence that the process of enhanced competition in EU banking markets is associated with lower average firm size. Cetorelli (2004) also finds that more competition in the banking sector is associated with more new entrants in non-financial industries.

Another strand of literature that is closely related to our paper comprises those few studies that use bank efficiency as an indicator of finance quality. Lucchetti et al. (2001) investigate the impact of bank efficiency on economic growth. They argue that departure from the quantity-side of finance may address the well-known issue of the endogeneity problem in the finance-growth relationship. Lucchetti et al. (2001) further point out that bank efficiency shows the allocative function, which has been neglected if using only quantitative indicators of financial development. Using cost efficiency for Italian regions, Lucchetti et al. find that bank efficiency has, indeed, an independent effect on real growth. Using a sample of 100 countries over 1996-2005, Hasan et al. (2009a) find that cost inefficiency associated with the banking sector has a negative effect on economic growth. Hasan et al. (2009b) argue that banks promote growth through three channels of quantity-based variables (e.g. credit), quality-based variables (e.g.

[3] There is a counterargument that a bank's market power may facilitate access to credit due to the acquisition of soft information by establishing lending relationships with firms over time (Petersen and Rajan, 1995).

efficient intermediates), and the interaction of both. Using data for 7000 banks in 11 European countries over the period 1996-2004, the impact of the quality of finance on regional growth is found to be almost three times as large as that of the quantity channel. Furthermore, Koetter and Wedow (2010) use data for a bank-based economy (Germany), and find that the quality measure of bank efficiency has a positive influence on promoting growth. These studies are based on a regional or aggregate indicator of economic growth. Our study extends this literature by using industry-level data for developing countries.

Our paper also develops another dimension of quality finance, financial stability, on economic growth. Kroszner et al. (2007) examine the impact of banking crises on the growth of industries, reporting that banking crises had a disproportionately negative influence on industries that depend more on external sources of finance. Dell'Ariccia et al. (2008) also find that, during a crisis period, industries that are more dependent on external finance grew more slowly than industries that are less dependent. In Klapper and Love (2011), more financially developed countries experienced a greater decline in business entry during the recent global crisis. Moore and Mirzaei (2016) argue that the recent crisis had an adverse impact on industry growth with a pronounced impact on external-finance dependent sectors. In a recent paper, Fernández et al. (2016) find that bank instability increases growth volatility of industries that are financially more vulnerable[4].

Overall, our study advances above finance – growth studies by distinguishing between them: We measure bank efficiency by controlling for bank compliance to the Basel III new structured liquidity regime, the NSFR, and we concentrate on industry growth in developing economies using up-to-date data, which enable us to explore the effects of the recent financial crisis.

2.2. Hypotheses

There is a theoretical aspect to suggest that efficiency in the banking sector has a non-trivial impact on the process of capital accumulation. The efficient banking sector contributes to the growth of non-financial firms through several channels by i) reducing loan application processes, ii) effectively evaluating and selecting productive projects, iii) effectively monitoring invested

[4] See also Claessens et al. (2012), Fernández et al. (2013B); Levintal (2013) and Creel et al. (2015).

projects, iv) facilitating working-capital financing of existing projects, v) increasing credit supply and reducing costs of capital, and vi) establishing more lending relationships with borrowers. In addition, it is argued that efficient banks contribute to the diversification of risk and improve the corporate governance mechanism. Regulations such as Basel III have been set to ensure a healthy and efficient banking sector[5]. The Macroeconomic Assessment Group (2010) points out that as banks become more resilient, both quantity and cost of credit are likely to be maintained. Hence efficiency constrained by the Basel III regulation increases industrial growth in developing countries. This effect would be more pronounced in more financially vulnerable industries. It follows that our first hypothesis is:

H1. *Risk-adjusted bank efficiency increases output growth more in financially vulnerable industries.*

To prevent financial crises and to mitigate their adverse impact on the real economy, Basel III regulations have been proposed. The proposal has an important prudential structural liquidity ratio, the NSFR, aimed at promoting bank resilience. Regulators argue that higher NSFR decreases liquidity risk, and this would make banks less vulnerable to external shocks and hence the transmission of shocks to the real sector through financial intermediations is mitigated.

The impact of the new Basel III liquidity requirements on economic growth is, however, ambiguous. The potential adverse impact of Basel III liquidity standards for economic recovery has been debated. Meeting the NSFR could have a negative impact on other dimensions of bank performance, for example, bank lending prices, profitability and net interest margins (King 2013; Dietrich et al. 2014). Kapan and Mioiu (2013) argue that compliance with the new Basel III framework may dampen bank performance and curb banks' ability to extend credit. Drumond and Jorge (2013) show that new regulatory standards under Basel III make bank lending more expensive. Allen et al. (2012), who study the real impact of the Basel III framework, argue that the reform causes credit supply to be limited. See also Angelini et al. (2015).

There are, however, some counterarguments that the NSFR may have a positive and significant impact on banks' core business (Dietrich et al, 2014). It will force banks to lower the maturity gap between deposits and loans by attracting deposits with longer maturity and

[5] The benefit of Basel III is spelt out for Hypothesis 2 (H2) below in relation to financial crises.

allocating investment with shorter maturity. Several empirical studies have shown that banks with strong structural liquidity are indeed more resilient to financial crises (Vazquez and Federico, 2012) and are better able to maintain lending during the crises (Cornett et al, 2010; Kapan and Minoiu, 2013). For example, Kapan and Minoiu (2013) find that banks with strong structural liquidity and higher capital did not decrease lending during the recent global crisis as much as did other banks. Overall, we expect that during a financial crisis those banks with better positions in stable funding are less likely to fail and hence may not need to curtail lending and/or raise lending rates. Hence, our second hypothesis is:

H2. *Risk-adjusted bank efficiency maintains or increases output growth of industries that are more financially vulnerable during a financial crisis period.*

3. Model Specification and Data

3.1. Model specification

3.1.1. Efficiency

In literature, there are two distinctive economic efficiency concepts: cost and profit efficiencies. Cost efficiency measures how close a bank's cost is to its optimal cost when producing the same bundle of outputs. Profit efficiency measures how well a bank performs relative to a 'best-practice' bank producing the same outputs under the same conditions. The estimation of banks' relative efficiency is often performed by estimating a profit function of the general stochastic frontier form (Lucchetti et al. 2001; Hasan et al. 2009b):

$$Ln\ (Y)_{it} = f(Q_{it}, W_{it}; \beta) + \varepsilon_{it} \qquad i = 1,2,3 \dots N; t = 1,2,3 \dots T$$

where Y_{it} is profit of bank i at time t; Q_{it} is a vector of outputs; W_{it} denotes a vector of values of input prices associated with a suitable functional form; and β is a vector of unknown scalar parameters to be estimated[6].

Two recent papers depart from such a common model by investigating regulatory compliance on bank efficiency (Ayadi et al. 2016) and by including an indicator of bank stability

[6] $\varepsilon_{it} = -u_{it} + v_{it}$, where u_{it} is the non-negative inefficiency effects in the model with *i.i.d.* $N(0, \sigma_u^2)$ and v_{it} is random errors with *i.i.d.* $N(0, \sigma_v^2)$.

or risk into a bank efficiency model (Baltas et al. 2015). Ayadi et al. (2016) propose two opposing theories regarding the relationship between observance of international regulatory standards and bank efficiency: a public interest view and a private interest view. According to the former case, regulators regulate and supervise banks in order to acquire a well-functioning and more efficient banking sector, exerting a positive effect on bank performance. In the latter theory, however, such intervention and control by regulators is likely to jeopardise bank efficiency, for instance, regulators may direct banks as to where they channel resources[7]. Using bank data for 75 countries over 1994-2014, Ayadi et al. (2016) find that compliance with international capital standards has generally no impact on bank efficiency. However, during the financial crisis period, cohesion with regulatory standards is found to positively influence bank efficiency, supporting the public interest view. Using U.S. commercial banks over the period 2003-2012, Baltas et al. (2015) develop profit-efficient indicators by specifying leverage as a proxy for bank risk. Baltas et al. find that the risk-adjusted efficiency indicators are effective predictors of future profit, as compared to other efficiency proxies.

We specify the NSFR in measuring bank efficiency following Ayadi et al. (2016). Note that Ayadi et al. (2016) use country-level data from the IMF and World Bank Basel Core Financial Sector Assessment Program database as compliance to regulation standards. Our approach advances the study of Ayadi et al. by using the *individual bank data* in estimating the bank efficiency, which provide a more refined and accurate measure of efficiency.

Our empirical model for estimating efficiency, which specifies a log-linear transformation of a Cobb Douglas functional form, can be shown as follows:

$$\pi_{it} = \delta_0 + \sum_{m=1}^{4} \delta_{Q,m}.Q_{it,m} + \sum_{n=1}^{3} \delta_{W,n}.W_{it,n} + \delta_1.\pi I_{it}^{-} + \delta_2.NPL_{it} + \delta_3.NSFR_{it} + \delta_4.KKZ_t + \delta_5.BankSpec - u_{it} + v_{it} \quad (1)$$

where i and t index the bank and year, respectively. $m = 1, 2,3,4$ implies the four output variables and $n = 1, 2,3$ shows the three input variables. Following Baltas et al. (2015), the

[7] See also Barth et al. (2013) for further discussion on the conflicting impact of regulation and supervision on banks.

dependent variable is bank profit that represents either a bank's pre-tax profit (PBT)[8], return on average equity ($ROAE$) or return on average assets ($ROAA$). Following previous literature (e.g. Berger et al., 2004; Sun and Chang, 2011; Sun et al. 2013) we assume four outputs: total loans Q_1, total other earning assets Q_2, total deposits Q_3, and total non-interest income Q_4. Note that we introduce total non-interest income in order to capture a bank's off-balance sheet activities (Sun et al. 2013). Furthermore, W_1, W_2 and W_3 are the input prices of funds, capital, and labour, respectively, calculated as the ratio of interest expenses to total deposits and short-term funding, personal expenses to total assets[9], and the ratio of non-interest expenses to total fixed assets, respectively. Following Bos and Koetter (2011) and Delis et al. (2014), we impose $\pi = 1$ for all $\pi < 0$ and construct a negative profit indicator variable (i.e. $\pi I^{-} = |\pi^{-}|$), which we use as an additional explanatory variable[10]. In this way, we can avoid taking a logarithm of a negative number for those banks that encounter a loss,

NPL is non-performing loans to total loans as an indicator of *ex post* bank risk and $NSFR$ represents a proxy for *ex ante* bank risk[11]. KKZ is an index of a country's institutional quality that may influence bank efficiency[12]. We also use a set of bank specialization ($BankSpec$) dummies to account for the effect of each of two types of bank: commercial and Islamic banks (e.g. Mirzaei and Moore 2014).

[8] Since tax rates differ across countries, using profit after tax would make banks in countries with higher rates appear as less efficient, when in fact they are not.

[9] Due to data unavailability in calculating W_3 we use total assets rather than the number of employees.

[10] Note that our results do not change significantly to an alternative strategy, when we add a constant θ (calculated as $\theta = |\pi^{min}| + 1$ where $|\pi^{min}|$ is the minimum absolute value of π over all banks in the sample) to avoid taking a logarithm of a negative number.

[11] A low NSFR could be seen as an indicator of risk in the long-run, whilst a high NSFR could reduce the likelihood of bank failure (Gomes and Wilkins, 2013).

[12] We also attempt to include other determinants at country-level to bank efficiency such as domestic credit, GDP growth and a proxy for property rights, but they are highly correlated with KKZ.

Note that in order to satisfy linear homogeneity for input prices that require $\sum_{n=1}^{3} \delta_{W,n} = 1$, the dependent variable and all the terms related to the input prices are deflated by W_3. Eq. (1) estimates bank profit efficiency for a given level of risk[13].

Overall, we approximate the quality of finance by banks' relative (risk-adjusted) efficiency to intermediate saving funds to viable investment projects, assuming that banks are price takers in factor markets and maximize profit (Koetter and Wedow 2010). In order to provide financial services and loans, an efficient bank demands factor inputs such as labour and deposits in optimal proportions at given prices of salaries and deposits rates. When banks employ too many inputs or misallocate credit to suboptimal projects, for example, due to the low quality of managerial skill or due to the pursuit of objectives that are not necessarily value maximising (Koetter, 2008), inefficiency arises, wasting the resources intermediated to investors.

3.1.2. Net Stable Funding Ratio (NSFR)

The Basel III framework proposes two important standards: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR)[14]. The LCR and NSFR were designed to promote short-term and long-term resilience of banks, respectively, against liquidity shocks. In this paper, we focus on estimating the NSFR[15]. The NSFR dictates that the amount of "available stable funding (e.g. capital and long-term liability)" must be greater than the amount of "required stable funding (e.g. business loans)", computed as:

$$NSFR = \frac{Available\ stable\ funding\ (ASF)}{Required\ stable\ funding\ (RSF)} = \frac{\sum_m w_m L_m}{\sum_n w_n A_n} \qquad (2)$$

where L indicates liabilities, A indicates assets, and w stands for weights attributed to distinct liabilities and assets (Kapan and Minoiu, 2013). Weights take a value between 0 and unit, where large weights are assigned to more stable sources of funding and to more illiquid assets. The

[13] To alleviate the problem of misspecification, a series of tests has been conducted. For examples, we compared Eq. (1) against: (i) a model where we include bank equity into the model, (ii) a model that we normalize the dependent variable with bank equity, and (iii) a model where we include country dummies and exclude kkz. In all the cases, the likelihood ratio tests are in favour of the model specification in Eq. (1).

[14] For a review of Basel III, see BCBS (2010).

[15] It is impossible to calculate the LCR due to data availability.

higher the NSFR is, the lower liquidity risk. The Basel III regulations require banks to maintain a NSFR that exceeds one. Note that in order to estimate the NSFR, we impose some assumptions in the definitions of ASF and RSF, such as classifications of different liabilities and asset classes, and the weights assigned to these classes (Hong et al, 2014). Table A1 Appendix details the components and factor weights.

We have applied the method used by Vazquez and Federico (2012) and Kapan and Minoiu (2013)[16] for the computation of the NSFR. In calculating ASF, the greater weight given to sources that are least likely to vanish under stressed market conditions (King 2013). For instance, equity and longer-term liabilities are the most stable forms of funding, followed by customer deposits. However, we cannot split customer deposits by types, which under Basel III entail different weighs, ranging from 0.70 to 0.85 (Table A1 Appendix), as detailed information for bank deposits is not available for most banks. We therefore use a conservative approach by allocating an overall weight of 70% to total customer deposits. Short-term debt such as interbank funding is not viewed as a stable funding source and is given a factor of 0%. In estimating RSF, the weights are distributed based on liquidation of an asset value under stressed conditions. Loan and non-earning assets that are illiquid are given the highest weight, followed by other earning assets. Again, loan portfolios are not available based on their categories. Hence, despite the fact that Basel III requires different weights, ranging from 0.5 to 1.0 (Table A1 Appendix), we follow Vazquez and Federico (2012) in allocating an overall weight of 1.0 to total loans. For such assets as cash, securities with less than 1 year to maturity and interbank claims, there is no need for funding, hence a weight of 0% is applied.

Note that the NSFR has not been implemented yet, but following previous studies (e.g. Dietrich et al. 2014), we look back and examine how it has affected bank efficiency, which would identify the potential impact of the NSFR in the future.

3.1.3. Quality finance and growth

[16] The NSFR computed by Vazquez and Federico (2012) is consistent with the formulations proposed in Basel III. See also Hong et al. (2014) for a relatively more appropriate calculation of the NSFR for U.S. commercial banks.

Utilising the estimated (risk-adjusted) profit efficiency derived from Eq. (1) as a proxy for quality finance, we model a panel linear relationship between industry growth and finance quality as follows:

$$Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2\left(QualityFinance_{c,t} \times Ext\ dep_i\right) + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t} \quad (3)$$

$Growth_{i,c,t}$ is the growth of real output in industry i, country c and year t measured as $Growth_{i,c,t} = (Output_{i,c,t} - Output_{i,c,t-1})/Output_{i,c,t-1}$. Following Rajan and Zingales (1998), Dell'Ariccia et al. (2008) and Hsu et al. (2014), *Share* is constructed as industry i's share of total real value added in manufacturing industries in country c in year t, i.e. $Share_{i,c,t} = Value\ Added_{i,t}/Value\ Added_{i,c,t}$. We control for the industrial share of total value added due to the heterogeneous degrees of development across different industries within a country. We hypothesise the convergence of growth, where mature industries that have grown considerably in the early stage of their life-cycle are unlikely to grow at a high rate in the future (Rajan and Zingales 1998, Cetorelli and Gambera 2001 and Cetorelli 2004). Hence, a negative sign is predicted for the coefficient on $Share$.

$QualityFinance_{c,t}$ is the average profit efficiency scores in country c in year t. $Ext\ dep_i$ is the measure of dependence on external finance for industry i. Rajan and Zingales (1998) argue that industries that are heavily dependent on external finance benefit more from well-developed financial sectors than industries that are not heavy users of external finance. In this context, we use an interaction term between quality finance and external dependence of each industry. This allows for financially vulnerable industries to be more sensitive to bank efficiency, since they may experience higher output growth if they are located in countries with an efficient banking system. If φ_2 is positive and significant, it suggests that qualitative finance exerts a disproportionately positive effect on industries that are highly dependent on external finance.

τ_i is the industry fixed effect that absorbs the effects of industrial variations such as industrial R&D and global shocks to the industry. $\mu_{c,t}$ is the country–year fixed effect that captures time-varying country characteristics such as government policies and country-wide reforms. One key advantage of our three-dimensional (industry–country–year) panel is that it allows us to use interacted fixed effects to control for a wide array of omitted variables (Hsu et al.

2014). This lessens the usual difficulties associated with omitted variable bias. We cluster standard errors by industry. Note that following previous studies (e.g. Maskus et al. 2012 and Hsu et al. 2014), we do not specify the direct effects of external financial dependence in the model, since it is captured by the included dummies. Our method may clarify the relationship between quality finance and its externalities to bank service users, establishing a clearer channel through which a banking system influences economic growth[17].

In the empirical work of finance – growth nexus with quantity finance, simultaneity or endogeneity is a common problem. Quantity finance may be correlated with growth since in a boom period the demand for loans increases, or due to the simple fact that production must be financed in advance. However, the ability of banks to maximize profit by choosing optimal output is different across banks, regardless of business cycles, and it is conceptually less prone to reverse causality criticism (Lucchetti et al. 2001 and Hasan et al. 2009b). Moreover, since external finance dependence is measured using data from U.S.-listed firms (see 3.2 Date below) it is unlikely that U.S. financial dependence responds to output growth in developing countries (Fernández et al. 2013b)[18].

3.2. Data

Data on industry growth (real output growth) for each industry are retrieved from the Industrial Statistics Database of the United Nations Industrial Development Organization (UNIDO). Real output is computed by deflating the nominal series by the U.S. producer price index of finished goods (base year 1982). The industries are classified according to Revision 2 of the International Standard Industrial Classification of All Economic Activities (ISIC). We re-group the ISIC Rev. 3 data into ISIC Rev. 2 and conduct the empirical analysis for the re-grouped 28 three-digit manufacturing industries[19]. Furthermore, the external finance dependence data for each industry are retrieved from Laeven and Valencia (2013) for a sample of US companies over the period

[17] The type of our econometric specification has been previously employed to test the impact on industrial growth for banking system concentration (Cetorelli and Gambera 2001), the strength of property rights (Claessens and Laeven 2003) and the degree of competition (Cetorelli, 2004 and Claessens and Laeven, 2005).

[18] Yet, the endogeneity problem may not be entirely eradicated in the model, for example, government regulations on bank efficiency and stability could be an endogenous response to a decrease in real economic activity.

[19] See Panel B in Table 1 that shows the association between ISIC Rev.2 and ISIC Rev.3.

1980-2006, and this is used as a benchmark for other countries. Rajan and Zingales (1998) assume that financial markets in the US are relatively frictionless and informative and hence industry characteristics based on US firm data carry over to other countries[20]. We include 52 developing countries that have observations on industry growth. Note that industry data are reported by UNIDO with a multi-year lag, and 2009 is the last year where data for most countries are available. Hence our series are annual, spanning 2001-2009. Using the sample period, we examine the impact of bank efficiency on industry growth in the pre-crisis period of 2001-2007 and during the crisis period of 2008-2009.

The source of data for estimating bank efficiency is BankScope. We include all commercial (conventional and Islamic) banks over the period 2001 to 2009. These banks are the main provider of funds for industry. In some countries (such as Iran, Kuwait and Malaysia) Islamic banks play a major role in financing non-financial firms and hence the efficiency of Islamic banks is expected to be as important as that of conventional banks[21]. Furthermore, the main variables were *winsorized* to the 1st and 99th percentiles of the distributions of the respective variables, excluding extreme values. Overall, we have a micro panel of data which consists of 4924 banks.

In terms of data on countries, they are collected from the World Development Indicators (WDI) database, the Heritage Foundation and Worldwide Governance Indicators.

Table A2 in Appendix presents the definition and sources of all variables.

[Table 1 about here]

[20] Rajan and Zingales (1998) discuss whether external dependence reflects technological characteristics of industries that are relatively stable across countries. In addition, they argue that since the US capital market is a relatively sophisticated and more developed market than other countries' financial markets, it allows US firms to face fewer barriers to attaining their desired financial structure than firms in other countries. Thus, the use of external financial dependence by U.S. firms could be deemed to be a benchmark for firms in other countries. This, however, does not mean that industries in every country require precisely the same level of external finance. Instead, 'it does rely on the ranking of sectors remaining stable across countries' (Manova, 2013).

[21] In an empirical study, Imam and Kpodar (2015) find a positive impact of Islamic banking on economic growth in low and middle income countries.

Table 1 shows summary statistics of the key variables of Industry growth, Quality finance (i.e. bank efficiency), Share and External finance dependence. In Panel A, the country-level average of industry growth (output growth) is observed ranging from -30% (Argentina) to 60% (Mongolia). The industry-level average of industry growth is shown in Panel B ranging from 6% (Footwear industry, ISIC 324) to 30% (Miscellaneous petroleum and coal products, ISIC 354). Panel C reports the mean and standard deviation of industry growth at 15% and 54%, respectively over the sample period 2001-2009.

Panel A also shows the value of NSFR by country. We observe that the highest NSFR is for Yemen (1.48), on the other hand, several eastern European countries demonstrate a lower NSFR, e.g. Hungary (0.76). It appears that 50% of our sample countries meet the regulatory minimum requirement.

Each industry's dependence on external finance shown in Panel B ranges from -1.76 (Tobacco industry, ISIC 314) to 0.85 (Professional and scientific equipment, ISIC 385). $Share$ industry-wise in Panel B indicates that, amongst others, Food Products exhibits the highest value at 0.169.

4. Empirical results

The definitions and summary statistics of variables used for the estimation of the profit function Eq. (1) are presented in Panel A in Table A3 Appendix. In Panel B we present the results for four selected years: 2005 and 2006 in the pre-crisis period and 2008 and 2009 during the crisis period for the dependent variable of PBT. In general, the data fit the model well. The coefficients of banks' outputs and factor prices are mostly found to be highly significant with an expected sign on parameters. As to the impact of NSFR on bank performance, the coefficients are positive and statistically significant both before and during the crisis periods. The results support the public interest view arguing that bank regulations are beneficial for well-functioning and more efficient banking systems.

The averages of profit bank efficiency for individual countries are presented in Panel A in Table 1. The dispersion of banks' relative ability to intermediate financial funds is large across countries. Focusing on bank efficiency scores with PBT, it ranges from 0.47 in Yemen to 0.77 in Ethiopia. A similar pattern is evident when using alternative dependent variables. Panel C reports

the mean and standard deviation of profit efficiency where the three efficiency scores are close to each other with around 63-65% and 9-10%, respectively.

[Fig. 1 about here]

Fig. 1 plots industry output growth against bank (risk-adjusted) efficiency. The figure suggests that the links between bank efficiency and industry growth are empirically relevant. The relationship is apparently positive both before and during the crisis periods. We now turn to formal multivariate tests to explore the relationship in the data.

[Table 2 about here]

For estimation, we employ the ordinary least square method. Table 2 shows the empirical results of the impact of quantity finance on industry growth with three types of efficiency scores: PBT, ROAE and ROAA. For each, we present two types of regression, depending on how we include a set of dummies. F-test, at the bottom, tests whether FE (dummies) are jointly significant. In Eq. (1), (3) and (5), we specify the interaction of efficiency and external dependence with the industry fixed effect and country*year fixed effect. In Eq. (2), (4) and (6), we include efficiency with industry, country and year fixed effects. The latter is to see any independent behaviour of efficiency on growth.

It should be noted that, in line with the previous studies (e.g. Rajan and Zingales 1998), the coefficient of the share in value is found to be negative and statistically significant in all regressions. A convergence effect across different maturities of industries is apparent in this respect.

As observed, all the coefficients on the interaction term are highly significant, whereas the coefficient on efficiency is only significant in (2). The results indicate that bank efficiency does not necessarily improve the growth of all industries, but only those industries that rely heavily on external finance. The results are supportive to the contention that the beneficiaries of the development of quality finance are, primarily, those industries with external financial dependence. In addition, these results suggest that, although the NSFR may reduce aggregate lending, it improves loan quality and that this is channelled to the real sector in the form of higher economic growth for financially vulnerable industries.

The impact of quality finance on industry output growth is not only statistically significant but also economically large. To measure the size of the estimated impact of quality finance on growth, we consider two set of industries at the extremes of the distribution by the degree of dependence on external finance. Using the coefficients of interaction terms, we estimate the difference in output growth between one with a high dependence on external financing (90^{th} percentile of distribution) and the other with a low dependency (10^{th} percentile) when moving from a country with a low bank efficiency (10^{th} percentile) to a country with a high bank efficiency (90^{th} percentile). The computation is as follows (Aghion et al. 2007):

$$\varphi \times [Ext\ dep^{90th} - Ext\ dep^{10th}] \times [QulaityFinance^{90th} - QualityFinance^{10th}]$$

where φ is the estimated coefficient on interaction terms, $Ext\ dep$ and $QualityFinance$ are the dependence on external financing and quality finance (as measured by bank efficiency), respectively. Focusing on regression (1) in Table 2 for a reference, the impact of bank efficiency (based on PBT) on industry growth is 5.79 percentage points, which is 34% of the observed sample mean of 17% during the pre-crisis period of 2001-2007. In other words, an industry at 90^{th} percentile level of external financial dependence (e.g. Non-electrical machinery, ISIC 382) grows 5.79% faster than an industry at 10^{th} percentile (e.g. Footwear, ISIC 324) when it is located in a country at the 90^{th} percentile of bank efficiency (e.g. Azerbaijan) rather than in one at 10^{th} percentile (e.g. Uruguay). Furthermore, if we consider bank efficiency based on ROAE (ROAA) from regression (3) (regression (5)), we estimate an impact of 5.95 (5.83) percentage points, which is 35% (34%) of the observed sample mean. Overall, these average effects of quality finance on industry growth are economically meaningful. (This remains in the subsequent robustness tests in Table 3, Table 5 and Table 6).

[Table 3 about here]

Table 3 shows the estimation results by specifying *quality finance* (bank efficiency) together with *quantity finance* (credit) of finance interacting with external financial dependence. Note that the regressions in Table 3 include variables that take account of institutional environments for these developing countries: the KKZ index, Property rights and real GDP per head (GDPPC). See Table A2, Appendix for the definition and data source.

It is evident that the coefficients of credit are insignificant in all regressions, indicating that there is little evidence that quantity of credit exerts a valid effect on industry growth in all cases. This is complementary to the recent evidence that a larger lending volume alone does not stimulate growth (Rousseau and Wachtel, 2011). One may wonder if the result is due to 'reverse causality', as Lucchetti et al. (2001) point out, that the growth of credit is more influenced by the economic activities of industry rather than the other way round. The insignificant result of the credit is sharply contrasted with the quality of finance variables, where the coefficients of all three types of efficiency remain to be highly significant at the 1% level with similar magnitudes to those in Table 2. It indicates that the identified quality effect of bank efficiency is not affected by quantity effects. The ability to select and monitor investments efficiently is apparently more important than the mere availability of finance.

[Table 4 about here]

The results in Table 2 and 3 are based on the indicators of external financial dependence of Laeven and Valencia (2013) for a sample of US companies over the period 1980-2006. As a robustness test, we re-estimate the industry growth model by using an alternative external dependence indicator, R&D, which is the median level of the ratio of R&D expenses over sales for each US industry for the period 1980–1999 (See Table A2). One would expect that as industries invest more on intangible R&D expenditures, they rely more on external finance (Manova, 2013). See Table 4 for the results. The efficiency effect remains significant when it is measured by the alternative external financial dependence. Note, however, that the size of the coefficients on the interaction term has become much larger, exhibiting around 4.6 to 4.9. This indicates a stronger sensitivity of industries that are more dependent on R&D to bank efficiency in promoting industry growth.

The results presented in Table 2, 3 and 4 overall suggests the valid effect of risk-adjusted efficiency on growth for those industries that are heavily reliant on external finance in developing countries.

[Table 5 and Table 6 about her]

There is, however, the issue of whether efficiency may be closely correlated with competitiveness. In this instance, we cannot yet translate the efficiency as the channel of quality

finance to corporate sector growth. Hence, in order to determine bank efficiency as an appropriate proxy of quality of finance, we specify other measures of banking system performance, namely, the degree of bank competition. We consider the Lerner index that is a market-power measured by mark-up, and the Boone indicator that is the elasticity of profit to marginal costs. Also, the effect of concentration measured by the assets of the five largest banks as a share of total banking assets is specified. An increase in these three variables implies a deterioration of the competitive conduct of banks. See Appendix Table A2 for the detail of the data.

The estimation result in Table 5 shows that market power proxied by the Lerner index and Concentration have shown a negative effect on growth, in other words, competition is likely to exert a positive effect. This is contrasted with the positive effect of the Boone index. Nonetheless, all these effects from the competitive indicators are not significant at the 5% level. The coefficients on efficiency remain to be highly significant at the 1% level.

Furthermore, we specified proxies for bank competition-enhancing regulations including activity restriction, entry restriction and presence of foreign banks (see Appendix Table A2 for the detailed data). In Table 6, we can again observe that none of the variables are statistically significant, whereas efficiency effects are significant. The overall results in Table 5 and 6 suggest that there is little doubt that quality finance amounts to bank efficiency, rather than competition within the spectrum of our study.

The existing literature has shown a positive significant relationship between bank competition and industry growth. However, our study finds an insignificant effect of competition. This conflicting result may be due to the omitted variable, i.e. efficiency, in the competition-growth model. We can conjecture that bank efficiency is the best fit as a proxy of quality finance.

5. Financial crisis

[Table 7 about here]

Table 7 presents the empirical results for the crisis period, 2008-09. Panel A shows the insignificant interaction terms indicating that financially vulnerable industries do not seem to benefit from (risk-adjusted) efficient banking sector. However, interestingly, in Panel B the

efficiency variable without interaction with *Ext dep* is significant for PBT and ROAE, suggesting that all industries benefit from efficient banking. This may be explained by the fact that during the crisis period all industries suffer from shortages of funds, for example, due to the deterioration of consumer demand and/or international trade, leading to an increase in demand for external finance for almost all industries. Hence benefits from efficiency may apply equally to all sectors of industry.

Note that in Panel C, the estimation is conducted for countries with a relatively high level of financial-development, where we select those countries with upper quartile (i.e. the 75th percentile of distribution). Financial development indicator is the ratio of the sum of domestic credit to private sector and stock market capitalization and GDP. Note that 75 percentile is 120.2%, and hence highly financially developed means countries with the score exceeding the ratio. We find that bank risk-adjusted efficiency may improve the growth of financially vulnerable industries in countries with high financial development. The implication is that during a financial crisis, the effectiveness of efficiency is constrained to a certain degree by the level of financial development in the low-income countries.

Overall our empirical results seem to support the view that banks with stable funding are resilient to financial crises.

6. Conclusion

This article proposes a methodological contribution to the finance-growth nexus by suggesting a measure of Basel III-compliant bank efficiency as an unobserved quality channel, which encourages growth in manufacturing sectors, controlling their external finance dependence.

We initially find that bank efficiency increases with the structural liquidity indicator of Basel III, supporting the public interest view where regulations exerts a positive effect on the functioning of banks.

The main insight of this study is that at least by maintaining the focus on the effects on industrial growth, risk-adjusted bank efficiency plays a major role as compared to that of credit provision. Industries that depend heavily on external finance grow faster in countries with more profit efficient banking systems. The results have an implication for the priorities of economic

policy: Improving the ability of banks to provide financial products and services efficiently is warranted, rather than merely expanding the quantity of credit during normal periods. The main result is robust to a number of robustness tests, in particular, efficiency has been shown to be a stronger candidate as a proxy of quality finance when compared with bank competition. During the financial crisis period, evidence reveals that all industries, regardless of their degree of financial dependence, appear to benefit from bank efficiency that is compliant with Basel III. This indicates the relevance and the positive effects of Basel III, which may generate policy implications for banking regulators in developing countries.

Table A1: Calculation of structural liquidity (net stable funding ratio: NSFR)

	Assets Side (Required Stable Funding)			Liability & Equity Side (Available Stable Funding)	
	Items	Weight		Items	Weight
1	Total earning assets		1'	Deposits and short-term funding	
1.a	Loans	100%	1'.a	Customer deposits	
1.a.1	Total customer loans		1'.a.1	Customer deposit-current	85%
	Mortgages		1'.a.2	Customer deposit-savings	70%
	Other mortgage loans		1'.a.3	Customer deposit-term	70%
	Other consumer / retail loans		1'.b	Deposits from banks	0%
	Corporate & commercial loans		1'.c	Other deposits and short-term borrowings	0%
	Other loans				
1.a.2	Reserves for impaired loans/NPLs		2'	Other interest-bearing liabilities	
1.b.	Other earning assets	35%	2'.a	Derivatives	0%
1.b.1	Loans and advances to banks		2'.b	Trading liabilities	0%
1.b.2	Derivatives		2'.c	Long-term funding	100%
1.b.3	Other securities		2'.c.1	Total long-term funding	100%
	Trading securities			Senior debt	
	Investment securities			Subordinated borrowing	
1.b.4	Remaining earning assets			Other funding	
			2'.c.2	Preferred shares and hybrid capital	100%
2	Total non-earning assets				
2.a	Fixed assets	100%	3'	Other (non-interest bearing liabilities)	100%
2.b	Other non-earning assets				
3.a	Cash and due from banks	0%	4'	Loan loss reserves	100%
3.b	Goodwill	100%	5'	Other reserves	100%
3.c	Other intangibles	100%			
3.d	Other assets	100%	6'	Equity	100%

Table A2: Definition and source of variables

Variable	Definition and source
Industry characteristics	
Industry growth	Simple growth rate of real output in a particular sector in each country over 2001-2009. Nominal output deflated using U.S. producer price index of finished goods index. Source: UNIDO database, and own calculation.
Share	The value added of each sector as a percentage of the total value added of all sectors in an economy. Source: UNIDO database, and own calculation.
External dependence	External financial dependence of U.S. firms by 3-digit ISIC codes over the period 1980-2006. This is an industry-level median of the ratio of capital expenditures minus cash flow over capital expenditures. Cash flow is defined as the sum of funds from operations, decreases in inventories, decreases in receivables, and increases in payables. Capital expenditures include net acquisitions of fixed assets. Source: Laeven and Valencia (2013) based on Rajan and Zingales' (1998) approach.
R&D intensity	R&D intensity is the median level of the ratio of R&D expenses over sales for each US industry for the period 1980–1999. Source: Kroszner et al. (2007).
Quality of finance	
Profit efficiency	Average profit efficiency of a country's banking system over the period 2001-2009, derived from stochastic relative profit frontier estimates. We estimate three types of profit efficiency, depending on whether the dependent variable in Eq. (1) is profit before tax (PBT), return on average equity (ROAE) and return on average assets (ROAA). Source: BankScope and own estimation.
Other variables	
Credit	The ratio of domestic credit to private sector to GDP of a country over the period 2001-2009, which refers to financial resources provided to the private sector. Source: World Bank-WDI.
GDPPC	Natural log of real GDP per capita of a country over the period 2001-2009. Source: World Bank-WDI and own calculation.
Property rights	Property right measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws over 2001-2009. It also assesses the likelihood that private property will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce contracts. It ranges from 0 to 100. A higher score indicates better protection of property rights and signify greater protection of private property rights. Source: Heritage Foundation.
KKZ index	KKZ institution index is an aggregate indicator of the quality of institutional development in the country over 2001-2009. The index is calculated using the average indicators of information on six issues: voice accountability, political stability, government's effectiveness, regulatory quality, rule of law, and control of corruption. Higher value indicates higher institutional quality. Source: Worldwide Governance Indicator, Kaufman et al. (2010) and own calculation.
Lerner index	A measure of market power in the banking market over 2001-2009. It compares output pricing and marginal costs (that is, markup). An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries. Source: World Bank: The Global Financial Development Database, Čihák et al. (2012).
Boone indicator	A measure of degree of competition based on profit-efficiency in the banking market over 2001-2009. It is calculated as the elasticity of profits to marginal costs. An increase in the Boone indicator implies a deterioration of the competitive conduct of financial intermediaries. Source: World Bank: The Global Financial Development Database, Čihák et al. (2012).

Table A2: Continued …

Concentration	Assets of five largest banks as a share of total commercial banking assets over 2001-2009. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax, discontinued operations and other assets. Source: World Bank: The Global Financial Development Database, Čihák et al. (2012).
Activity restriction	A variable that ranges from zero to twelve, with twelve indicating the highest restrictions on bank activities, over 2001-2009. The activity restrictions include restrictions on securities activities, insurance activities, and real estate activities. A value of 1 is added to the index if an activity is unrestricted, 2 if it is permitted, 3 if it is restricted, and 4 if it is prohibited. Source: World Bank surveys on bank regulation. Surveys on bank regulation were conducted in 1999, 2003, 2007, and 2011, covering 180 countries. Barth et al. (2013).
Entry restriction	Entry restriction measures whether various types of legal submissions are required to obtain a banking license over 2001-2009. It examines whether the eight documents (such as draft by-laws, intended organization chart) are legally required to be submitted before issuance of the banking license. The indicator ranges from zero to eight, with higher values indicate greater stringency. Source: Barth et al. (2013).
Foreign bank	The extent to which the banking system's assets are foreign owned. Source: Barth et al. (2013).

Table A3: Summary statistics and regression results of Eq. (1)

This table presents variable definition and summary statistics in Panel A, and reports profit efficiency estimation results adjusted for new structural liquidity (NSFR) for four distinct time periods.

Panel A: Definitions and summary statistics of variables used in Eq. (1)

Variable	Definition	Mean	St.dev.	Min.	Max.
PBT	Total profit before tax (in $1,000)	50,981	169,844	-56,453	1,241,484
ROAE	Return on average equity (%)	10.142	16.204	-67.364	57.827
ROAA	Return on average asset (%)	1.273	2.776	-12.046	9.660
Output 1 (Q_1)	Total loans (in $1,000)	1,671,192	5,041,139	379	3.63E+07
Output 2 (Q_2)	Total other earning assets (in $1,000)	1,053,789	3,225,478	181	2.30E+07
Output 3 (Q_3)	Total deposits (in $1,000)	1,891,192	5,701,344	0	3.99E+07
Output 4 (Q_4)	Total non-interest income (in $1,000)	62,050	180,636	-9,258	1,324,462
Input price 1 (W_1)	Interest expenses/total deposits	0.0793	0.1164	0.0000	0.8668
Input price 2 (W_2)	Personnel expenses/total assets	0.0259	0.0211	0.0003	0.1108
Input price 3 (W_3)	Non-interest expenses/total fixed assets	11.4475	40.9075	0.0000	322.9622
πI^-	Negative profit indicator	2,142.0	16,087.4	0.0	218,790.1
NPL	Non-performing loans to total loans (%)	6.860	12.468	0.000	85.900
NSFR	Net stable funding ratio	0.958	0.335	0.282	2.144
KKZ	KKZ institutional index	-0.329	0.519	-1.268	1.273

Panel B: Estimation results from Eq. (1)
Dependent variable: Ln(PBT/W_3)

	2005		2006		2008		2009	
	Coeff.	T.value	Coeff.	T.value	Coeff.	T.value	Coeff.	T.value
LnQ_1	0.741***	(17.67)	0.656***	(14.98)	0.764***	(17.50)	0.741***	(17.67)
LnQ_2	0.522***	(16.69)	0.352***	(12.05)	0.382***	(14.39)	0.522***	(16.69)
LnQ_3	-0.015	(-0.77)	0.010	(0.46)	0.004	(0.19)	-0.015	(-0.77)
LnQ_4	-0.215***	(-8.54)	0.019	(0.68)	-0.139***	(-5.18)	-0.215***	(-8.54)
$Ln(W_1/W_3)$	0.104***	(3.79)	0.163***	(5.61)	0.158***	(5.55)	0.104***	(3.79)
$Ln(W_2/W_3)$	0.719***	(26.23)	0.633***	(21.65)	0.708***	(26.11)	0.719***	(26.23)
$Ln\pi I^-$	-0.963***	(-92.73)	-1.094***	(-49.58)	-0.967***	(-68.19)	-0.963***	(-92.73)
LnNPL	-0.052**	(-2.46)	-0.039**	(-2.17)	-0.050**	(-2.41)	-0.052**	(-2.46)
LnNSFR	0.371***	(3.56)	0.511***	(5.39)	0.573***	(5.59)	0.371***	(3.56)
KKZ	0.137*	(1.72)	0.122*	(1.67)	0.113	(1.50)	0.137*	(1.72)
…								
Sig2u	30.34		23.1		100.05		155.82	
Sig2v	0.453		0.539		0.581		0.615	
# Observations	1218		1015		1155		1218	

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Table 1: Summary statistics

Panel A reports the country-level averages including the pooled averages of industry growth, the NSFR and bank (risk-adjusted) efficiency. Industry growth is defined as the real growth of output. Bank efficiency is the country mean of its banking sector profit efficiency (profit before tax (PBT), return on average equity (ROAE), and return on average assets (ROAA)), taken from frontier estimations of Eq. (1). Our sample includes 28 industries with three-digit ISIC codes in 52 developing countries. The Sample period is 2001-2009.

					Bank variables					
	Panel A		Industry growth		No. of		Efficiency			
Row	Country	Code	Obs.	Mean	bank	NSFR	PBT	ROAE	ROAA	Share
1	Albania	ALB	124	0.24	13	1.20	0.66	0.68	0.66	0.081
2	Argentina	ARG	52	-0.30	80	0.86	0.61	0.57	0.62	0.039
3	Azerbaijan	AZE	271	0.29	31	1.11	0.75	0.72	0.72	0.036
4	Bolivia	BOL	27	-0.12	13	1.02	0.61	0.61	0.63	0.037
5	Brazil	BRA	252	0.11	175	0.97	0.61	0.52	0.56	0.040
6	Bulgaria	BGR	237	0.15	26	1.03	0.64	0.65	0.60	0.041
7	Chile	CHL	168	0.06	34	1.07	0.61	0.55	0.57	0.047
8	China	CHN	196	0.24	194	0.92	0.66	0.62	0.59	0.036
9	Colombia	COL	255	0.09	37	0.96	0.64	0.63	0.63	0.039
10	Czech Republic	CZE	166	0.17	27	1.07	0.65	0.64	0.60	0.041
11	Ecuador	ECU	214	0.12	36	1.02	0.57	0.61	0.56	0.036
12	Egypt	EGY	54	0.16	35	1.16	0.66	0.66	0.67	0.037
13	Estonia	EST	227	0.12	8	0.89	0.71	0.69	0.70	0.040
14	Ethiopia	ETH	198	0.19	9	1.08	0.77	0.79	0.77	0.036
15	Georgia	GEO	249	0.27	17	1.11	0.66	0.62	0.62	0.038
16	Hungary	HUN	244	0.10	39	0.76	0.61	0.59	0.58	0.036
17	India	IND	252	0.13	80	0.99	0.61	0.63	0.57	0.036
18	Indonesia	IDN	241	0.19	95	1.11	0.64	0.60	0.59	0.037
19	Iran	IRN	252	0.07	16	0.86	0.56	0.52	0.46	0.036
20	Jordan	JOR	270	0.10	14	1.13	0.66	0.63	0.67	0.036
21	Kenya	KEN	180	0.11	42	1.09	0.65	0.63	0.64	0.057
22	Kuwait	KWT	115	0.09	16	0.99	0.73	0.68	0.72	0.041
23	Kyrgyz Republic	KGZ	259	0.26	11	1.23	0.70	0.69	0.73	0.041
24	Latvia	LVA	236	0.13	23	0.98	0.65	0.67	0.62	0.040
25	Lithuania	LTU	270	0.15	13	0.79	0.58	0.60	0.59	0.036
26	Macedonia	MKD	223	0.05	18	1.16	0.70	0.68	0.71	0.040
27	Madagascar	MDG	100	-0.07	6	1.12	0.67	0.72	0.63	0.056
28	Malaysia	MYS	270	0.07	60	0.88	0.69	0.66	0.63	0.036
29	Malta	MLT	198	0.06	12	1.12	0.65	0.66	0.59	0.038
30	Mauritius	MUS	152	0.08	21	1.05	0.71	0.72	0.70	0.063
31	Mexico	MEX	270	0.13	59	0.98	0.62	0.51	0.54	0.037
32	Moldova	MDA	261	0.22	17	1.14	0.72	0.73	0.76	0.060
33	Mongolia	MNG	105	0.60	10	0.97	0.57	0.53	0.47	0.045
34	Morocco	MAR	278	0.08	16	0.90	0.68	0.56	0.57	0.036
35	Oman	OMN	250	0.21	10	0.89	0.69	0.67	0.70	0.038
36	Panama	PAN	36	0.01	99	0.97	0.64	0.64	0.64	0.045
37	Peru	PER	233	0.07	24	0.91	0.60	0.57	0.56	0.038
38	Poland	POL	237	0.12	63	0.78	0.59	0.54	0.52	0.037
39	Qatar	QAT	170	0.46	12	0.98	0.75	0.71	0.77	0.054
40	Romania	ROM	264	0.12	30	1.06	0.62	0.59	0.60	0.039
41	Russia	RUS	246	0.22	1123	0.91	0.62	0.56	0.58	0.040
42	Senegal	SEN	191	0.10	13	0.89	0.75	0.77	0.74	0.039
43	Slovak Republic	SVK	207	0.22	17	0.99	0.58	0.62	0.58	0.040
44	Slovenia	SVN	252	0.07	20	0.89	0.57	0.55	0.56	0.037
45	South Africa	ZAF	220	0.06	28	0.93	0.61	0.59	0.58	0.045
46	Sri Lanka	LKA	91	0.27	18	1.02	0.64	0.71	0.60	0.042
47	Tanzania	TZA	131	0.06	33	1.12	0.65	0.62	0.62	0.052
48	Trinidad and Tob	TTO	139	0.12	10	1.07	0.70	0.65	0.68	0.044
49	Turkey	TUR	207	0.23	47	1.04	0.63	0.57	0.60	0.042
50	Uruguay	URY	138	0.13	43	1.13	0.53	0.53	0.51	0.040
51	Vietnam	VNM	144	0.40	52	0.86	0.69	0.67	0.66	0.036
52	Yemen	YEM	96	0.23	10	1.48	0.47	0.37	0.39	0.064

Panel B shows the correspondence between ISIC Rev.2 and ISIC Rev.3, and reports industry-level averages, including the pooled averages of industry growth, external financial dependence (taken from Laeven and Valencia, 2013) and share of value added.

Row	**Panel B** Industry	ISIC Rev. 2, 3-digit	ISIC Rev. 3, 3- & 4-digit	Obs.	Output growth	External dependence	Share
1	Food products	311	151, 1520, 153, 154	433	0.10	0.14	0.169
2	Beverages	313	155	399	0.09	0.06	0.067
3	Tobacco	314	1600	311	0.09	-1.76	0.030
4	Textiles	321	171, 172, 1730	424	0.07	0.17	0.039

Table 1: Continued …

5	Wearing apparel, except footwear	322	1810	409	0.08	0.05	0.050
6	Leather and fur products	323	1820, 191	394	0.14	-0.98	0.008
7	Footwear, except rubber or plastic	324	1920	364	0.06	-0.56	0.007
8	Wood products, except furniture	331	2010, 202	433	0.14	0.14	0.026
9	Furniture and fixtures, excel. metal	332	3610	426	0.16	-0.07	0.020
10	Paper products	341	210	415	0.14	0.13	0.024
11	Printing and publishing	342	2211, 2212, 2219, 222	353	0.09	0.06	0.026
12	Industrial chemicals	351	2330, 241, 2421, 2430	410	0.21	0.06	0.057
13	Other chemical product	352	2422, 2423, 2424, 2429	308	0.12	-0.07	0.051
14	Petroleum refineries	353	2320	256	0.24	0.03	0.127
15	Misc. petroleum and coal products	354	2310	170	0.30	0.27	0.018
16	Rubber products	355	251	406	0.19	0.37	0.014
17	Plastic products	356	2520	371	0.16	0.24	0.029
18	Pottery, china, earthenware	361	2691	232	0.16	-0.52	0.003
19	Glass and products	362	2610	396	0.21	0.24	0.024
20	Other non-metalic mineral products	369	2692, 2693, 2694, 2695, 2696, 2699	304	0.13	0.09	0.065
21	Iron and steel	371	2710, 2731	393	0.22	0.24	0.048
22	Non-ferrous metals	372	2720, 2732	311	0.20	0.32	0.047
23	Fabricated metal products	381	281, 289	392	0.18	0.19	0.044
24	Non-electrical machinery	382	291, 292, 2930, 3000	423	0.17	0.50	0.040
25	Electrical machinery	383	2213, 2230, 3110, 3120, 3130, 3140, 3150, 3190, 3210, 3220, 3230	411	0.17	0.39	0.046
26	Transport equipment	384	3410, 3420, 3430, 351, 3520, 3530, 359	422	0.21	0.13	0.048
27	Professional and scientific equipmen	385	331, 3320, 3330	349	0.18	0.85	0.009
28	Other manufacturing	390	369	342	0.13	0.52	0.011

Panel C reports the summary statistics of variables across all country–industry–year observations.

Panel C variables	Mean	Standard deviation	Minimum	Median	Maximum
Output growth	0.15	0.54	-0.94	0.09	4.65
Share	0.04	0.06	-0.04	0.02	0.70
External dependence	0.04	0.49	-1.76	0.14	0.85
Efficiency (PBT)	0.65	0.09	0.10	0.65	0.83
Efficiency (ROAE)	0.63	0.10	0.12	0.64	0.83
Efficiency (ROAA)	0.63	0.10	0.13	0.63	0.82

Panel D reports the correlation coefficients between variables.

Panel D variables	Output growth	a	b	c
(a): Share (t-1)	0.028***			
(b): Efficiency (PBT)	0.092***	0.017		
(c): Efficiency (ROAE)	0.079***	0.021**	0.807***	
Efficiency (ROAA)	0.065***	0.020*	0.813***	0.879***

Table 2: Quality finance (bank efficiency) and industry growth – baseline results

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency (i.e. average profit efficiency scores estimated based on Eq. 1) in country c in year t. $Share$ is the share of value added of industry i to total value added of all industries in country c in year t. $Ext\ dep$ is the external financial dependence of industry i taken from Laeven and Valencia (2013).

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2001-2007.

	Bank (risk-adjusted) efficiency based on:					
	PBT		ROAE		ROAA	
	[1]	[2]	[3]	[4]	[5]	[6]
Share (t-1)	-0.485***	-0.510***	-0.486***	-0.509***	-0.483***	-0.507***
	(-4.17)	(-4.30)	(-4.16)	(-4.28)	(-4.17)	(-4.28)
Efficiency × Ext dep	0.254***	0.240***	0.244***	0.230***	0.229***	0.218***
	(3.20)	(3.09)	(4.24)	(3.31)	(3.66)	(3.28)
Efficiency		0.240**		0.098		0.102
		(2.35)		(1.06)		(1.32)
Constant	0.653*	0.118	0.655*	0.206**	0.656*	0.207**
	(1.84)	(1.61)	(1.84)	(2.54)	(1.84)	(2.70)
Controls:						
Industry FE	Y	Y	Y	Y	Y	Y
Country FE	N	Y	N	Y	N	Y
Year FE	N	Y	N	Y	N	Y
Country × Year FE	Y	N	Y	N	Y	N
# Countries	52	52	52	52	52	52
# Industries	28	28	28	28	28	28
# Observations	6252	6252	6252	6252	6252	6252
R^2	0.212	0.097	0.212	0.097	0.212	0.097
F-test	8.46***	61.96***	8.44***	60.00***	8.45***	55.02***

Table 3: Quality finance (bank efficiency) and industry growth – Robust to financial development and control variables

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \varphi_3(Credit_{c,t} \times Ext\ dep_i) + \varphi_4 X_{c,t} + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency (i.e. profit estimated based on Eq. 1) in country c in year t. $Credit$ is a proxy for financial development i.e. domestic credit to private sector. X is a vector of other control variables: GDP per capita, property rights and KKZ index. $Share$ is the share of value added of industry i to total value added of all industries in country c in year t. $Ext\ dep$ is the external financial dependence of industry i taken from Laeven and Valencia (2013). τ_i denotes the dummies for industry i and $\mu_{c,t}$ denotes the dummies for country c in year t.

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2001-2007. Sample size varies across regression specifications because not all variables are available for all industries, countries or full sample period.

	PBT		ROAE		ROAA	
	[1]	[2]	[3]	[4]	[5]	[6]
Share (t-1)	-0.486***	-0.489***	-0.487***	-0.489***	-0.484***	-0.487***
	(-4.17)	(-4.19)	(-4.15)	(-4.18)	(-4.17)	(-4.19)
Efficiency × Ext dep	0.252***	0.253***	0.246***	0.247***	0.231***	0.232***
	(3.15)	(3.17)	(4.37)	(4.38)	(3.72)	(3.74)
Credit × Ext dep	0.000	0.000	0.000	0.000	0.000	0.000
	(0.69)	(0.67)	(1.00)	(0.99)	(1.00)	(0.98)
Constant	0.653*	22.744***	0.654*	22.741***	0.655*	22.754***
	(1.83)	(2.80)	(1.83)	(2.80)	(1.83)	(2.80)
Controls:						
Log(GDPPC), Property rights, KKZ index	N	Y	N	Y	N	Y
Industry FE	Y	Y	Y	Y	Y	Y
Country × Year FE	Y	Y	Y	Y	Y	Y
# Countries	52	52	52	52	52	52
# Industries	28	28	28	28	28	28
# Observations	6252	6239	6252	6239	6252	6239
R^2	0.212	0.212	0.212	0.212	0.212	0.212

Table 4: Quality finance (bank efficiency) and industry growth – Robust to alternatives

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency in country c in year t. $Ext\ dep$ is the R&D intensity of industry i taken from Kroszner et al. (2007). τ_i denotes the dummies for industry i and $\mu_{c,t}$ denotes the dummies for country c in year t.

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2001-2007. Sample size varies across regression specifications because not all variables are available for all industries, countries or full sample period.

	Alternative external dep. (R&D)		
	PBT	ROAE	ROAA
	[1]	[2]	[3]
Share (t-1)	-0.482***	-0.480***	-0.480***
	(-4.10)	(-4.10)	(-4.10)
Efficiency × Ext dep	4.641**	4.980**	4.980**
	(2.44)	(2.18)	(2.18)
Constant	0.636*	0.632*	0.632*
	(1.77)	(1.77)	(1.77)
Controls:			
Industry FE	Y	Y	Y
Country × Year FE	Y	Y	Y
# Countries	52	52	52
# Industries	28	28	28
# Observations	6252	6252	6252
R^2	0.212	0.212	0.212

Table 5: Quality finance (bank efficiency) and industry growth – Robust to bank competition variables

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \varphi_3(Competition_{c,t} \times Ext\ dep_i) + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency (i.e. profit estimated based on Eq. 1) in country c in year t. $Competition$ is a vector of bank competition: Lerner index, Boone index and 3-firm concentration. $Share$ is the share of value added of industry i to total value added of all industries in country c in year t. $Ext\ dep$ is the external financial dependence of industry i taken from Laeven and Valencia (2013). τ_i denotes the dummies for industry i and $\mu_{c,t}$ denotes the dummies for country c in year t.

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2001-2007. Sample size varies across regression specifications because not all variables are available for all industries, countries or full sample period.

	PBT			ROAE			ROAA		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Share (t-1)	-0.492***	-0.485***	-0.448***	-0.492***	-0.485***	-0.448***	-0.489***	-0.483***	-0.447***
	(-4.13)	(-4.15)	(-3.77)	(-4.12)	(-4.15)	(-3.77)	(-4.14)	(-4.16)	(-3.76)
Efficiency × Ext dep	0.368**	0.248***	0.138*	0.319***	0.246***	0.215***	0.305***	0.231***	0.119
	(2.47)	(2.95)	(1.87)	(3.87)	(4.24)	(2.95)	(3.35)	(3.54)	(1.19)
Lerner index × Ext dep	-0.211			-0.205			-0.199		
	(-1.07)			(-1.12)			(-1.11)		
Boone index × Ext dep		0.132			0.132			0.132	
		(1.52)			(1.54)			(1.56)	
Concentration × Ext dep			-0.000			-0.000			-0.000
			(-0.05)			(-0.20)			(-0.09)
Constant	0.653*	0.655*	0.173***	0.658*	0.656*	0.169***	0.658*	0.657*	0.175***
	(1.84)	(1.84)	(3.43)	(1.86)	(1.85)	(3.36)	(1.86)	(1.84)	(3.42)
Controls:									
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
# Countries	52	52	52	52	52	52	52	52	52
# Industries	28	28	28	28	28	28	28	28	28
# Observations	6196	6202	5731	6196	6202	5731	6196	6202	5731
R^2	0.212	0.213	0.229	0.212	0.213	0.229	0.212	0.213	0.229

Table 6: Quality finance (bank efficiency) and industry growth – Robust to bank competition enhancing variables

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \varphi_3(Competition\_Enhancing_{c,t} \times Ext\ dep_i) + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency (i.e. profit estimated based on Eq. 1) in country c in year t. $Competition\_Enhancing$ is a vector of bank competition-enhancing variables: Activity restriction, entry restriction, and foreign bank penetration. $Share$ is the share of value added of industry i to total value added of all industries in country c in year t. $Ext\ dep$ is the external financial dependence of industry i taken from Laeven and Valencia (2013). τ_i denotes the dummies for industry i and $\mu_{c,t}$ denotes the dummies for country c in year t.

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2001-2007. Sample size varies across regression specifications because not all variables are available for all industries, countries or full sample period.

	PBT			ROAE			ROAA		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Share (t-1)	-0.340**	-0.341***	-0.320***	-0.341**	-0.341***	-0.320***	-0.336**	-0.337***	-0.317***
	(-2.66)	(-2.81)	(-2.91)	(-2.66)	(-2.81)	(-2.91)	(-2.64)	(-2.80)	(-2.89)
Efficiency × Ext dep	0.329**	0.289**	0.246*	0.295***	0.258***	0.226**	0.351**	0.316**	0.278*
	(2.73)	(2.35)	(1.85)	(3.41)	(3.08)	(2.49)	(2.61)	(2.55)	(1.93)
Activity res. × Ext dep	-0.008			-0.008			-0.007		
	(-0.62)			(-0.62)			(-0.57)		
Entry res. × Ext dep		0.005			0.003			0.004	
		(0.39)			(0.27)			(0.35)	
Foreign bank × Ext dep			0.001			0.001			0.001
			(1.62)			(1.33)			(1.46)
Constant	0.630*	0.619*	0.639*	0.634*	0.624*	0.642*	0.628*	0.618*	0.637*
	(1.76)	(1.73)	(1.80)	(1.76)	(1.74)	(1.81)	(1.75)	(1.73)	(1.79)
Controls:									
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
# Countries	52	52	52	52	52	52	52	52	52
# Industries	28	28	28	28	28	28	28	28	28
# Observations	5282	5486	4943	5282	5486	4943	5282	5486	4943
R^2	0.230	0.227	0.192	0.230	0.227	0.192	0.231	0.227	0.192

Table 7: Quality finance (bank efficiency) and industry growth – During the recent financial crisis

This table reports the results estimating various forms of $Growth_{i,c,t} = \varphi_0 + \varphi_1 Share_{i,c,t-1} + \varphi_2(QualityFinance_{c,t} \times Ext\ dep_i) + \tau_i + \mu_{c,t} + \varepsilon_{i,c,t}$.

$Growth_{i,c,t}$ is the real growth rate of output of industry i in country c in year t. $QualityFinance$ is an indicator of banking sector efficiency in country c in year t. $Ext\ dep$ is either the external financial dependence of industry i taken from Laeven and Valencia (2013). τ_i denotes the dummies for industry i and $\mu_{c,t}$ denotes the dummies for country c in year t.

For detail definition of variables see Table A1 in Appendix. All regressions include a constant term (unreported). The statistical inferences are based on robust standard errors (associated t-values reported in parentheses) clustered by industry. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Our sample includes 28 industries with three-digit ISIC, Rev.2 for 52 countries. The sample period is 2008-2009. Sample size varies across regression specifications because not all variables are available for all industries, countries or full sample period.

	Panel A: All countries			Panel B: All but without interaction with Ext dep			Panel C: High financially developed		
	PBT	ROAE	ROAA	PBT	ROAE	ROAA	PBT	ROAE	ROAA
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Share (t-1)	-0.791***	-0.797***	-0.798***	-0.802***	-0.795***	-0.797***	-0.403	-0.427	-0.423
	(-2.93)	(-2.94)	(-2.94)	(-2.88)	(-2.85)	(-2.85)	(-1.09)	(-1.14)	(-1.13)
Efficiency × Ext dep	0.243	0.062	-0.037	1.524***	1.037*	0.642	0.931**	0.741**	0.439
	(0.61)	(0.18)	(-0.11)	(2.99)	(2.00)	(1.32)	(2.12)	(2.43)	(0.98)
Constant	0.196*	0.213*	0.221**	-0.699*	-0.410	-0.120	0.074	0.102	0.127
	(1.82)	(1.98)	(2.07)	(-2.01)	(-1.08)	(-0.35)	(0.61)	(0.92)	(1.10)
Controls:									
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Year FE	Y	Y	Y	N	N	N	Y	Y	Y
Country FE	N	N	N	Y	Y	Y	N	N	N
Year FE	N	N	N	Y	Y	Y	N	N	N
# Countries	52	52	52	52	52	52	14	14	14
# Industries	28	28	28	28	28	28	28	28	28
# Observations	1779	1779	1779	1779	1779	1779	700	700	700
R^2	0.191	0.191	0.191	0.166	0.161	0.159	0.185	0.184	0.182

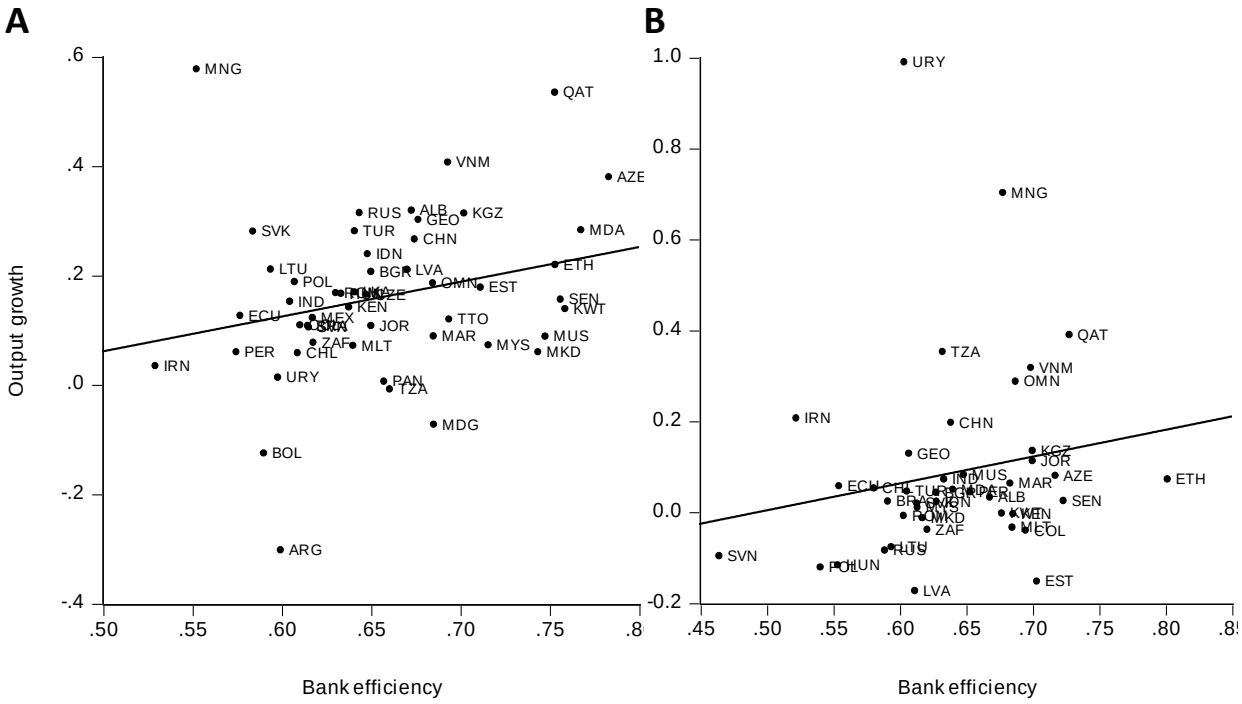

Fig. 1: Bank risk-adjusted efficiency and industry output growth during pre-crisis 2001-2007 (Panel A) and during the crisis 2008-2009 (Panel B). Samples include 50 and 42 countries where both efficiency and output growth are available for pre and during the crisis, respectively. In both Panel A and B, the vertical axis is industry output growth and the horizontal axis is bank (risk-adjusted) efficiency taken from Eq. (1) where the dependent variable is profit before tax(PBT).