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Finance and growth in China, 1995–2013: more liquidity or more development?

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We study the relation of financial development with income growth in China over 1995–2013. In panel and GMM analyses of province-level data, we find that accounting for the short-term spending effect of credit flows on growth, the effect of credit stocks to GDP (the traditional measure of financial development) is negative or insignificant. To identify the channels, we study the effects on GDP aggregates. Our findings suggest that credit expansion held back consumption growth by claiming resources for investment in gross capital formation and net exports. This effect is stronger with more rapid credit growth. The findings are consistent with an investment bias in China's development path.

Keywords: China, consumption, financial development, investment, stocks and flows
JEL Classifications: E44, O47, O57

Introduction

In this article, we report the effects of financial development during 1995–2013 across China's 31 provinces on the growth of provincial GDP and on production and consumption aggregates. We distinguish the effect of financial development (measured by credit stocks) from a liquidity effect (credit flows) on income growth. After correcting for the liquidity effect of credit expansion, it appears that financial development did not support, or even held back, income growth. Specifically, our findings suggest that by claiming resources for investments in gross capital formation and net exports, credit expansion may have held back the growth of consumption by households and government.

We undertake this analysis against the background of a change in the academic consensus on the effects of financial development. A large empirical literature, starting with King and Levine's 1993 'Finance and Growth: Schumpeter Might be Right', has found a positive correlation between financial development, measured by the ratio of credit to GDP and economic growth. Over the last two decades, many cross-country studies reproduced this result, with increasing econometric sophistication (see the overviews by Ang, 2008; Levine, 2005; Valickova et al., 2015). This traditional

perspective, dating back to Schumpeter (1934), views loans as financing investments in productive assets, which expand the capacity of the economy to generate future incomes.

Dissonants to this consensus came from the 'financialization' literature (Epstein, 2005; Palley, 2013) grounded in Keynesian and Marxian views. This pointed to lending that leads to an increase in the price of assets, without enlarging or improving the productive asset stock. This includes lending for trade in existing real estate or for corporate take-overs and stock repurchases. These loans may increase the market price of real estate, stocks, bonds and other financial assets, without increasing the quality of housing or the efficiency of firms (Mazzucato and Wray, 2015). They generate capital gains but they do not enhance future output and income (Werner, 2012).

Recent research shows that debt allocation by banks has indeed shifted away from supporting future production and incomes and towards financing capital gains in real estate and financial asset markets. This can be observed in a large sample of developed and emerging economies in recent decades (Bezemer et al., 2016; Jordà et al., 2014). Increasingly, researchers find that financial-sector growth is associated with less investment and innovation (Cecchetti and Kharroubi, 2013) and lower income growth (Arcand et al., 2015; Bezemer et al., 2016)—not just after a crisis, but in general, across many countries and years. Some papers posit a hump-shaped development of the growth effect of credit over levels of financial development (Figure 1a), and falling growth effectiveness of bank credit over time (Figure 1b). The interpretation is that, apparently, financial development can be 'bad for growth'. The underlying reason could be either or both of the following: many countries have 'too much finance' (the title of Arcand et al.'s (2015) paper, in which Figure 1 appears), or the allocation of financial resources has become less growth-enhancing over time (as argued by Bezemer et al., 2016). Either way, there is now an intense debate in economic journals and policy reports by leading institutions (OECD, 2015; Sahay et al., 2015) about the role of the financial sector in the economy.

Many explanations for this new finding have been suggested. The value-added of banking activities may have shifted to non-intermediation activities so that utilizing credit/GDP as measure for financial development misses the beneficial effects of financial development (Beck et al., 2014). Other explanations suggest a trade-off between positive and negative effects, such that at high levels of financial development (to the right of Figure 1a and b), the effect diminishes. Financial-market liberalization in the 1990s without the building of solid institutions (Rousseau and Wachtel, 2011), or rising expectations of a bailout by financial agents (Arcand et al., 2015), may have led to over-lending. Or perhaps a brain drain of highly educated workers from innovative sectors into finance was the culprit (Cecchetti and Kharroubi, 2013). Over-borrowing also leads to higher probability of crisis, and longer post-crisis recessions—especially if household debt levels are high (Claessens et al., 2010; Didier, 2012; Dynan, 2012; Feldkircher, 2014).

This changing relation between financial development and economic growth over the last decades raises the question: under what conditions does finance help, hinder or hurt the economy? In this article, we ask this question for the Chinese economy and the Chinese financial system. We do not just analyze the recent credit bubble in China, but study the Chinese credit-growth relation since 1995. Taking our cue from the literature reviewed above, we study both the level and the allocation of credit, since both could drive the credit-growth relation. But differently from the cross-country literature, we study allocation defined by its effects on GDP components (consumption versus production) rather than defined by borrowing sector (households versus firms), as in, e.g. Beck et al. (2012) and Bezemer et al. (2016). Thus, this study is not just relevant to China. It asks the same questions asked in the cross-country literature

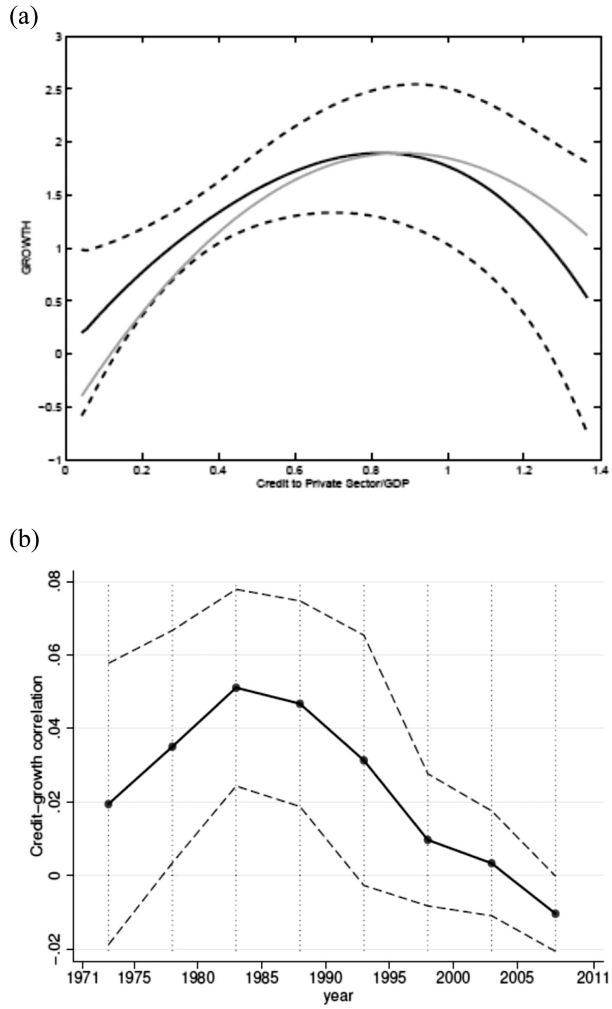

Figure 1. *The falling growth effectiveness of financial development. (a) Over levels of financial development. (b) over time. Note*: (a) plots the relationship between real GDP per capital growth on the vertical axis and credit to the private sector as a ratio to GDP on the horizontal axis (Arcand et al., 2015), estimated without (black solid line) and with quadratic term (grey solid line). (b) plots the credit-growth correlation over time (Bezemer et al., 2016). In both graphs, dotted lines indicate 5% confidence intervals.

reviewed above, and in this way tests the generalizability of the cross-country findings.

We go beyond a benchmark 'credit-and-growth' regression analysis in four ways. An innovation in our study compared to most of the literature is that we distinguish the effect on income growth of *financial development* (captured in credit stocks) from a *liquidity effect* (captured in credit flows). We discuss this distinction in the next section. Doing this allows us to ask whether the financial development effect corrected for the liquidity effect is still positive. This is an especially pressing question for recent years, after the global financial crisis when credit flows were very large.

Second, given the current discussion on China's need for re-balancing the economy towards domestic consumption, we undertake

the analysis both for total GDP and for two GDP aggregates, namely 'production' and 'consumption'. Current discussions revolve around the idea that China is overly dependent for its income growth on growth of net export and of domestic investment. In order to realize continued growth, so the argument goes, it should shift towards more dependence on domestic consumption spending. We aggregate reported gross capital formation and net exports into a 'production' component of GDP, and the sum of household consumption and public consumption into a 'consumption' component of GDP. Admittedly, these two categories are only rough first approximations of the income effects of spending on domestic consumption versus spending on net exports and investment. But by analyzing their correlations to credit growth we might obtain a first assessment of the contribution of financial development to China's dependence on net exports and investment.

Third, given the potential harmful effect of high debt levels and of credit booms observed in the wider literature, we also explore the variation across years and provinces in the credit-growth relation between high and low credit growth rates and between high and low debt levels. And a fourth distinction of our study is that we use very recent data, covering the post-2007 years until 2013, in which there was arguably a dramatic change in the credit-growth relation in China.

Previewing the findings, we find a clear 'liquidity' effect of credit flows on contemporaneous income growth, but a negative effect of credit stocks, the traditional measure for financial development. We find that more rapid growth of credit worsens the negative financial-development effects, while weakening the positive liquidity effect to insignificance. Higher levels of private debt have the same detrimental effects. When we disaggregate GDP into a production component on one hand and a consumption component on the other hand, we find that larger credit stocks are associated with slower growth in consumption, but not with slower growth of production. This suggests that the negative effect of credit stocks on income growth is due to credit expansion (and therefore claims on resources) biased towards production growth, at the cost of resource allocation towards consumption growth. Combined with the argument from the literature that the Chinese economy would benefit from re-balancing—and argument that we do not test here—these findings support that the allocation of credit influences the growth effectiveness of credit. They are also in line with the cross-country literature showing that there can be 'too much' credit.

In the next section, we introduce the distinction between the effects of credit stocks and credit flows on income growth. In the third section, we explore the development of the Chinese financial system since the 1990s. In the fourth, we introduce and explore the provincial data on financial development. In the fifth section, we present the analysis, then conclude with a summary, discussion of limitations and future research, and policy relevance.

Effects of credit stocks and flows on income growth

Each bank loan is both new spending power and new debt. Current flows of credit are new spending power and therefore unambiguously 'good for growth' in an accounting sense—a dollar lent is a dollar spent, which typically results in income generated. We label this the 'liquidity effect'. In fact, it is not so much an 'effect' on income (suggesting a strictly causal interpretation) as the financial counterpart of the increase in income: the loan and the spending of the loan which increases GDP are both part of one borrow-and-spend transaction. This is not what economists mean by the effect of financial development on income growth, and we therefore want to distinguish the two.

The financial development effect is traditionally measured by the credit stock, which is the accumulation of current and past lending flows now circulating in the economy. Since this includes current flows of credit, the measure of credit stocks overstates the financial development effect by including the liquidity effect. Especially in times of strong credit growth, the positive liquidity effect may be so large that any negative debt effects are more than compensated. This may give the appearance of positive effects of financial development, while in reality there is a succession of positive liquidity effects. Instrumenting current stocks with past stocks—the usual way to account for the credit-growth endogeneity problem—helps to disentangle causality, but does not distinguish between stock and flow effects. Instead, including credit flows separate from credit stocks helps to distinguish between stock and flow effects. Indeed, Bezemer et al. (2016) find that on average for a large number of economies since the 1990s, there are negligible or negative effects of financial development on income growth, once we account for the liquidity effect.

In Bezemer et al. (2016) we also report that a key reason for this negligible or negative effects in most Western economies was too much allocation of loans to real estate since the 1990s. For China, we will investigate another dimension of the allocation of loans. There is now much discussion of the challenge of rebalancing the Chinese economy (Lai, 2015). Possibly, too much loan allocation to gross capital formation (including infrastructure and real estate) and net export capacity may have occurred, relative to investment in capacity to produce consumption goods for the domestic market. While massive debt-financed spending on gross capital formation contributed to GDP growth by definition (this is the liquidity effect due to credit flows), this does not imply that this investment increased GDP growth in the longer term via productivity gains (which would be apparent in a positive coefficient of credit stocks in a growth regression). We will test this in the analysis below.

Thus, even apart from the correction for the liquidity effect, the effect of financial development is ambiguous. It may allow productivity-enhancing reallocation of resources. This is the conventional, positive understanding of the effect of financial development. But reallocation need not be productivity enhancing. Too much of it may be allocated to real estate (as in Western economies) or too much of it may be allocated to investment, holding back consumption growth (as perhaps in the case of China). Finally, there may also simply be too much credit. Harmful effects of financial over-development may obtain since bank credit is also private debt. Debt detracts from future purchasing power and effective demand through the build-up of interest and repayment obligations. Since the stock of bank loans is also a stock of nonbank debt, and since debt may hold back future growth, financial development measured by the stock of bank loans may be 'bad for growth' also for this reason. In sum, in identifying the financial development effects (measured by credit stocks), we must correct for the liquidity effect (measured by credit flows). There are then two possible reasons for a negative effect of financial development on income growth: a reallocation effect and a debt level effect.

Credit markets in China since the 1990s

China has been reforming its financial system from one where the government completely determined the volumes and allocation of funds until the 1980s, towards allocation of credit by market forces. But there are still entry barriers to commercial banking and investment banking, and encouragement of lending to favoured sectors (Zhang and Daly, 2014). China's financial system is still shaped

by government directions and rules, and this is relevant to understanding and interpreting the speed and direction of its credit growth. For instance, it would otherwise be difficult to understand the acceleration of credit growth after 2007, which was not a market response but a government response to the global crisis, aimed at preventing a growth slowdown. In 2014, the Chinese financial system was populated by over 500 bank and nonbank financial firms Zhang and Daly (2014:7). Key public players in this system are the People's Bank of China (PBOC) responsible for monetary and exchange policies, foreign reserve management and the overseeing of deposit taking, commercial lending and development financing activities; and the China Banking Regulatory Commission (CBRC) established in April 2003 separately from the PBOC, with responsibility for the supervision of the commercial banking operations (García-Herrero et al., 2006).

Financial development was on a relatively high level in China already in the 1990s. To show this, we use the standard measure for financial development in international data, the ratio of bank loans to the private sector to GDP. Among a selection of emerging economies, China's bank credit/GDP ratio was the highest except for Malaysia (Figure 2a), and was much like that of developed economies such as Italy, Austria, Germany and France (Figure 2b). Its further rise over the last decades has been modest compared to that of some Western economies.

According to data used in international comparisons in the World Bank's *Financial Structure and Institutions* data set, which includes only credit to the private sector, the credit/GDP

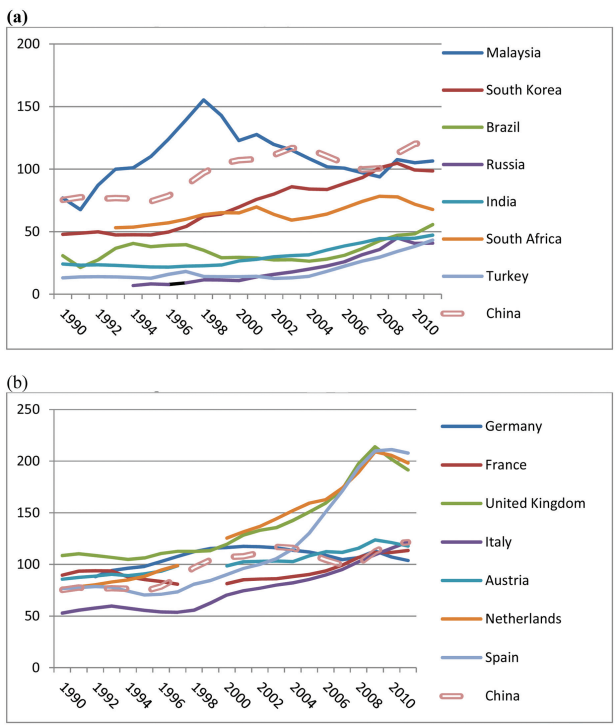

Figure 2. *China's financial development in international perspective. (a) Financial development in emerging countries: bank credit as share of GDP (%). (b) Financial development in advanced countries: bank credit as share of GDP (%). Source: Financial Structure and Institutions Data Set, World Bank.*

rise was from 80% of GDP in 1990 to 120% in 2012. By this measure, the credit/GDP ratio was actually falling in the boom of 2003–2007, as the economy (GDP) expanded faster than did private credit. We note that this data misses a part of actual credit expansion, to the public sector. We observe a clear upturn in credit/GDP in 2007–2008 as China undertook massive investment spending to ward off the recessionary effect of the global credit crisis. Recent years have seen stagnating credit levels again.

Funding, allocation and real estate markets

The sources of bank credit are overwhelmingly domestic. Based on 2013 PBOC data, we find that Chinese bank credit is 90% funded by deposits, with the remainder funded by currency in circulation (5%) and bonds and other liabilities (5%). About 45% of all deposits are household deposits, 35% are deposits of non-financial enterprises, and 15% are deposits held by government organizations. The loans/deposit ratio is 68%, which is lower than in most OECD countries. In a common interpretation, this may indicate relative inefficiency of Chinese banks.

Virtually all loans are domestic loans and 28% of the loan stocks are household loans. Fully 65% of household loans are consumption loans and the other 35% loans to households are 'operating loans', presumably to family businesses. Two thirds (64%) of household operating loans are short-term loans. Household mortgage loans are not reported as a separate category, even though other sources report they have become increasingly important in Chinese household lending (Barth et al., 2012). Household mortgage loans may be hidden in the household loans category, only one fifth of which is short-term. The remainder medium/long term loans may well be house purchase loans. This would imply that about 22% (four fifths of 28%) of all household bank loans in China are mortgages. It is striking that in the official data, the share of household credit in all credit is roughly stable. If these official data are to be trusted, then it is difficult to see how household mortgages could have financed the real estate boom.

Indeed, Guo and Huang (2010) find that short-term capital inflows ('hot money') was the second largest contributor to fluctuations of China's real estate prices between 1997 and 2008, as both foreign and Chinese investors with short-term funds have been keen to share in real estate capital gains. There are no reliable data, since short-term international capital inflows are officially restricted. But Guo and Huang (2010) identify several ways in which laws and regulations are circumvented. More than half of the short-term funds come in the form of over-reported FDI. A fifth is under-reported imports or over-reported net exports and about 5% comes via black-market money exchanges (also Martin and Morrison, 2008). Chan et al. (2007) point to large inflows of hot money from tax haven countries such as Hong Kong, and to underreporting of inflows linked to exploitation of the differential tax treatment between domestic and foreign firms. Given this international dimension of China's real estate financing, and the paucity of data on mortgages, we will in this article not analyse the link between China's domestic financial development and the real estate market. We will focus on the effect on income growth.

Financial development and income growth

There is mixed evidence in the literature to date that financial development supported economic development measured by income growth. He (2012) links financial deregulation from 1981 to 1998 to economic growth at the provincial level, largely through the reallocation of credit across sectors, rather than by changing savings and investment rates. He (2012) takes this as evidence of increased bank efficiency and profitability. Drivers of

bank profitability over 2004–2012 include the level of credit risk, capitalization rates, local economic growth and integration through trade and capital flows (Zhang and Daly, 2014). Berger et al. (2009) find that the 'Big Four' banks are by far the least efficient while foreign-owned banks are most efficient, even with minority foreign ownership. But focusing on the profitability of efficiency of individual banks runs the risk of misinterpreting the function of banks in the wider Chinese economic system, as Zhang et al. (2012) stress. This is not to be individually profitable, but to serve government-defined investment goals through government-directed credit allocation ('moral suasion' or 'window guidance'), which has been and still is practised widely in successful emerging economies in Asia. More generally, in the credit-and-growth literature, as in this article, one would like to understand the economy-wide impacts of financial development, not its effect on bank profit or efficiency. Questions about the macroeconomic effects of financial development must be answered not by reference to individual bank profitability but to the development of total incomes.

Turning to this evidence, Hasan et al. (2009) report that provincial GDP growth rates are robustly associated with the development of financial markets. Zhang et al. (2012), using data from 286 Chinese cities over the period 2001–2006, also find that most traditional indicators of financial development are positively associated with economic growth at the city level. Cheng and Degryse (2010) analyze data on both banks and non-banks in 27 Chinese provinces over the period 1995–2003. They find that compared to nonbanks, banking development has a larger and statistically more significant impact on local economic growth.

It appears that the causal direction has reversed over time. Liang and Teng (2006) use a multivariate VAR framework on data for 1952–2001 and find unidirectional causality from economic growth to financial development, conclusions departing distinctively from those in the previous studies. Hassan et al. (2011) show in a cross-country setting that this direction of causality is typical for the poorest countries and regions globally. The findings by Chang et al. (2010) are in line with this. They examine 1991–2005 provincial-level data of four state-owned commercial banks of China, which reallocate their funds nation-wide. They find that in the early period in this sample economic growth leads financial development in China, not the other way around. But as China's market-oriented reforms deepen, fund reallocation and loans started to manifest positive effects on growth.

In sum, the Chinese experience with financial development appears to be changing over time, from income growth driving financial development to financial development driving income growth. We add to this an investigation of the possibility that in recent years, finance has been undermining rather than supporting income growth.

Data

In Table 1, we present the data used in this study. We observe high real GDP per capita growth of 5.9% annually. Most growth was realized in gross capital formation and net exports, much more than in consumption either by households or by the public sector. Many observers believe that Chinese macro-economic data are subject to serious qualifications in terms of measurement error and reporting bias, due to the still partially planned economic system. In particular, output data are likely to be systematically overstated, and more so around the end of 5-year plan periods when reports are due. This must influence the measure for financial development (the credit/GDP ratio) unless credit data are subject to just the same biases. While this implies that any results from analysis of macro-economic data should be approached with caution, we have no evidence that the

Table 1. *Descriptive statistics.*

Name	Definition	Obs	Mean	Sd	Min	Max
Dependent variables						
GDP p.c. growth	Growth in real GDP per capita	210	15.323	5.881	4.648	30.813
Production growth	Growth in gross capital formation and net exports	210	18.104	10.855	−17.950	101.822
Consumption growth	Growth in household and public consumption	210	15.439	6.346	−3.299	37.904
Independent variables ('initial' means: for the first year of each 3-year period)						
Initial GPPPC	Initial level of GDP per capita	210	9.401	0.917	7.332	11.416
Initial production	Initial level of gross capital formation and net exports	210	7.443	1.443	3.288	10.327
Initial consumption	Initial level of household and public consumption	210	7.601	1.202	3.422	10.005
Credit flow	Change in credit stock divided by lagged GDP	210	16.605	7.883	−8.116	50.798
Credit stock	Credit-to-GDP ratio	210	102.748	30.736	56.336	211.953
Inflation	Annual percentage change in the CPI	210	−0.750	2.573	−7.160	3.914
Trade	(Imports + net exports)/GDP	210	30.699	39.044	3.400	166.916
Education	Growth in tertiary education enrollment	210	11.747	11.809	−23.611	52.241
FDI	Foreign direct investment/GDP	210	2.835	2.876	0.068	17.602

The source for all data is provincial statistical yearbooks. Annual data reported in the provincial statistical yearbooks over 1995–2013 were converted to 3-year averages in seven periods; an 'initial' value is the value for the first year of a 3-year period.

nature of the data systematically biased our results.

We are able to exploit large variation in the data on financial development, both over time and between provinces. Our measure for financial development is the volume of credit by banks and other domestic financial institutions to private and public nonfinancial firms and households. Large regional differences in this measure are apparent in Figure 3. As Martin (2010) stresses, a geographical perspective is needed to fully understand the interacting dynamics of the real and financial sectors. The ratio of credit to GDP in 2011–2013 varied from over 200% in Beijing to 68% in bordering Hebei. In all provinces except a few (Hainan, Inner Mongolia and Tibet), financial development levels increased between 1990 and 2013, most dramatically in southern and eastern provinces. Near the top end of the distribution—in Shanghai, Yunnan, Chongqing, Jiangsu and Fujian—financial development levels in 2011–2103 were around 50% larger than they had been in 1990–1992. In Beijing and Zhejiang, credit/GDP ratios were even 72 and 125% larger, respectively, in 2011–2103 compared to 1990–1992. But in other provinces it is striking how small the increase often was; in a quarter of all provinces, credit/GDP levels in 2013 are hardly larger than they were in 1990–1992 (in Qinghai, Gansu, Liaoning, Sichuian, Jiangxi, Heilongjian, Huan and Henan). Both credit and GDP expanded rapidly in these years, apparently resulting in credit/GDP ratios that barely changed. We also observe clear convergence in financial development over 1990–2013: Figure 4 shows that provinces which were less financially developed at the start of the 1995–2013 time window, experienced faster credit growth over that period.

Analysis

In order to assess the effect of financial development on economic development in China, we now undertake a series of province-level analyses over 1995–2013. We follow the literature on credit and growth by regressing growth in GDP per capita on credit stocks scaled by GDP. To identify the liquidity effect, we add credit flows scaled by last-period GDP. We also include some control variables that are standard in the literature: income levels, inflation, trade, education levels and foreign direct

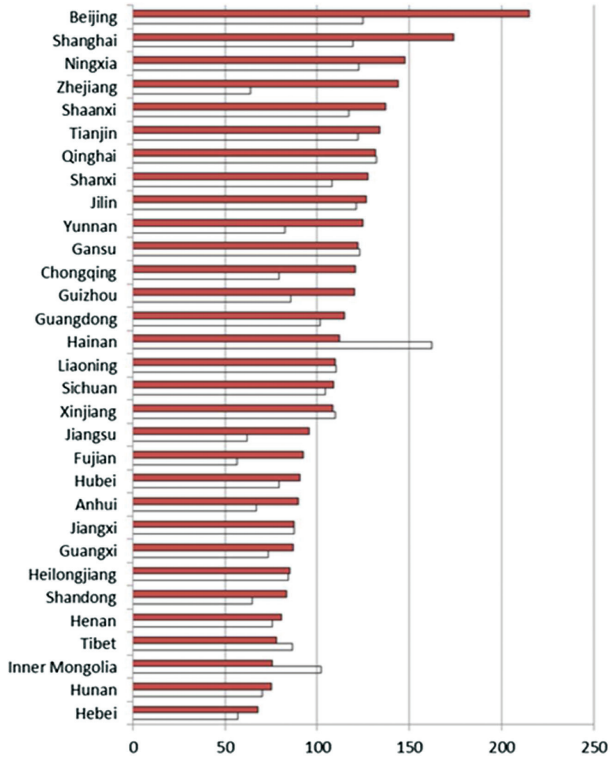

Figure 3. *Financial development in China's provinces: credit as share of GDP (%) in 1990–1992 (white) and in 2011–2013 (dark).*
Source: Statistical Yearbooks.

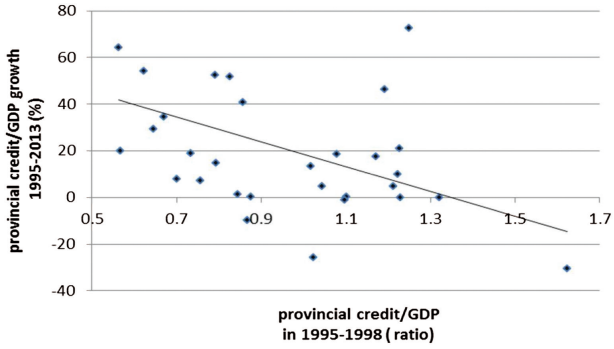

Figure 4. *Convergence in financial development over 1995–2013.*
Note: One outlier for Zhejiang (0.6, 125) was excluded for visibility.
Source: Statistical Yearbooks and authors' calculations.

investment. We take 3-year averaged values for all variables, to smooth out some of the short-term volatility. This gives us up to seven periods for 31 provinces and up to 210 province-period observations (with seven observations missing due to data availability). We run

panel regressions with fixed effect, where possible also applying system-GMM specifications. The system-GMM specification aims to correct for possible endogeneity of credit variables: it is well-known that OLS and panel specification may overestimate the finance-growth effects, by including a reverse causality channel or the effect of unobserved third variables. The system-GMM specification consists of two equations. One is in levels and the other is in differences. The (possibly) endogenous credit stocks and flows variables are instrumented by their lags. We use lagged differences as instruments for the level equation and lagged variables in levels as instruments for the difference equation. In all specifications, two or three lags are used as instruments. In all cases, the number of instruments is smaller than the number of provinces. To test for the validity of instruments, we apply Hansen tests for over-identifying restrictions, along with tests for first- and second-order serial correlation of the residuals.

We start with a conventional regression of income growth on credit (Table 2). Recall that we distinguish between the immediate liquidity effect of more spending power that loan

Table 2. *Credit stocks, credit flows and income growth.*

Dependent variable: real GDP p.c. growth	(1)	(2)	(3)	(4)	(5)	(6)
	FE	Sys-GMM	FE	Sys-GMM	FE	Sys-GMM
Credit flows	0.170***	0.225***			0.209***	0.384**
	(0.042)	(0.069)			(0.046)	(0.172)
Credit stocks			–0.029	–0.009	–0.049***	–0.071***
			(0.018)	(0.060)	(0.013)	(0.025)
Initial level of GDP per capita	–0.072	6.051***	–0.360	8.064	–1.113	2.146
	(2.123)	(1.982)	(2.655)	(6.090)	(2.116)	(4.293)
Inflation	–0.791*	–0.488	–1.348***	–1.077*	–0.814**	–0.548
	(0.400)	(0.435)	(0.394)	(0.628)	(0.383)	(0.754)
Trade openness	–0.067**	–0.095***	–0.054	–0.094	–0.045	–0.047
	(0.031)	(0.014)	(0.032)	(0.068)	(0.027)	(0.050)
Education	0.052	0.144**	0.024	0.128	0.038	0.030
	(0.040)	(0.061)	(0.045)	(0.130)	(0.043)	(0.077)
FDI/GDP	0.150	–0.128	0.206	–0.221	0.158	–0.055
	(0.232)	(0.172)	(0.221)	(0.312)	(0.178)	(0.149)
Constant	10.263	–53.929**	18.423	–71.153	25.423	–9.234
	(22.750)	(20.290)	(28.902)	(65.792)	(22.932)	(46.802)
Observations	210	210	210	210	210	210
R-squared	0.797		0.783		0.808	
Number of id	31	31	31	31	31	31
AR(1)		0.0102		0.0306		0.00617
AR(2)		0.797		0.362		0.990
Hansen		2.792		4.840		4.610
Hansen *P* value		0.593		0.304		0.595
Instruments		17		17		20

This table presents results for seven 2-year or 3-year periods over 1995–2013. Credit stocks are defined as the credit-to-GDP ratio, credit flows are defined as the annual change of credit stocks relative to lagged GDP, following Bezemer et al. (2016). Initial GDPPC is real GDP per capita at the beginning of each period. Inflation is the change in CPI. Trade is imports plus net exports, divided by GDP. Education is the growth in Tertiary education enrollment. FDI is foreign direct investment as a percentage of GDP. AR(1) and AR(2) are the Arellano–Bond serial correlation tests (we report *P* values). Over identification is Hansen J statistic (we report *P* values). All specifications include time dummies (coefficients not reported). Robust standard errors in parentheses.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

extension brings—a positive credit *flow* effect—and the longer-term, ambiguous effect of financial development and debt levels captured by the *stock* of outstanding loans. In Table 2, columns (1), (3) and (5), we report fixed-effects specifications. We find that the flow effect of extra liquidity is positive, but the stock effect is insignificant if included by itself and negative when the liquidity effect is accounted for—just as in a broader sample of developed economies (Bezemer et al., 2016). These results are robust to included lagged values of credit stocks and flows. In a sample excluding the post-crisis years from 2007, we find no negative effects. The credit boom since 2007 may be the driver of on average negative effects of financial development over 1995–2013 (although the smaller sample may also be the explanation).

We estimate a system-GMM specification in columns (2), (4) and (6). The negative effect is now stronger and more significant. Taken together, this is evidence suggesting that on average over 1995–2013, financial development in China was not supportive of GDP growth. Loans facilitated contemporaneous spending, but they appear to have held back growth in the longer term, as in many other countries. On the correlates, we note that the negative conditional correlation of net export is largely by construction, and does not survive the GMM specification.

We now probe the conditions under which credit expansion may hold back income growth. In the introduction we noted studies which argue for a negative effect of the *level* of financial development on income growth. On the other hand, the literature on *credit booms* shows that these also undermine the growth effectiveness of financial development. With more generous loan extension, loan allocation quality may suffer so that less income is generated for the same lending. The balance between (positive) factor re-allocation effects of credit and (negative) debt burden effects will be tilted away from the former and towards the latter. This argument is the more relevant in China, given the high rates of credit growth and the large regional variation in credit growth. We therefore ask if the negative effect in Chinese provinces was only due to the high *level* of financial development—and thus, of debt—or also to rapid credit *growth*? In Table 3, we tease out some of this underlying heterogeneity by splitting the sample into equally sized subsamples of 'small' and 'large' credit flows and 'small' and 'large' credit stocks.

Financial development effects (of credit stocks) are significantly negative in the sample with rapid credit growth (columns (2) and (4)), plausibly because with rapid credit growth the allocation of credit is less efficiency enhancing. This is not the case in the sample with slow credit growth (columns (1) and (3)). However, Chow test results indicate that the difference in stock effects for small and large flows in the GMM specification is barely significant ($P = 0.1$). Further, in the subsample with large credit/GDP stocks (columns (6) and (8)), an increase in credit stocks decreases income growth. This is not the case in the sample with small credit stocks (columns (5) and (7)). But the difference in the effect of credit stocks on income growth between the two subsamples is not significant. The positive 'flow' effect (more credit to be spent) is always present, but is not robust to a GMM specification if credit flows are small (column (3)), and there are no significant differences in the effect between subsamples with small and large flows or small and large stocks. These results across Chinese provinces are consistent with the international cross-country literature (Figure 1). While the results are statistically quite weak, they caution against high levels of indebtedness.

We now turn to more specific impacts on GDP aggregates in Tables 4 and 5. This may help us to answer the question, what is it about factor re-allocation that undermines positive effects on income growth?. Bank credit is a claim on resources, and if more credit leads to the use

Table 3. *Credit-growth effects for small and large Credit flows and small and large Credit stocks.*

Dep. Var:Real GDP per capita growth	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FE		Sys-GMM		FE		Sys-GMM	
	Small flows	Large flows	Small flows	Large flows	Small stocks	Large stocks	Small stocks	Large stocks
Credit flows	0.194*	0.270***	0.491	0.222*	0.314***	0.128**	0.398**	0.326***
	(0.102)	(0.069)	(0.337)	(0.122)	(0.054)	(0.054)	(0.182)	(0.087)
Credit stocks	–0.009	–0.111***	0.018	–0.097***	–0.032	–0.078***	0.001	–0.080*
	(0.034)	(0.023)	(0.087)	(0.029)	(0.042)	(0.020)	(0.041)	(0.046)
Initial GDP per capita	1.384	–2.677	3.391	5.163	–4.724	–0.243	6.281**	1.590
	(3.435)	(3.376)	(4.762)	(4.916)	(3.517)	(3.656)	(2.778)	(3.483)
Inflation	–0.589	–1.520***	0.533	–1.519***	–0.028	–1.587**	–0.348	–0.149
	(0.536)	(0.462)	–1.147	(0.516)	(0.664)	(0.709)	(0.700)	(0.796)
Trade	0.037	–0.049*	–0.070	–0.052	0.009	–0.050	–0.093***	–0.042
	(0.038)	(0.024)	(0.044)	(0.044)	(0.033)	(0.029)	(0.029)	(0.042)
Education	0.097	–0.110	0.195**	–0.041	0.150***	–0.109	0.137***	–0.085
	(0.060)	(0.100)	(0.074)	(0.064)	(0.046)	(0.080)	(0.036)	(0.090)
FDI	0.333*	0.205	0.038	–0.435	0.357	0.306	–0.031	–0.005
	(0.194)	(0.227)	(0.277)	(0.297)	(0.221)	(0.273)	(0.293)	(0.138)
Constant	–8.126	49.854	–30.684	–32.652	57.640	22.507	–58.669*	0.506
	(35.975)	(36.543)	(54.018)	(47.447)	(36.957)	(38.519)	(29.857)	(37.642)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	104	106	104	106	105	105	105	105
R-squared	0.827	0.809			0.891	0.793		
# Province	28	29	28	29	25	23	25	23
AR(1)			0.213	0.0386			0.0265	0.00966
AR(2)			0.354	0.565			0.103	0.916
Over identification			0.855	0.559			0.425	0.286
Chow Tests (*P* value)								
H0: equality of _b[credit flows]	0.35		0.366		0.1		0.456	
H0: equality of _b[credit stocks]	0.000		0.1		0.198		0.556	
H0: equality of _b[credit flows] and _b[credit stocks]	0.000		0.249		0.038		0.676	

This table presents results for seven 2-year or 3-year periods over 1995–2013. Credit stocks are defined as the credit-to-GDP ratio, credit flows are defined as the annual change of credit stocks relative to lagged GDP, following Bezemer et al. (2016). Initial GDPPC is real GDP per capita at the beginning of each 3-year period. Inflation is the change in CPI. Trade is imports plus net exports, divided by GDP. Education is the growth in tertiary education enrollment. FDI is foreign direct investment as a percentage of GDP. Columns (1)–(4) are split based on the median level of credit growth, whereas columns (5)–(8) are split based on the median level of credit stocks. AR(1) and AR(2) are the Arellano–Bond serial correlation tests (we report *P* values). is Hansen J statistic (*P* value) is reported for overidentification. All specifications include time dummies (coefficients not reported). Robust standard errors are in parentheses.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

of more resources for purposes which are not growth enhancing, then this re-allocation may be a reason for the negative effect of financial development on income growth. As noted, there is now circumstantial evidence that the Chinese economy is too much focused on investments supporting gross capital formation and net exports, and that this is increasingly a barrier

Table 4. *Financial development and the growth in GDP components.*

	(1)	(2)	(3)	(4)
	Dependent: growth in 'production'		Dependent: growth in 'consumption'	
	FE	Sys-GMM	FE	Sys-GMM
Credit flows	0.310**	0.472*	0.166*	0.252
	(0.131)	(0.258)	(0.091)	(0.211)
Credit stocks	−0.009	−0.120*	−0.055***	−0.084*
	(0.039)	(0.066)	(0.015)	(0.047)
Inflation	−0.082	0.575	−1.563***	−1.838**
	(1.073)	(1.430)	(0.536)	(0.697)
Trade	−0.158***	−0.086	−0.010	0.033
	(0.046)	(0.061)	(0.027)	(0.039)
Education	0.089	0.044	−0.084	−0.091
	(0.098)	(0.209)	(0.061)	(0.110)
FDI/GDP	0.097	−0.196	0.235	−0.047
	(0.258)	(0.613)	(0.145)	(0.272)
Initial production	−11.464	5.992		
	(6.776)	(4.550)		
Initial consumption			−6.920***	0.410
			(1.934)	(1.435)
Constant	112.065*	−34.883	75.610***	11.666
	(59.782)	(39.101)	(17.244)	(12.754)
Time FE	Yes	Yes	Yes	Yes
Observations	210	210	210	210
R-squared	0.449		0.650	
# Provinces	31	31	31	31
AR(1)		0.160		0.116
AR(2)		0.130		0.242
Over identification		0.506		0.241

This table presents results for seven 2-year or 3-year periods over 1995–2013. Credit stock is the credit-to-GDP ratio, credit flow is the annual change of credit stocks relative to lagged GDP, following Bezemer et al. (2016). 'Production' is gross capital investment plus net exports, 'consumption' is household consumption plus government consumption. The initial level is the level at the beginning of each 3-year period. Inflation is the change in CPI. Trade is imports plus net exports, divided by GDP. Education is the growth in tertiary education enrollment. FDI is foreign direct investment as a percentage of GDP. AR(1) and AR(2) are the Arellano–Bond serial correlation tests (we report *P* values). Over identification is Hansen J statistic (we report *P* values). All specifications include time dummies (coefficients not reported). Robust standard errors in parentheses.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

to continued income growth. China may need to rebalance towards investment that supports more domestic consumption by households and government. This would imply that in the past there was suboptimal allocation of resources, including through the use of bank credit. Hence, larger credit stocks may have contributed to more suboptimal re-allocation of resources and therefore lower income growth than otherwise.

To examine this issue, we analyze if the use of credit since 1995 led to re-allocation of resources which favoured growth in production, at the detriment of growth in consumption.

In Table 4, we find that credit flows are associated with the growth of investments in gross capital formation and net export capacity, albeit with weak statistical significance (column (2)) but not with growth in spending on

consumption by households and government (in the GMM specification, column (4)). The positive coefficient in the fixed-effect model (column (3)) is plausibly due to endogeneity of credit to growth. Larger credit stocks are associated with both smaller growth in consumption and smaller growth in investment in gross capital formation and net export. This evidence is in line with a debt financed spending bias towards gross capital formation and net export growth, at the cost of consumption growth—something that could be one explanation for a negative effect of financial development on overall income growth.

Consistent with the analysis of income growth, we also undertake this analysis for subsamples with small and large credit flows, and for subsamples with small and large credit stocks. Whereas above we found no significant differences between subsamples for overall GDP growth, we do find them for growth of GDP components. There are two findings, based on the GMM results and Chow test results. In Table 5 on investment and net export, we find that in the subsample with large credit flows, the coefficient of credit flows is higher. Larger credit flows increase the dependence of production on credit. Second, in Table 6, in the sample with larger credit flows, the effect of credit stocks is more negative. The interpretation we suggested is that when credit is spent faster, re-allocation of resources via bank credit is more at the costs of consumption growth.

To sum up, we find that over 1995–2013, an increase in credit stocks was associated with a decline in the growth of both production and consumption. And higher levels of financial development, implying more re-allocation of resources towards gross capital formation and net exports, depress consumption growth more. Speed matters: larger credit flows increase the dependence of investment and net exports on debt-financed spending. And with larger credit flows, re-allocation of resources via bank credit is more at the cost of consumption growth.

This analysis suggests a possible reason why increasing debt levels had negative income growth effects, as observed in Table 2. China may have over-invested in gross capital formation and net exports, relative to investment in resources that support consumption, such that the resulting reallocation of resources was detrimental to its income growth.

Summary, discussion and conclusions

This article contributes the literature on financial development effects on income growth in China in recent years. An emerging literature questions the erstwhile consensus that financial development is good for growth. Research has identified a global shift in credit allocation since the 1990s towards purposes which are less efficiency enhancing, such as real estate and financial markets. In this article, we ask what the effect of financial development in China has been in recent years. We do not focus on the link between domestic credit and real estate markets, which is much less clear in China than in Western economies. We study correlations between the stocks and flows of credit with growth of national income and its components. These may be informative on the effects of re-allocation of resources through bank credit, and on the effect of large credit stocks and high debt levels on income growth.

We use Chinese province-level data, which provide both spatial and temporal variations in credit and income plus other variables which we use as controls. In exploring the data, we do indeed observe large regional differentiation of financial development. In regressions of the financial development (credit stocks) and liquidity (credit flows) effects on income growth, we find a positive liquidity effect of credit flows and longer-term, negative effects of credit stocks, which capture debt levels and re-allocation. Larger credit stocks depress growth in consumption, and this effect tends to be more

Table 5. *Credit growth in GDP 'Production' component for small and large Credit flows and stocks.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: growth in GDP 'production' component (gross capital investment and net net exports)								
	FE		Sys-GMM		FE		Sys-GMM	
	Small flows	Large flows	Small flows	Large flows	Small stocks	Large stocks	Small stocks	Large stocks
Credit flows	0.201	0.327**	−0.165	0.697***	0.392	0.106	0.279	0.331
	(0.335)	(0.149)	(1.094)	(0.227)	(0.232)	(0.067)	(0.724)	(0.259)
Credit stocks	0.127	−0.073	0.272	−0.169***	0.222	−0.047	0.030	0.064
	(0.117)	(0.047)	(0.189)	(0.050)	(0.228)	(0.044)	(0.161)	(0.095)
Initial production	−25.699	−5.273*	8.678	3.402	−27.442**	−2.417	5.380	−0.011
	(16.953)	(3.016)	(6.402)	(2.849)	(12.858)	(2.166)	(4.209)	(1.996)
Inflation	0.294	−1.290	0.505	0.237	2.378*	−0.578	0.585	1.097
	(2.274)	(0.797)	(3.424)	(0.945)	(1.237)	(0.714)	(1.581)	(1.500)
Trade	−0.184	−0.105**	−0.190*	−0.054	−0.120	−0.115**	−0.127***	−0.080
	(0.160)	(0.041)	(0.110)	(0.037)	(0.084)	(0.055)	(0.042)	(0.061)
Education	0.656	−0.157	0.513	−0.276	0.361***	−0.167	0.333	0.009
	(0.415)	(0.119)	(0.824)	(0.343)	(0.109)	(0.128)	(0.207)	(0.187)
FDI	1.068*	−0.208	0.468	−0.514	0.737	0.080	−0.104	0.002
	(0.624)	(0.333)	(0.843)	(0.413)	(0.817)	(0.401)	(1.062)	(0.396)
Constant	227.167	64.048**	−91.235	−6.400	238.598**	40.860*	−44.131	1.116
	(152.984)	(28.008)	(63.316)	(26.601)	(102.005)	(21.325)	(38.565)	(19.308)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	104	106	104	106	105	105	105	105
R-squared	0.565	0.536			0.635	0.483		
Number of id	28	29	28	29	25	23	25	23
AR(1)			0.271	0.112			0.276	0.0807
AR(2)			0.390	0.431			0.305	0.418
Over identification			0.772	0.703			0.191	0.385
Chow tests (*P* value)								
H0: equality of _b[credit flows]	0.478		0.097		0.116		0.755	
H0: equality of _b[credit stocks]	0.005		0.312		0.166		0.824	
H0: equality of _b[credit flows]and _b[credit stocks]	0.011		0.027		0.03		0.561	

This table presents results for seven 2-year or 3-year periods over 1995–2013. Credit stock is the credit-to-GDP ratio, credit flow is the annual change of credit stocks relative to lagged GDP, following Bezemer et al. (2016). Initial production is the level at the beginning of each 3-year period. Inflation is the change in CPI. Trade is imports plus net exports, divided by GDP. Education is the growth in tertiary education enrollment. FDI is foreign direct investment as a percentage of GDP. Columns (1)–(4) are split based on the median level of credit growth, whereas columns (5)–(8) are split based on the median level of credit stocks AR(1) and AR(2) are the Arellano–Bond serial correlation tests (we report *P* values). Over identification is Hansen J statistic (we report *P* values). All specifications include time dummies (coefficients not reported). Robust standard errors in parentheses.
***$P<0.01$, **$P < 0.05$, *$P < 0.1$.

negative when financial development is faster. The results allow us to tentatively attribute the negative effect of financial development on income growth to over-investment in gross capital formation and net exports relative to investment in resources that support consumption,

Table 6. *Credit growth in GDP 'Consumption' component for small and large Credit flows and stocks.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: growth in 'consumption' component (private and government consumption)								
	FE		Sys-GMM		FE		Sys-GMM	
	Small flows	Large flows	Small flows	Large flows	Small stocks	Large stocks	Small stocks	Large stocks
Credit flows	0.127	0.308**	0.756	0.237*	0.217	0.219**	0.425	0.223***
	(0.098)	(0.121)	(0.716)	(0.128)	(0.141)	(0.104)	(0.357)	(0.073)
Credit stocks	−0.028	−0.080***	−0.132	−0.076***	−0.114*	−0.033	−0.074	−0.080**
	(0.038)	(0.023)	(0.112)	(0.025)	(0.061)	(0.026)	(0.064)	(0.036)
Initial consumption	−18.973*	−3.979	−4.051**	−0.424	−8.956***	−8.126**	−4.968***	1.206
	(9.623)	(2.734)	(1.762)	(1.155)	(2.934)	(3.668)	(1.585)	(0.929)
Inflation	−1.151	−1.257	−0.374	−1.929**	−1.945**	−1.239	−1.276	−0.372
	(1.180)	(0.923)	(1.419)	(0.895)	(0.721)	(1.142)	(1.492)	(1.044)
Trade	0.061	−0.021	0.059	0.038**	0.045	−0.022	0.042	0.012
	(0.055)	(0.027)	(0.035)	(0.017)	(0.041)	(0.031)	(0.029)	(0.031)
Education	−0.303*	−0.141	−0.185	−0.078	−0.007	−0.167**	−0.017	−0.184
	(0.168)	(0.110)	(0.132)	(0.155)	(0.065)	(0.076)	(0.126)	(0.136)
FDI	0.082	0.030	−0.029	−0.086	0.231	0.247	0.257	0.168
	(0.304)	(0.155)	(0.263)	(0.171)	(0.224)	(0.164)	(0.304)	(0.176)
Constant	179.827*	52.104**	51.389**	18.806*	96.208***	82.967**	56.416***	7.455
	(87.682)	(22.628)	(19.174)	(9.613)	(32.462)	(29.996)	(14.251)	(9.577)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	104	106	104	106	105	105	105	105
R-squared	0.540	0.768			0.651	0.733		
# Province	28	29	28	29	25	23	25	23
AR(1)			0.164	0.0409			0.271	0.0108
AR(2)			0.320	0.626			0.298	0.369
Over identification			0.487	0.448			0.358	0.422
H0: equality of _b[credit flows]	0.689		0.105		0.042		0.704	
H0: equality of _b[credit stocks]	0.09		0.04		0.812		0.575	
H0: equality of _b[credit flows] and _b[credit stocks]	0.215		0.144		0.098		0.795	

This table presents results for seven 2-year or 3-year periods over 1995–2013. Credit stock is the credit-to-GDP ratio, credit flow is the annual change of credit stocks relative to lagged GDP, following Bezemer et al. (2016). Initial consumption is the level at the beginning of each 3-year period. Inflation is the change in CPI. Trade is imports plus net exports, divided by GDP. Education is the growth in tertiary education enrollment. FDI is foreign direct investment as a percentage of GDP. Columns (1)–(4) are split based on the median level of credit growth, whereas columns (5)–(8) are split based on the median level of credit stocks AR(1) and AR(2) are the Arellano–Bond serial correlation tests (we report *P* values). Over identification is Hansen J statistic (we report *P* values). All specifications include time dummies (coefficients not reported). Robust standard errors in parentheses.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

such that the resulting reallocation of resources was detrimental to income growth.

These results are new and they merit further study, especially because of the data limitations. With questions hanging over the quality of the official data, these issues should be further investigated with perhaps more reliable micro-level data. This will also allow for tackling endogeneity issues better, and it will provide more scope for distinguishing between the different mechanisms outlined here (especially, debt overhang effects versus negative re-allocation effects).

One dimension that we did not research is the institutional dimension. Property rights and supervision and governance of the financial sector are, for example, important determinants of the effects of financial development on income growth (Levine, 2005). In this article, we analyzed how strong the effect is. We do not explain China's credit-growth relation vis-á-vis other countries, in which case the different nature of Chinese institutions could be an explanatory factor. But it is still the case that a weak credit-growth relation might be due to institutional factors. A natural follow-up question is therefore what the institutional explanation for the apparent weakness of this effect is, and for the proximate causes such as credit allocation that we identified. Which institutions cause a re-allocation bias, if it exists? This will involve delving deeper into China's mixed planned/market system and its implications for allocation of financial resources.

Yet another avenue for future research is the link to real estate markets. In the cross-country literature, the negative effects of financial development, if they exist, are often linked to over-borrowing in household mortgage markets. It is plausible that China's real estate markets have effects on its growth and the stability of its growth, but it is unclear (and beyond the scope of this article) what the linkages to credit and other financial markets are. Further, in this article we did not address any growth in financial fragility connected to financial development. This would be important in assessing not only average effects on growth as we did here, but also any effects on the sustainability of growth, the impact of financial development on the likelihood of a crisis, and the damage to income growth in the event of a crisis. Each of these issues connected to the build-up of financial fragility appears highly relevant to China's recent experience. Finally, a policy implication of the analysis is that policy makers with the power to induce growth of bank lending face a trade-off between short-term stimulus and longer-term growth costs.

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