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What is new in the finance-growth nexus: OTC derivatives, bank assets and growth

Working papers

What is new in the finance-growth nexus: OTC derivatives, bank assets and growth

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Abstract

We investigate the finance-growth nexus before and around the global financial crisis using for the first time OTC derivative data in growth estimates. Beyond the most recent Wacthel and Rousseau (2010) evidence which documents the interruption of the positive finance-growth relationship after 1989, we show that bank assets contribute indeed negatively, while OTC derivative positively or insignificantly with a much smaller effect in magnitude. At the same time the impact of the crisis is captured by a very strong negative effect of year dummies around the event. Our findings and their discussion aim to provide insights for policy measures aimed at tackling the crisis, disentangling positive from negative effects of derivatives and bank activity on the real economy and restoring the traditional positive link between finance and growth.

Keywords: finance and growth, OTC derivatives, banking, global financial crisis.

JEL Numbers: E44, G10, O40.

1.Introduction

The global financial crisis which exploded in the second half of the first decade of the new century, created unprecedented challenges to policymakers and led academicians to re-examine the nexus between finance and growth in a dramatically changed scenario. According to different estimates Central Banks and governments disbursed between 5 and 10 trillion dollars in terms of loans, direct non recoverable outlays or guarantees to save banks and the financial system.[1] This is why many intellectual energies are currently dedicated to understand why the crisis happened and how it is possible to avoid that something similar may happen again in the future.

[1] The IMF calculated in August 2009 the total cost of the financial crisis at 11,9 dollar trillions including capital injections to save banks, costs of absorbing toxic assets and guarantees over debt and liquidity support from Central Banks (http://www.telegraph.co.uk/finance/newsbysector/banksandfinance/5995810/IMF-puts-total-cost-of-crisis-at-7.1-trillion.html). Panetta et al. (2009) calculate total commitments at July 2009 at around 5 dollar trillions.

A main change occurred in the last years in financial markets well before the crisis is undoubtedly the impressive surge in the volume of derivatives created and traded. Heiss and Sammer (2010) document that in 1990 (Q1) derivatives accounted for 433.8% of the US GDP, slightly less than bonds (477.2%), while in 2008 (Q3) they jumped to 4,880.2% of GDP, ahead of bonds, equities, bank assets and the total of bank assets/equities/bonds by far. In the same period US derivatives (both exchange and OTC traded) held by US commercial banks and trust companies, grew by 544.8 percent (exchange rate derivatives), 42,132.9% (interest rate derivatives) up to 84.889.5 percent (credit derivatives). This growth was mostly driven by OTC derivatives. The same numbers clearly indicate that the growth of derivatives far exceeded not only that of the real economy but also of the underlying financial assets that derivatives are generally expected to hedge. At the same time the new financial development oriented always more banks toward non interest income activities progressively transforming their role. This is part of a longer run transformation as documented by Edwards and Miskin (1995) showing that the share on non-interest income as a fraction of net operating revenue raised from around 18 in 1978 to 35 percent in 1994, and to 42 percent in just the last twenty years for commercial banks (Allen, 2005).

Our claim is that, due to these reasons, the finance and growth literature, one of the most popular research topics in economics with one of the longest historical traditions in the field, cannot neglect anymore the role of derivatives and the transformation of the role of banks and faces the challenge of understanding whether and in which way their surge has modified the traditional links between the financial sector and the real economy.[2]

As it is well known the traditional functions performed by financial markets are pooling resources, transferring value intertemporally and cross-sectionally, providing ways of clearing and settling payments, allocating financial resources to the most productive destinations, managing risk and implementing price information (Bhattacharya and Thakor, 1993; Merton and Bodie, 2005). In this

[2] Among the most well known theoretical contributions on the role of financial markets on the real economy following the intuition of Schumpeter see Bencivenga et al. (1991), Boyd et al. (1986) and Greenwood et al. (1990).

respect Heiss and Sammer (2010) document that derivatives have original features which broaden the set of these traditional functions since they may be conceived as “adapters” among different financial systems which are not fully integrated (Merton and Bodie, 2005).

First of all, derivatives allowed immense resource pooling in the last years and their enormous growth dramatically affected balance sheets of financial institutions. In addition to it, derivatives are generally regarded as lowering transaction costs and helping information discovery with positive effects on economic activity (Merton, 1992). As a consequence, one of the questions that an empirical analysis on them must tackle is whether this growth of financial securities generated wealth and income effects with positive impact on economic growth.

Another crucial role of derivatives has been by far that of enhancing risk allocation. Currency swaps allow for instance to hedge foreign currency flows into the home currency thereby eliminating (even though at a cost) foreign currency risk for those main currencies for which a currency swap market exists. In the same way interest rate swaps allow to hedge interest rate risk among counterparties with fixed/flexible interest debt. In both cases the rise of derivative markets may be regarded as having extensive and intensive effects on the demand for real investment and trade of goods and services on foreign markets thereby positively affecting economic growth. Finally, the existence of derivatives has been generally viewed as enhancing arbitrage opportunities eliminating market inefficiencies (Heiss and Sammer, 2010).

Beyond these distinctive characteristics derivatives modified the same way in which the traditional lending activity is carried out. Securitization of subprime loans and creation of credit derivatives, with the switch from the *originate-to-hold* to the *originate-to-distribute* model, allowed original lenders who sold the loan to the originator (and large financial intermediaries who bought the credit derivatives created by the latter) to improve their capital requirements without effectively reducing their level of risk, even though a different type of (counterparty and systemic) risk was replaced to the traditional one. Since the triple A rating score gained by many credit derivatives based on riskier

underlying mortgages allowed counterparties to reduce capital requirements, derivatives may be considered monetary base and their growth may have had consequences similar to those of expansionary monetary policies.[3]

On the negative side, several authors have warned against some potentially negative effects of derivatives. The same decoupling between their volume (and their turnover) and the corresponding aggregates for the underlying financial assets suggests that derivatives are, to a large extent, not used to hedge but for tax and regulatory arbitrage and for short term trading (Blundell and Atkinson, 2011). This phenomenon was led by individual traders not interested in the derivative hedging properties, by the same banks and pension systems which adopted more aggressive management strategies and by the progressive diffusion of high frequency trading.

Rajan (2006) observes that the above described financial innovation increased appetite for risk of large financial intermediaries and made financial systems "more exposed to financial-sector-induced turmoil and the possibility of low probability but costly downturns". Blundell and Atkinson (2011) emphasize that derivatives shift but do not eliminate aggregate risk. Since derivatives often raise leverage and derivative trades are often zero sum games, they increase counterparty risk. Given that complex derivative transactions involve several intermediaries and the failure of one of them may prevent all the others from fulfilling their obligations, derivatives may significantly increase systemic risk in the economy.

A final question concerns the concentration of the derivatives market on the supply side. Sundaram and Willey (2008) calculate that the top 25 US banks account for 99% of the total notional amounts of derivatives in the US commercial banking system. Blundell and Atkinson (2011) calculate Herfindal Indexes for different segments of derivatives market and show that most of them are dominated by a few players. The concentration increased after the crisis due to the failures and mergers of large institutions. Given such concentration the question is whether efficiency gains

[3] Savona, Maccario and Oldani (2000) test this hypothesis and find support for it by showing that derivatives influence coeteris paribus interest rates and may therefore be considered "speculative demand of money".

discussed above are appropriated by this oligopoly or by consumers and investors. The concern is enhanced also because, in a framework of asymmetric information, lack of competition and lack of diversity of views on price formation and wide bid-ask spreads worsen the problem of risk mispricing.

Based on similar considerations Fink et al. (2006) argue that misuse of derivatives, and not derivatives per se, should be blamed for having amplified the crisis and regulators should not lose sight of the real benefits of derivatives (Murphy, 2009).

A related source of problems leading to the financial crisis has focused not just on the misuse of new financial instruments (financial derivatives) but on its causes, identifying them in a distorted system of incentives of financial intermediaries. The drive of the latter for profit maximization, combined with the use of new sophisticated financial instruments for which all (interconnectedness, counterparty, systemic) risk features where difficult to detect, caused them to miss the target of "risk adjusted profit maximization" and led to excessive short term risk taking which endangered the same organization survival. Managerial stock options (without clawbacks) and golden parachutes, together with traders bonus, were in fact tailored to reward short term returns without penalizing medium run increase of risk. In this framework, as mentioned above, even commercial banks traditionally oriented toward (lower return and lower risk) traditional lending activity adopted disintermediation strategies which led to a progressive reduction of the share of profits arising from the traditional lending activity. Excessive risk taking may also have been fostered by two sources of moral hazard. Some of these financial intermediaries were too big to fail and some of them were also commercial banks and therefore anticipated their higher probability of being saved due to the presence of bank deposits.

Given the presence of the above mentioned controversial effects arising from the combination of derivatives proliferation and the incentive systems of financial intermediaries, and given the impressive way in which they change the international financial scenario, it is no wonder that the traditional finance and growth nexus is going to be affected by them. Rousseau and Wacthel (2006

and 2009) with panel data over the period 1960 to 2003 document that the positive link between finance and growth found by King and Levine (1993) is no more robust over their extended period and disappears after 1989. They attribute such finding to the financial crisis and to the process of financial liberalization.

We intend to provide further reflection on this point with an econometric analysis which extends up to 2009 (and therefore covers a longer time spell around and after the financial crisis) by explicitly introducing proxies of derivatives turnover among relevant regressors.[4]

The paper is divided into four sections (including introduction and conclusions). In the second section we accurately describe our database (countries considered and variables used). In the third section we illustrate our econometric specification and comment our findings. The fourth section concludes.

2.Database

Given the importance of the issue at stake, we provide in this section, and in the one which follows, full evidence on our data and estimating techniques in order to make it easier to replicate our results and to compare them with further research on this topic.

Our study includes panel data on financial and macroeconomic indicators for 37 countries[5] over the 1995-2010 period. Data are taken from the 2011 edition of the World Bank's *World Development Indicators* database, except for OTC data which are from the *Triennial Central Bank Survey of*

[4] The only attempt we know (Baluch and Ariff, 2007) does not use conditional convergence estimates and is run on a sample of 11 countries in a time spell which ends before the financial crisis. Empirical findings document that illiquid derivative markets have a negative impact on growth non contradicting the positive role that derivative risk transfer may have on economic activity.

[5] Australia, Austria, Bahrain, Belgium, Brazil, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, Korea, Rep., Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, United States.

Foreign Exchange and Derivatives Market Activity of the Bank for International Settlements (BIS) (see Table 1 for variable description). The number of country-year observations is constrained to this time spell by the availability of OTC turnover. OTC data are made publicly available by the BIS for 38 countries any three years starting from 1988. Countries are mostly high income OECD and generally those with most developed financial markets.

The number of countries and the time window in our panel are different from those considered by Rousseau and Wachtel (2000) (henceforth also RW) and Back and Levine (2004) in their previous work on finance and growth using panel data, where they investigate the impact of the stock market on economic growth. More specifically, RW (2000) constructed a panel data set with annual observations from 1980 to 1995 for 47 countries, while Back and Levine (2004) worked with a panel of 40 countries and 146 observations, where data are averaged over five 5-year periods between 1976 and 1998.

All data are recorded at yearly frequency with the exception of our OTC variable, which is the OTC interest rate derivatives daily average turnover recorded in the BIS survey. This information is available every three years. In order to have yearly data we interpolate this series by using the piecewise cubic Hermite interpolation. Robustness checks with different interpolation approaches do not change substantially what follows.[6] Once we obtain the values of the average daily turnover for each year of the observation period, our data are annualized assuming 252 trading days for each year in order to obtain a series with other variables used in the econometric analysis.

Borrowing from previous research we use the closest possible set of controls to RW (2000). Controls include on the financial side domestic credit provided by banking sector (BANKCRED), liquid liabilities less narrow money (M3-M1) and domestic credit to private sector (PRICR). Stock trading volume (VTRADE) and stock market capitalization (MCAP), together with OTC

[6] More specifically we try linear and spline interpolation but, due to the exponential growth of the series, the piecewise cubic Hermite interpolation produces significantly smaller mean squared errors on the few countries (Italy, France and Germany) for which we have official yearly data. Evidence on this point is omitted for reasons of space and available upon request.

derivatives market turnover (OTC), are our financial market variables. Finally, we add standard controls in growth estimates such as gross fixed capital formation (INV), human capital investment proxied by gross school enrollment (SCHOOL), initial GDP level (GDP1998), inflation (INFLA), trade (TRADE) and general government final consumption expenditure (GOVEXP).

3.Empirical findings

We provide summary statistics in Table 2 and the pairwise correlation matrix of our variables in Table 3. Table 3 shows that correlations among the variables we will use in our econometric analysis are not particularly high and always below .5. The only exception, as it is obvious to be, is the correlation between bank assets and private credit (.93 percent) which may be considered as close substitutes and will therefore be used alternatively.

We start estimating the finance-growth nexus with the following fixed effect benchmark specification

$$\ln(Y)_{it} - \ln(Y)_{i,t-k} = \alpha_0 + \alpha_1 \ln(Y)_{t-k} + \alpha_2 \ln(Bankcred)_{t-k} + \alpha_3 \ln(OTCTurn)_{t-k} + \alpha_4 \ln(School)_{t-k} + \alpha_5 \ln(Gov\,ex)$$
$$+ \alpha_6 \ln(M3)_{t-k} + \alpha_7 \ln(Trade)_{t-k} + \eta_j + \sum_t DYear_t + \varepsilon_{it}$$

where Y is real per capita GDP at constant 1998 dollars and the left hand side variable is the GDP rate of growth calculated in log differences. On the right hand side we include as variables of financial development total assets of the domestic banking system over GDP (*Bankcred)* and the interest rate derivatives turnover measured as daily averages in "net gross" basis (i.e. adjusted for local inter-dealer double-counting) (*OTCTurn).* The variable is built as explained in section 2. Other

controls include *School* (secondary school enrollment rate),[7] *Govexp* (government expenditure as percent of GDP) and *Trade* (volume of trade as percent of GDP).

Our specification closely resembles that of Rousseau and Wacthel (2009). The only difference in regressors is that we replace their M3-M1 and M3 measures of financial depth with the OTC variable and M1 due to lack of data.[8] Furthermore, RW (2009) use OLS and system GMM five year period estimates while, due to the data constraint imposed by the use of the OTC variable, we perform our estimate by adopting the same two methodologies but on two and three year period estimates. As in WR (2009) all rhs regressors are beginning of period values.

3.1 OLS fixed effect estimates

Results on our two and three year period fixed effect estimates are provided in Tables 4.1 and 4.2 respectively. Overall, the goodness of fit of our estimates including year dummies never falls below 40 percent and is remarkably high in the fully specified estimate of the three year period estimate (71 percent). The most surprising finding is the negative relationship between bank credit and economic growth. This is one of the most robust results we have. The magnitude of the estimated coefficients implies that in the two year fixed effect estimates with year dummies a 100 percent increase in bank assets is associated to a negative growth rate effect of 2-3 percent (Table 4.1, columns 1-4). The post crisis year dummy (2008) effect is around -2 percent. The magnitude is similar when we do not introduce year effects. When we move to three year panels the negative impact of the bank assets variable persists but the magnitude grows to 6-8 percent and is remarkably

[7] As it is well known the growth literature also uses alternative human capital investment measures corrected for quality (see for instance Hanusek and Kinko, 2000). Our results are invariant to the use of such measures. Evidence is omitted for reasons of space and available upon request.

[8] More specifically our choice is motivated by the fact that in the last years (beyond the time interval considered in Wacthel and Rousseau) we have some discontinuities in M3 for countries included in the sample. This is why we opt for the M1 alternative.

stable in all kinds of specification (including fixed effects with or without year dummies) (Table 4.2). The post crisis year dummy (2009) is now between -4 and -7 percent points.[9]

An interpretation of our findings may be related to the dynamics of the financial crisis. Most banks were involved in purchasing credit derivatives which inflated their total assets before the crisis. The value of credit derivatives however fell abruptly over the crisis. As a consequence, the larger the volume of assets of the banking system, the heaviest the government and central bank intervention needed to save them. This is why after the crisis the ratio between total bank assets and GDP became a crucial factor proxying country difficulties in recovering from the crisis (as the situations of Iceland and Ireland document).[10]

What can be also noted in order to interpret this finding is that, as mentioned in the introduction, banks have progressively reduced in the considered period the share of profits due to the traditional lending activity. In other terms, while in normal periods a higher volume of bank assets should imply a one to one higher volume of investment, before the financial crisis that volume corresponded to a progressively reduced share of traditional intermediation activity while during the financial crisis it became a proxy of the amount of financial system losses and of the dimension of the recovery intervention required. Note as well that that, if the negative bank effect would be due only to the crisis event, one would expect the negative sign to disappear when introducing year dummies. Since this is not the case the rationale for our findings should be different.

[9] These magnitudes are slightly larger than those on two year estimates even when we project the latter in the three year time interval of the new estimates.

[10] Total assets in the three large Icelandic banks in 2008 were roughly 9.8 times Iceland's annual gross domestic product (GDP). By comparison, bank assets in the United States were 1.2 times the domestic GDP in 2008. Iceland's banking sector growth was a recent development. In 2003, bank assets were only 1.7 times the domestic GDP. From 2003 to 2008, they grew by a factor of 10. In Ireland bank assets raised from 1.8 to 2.8 scaled on GDP from 2003 to 3.8 in 2007 and fiscal costs of the crisis were estimated at 40 percent of GDP (the highest among EU countries) (McGowan, 2011). Note that Ireland had not the highest bank asset to GDP share among EU countries, but definitely the highest bank asset to GDP share growth between 2003 and 2007.

Given that bank assets have a negative impact net of year and time dummies, this implies that such effect does not depend on country specific idiosyncratic factors (ie. domestic regulation) and is significant even if we account for the impact of the years in which the financial crisis was more pronounced and affected cross-sectionally all countries in our sample. Since what we capture is a within effect this implies that a within country increase in financial depth of the system reduces economic growth in the considered period.

How to evaluate the overall impact of derivatives based on our data ? Our results definitely find trace of the positive side of the derivative use on the real economy thereby finding empirical support to the arguments developed in the introduction. The magnitude of the effect is very limited with an elasticity below one percent. The positive direct effect of OTC turnover may be due to the wealth effects it generates and to the hedging properties of these financial instruments which improved efficiency and increased investment. On the other side, we cannot exclude that two factors impacting negatively (year dummies during the financial crisis and bank credit) may have been related to the misuse of derivatives even though we have no direct proof of it.

With regard to other regressors we observe that the volume of trade is positive and significant while human capital investment proxied by school enrolment is not. This is not a surprise in the literature which shows that the human capital is much more a between than a within effect (see Mankiw et al., 1992 and Islam, 1995), that is, the only effect of regressors which can be captured in our fixed effect estimate.

3.2 Robustness

For a robustness check on the significance of the bank asset variable we calculate whether our findings are sensitive to the inclusion/exclusion of one of the 37 countries of our sample. Following

a standard approach (see Frei and Stutzer, 2000) we subtract the coefficient of the estimate which excludes the given country from the coefficient of the full sample estimate and divide the value for the coefficient standard deviation. The robustness check is performed on the fully augmented estimate (Table 4.1, column 4). The resulting F-test is never above the significance level of 1.96 and actually never above .5. More specifically, the coefficients of the 37 reduced estimates are always significant and the maximum deviation from the full estimate coefficient (.0235) is .003 points against a standard error of the full estimate coefficient of .007 (Table 4.3).[11]

We try several other robustness checks which do not change the substance of our findings on the bank-growth nexus. We use private credit instead of bank assets following King and Levine and Wacthel and Rousseau (2000) and results are unchanged.[12] Finally, we try a specification which is more akin to that of the growth convergence literature by introducing physical capital investment and, here as well, results are not substantially different (see Table 4.4).[13]

Note that it is hard to interpret this nexus between the two variables with an inverse causality rationale, contrary to what happens in case of positive impact where the suspicion is stronger and a long literature debate exists discussing whether it is the growth of the real side which drives the growth of the financial side or viceversa. In our case it is quite difficult to imagine why an increase in the GDP rate of growth should cause a reduction in bank assets two year before. However, since it may be thought that high order autocorrelation of the rate of growth might explain the change in the bank asset to GDP ratio we also use bank assets not scaled for GDP and the negative and significant effect is still there (Table 4.4).

3.3 GMM estimates

[11] We obtain similar findings for all other specifications. Results are omitted for reasons of space and available upon request.

[12] As documented in Table 3 the two variables are almost collinear but we prefer the use of bank assets in our main specification since it is more consistent with our goal of evaluating the role of banks on growth.

[13] Results are omitted for reasons of space and available from the authors upon request.

In order to avoid bias and inconsistency in our estimates in presence of autocorrelation of the lagged dependent variable with the error term (Arellano-Bover, 1995; Blundell-Bond, 1998) we check the robustness of our findings with GMM estimates. To overcome the limits of first generation "first differenced GMM approach[14] we adopt a "second generation" system GMM in which the first differences standard set of equations of the first approach is combined with a second set of equations in levels where suitably lagged first-differences are introduced as instruments (Arellano-Bover, 1995; Blundell-Bond, 1998). As it is standard we use year dummies as strictly exogenous instrument while lagged first differences of all other variables are used as (non strictly exogenous) GMM instruments.

Diagnostics on all reported estimates do not reject the hypothesis that errors in the first differenced regression exhibit first order, but not second order correlation. The Sargan test does not reject the null hypothesis of the overall validity of the instruments only in some of our specifications and, more specifically, in those who are fully augmented with all controls included in OLS estimates.
The bank variable remains negative and significant in all but the last specification when we introduce government expenditure. The magnitude is smaller but consider that here fixed effects are omitted. Hence the within effect mixes up with the between effect in such estimates.

4. Conclusions

[14]Blundell and Bond (1988) show on this point that lagged levels are often poor instruments for first differences. Bond et al. (2001) document that the first generation GMM estimator has poor finite sample properties when the autoregressive parameter (the correlation of output with its one period lagged value) approaches unity or the variance of time invariant individual effects is large with respect to time varying and transient shocks.

Our research aims to investigate the finance and growth nexus with two novelties with respect to the previous literature. It extends the periods of inquiry to the years of the financial crisis and includes proxies of derivatives expansion among regressors. In spite of the inevitable limit of our data we deem our attempt important in order to enlarge the scope of research of the traditional finance an growth literature.

Our findings clearly evidence a non conventional finance and growth nexus. The negative impact on real economic growth of year dummies in the years in which the crisis was more pronounced is strong and evident. OTC turnover has a weak but positive effect on growth while the volume of bank credit is, surprisingly, significant and negative.

With regard to bank assets we note that a non significant effect would already be a relevant result given the strong tradition of the positive nexus between finance and growth. Hence, the significant negative within effect found in almost all specifications is even more relevant since the within effect captured with our estimates documents that, in the considered years, an increase in bank assets impacted negatively on economic growth.

Our main finding is therefore the identification of three empirical channels: a first positive and weak link between OTC trading and economic growth, a second negative and significant link between aggregate bank credit and economic growth (larger in magnitude than the first) and the negative impact of the global financial crises in the last years of our sample period. The first channel is likely to capture wealth and efficiency effects embedded in derivatives hedging properties. An overall evaluation of the role of derivatives on growth deserves however further attention. If the negative impact of bank credit, and definitely more so, the overall negative effect of the financial crisis have to be related to the negative properties of derivatives (increase of interconnectedness and systemic risk) the net impact of the latter may turn out to be negative at least in the current regulatory framework.

The challenge for the future for regulators and policymakers is therefore how to preserve the positive efficiency effects of derivative hedging properties, while contrasting their contributions to interconnectedness, counterparty and systemic risk which led to the global financial crisis and made bank assets a problem for domestic GDPs.

Basel III reforms of capital requirements accounting for these new risk dimensions, reforms of incentive schemes for managers and traders, separation between commercial and merchant banking, tax on financial transactions to deter high frequency trading, limits to bank leverage and regulation of OTC derivatives are among the main directions currently under discussion in order to achieve this goal.

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Table 1. Variables description

Variable	Meaning	Source
Bankassets	Total bank assets (percent of GDP)	World Bank Development Indicators (2011 edition)
Trade	Volume of trade (percent of GDP)	World Bank Development Indicators (2011 edition)
GDP/N	real per capita GDP at constant 1998 dollars	World Bank Development Indicators (2011 edition)
OTC	interest rate derivatives turnover measured as daily averages in "net gross" basis (ie. adjusted for local inter-dealer double-counting)	*Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity* of the Bank for International Settlements (BIS)
School	Secondary school enrollment rate	World Bank Development Indicators (2011 edition)
Govexp	Government expenditure (percent of GDP)	World Bank Development Indicators (2011 edition)
Money	M1 current	World Bank Development Indicators (2011 edition)
Infl		
Investment	Gross fixed capital formation (percent of GDP)	World Bank Development Indicators (2011 edition)

Table 2 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP/N	478	19228.49	12586.8	419.3959	56389.21
School	398	100.9616	20.1141	44.23343	161.7809
Bankcred	465	0.95938	0.595312	-0.02083	3.675944
OTC	430	10880.79	35326.5	0	311194.8
Govexp	438	0.136919	0.049603	0.033006	0.286328
Trade	451	0.865816	0.845484	0.093947	4.927071
Pricr	465	0.827112	0.474303	0.113099	2.686254
Vtrade	477	0.85938	0.992718	0.004602	7.597483
Mcap	477	1.069447	1.077781	0.098388	12.13836
Infl	481	0.029734	0.038111	-0.0448	0.583871
Money	442	41.89584	194.7956	0.05593	1438.81
Investment	478	.2173897	.0379284	.1154865	.3660929

Table 3 Variance-covariance matrix

	GDP/N	School	Bankcred	OTC	Govexp	Trade	Pricr	Vtrade	Mcap	Infl	Money	Investment
GDP/N	1											
School	0.337	1										
Bankcred	0.474	0.0374	1									
OTC	0.2951	-0.0234	0.2946	1								
Govexp	0.1896	0.4552	0.3506	0.0168	1							
Trade	0.2403	-0.1579	0.064	-0.1551	-0.097	1						
Pricr	0.5582	0.0722	0.9354	0.3119	0.2749	0.2245	1					
Vtrade	0.2618	-0.0902	0.2475	0.358	-0.1219	0.2581	0.3609	1				
Mcap	0.26	-0.1781	0.2315	0.0612	-0.1781	0.6179	0.3665	0.7252	1			
Infl	-0.4849	-0.2361	-0.3177	-0.1135	-0.1099	-0.1365	-0.3776	-0.1417	-0.1514	1		
Money	-0.1369	-0.1541	-0.0313	-0.0415	-0.1877	-0.0862	-0.0859	-0.0307	-0.0451	0.1719	1	
Investment	-0.2096	-0.0997	-0.0624	-0.2175	-0.3594	-0.0426	-0.0555	-0.0243	-0.0833	0.0940	0.2391	1

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Tab 4.1 Fixed effect OLS growth estimates (two year periods with and without year dummies)

Year dummies	Yes	Yes	Yes	Yes	No	No	No	No
$Ln(School)_{t-1}$	2.98E-05	-4.7E-05	0.00015	8.98E-05	3.82E-05	-6.7E-05	0.000215	0.000158
	(0.21)	(-0.33)	(0.86)	(0.51)	(0.20)	(-0.34)	(0.93)	(0.67)
$Ln(GDP/N)_{t-1}$	-0.06782	-0.12428	-0.06475	-0.09541	-0.08963	-0.15427	-0.0681	-0.09787
	(-2.92)	(-3.94)	(-2.53)	(-2.58)	(-3.63)	(-3.87)	(-2.26)	(-1.99)
Dyear_2000	-0.00049	0.00174	0.0001	-0.00625				
	(-0.07)	(0.19)	(0.34)	(-0.63)				
Dyear_2002	-0.02211	-0.01691	-0.01689	-0.01843				
	(-3.44)	(-2.08)	(-3.80)	(-2.20)				
Dyear_2004	-0.00231	0.000173	0.002561	-0.00188				
	(-0.37)	(0.02)	(0.53)	(-0.22)				
Dyear_2006	-0.00074	-0.00029	0.004887	-0.00103				
	(-0.17)	(-0.06)	(0.85)	(-0.19)				
Dyear_2008	-0.02451	-0.02475	-0.01837	-0.02479				
	(-7.01)	(-6.66)	(-2.63)	(-6.42)				
$Ln(Bankcred)_{t-1}$	-0.03247	-0.02356	-0.03266	-0.02627	-0.03395	-0.02583	-0.03491	-0.02966
	(-5.12)	(-3.07)	(-4.47)	(-2.89)	(-4.07)	(-2.53)	(-3.62)	(-2.44)
$Ln(OTC)_{t-1}$		0.002194		0.002349		0.001808		0.002311
		(0.96)		(0.89)		(0.63)		(0.70)
$Ln(Trade)_{t-1}$	0.040928	0.04253	0.040078	0.035449	0.024184	0.023827	0.024957	0.016126
	(4.42)	(3.38)	(4.08)	(2.60)	(2.09)	(1.66)	(2.02)	(1.03)
$Ln(Govexp)_{t-1}$	-0.01368	-0.03433	-0.00895	-0.01581	-0.00874	-0.02205	-0.003	0.000796
	(-0.98)	(-1.57)	(-0.62)	(-0.68)	(-0.59)	(-1.07)	(-0.19)	(0.03)
$Ln(Money)_{t-1}$			-0.00527	-0.01004			-0.00586	-0.01629
			(-0.68)	(-1.28)			(-0.62)	(-1.63)
Constant	0.660586	1.170342	0.621494	0.907378	0.859765	1.473401	0.647898	0.939862
	(3.11)	(4.11)	(2.72)	(2.73)	(4.06)	(4.20)	(2.50)	(2.17)
N	188	165	172	151	188	165	172	151
R-squared	0.464818	0.496046	0.409556	0.426045	0.014319	0.048234	-0.07838	-0.07484

Variable legend: see Table 1.T-stats in round brackets.

Tab 4.2 Fixed effect OLS growth equations (three year periods with and without year dummies)

Year dummies	Yes	Yes	Yes	Yes	No	No	No	No
$Ln(School)_{t-2}$	-2.78E-06	-0.00014	0.00031	0.000126	0.000554	-0.0002	0.001032	0.000372
	(-0.01)	(-0.29	(0.60)	(0.26)	(0.80)	(-0.33)	(1.40)	(0.65)
$Ln(GDP/N)_{t-2}$	-0.16757	-0.36933	-0.16108	-0.25693	-0.29891	-0.42036	-0.34343	-0.21504
	(-1.84)	(-2.55)	(-1.67)	(-1.67)	(-2.53)	(-2.24)	(-2.72)	(-1.18)
Dyear_2003	-0.02919	-0.02139	0.048677	0.05283				
	(-3.22)	(-2.41)	(2.98)	(2.52)				
Dyear_2006	0.063772	0.037312	0.076069	0.02406				
	(5.17)	(3.94)	(4.88)	(2.03)				
Dyear_2009	-0.06399	-0.07245	-0.04182	-0.03691				
	(-5.30)	(-6.22)	(-2.57)	(-1.68)				
$Ln(Bankcred)_{t-2}$	-0.08844	-0.06647	-0.10381	-0.10968	-0.07247	-0.09363	-0.11553	-0.18355
	(-3.64)	(-2.16)	(-3.60)	(-2.49)	(-2.03)	(-2.39)	(-2.77)	(-3.85)
$Ln(OTC)_{t-2}$		0.010198		0.00641		0.011024		0.004216
		(1.23)		(0.75)		(1.12)		(0.45)
$Ln(Trade)_{t-2}$	0.05685	0.025357	0.058618	-0.01517	-0.06459	-0.13942	-0.04141	-0.15831
	(1.88)	(0.55)	(1.90)	(-0.30)	(-1.68)	(-2.97)	(-1.02)	(-3.60)
$Ln(Govexp)_{t-2}$	0.000859	-0.02727	0.012329	0.083761	0.148534	0.242123	0.145146	0.34234
	(0.02)	(-0.31)	(0.26)	(0.81)	(2.46)	(2.75)	(2.36)	(3.96)
$Ln(Money)_{t-2}$			-0.01185	-0.0287			0.012535	-0.03018
			(-0.50)	(-1.24)			(0.38)	(-1.12)
Constant	1.627338	3.462005	1.590147	2.602765	3.060384	4.451794	3.419731	2.619115
	(1.98)	(2.67)	(1.83)	(1.92)	(2.97)	(2.68)	(3.11)	(1.63)
N	99	84	94	80	99	84	94	80
R-squared	0.688267	0.65664	0.648181	0.712471	0.254385	0.506891	0.255322	0.594125

Variable legend: see Table 1. T-stats in round brackets.

Table 4.3 Robustness check on the impact of outlier countries on our estimates

Country	$Ln(Bankcred)_{t-2}$	**F-test***
Australia	-0.0235984	0.01
Austria	-0.02399	0.06
Bahrain	-0.0235584	0.00
Belgium	-0.0273483	0.49
Brazil	-0.0230124	-0.07
Canada	-0.024795	0.16
Czech Republic	-0.0232806	-0.04
Denmark	-0.0278309	0.56
Finland	-0.0230002	-0.07
France	-0.0235849	0.00
Germany	-0.0223428	-0.16
Greece	-0.0235068	-0.01
Hong Kong	-0.0234004	-0.02
Hungary	-0.0233141	-0.03
India	-0.0227888	-0.10
Indonesia	-0.0235584	0.00
Ireland	-0.0190135	-0.59
Italy	-0.0232068	-0.05
Japan	-0.0228228	-0.10
Korea, Rep.	-0.0240058	0.06
Luxembourg	-0.0236149	0.01
Malaysia	-0.0198634	-0.48
Mexico	-0.0254344	0.24
Netherlands	-0.0223189	-0.16
New Zealand	-0.0237365	0.02
Norway	-0.023193	-0.05
Poland	-0.0228105	-0.10
Portugal	-0.0235277	0.00
Saudi Arabia	-0.0235584	0.00
Singapore	-0.0235584	0.00
South Africa	-0.0248758	0.17
Spain	-0.0230333	-0.07
Sweden	-0.029973	0.84
Switzerland	-0.0237356	0.02
Thailand	-0.0223299	-0.16
United Kingdom	-0.0228177	-0.10
United States	-0.0233303	-0.03

$Ln(Bankcred)_{t-1}$ coefficient in the estimate which excludes the row country minus from the $Ln(Bankcred)_{t-1}$ coefficient of the full sample estimate scaled for the value of the second coefficient standard deviation

Table 4.4 Robustness check on the bank assets-growth nexus

Year dummies	Yes	Yes	Yes	Yes	No	No	No	No
Specifications in Table 4.1, augmented with physical capital investment (as in standard conditional convergence estimates)								
Ln(Bankcred) $_{t-1}$	-0.0323	-0.02266	-0.03267	-0.0254	-0.03342	-0.02543	-0.03427	-0.02831
	(-5.05)	(-2.95)	(-4.45)	(-2.77)	(-4.00)	(-2.52)	(-3.55)	(-2.35)
Specifications in Table 4.1, with bank assets not scaled for GDP								
Ln(Bankcred) $_{t-1}$	-0.02869	-0.02008	-0.02781	-0.02196	-0.02659	-0.01919	-0.02448	-0.01956
	(-4.41)	(-2.65)	(-3.76)	(-2.49)	(-3.22)	(-2.00)	(-2.58)	(-1.75)
Specifications in Table 4.2, augmented with physical capital investment (as in standard conditional convergence estimates)								
Ln(Bankcred) $_{t-2}$	-0.09305	-0.06602	-0.11029	-0.10969	-0.0663	-0.08732	-0.10726	-0.17041
	(-3.77)	(-2.11)	(-3.77)	(-2.44)	(-1.85)	(-2.27)	(-2.51)	(-3.51)
Specifications in Table 4.2, with bank assets not scaled for GDP								
Ln(Bankcred) $_{t-2}$	-0.074	-0.04743	-0.08567	-0.07031	-0.07636	-0.08902	-0.11439	-0.14487
	(-2.85)	(-1.47)	(-2.80)	(-1.56)	(-2.12)	(-2.34)	(-2.75)	(-3.29)

The table displays only the bank asset coefficient and its standard error. Full estimate results are omitted for reasons of space and available upon request. T-stats in round brackets.

Tab 5.1 GMM growth equations with year dummies

Variable						
$Ln(GDP/N)_{t-1}$	-0.01276	-0.01029	-0.01283	-0.02503	-0.01923	-0.01794
	(-4.06)	(-3.25)	(-4.61)	(-5.01)	(-7.20)	(-3.77)
$Ln(School)_{t-1}$	-0.00069	-0.00039	-0.00042	-6.8E-05	-0.00016	-2E-05
	(-3.40)	(-2.82)	(-3.36)	(-0.33)	(-1.58)	-0.11)
$Ln(Bankcred)_{t-1}$		-0.01704	-0.02076	-0.01191	-0.00812	0.000126
		(-2.98)	(-4.24)	(-1.66)	(-2.12)	0.02)
$Ln(OTC)_{t-1}$			0.002815	0.006031	0.00598	0.002965
			(2.53)	(2.71)	(4.88)	1.27)
$Ln(Trade)_{t-1}$				0.013228	0.012044	0.012545
				(2.46)	(4.29)	(2.53)
$Ln(Money)_{t-1}$					0.00333	0.001112
					(3.60)	(0.69)
$Ln(Govexp)_{t-1}$						-0.02651
						(-1.77)
Constant	0.216818	0.159745	0.163537	0.200562	0.187182	0.091712
	(14.03)	(6.87)	(8.74)	(6.35)	(9.48)	(1.9)
	-0.18	-0.27	-0.89	-0.17	0.86	-0.33
AR(2)	(0.58)	(0.787)	(0.375)	(0.865)	(0.389)	(0.744)
Sargan on IV	68.25	76.61	62.69	10.45	25.31	1.62
instruments	(0.00)	(0.00)	(0.00)	(0.31)	(0.03)	(0.99)
N	198	192	169	169	155	151
	F(7, 190)	F(8, 183)	F(9, 159)	F(10, 158)	F(11, 143)	F(12, 138)
F-test	59.56	59.99	50.42	18.08	36.86	12.67

T-stats in round brackets.

Table 5.2 Robustness check on the bank assets-growth nexus

Year dummies	Yes	Yes	Yes	Yes	Yes
Specifications in Table 5.1, columns 2-6 augmented with physical capital investment (as in standard conditional convergence estimates)					
L2lbankcred	-0.01166	-0.01552	-0.00955	-0.00751	-0.00229
	(-2.38)	(-3.25)	(-1.36)	(-2.05)	(-0.40)
AR(2)	0.18	0.87	0.92	0.76	0.51
	(-0.86)	(-0.38)	(-0.36)	(-0.45)	(-0.61)
Sargan on IV instruments	124.53	134.72	133.73	126.21	122.998
	(0.03)	(0.02)	(0.09)	(0.22)	(0.31)
N	192	169	169	192	151
F-test	F(9,182)	F(10,158)	F(11,157)	F(9,182)	F(13,137)
	46.57	30.45	15.11	46.57	11.28
Year dummies	Yes	Yes	Yes	Yes	Yes
Specifications in Table 5.1, columns 2-6 with bank assets not scaled for GDP					
L2lbankcred	-0.00466	-0.00815	-0.005	-0.00619	-0.00192
	(-3.26)	(-4.62)	(-2.54)	(-3.08)	(-1.25
AR(2)	0.27	0.87	0.92	0.76	0.51
	(0.79)	(0.38)	(0.36)	(0.44)	(0.61)
Sargan on IV instruments					
	112.25	104.52	115.04	113.56	101.98
	(0.06)	(0.09)	(0.09)	(0.29)	(0.38)
N	192	169	169	155	151
F-test	F(8,183)	F(9,159)	F(10,158)	F(11,143)	F(12,138)
	59.26	51.86	48.82	48.71	36

The table displays only the bank asset coefficient and its standard error. Full estimate results are omitted for reasons of space and available upon request.