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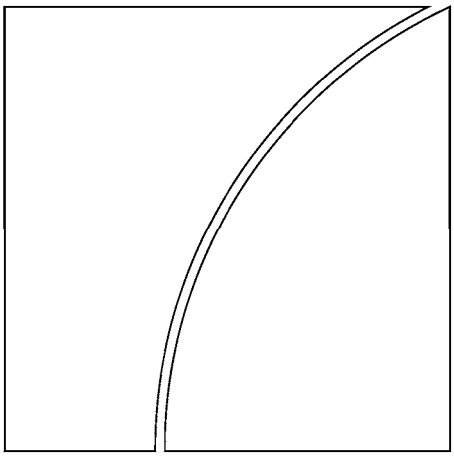

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Reassessing the impact of finance on growth

by Stephen G Cecchetti and Enisse Kharroubi

Monetary and Economic Department

July 2012

JEL classification: D92, E22, E44, O4

Keywords: Growth, financial development, credit booms, R&D intensity, financial dependence

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Reassessing the impact of finance on growth

Stephen G Cecchetti and Enisse Kharroubi*

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Abstract

This paper investigates how financial development affects aggregate productivity growth. Based on a sample of developed and emerging economies, we first show that the level of financial development is good only up to a point, after which it becomes a drag on growth. Second, focusing on advanced economies, we show that a fast-growing financial sector is detrimental to aggregate productivity growth.

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1. Introduction

One of the principal conclusions of modern economics is that finance is good for growth. The idea that an economy needs intermediation to match borrowers and lenders, channelling resources to their most efficient uses, is fundamental to our thinking. And, since the pioneering work of Goldsmith (1969), McKinnon (1973) and Shaw (1973), we have been able to point to evidence supporting the view that financial development is good for growth. More recently, researchers were able to move beyond simple correlations and establish a convincing causal link running from finance to growth. While there have been dissenting views, today it is accepted that finance is not simply a by-product of the development process, but an engine propelling growth.[1] This, in turn, was one of the key elements supporting arguments for financial deregulation. If finance is good for growth, shouldn't we be working to eliminate barriers to further financial development?

It is fair to say that recent experience has led both academics and policymakers to reconsider their prior conclusions. Is it true regardless of the size and growth rate of the financial system? Or, like a person who eats too much, does a bloated financial system become a drag on the rest of the economy?

In this paper, we address this question by examining the impact of the size and growth of the financial system on productivity growth at the level of aggregate economies. We present two very striking conclusions. First, as is the case with many things in life, with finance you can have too much of a good thing. That is, at low levels, a larger financial system goes hand in hand with higher productivity growth. But there comes a point – one that many advanced economies passed long ago – where more banking and more credit are associated with lower growth.

Our second result comes from looking at the impact of growth in the financial system – measured as growth in either employment or value added – on real productivity growth. Here we find evidence that is unambiguous: faster growth in finance is bad for aggregate real growth. One interpretation of this finding is that financial booms are inherently bad for trend growth.

At first, these results may seem surprising. After all, a more developed financial system is supposed to reduce transaction costs, raising investment directly, as well as improving the distribution of capital and risk across the economy.[2] These two channels, operating through the level and composition of investment, are the mechanisms by which financial development improves growth.[3] But the financial industry competes for resources with the rest of the economy. It requires not only physical capital, in the form of buildings, computers and the like, but highly skilled workers as well. Finance literally bids rocket scientists away from the satellite industry. The result is that people who might have become scientists, who in another

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[1] The view that financial development is simply a by-product of growth is discussed in Robinson (1952): "Where enterprise leads, finance follows". For the more recent work establishing causality, see Levine et al (2000) for country-level evidence and Rajan and Zingales (1998) for industry-level evidence. For an alternative view, see Easterly et al (2000), who suggest that financial development may only be good up to a point.

[2] See Pagano (1993) for a simple analytical model of financial development as a reduction in transaction costs in the context of an AK model. A more comprehensive approach is developed in Holmström and Tirole (1997), who provide a model for why different financial patterns (direct finance vs intermediated finance) may coexist altogether.

[3] Theoretical contributions relating the role of financial intermediaries to the composition of investment include: Acemoğlu and Zilibotti (1997), who look at how the presence of financial intermediaries affects the risk return profile of entrepreneurs' projects; Holmström and Tirole (1998), who examine how financial intermediaries can help save on liquidity hoarding; and Aghion et al (2010), who show how financial development helps reduce the growth cost of economic fluctuations.

age dreamt of curing cancer or flying to Mars, today dream of becoming hedge fund managers.[4]

There is an important sense in which this description of the consequences of a financial boom is no different from those of the dotcom boom of the 1990s, or the impact of any other boom tied to more tangible output. Booming industries draw in resources at a phenomenal rate. It is only when they crash, after the bust, that we realise the extent of the overinvestment that occurred. Too many companies were formed, with too much capital invested and too many people employed. Importantly, after the fact, we can see that many of these resources should have gone elsewhere. Following the dotcom bust innumerable computers were scrapped, office buildings vacated and highly trained people laid off.

The remainder of the paper provides the empirical evidence for our conclusions. In Section 2, we examine the impact of financial system size on productivity growth in a sample of 50 advanced and emerging market economies over the past three decades. To measure financial sector size, we consider both output measures like private credit to GDP as well as input measures like the financial sector's share in total employment (in this latter case, we restrict our analysis restricted to advanced countries because of limited data availability). Considering the level of financial development, we find that when private credit grows to the point where it exceeds GDP, it becomes a drag on productivity growth. Using employment measures, we find that when the financial sector represents more than 3.5% of total employment, further increases in financial sector size tend to be detrimental to growth.

In Section 3, we examine the impact of the growth rate of the financial system on aggregate productivity growth in a sample of advanced countries over the past three decades. Again, our analysis is restricted to advanced economies due to data limitations. There we find that, compared with a country where the financial sector's share in total employment is stable, a typical financial boom – employment growth of 1.6% per year – reduces growth in aggregate GDP per worker by roughly one half of 1 percentage point.

2. The inverted U-shaped effect of financial development

We begin by examining the relationship between the size of a country's financial system and its productivity growth to see whether there is a point where bigger is no longer better. In what follows, we examine various measures of financial development, starting with the ratio of private credit to GDP.

2.1 Private credit and growth

We begin with a simple histogram constructed from a sample of 50 advanced and emerging countries over the period 1980–2009. Using five-year non-overlapping GDP-per-worker growth and private credit to GDP we compute the average growth conditional on the quartiles of the ratio of private credit to GDP. The resulting histogram in Graph 1, computed from a total of 300 data points, shows that GDP-per-worker growth increases from the first to the

[4] Philippon and Reshef (2009) provide empirical evidence that, over the past 30 years, the US banking industry has become relatively skilled-labour-intensive. Analytical contributions investigating occupational choices between producing and financing include Philippon (2007), which provides a model where human capital is allocated between entrepreneurial and financial careers, and where entrepreneurs can innovate but face borrowing constraints that financiers can help to alleviate. Cahuc and Challe (2009) also develop an analytical model focusing on the allocation of workers between financial intermediation and production sectors in the presence of asset price bubbles.

third private credit to GDP quartile, before declining in the final quartile. That is, countries with the highest level of private credit to GDP have lower trend growth than the rest.

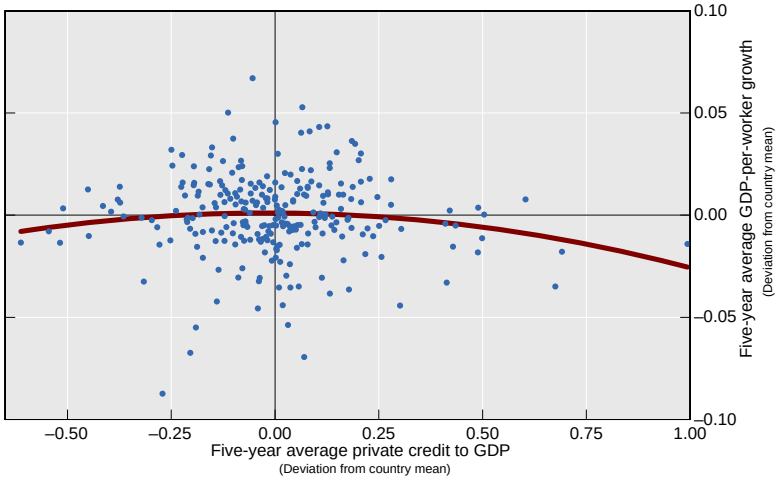
Graph 1

Average GDP-per-worker growth by private credit to GDP quartiles

Each bar represents the five-year average GDP-per-worker growth conditional on the five-year average private credit to GDP ratio belonging to a specific quartile of the sample distribution. The sample covers 50 countries over the period 1980–2009. GDP-per-worker growth and private credit to GDP are averaged for non-overlapping periods over five years. For country sample and sources, see data appendix.

Graph 2

Private credit to GDP ratio and growth



Graphical representation of $\Delta y_{k,t+5,t} = \alpha + \beta_k + \gamma_0\left(fd_{k,t,t+5}\right) + \gamma_1\left(fd_{k,t,t+5}\right)^2 - \delta y_{k,t} + \varepsilon_{k,t}$ over the period 1980–2009. For country sample and sources, see data appendix.

Of course, this histogram does not imply that private credit is bad for growth at high levels. Countries with high private credit to GDP are more developed economies, which grow more slowly for a variety of reasons. Convergence effects are the most obvious. To address this, we compute deviations from country-specific means, and control for initial conditions. The result, based on the sample of data, is in Graph 2. The relationship is clearly not monotonic. That is, at low levels of credit, more credit raises trend growth. But there comes a point where the additional lending and a bigger financial system become a drag on growth.

To get a more precise sense of this relationship, and to test our hypothesis that the effects of finance on growth can go from good to bad, we turn to a panel regression.[5] We regress the five-year average growth in output per worker in a given country on the following variables: the level of financial development; the squared level of financial development (looking for the parabola in Graph 2); and a series of control variables known to influence aggregate growth.

To fix ideas and notation, we write this as:

$$\Delta y_{k,t+5,t} = \alpha + \beta_k + \gamma_0\left(fd_{k,t+5,t}\right) + \gamma_1\left(fd_{k,t+5,t}\right)^2 + \gamma_2 X_{k,t+5,t} - \delta y_{k,t} + \varepsilon_{k,t} \quad (1)$$

where $y_{k,t}$ is the log of output per worker in country k in year t; $\Delta y_{k,t+5,t}$ is the average growth in output per worker in country k from time t to $t+5$; $fd_{k,t+5,t}$ is the average ratio of private credit to GDP in country k from time t to $t+5$, our measure of financial development; $X_{k,t+5,t}$ is a set of control variables averaged from time t to $t+5$, including working population growth, openness to trade measured by the ratio of imports and exports to GDP, the share of government consumption in GDP and CPI inflation; α is a constant and β_k is a vector of country dummies; and ε is the error term, which we allow for heteroskedasticity. Our hypothesis is that γ_0 will be positive and γ_1 negative.

In the first column of Table 1 we report the result with no controls. Here we see what we expect – the relationship is parabolic. Continuing across the columns of the table, we sequentially add controls. The nonlinearity is robust. Regardless of the exact specification, the coefficient of the level of financial development, γ_0, is around 0.035 and that on the quadratic term, γ_1, is always close to –0.018.[6]

We can use the estimated coefficients to compute an estimate of the peak of the inverted U – the vertical line in Graph 2. These are reported near the bottom of the table, together with 95% interval estimates. The point estimates all roughly 100% of GDP, a figure that is quite close to the threshold of 90% computed in Cecchetti et al (2011).[7]

To see what these numbers mean, we can look at a few examples. Starting with New Zealand, in the first half of the 1990s, private credit was below 90% of GDP. Credit then rose steadily, reaching nearly 150% of GDP by the time of the crisis. The estimates in Table 1 suggest that this increase created a drag of nearly one half of 1 percentage point on trend productivity growth.

Thailand is another interesting case. In the run-up to the Asian crisis of 1997–98, the ratio of Thai private credit to GDP reached 150%. More recently, this measure of financial sector size has fallen to roughly 95%. This time, the result is a benefit of roughly one half of 1 percentage point in trend productivity growth.

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[5] Our work in this section builds on an extensive body of research, especially the empirical literature relating growth to finance. Notable contributions on this topic include King and Levine (1993), Islam (1995), Levine and Zervos (1998), Beck et al (2000) and Cecchetti et al (2011). Comprehensive surveys can be found in Levine (1997, 2005).

[6] We note that the results reported in Table 1 are robust to adding a variety of changes to equation (1). These include: (i) using GDP per capita instead of GDP per worker as the dependent variable; (ii) using alternative measures of financial development like private credit by banks to GDP, bank deposits to GDP, financial system deposits to GDP, or bank assets to GDP; and (iii) dropping certain countries, such as the former communist countries, from the sample.

[7] The difference between the estimates is probably a result of differences in data and methods. The current study uses a broader set of countries, while the latter employs a somewhat more sophisticated econometric model.

Finally, take the example of the United States, where private credit grew to more than 200% of GDP by the time of the financial crisis. Reducing this to a level closer to 100% would, by our estimates, yield a productivity growth gain of more than 150 basis points.

Table 1

GDP-per-worker growth and private credit to GDP

Dependent variable: five-year average real GDP-per-worker growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Five-year average private credit to GDP	**0.036*** ***(0.011)***	**0.038*** ***(0.011)***	**0.035*** ***(0.011)***	**0.035*** ***(0.011)***	**0.035*** ***(0.011)***	**0.048** ***(0.021)***
Five-year average private credit to GDP *squared*	**–0.018*** ***(0.005)***	**–0.018*** ***(0.005)***	**–0.018*** ***(0.005)***	**–0.017*** ***(0.005)***	**–0.017*** ***(0.005)***	**–0.022*** ***(0.008)***
Log of real GDP per worker	**–0.742*** ***(0.211)***	**–1.020*** ***(0.210)***	**–1.110*** ***(0.208)***	**–1.110*** ***(0.207)***	**–1.160*** ***(0.204)***	**–6.220*** ***(1.200)***
Five-year working population growth		**–0.478*** ***(0.162)***	**–0.480*** ***(0.160)***	**–0.471*** ***(0.163)***	**–0.501*** ***(0.152)***	**–0.685*** ***(0.162)***
Five-year average openness to trade			**0.010*** ***(0.003)***	**0.010*** ***(0.003)***	**0.009*** ***(0.003)***	**0.054*** ***(0.010)***
Five-year average government consumption share in GDP				**0.0106** ***(0.046)***	**0.0107** ***(0.045)***	**–0.145** ***(0.331)***
Five-year average CPI inflation					**0.0378** ***(0.036)***	**0.047** ***(0.037)***
Turning point for the effect of private credit to GDP on real GDP-per-worker growth	**0.98**	**1.02**	**0.99**	**0.99**	**1.01**	**1.08**
95% confidence interval	[0.97;1.00]	[1.01;1.03]	[0.98;1.01]	[0.98;1.01]	[0.99;1.02]	[1.06;1.11]
Observations	270	270	270	270	270	270
R-squared	0.098	0.160	0.190	0.190	0.213	0.424

The dependent variable is the five-year average real GDP-per-worker growth for 1980–2009 for each country, which yields six observations per country. Five-year averages for the independent variables are computed over the same period as the dependent variable. The log of real GDP per worker is the natural logarithm of real GDP per worker for the initial year of the period over which the averages are computed, divided by 100. All estimates include a non-reported constant. Column (6) includes country dummies. Robust standard errors are in parentheses. Significance at the 1/5/10% level is indicated by ***/**/*. The turning point for the effect of private credit to GDP on real GDP-per-worker growth is the level for private credit to GDP below (above) which an increase in private credit to GDP is estimated to raise (reduce) real GDP-per-worker growth. For country sample and sources, see data appendix.

We should be very clear that we do not in any way view these peak debt values as targets, and neither should any readers (or authorities). These are levels of debt that a country should only approach in extremis. And as discussed in more detail by Cecchetti et al (2011), under normal circumstances we would expect to see debt at much lower levels than these thresholds. Keeping debt well below 90% of GDP provides the room needed to respond in

the event of a severe shock. Otherwise, should a crisis arise, the additional accumulation of debt would result in a drag on growth that would make recovery even more difficult than it already is.[8]

2.2 Alternative measures of financial development

In the previous section, financial development was measured using total credit extended to the private sector. In this section we examine the robustness of this result to the use of alternative measures of financial sector size. We start by looking at the consequences of using bank credit rather than total credit, and then move on to study the relationship between growth and the share of employment accounted for by the financial sector.

2.2.1 Bank credit as a measure of financial development

Differences in financial system structure imply that credit can mean different things in different countries. And this difference could be the driving force behind our results. For example, the inverted U-shape could reflect compositional effects, with bank-based financial systems being one part of the parabola and market-based financial systems being the other. To examine this possibility, we replace private credit with private credit by banks (relative to GDP) in equation (1).

Table 2 presents the results of this exercise. Again, we start with no controls in the first column and add controls sequentially moving to the right in the table. The results confirm both the parabolic relationship and its robustness. Furthermore, the point estimates themselves are very close to those in Table 1.

Looking at the peak of the parabola, we estimate that for private credit extended by banks, the turning point is closer to 90% of GDP – somewhat lower than for total credit. Many countries are close to or beyond this level, suggesting that more credit will not translate into higher trend growth. For example, in Portugal, private credit by banks was 160% of GDP at the onset of the financial crisis. The corresponding figure for the UK was 180% of GDP and even reached 200% of GDP in Denmark. By contrast, a country like India, where bank credit is less than 50% of GDP, can still reap significant benefits from further financial deepening in terms of increasing productivity growth.

[8] This argument is consistent with the results of welfare maximisation, which would imply that, in normal times, debt should be maintained below the level at which borrowing constraints become binding.

Table 2

GDP-per-worker growth and private credit by banks to GDP

Dependent variable: five-year average real GDP-per-worker growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Five-year average private credit by banks to GDP	**0.0369*** **	**0.0373*** **	**0.0336*** **	**0.0334*** **	**0.0325*** **	**0.0477** **
	(0.0117)	*(0.0116)*	*(0.0118)*	*(0.0118)*	*(0.0121)*	*(0.0208)*
Five-year average private credit by banks to GDP *squared*	**–0.0196*** **	**–0.0193*** **	**–0.0185*** **	**–0.0184*** **	**–0.0178*** **	**–0.0229*** **
	(0.00520)	*(0.00522)*	*(0.00521)*	*(0.00519)*	*(0.00543)*	*(0.00836)*
Log of real GDP per worker	**–0.732*** **	**–0.979*** **	**–1.046*** **	**–1.049*** **	**–1.086*** **	**–6.279*** **
	(0.195)	*(0.197)*	*(0.195)*	*(0.195)*	*(0.191)*	*(1.174)*
Five-year working population growth		**–0.461*** **	**–0.463*** **	**–0.455*** **	**–0.483*** **	**–0.675*** **
		(0.164)	*(0.163)*	*(0.166)*	*(0.155)*	*(0.164)*
Five-year average openness to trade			**0.0105*** **	**0.0105*** **	**0.00979*** **	**0.0545*** **
			(0.00295)	*(0.00297)*	*(0.00296)*	*(0.0108)*
Five-year average government consumption share in GDP				**0.00962**	**0.00977**	**–0.114**
				(0.0453)	*(0.0445)*	*(0.329)*
Five-year average CPI inflation					**0.0364**	**0.0456**
					(0.0368)	*(0.0368)*
Turning point for the effect of private credit to GDP on real GDP-per-worker growth	**0.94**	**0.96**	**0.91**	**0.91**	**0.92**	**1.04**
95% confidence interval	[0.93;0.95]	[0.95;0.98]	[0.90;0.92]	[0.90;0.92]	[0.90;0.93]	[1.02;1.07]
Observations	269	269	269	269	269	269
R-squared	0.103	0.161	0.194	0.194	0.215	0.426

The dependent variable is the five-year average real GDP-per-worker growth for 1980–2009 for each country, which yields six observations per country. Five-year averages for the independent variables are computed over the same period as the dependent variable. The log of real GDP per worker is the natural logarithm of real GDP per worker for the initial year of the period over which the averages are computed, divided by 100. All estimates include a non-reported constant. Column (6) includes country dummies. Robust standard errors are in parentheses. Significance at the 1/5/10% level is indicated by ***/**/*. The turning point for the effect of private credit by banks to GDP on real GDP-per-worker growth is the level for private credit by banks to GDP below (above) which an increase in private credit to GDP is estimated to raise (reduce) real GDP-per-worker growth. For country sample and sources, see data appendix.

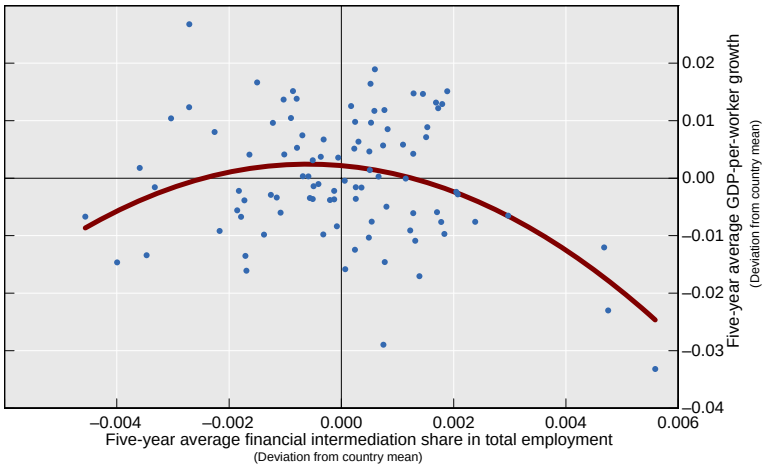
2.2.2 Financial sector employment as a measure of financial development

The use of credit as a measure of financial development means that we are focusing on the output of the sector. An alternative gauge of financial sector size and financial development, one based on inputs, is the financial sector's share in the economy's total employment. Using a more limited sample drawn from 21 OECD economies over the period from 1980 to 2009, we look at the relationship between the financial sector's use of the economy's labour resources and aggregate growth. In addition to providing a different measure of financial development, the analysis using an input-based measure of financial development provides

an important check that the inverted U-shaped effect on growth is not simply the result of using a sample which mixes advanced and emerging market economies.

Graph 3

Financial sector share in employment and growth[1]



[1] Graphical representation of $\Delta y_{k,t+5,t} = \alpha + \beta_k + \gamma_0 \left(fs_{k,t,t+5}\right) + \gamma_1 \left(fs_{k,t,t+5}\right)^2 - \delta y_{k,t} + \varepsilon_{k,t}$ over the period 1980–2009. For country sample and sources, see data appendix.

We start with a scatter plot in Graph 3, which is analogous to Graph 2. The results confirm our previous results: the relationship between growth and the financial sector's share in employment is an inverted U. At low levels, an increase in the financial sector's share in total employment is actually associated with higher GDP-per-worker growth. But there is a threshold beyond which a larger financial sector becomes a drag on productivity growth.

Turning to the regression analysis, we estimate equation (1) using the five-year average financial sector share in total employment in country as a measure of financial development (*fd*). Again, on the left-hand side we have the five-year average growth in output per worker in a given country. And on the right-hand side, we have the financial sector's share in total employment, the financial sector's share in total employment *squared*, and various controls.

Table 3 presents the results from this exercise. Here we see the result that we expect – the relationship is parabolic.[9] Again, the result is robust to the addition of controls.

[9] Introducing country fixed effects changes the results only modestly. In particular, the estimated coefficient for the linear and the quadratic term are such that the share of financial intermediation in total employment that maximises growth is lower than the one obtained without country fixed effects. This reinforces the idea that the estimated turning point should be regarded not as a target but rather as an upper bound.

Table 3

GDP-per-worker growth and financial sector share in employment

Dependent variable: five-year average real GDP-per-worker growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Five-year average financial intermediation share in total employment	**3.345*** ***(0.690)***	**3.335*** ***(0.677)***	**3.354*** ***(0.675)***	**3.347*** ***(0.706)***	**3.341*** ***(0.705)***	**5.574**** ***(2.602)***
Five-year average financial intermediation share in total employment *squared*	**–43.35*** ***(9.025)***	**–43.31*** ***(9.004)***	**–43.48*** ***(8.980)***	**–43.37*** ***(9.516)***	**–43.30*** ***(9.493)***	**–103.6*** ***(35.82)***
Log of real GDP per worker	**–3.346*** ***(0.665)***	**–3.334*** ***(0.672)***	**–3.409*** ***(0.708)***	**–3.417*** ***(0.708)***	**–3.407*** ***(0.707)***	**–6.087*** ***(1.537)***
Five-year working population growth		**0.0243** ***(0.189)***	**0.00762** ***(0.174)***	**0.00799** ***(0.174)***	**0.0129** ***(0.181)***	**–0.111** ***(0.237)***
Five-year average openness to trade			**0.00195** ***(0.00431)***	**0.00194** ***(0.00442)***	**0.00193** ***(0.00439)***	**0.0171** ***(0.0173)***
Five-year average government consumption share in GDP				**0.00260** ***(0.0581)***	**0.00249** ***(0.0586)***	**–0.360** ***(0.269)***
Five-year average CPI inflation					**–0.00256** ***(0.0236)***	**0.0181** ***(0.0250)***
Turning point (in %) for the effect of financial intermediation share in total employment on real GDP-per-worker growth	**3.86**	**3.85**	**3.86**	**3.86**	**3.86**	**2.69**
95% confidence interval	[1.20;6.51]	[1.28;6.42]	[1.29;6.42]	[1.22;6.50]	[1.22;6.50]	[–6.34;11.7]
Observations	95	95	95	95	95	95
R-squared	0.331	0.331	0.333	0.333	0.333	0.536

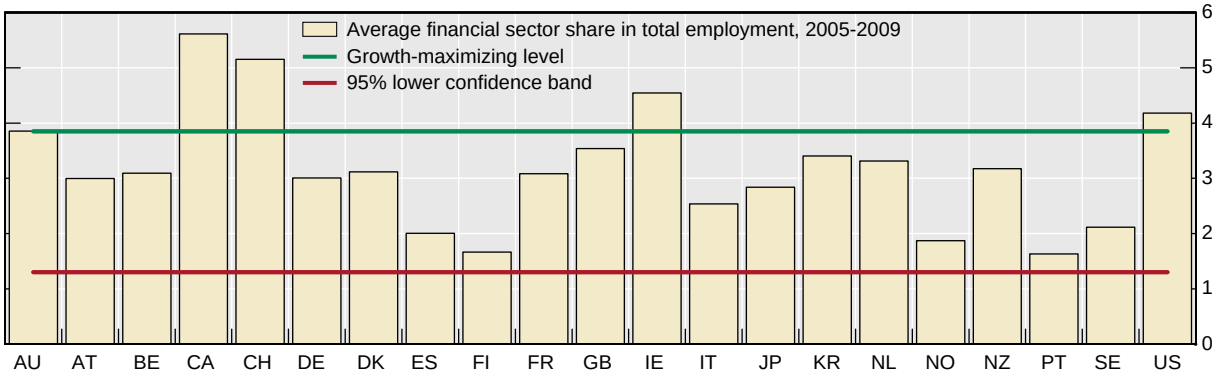
The dependent variable is the five-year average real GDP-per-worker growth for 1980–2009 for each country, which yields six observations per country. Five-year averages for the independent variables are computed over the same period as the dependent variable. The log of real GDP per worker is the natural logarithm of real GDP per worker for the initial year of the period over which the averages are computed, divided by 100. All estimates include a non-reported constant. Column (6) includes country dummies. Robust standard errors are in parentheses. Significance at the 1/5/10% level is indicated by ***/**/*. The turning point for the effect of the financial sector's share in total employment on real GDP-per-worker growth is the level of the financial sector's share in total employment below (above) which an increase in the financial sector's share in total employment is estimated to raise (reduce) real GDP-per-worker growth. For country sample and sources, see data appendix.

To see what these numbers mean, we first look at the recent data for the sample countries and evaluate them against the estimate for the turning point of 3.9% reported at the bottom of Table 3. Graph 4 shows that in most countries, the financial sector's share in total employment is below or significantly below the threshold beyond which the effect on GDP-per-worker growth turns from positive to negative. Indeed, the size of the financial sector is above this growth-maximising point only in some cases. Examples are Canada, Switzerland, Ireland and, to a lesser extent, the United States. However, as was stressed above, the

growth-maximising size of the financial sector should not be considered as a target, in particular because it is possible that the negative effect on growth may start materialising for lower levels. From that point of view, all countries in our sample are considerably above the lower band of the 95% confidence interval around the estimate for the turning point. This means that for all countries, further increases in financial sector size are most likely to have mixed effects on productivity growth. However, this result also owes to the limited sample we use, which mechanically raises the size of the confidence interval around the estimated turning point.

Graph 4

Average financial sector share in total employment, 2005–09[1]



[1] AU = Australia, AT = Austria, BE = Belgium, CA = Canada, CH = Switzerland, DE = Germany, DK = Denmark, ES = Spain, FI = Finland, FR = France, GB = United Kingdom, IE = Ireland, IT = Italy, JP = Japan, KR = Korea, NL = Netherlands, NO = Norway, NZ = New-Zealand, PT = Portugal, SE = Sweden, US = United States.

Sources: OECD Structural Analysis database; authors' calculations.

Coming back to the countries where the financial sector's share in total employment is above the growth-maximising point, we can compute the gain in GDP-per-worker growth if their financial sectors were to shrink back to the growth-maximising point. For Canada, the gain is 1.3 percentage points, for Switzerland 0.7 percentage points and for Ireland 0.2 percentage points.

The case of Ireland is interesting because over the period 1995–99, the share of the Irish financial sector's share in total employment was 3.84% – very close to the growth-maximising value. But over the next 10 years, the share rose to more than 5%. Had the share been constant between1995–99 and 2005–09, our estimates suggest that Irish trend GDP-per-worker growth could have been as much as 0.4 percentage points higher over the past decade.

3. The real effects of financial sector growth

Having established that there is a point at which financial development switches from propelling real growth to holding it back, we now turn to an examination of the impact of the speed of development on productivity growth. Put another way, we examine how financial

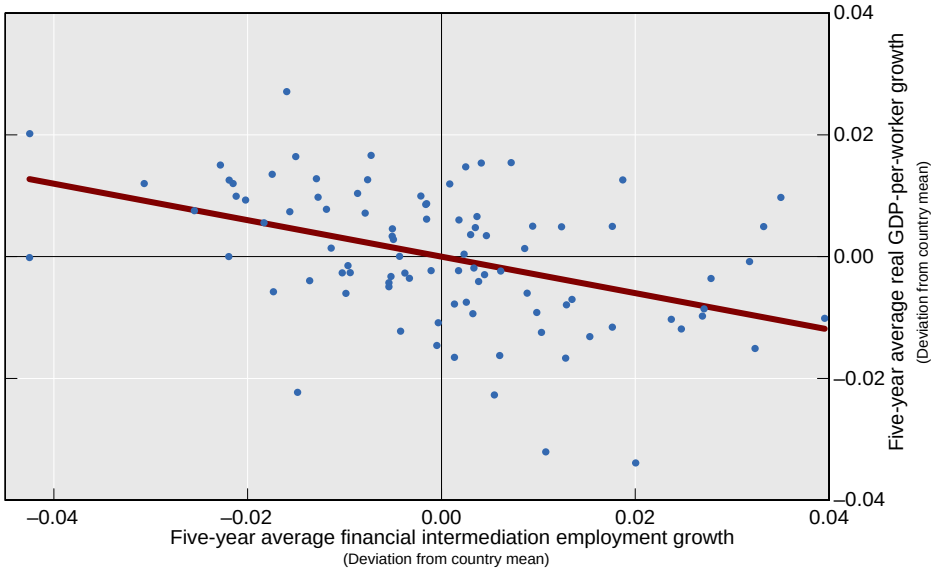
sector booms – periods when financial development is moving at a particularly fast pace – can affect growth.[10]

Unlike in the earlier exercise, we cannot simply rely on the ratio of private credit to GDP to measure financial sector growth. If we were to do this, financial sector growth would be negatively associated with GDP growth by construction. To bypass this problem, we use data on employment in the financial sector and measure financial sector growth as the growth rate in the financial sector's share in total employment.

As noted in the previous section, using employment data comes at a cost since employment data for the financial sector are available for a limited subset of our previous sample of countries. Hence we focus on the 21-country subset of OECD countries.

Graph 5

Financial sector growth and productivity growth[1]



[1] Graphical representation of $\Delta y_{k,t+5,t} = \alpha + \beta_k + \gamma_0 \Delta fd_{k,t+5,t} - \delta y_{k,t} + \varepsilon_{k,t}$ over the period 1980–2009, where $y_{k,t}$ is the log of output per worker in country k in year t; $\Delta y_{k,t+5,t}$ is the average growth in output per worker in country k from time t to $t+5$; $\Delta fd_{k,t+5,t}$ is the average growth in financial intermediation employment in country k from time t to $t+5$; β_k is a vector of country dummies; and $\varepsilon_{k,t}$ is a residual. For country sample and sources, see data appendix.

Graph 5 summarises our main finding. Again, on the vertical axis we plot the five-year average GDP-per-worker growth. On the horizontal axis, we now plot the five-year average growth in the financial sector's share in total employment.[11] (As in Graphs 2 and 3, both variables are measured as deviations from their country-specific means.) The result is quite

[10] There is a large and well-known literature on this financial accelerator and its quantitative implications for the business cycle (see Bernanke and Gertler (1989) and Bernanke et al (1999), for instance). Likewise, there is a significant body of research examining credit cycles (from Kiyotaki and Moore (1997) to more recent work by Caballero et al (2006) on the dotcom bubble or Lorenzoni (2008), who look at the normative implications of credit booms). We are, however, unaware of empirical studies on the implications of financial booms for long-run growth.

[11] The results reported in this section are robust to the use of financial sector value added in place of the financial sector's share in total employment.

striking: there is a very clear negative relationship. The faster the financial sector grows, the slower the economy as a whole grows!In order to verify that this relationship is robust, we follow the same procedure as before, estimating a panel regression with the five-year average annual growth rate in GDP per worker as the dependent variable. In addition to the controls used in equation (1), we now introduce financial sector growth. But, unlike in the earlier exercise, we cannot simply take the change in the ratio of private sector to GDP as the object of interest. If we were to do this, we would have GDP growth on the left-hand side of the regression and the inverse of GDP growth on the right-hand side, so finding a negative relationship would be wholly uninformative. It is for this reason that we now measure financial sector growth using employment growth and estimate:

$$\Delta y_{k,t+5,t} = \alpha + \beta_k + \gamma_0 \Delta fd_{k,t+5,t} + \gamma_1 X_{k,t+5,t} - \delta y_{k,t} + \varepsilon_{k,t} \quad (2)$$

where all variables are defined as before, with the exception of $\Delta fd_{k,t+5,t}$, which is the average growth in the financial sector's share in total employment in country k from time t to $t+5$. We note that the vector of controls in equation (2) includes the growth rate of the working population, trade openness measured as the ratio of imports plus exports to GDP, the share of government consumption in GDP, CPI inflation and the *level* of financial development.

Table 4 presents the results of estimating equation (2) using a variety of measures of financial sector size as controls. Our interest is in the first row of the table, which reports the estimates of γ_0, the coefficient on the financial sector growth. The result evident in Graph 4 is confirmed by more careful statistical analysis: the faster financial sector employment grows, the worse it is for productivity growth (measured as five-year average growth in GDP per worker). Moreover, this effect survives regardless of the combination and definition of the controls.[12]

To assess the magnitude of the effects, we start by comparing a country with constant employment in financial intermediation with one in which employment grows at 1.6 percentage points per year, the sample average for those with positive growth. The elasticity estimate of –0.33 implies that the first country will grow on average 50 basis points faster than the second country. Given that the sample average productivity growth rate is 1.3%, this strikes us as sizeable.

Turning to some country examples, we look at Ireland and Spain – admittedly extreme cases. During the five years beginning in 2005, Irish and Spanish financial sector employment grew at an average rate of 4.1% and 1.4% per year, while output per worker fell by 2.7% and 1.4%, respectively. Our estimates imply that if financial sector employment had been constant in these two countries, it would have shaved 1.4 percentage points from the decline in Ireland and 0.6 percentage points in Spain. In other words, by our reckoning financial sector growth accounts for one third of the decline in Irish output per worker and 40% of the drop in Spanish output per worker.

[12] Note that the effect of control variables is relatively different from what it was in the previous regression. In particular, government size now has a significant negative effect on growth at the margin. This could be related to the fact that here we focus on advanced economies, where high government consumption is more likely to have a detrimental effect on the private sector. The speed of convergence is also much higher (between 7 and 8% a year) than in the previous regressions, which is also probably related to sample difference.

Table 4

GDP-per-worker growth and financial sector growth

Dependent variable: five-year average real GDP-per-worker growth	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Five-year average financial intermediation employment growth	**−0.471***** *(0.083)*	**−0.327***** *(0.074)*	**−0.325***** *(0.073)*	**−0.328***** *(0.073)*	**−0.331***** *(0.074)*
Five-year working population growth	**−0.356*** *(0.204)*	**−0.275** *(0.186)*	**−0.286** *(0.183)*	**−0.270** *(0.188)*	**−0.259** *(0.191)*
Five-year average openness to trade	**0.007** *(0.0148)*	**0.022** *(0.0138)*	**0.023** *(0.0143)*	**0.022** *(0.0142)*	**0.022** *(0.0138)*
Five-year average government consumption share in GDP	**−0.762***** *(0.212)*	**−0.636***** *(0.219)*	**−0.626***** *(0.220)*	**−0.637***** *(0.220)*	**−0.635***** *(0.219)*
Five-year average CPI inflation	**0.021** *(0.018)*	**0.011** *(0.018)*	**0.011** *(0.018)*	**0.011** *(0.018)*	**0.011** *(0.018)*
Log of real GDP per worker	**−0.083***** *(0.014)*	**−0.073***** *(0.012)*	**−0.072***** *(0.012)*	**−0.074***** *(0.012)*	**−0.076***** *(0.012)*
Financial intermediation share in total employment	**−1.732***** *(0.529)*				
Private credit to GDP		**−0.001** *(0.005)*			
Private credit by banks to GDP			**−0.002** *(0.006)*		
Financial system assets to GDP				**−0.000** *(0.006)*	
Banking system assets to GDP					**0.002** *(0.005)*
Observations	104	110	110	110	110
R-squared	0.616	0.583	0.584	0.583	0.583

The dependent variable is the five-year average real GDP-per-worker growth for 1980–2009 for each country. Five-year averages for the independent variables are computed over the same period as the dependent variable. The log of real GDP per worker is the natural logarithm of real GDP per worker for the initial year of the period over which the averages are computed. The financial intermediation share in total employment is the share of the financial intermediation sector in total employment for the initial year of the period over which the averages are computed. Private credit (by banks) to GDP is the ratio of private credit (by banks) to GDP for the initial year of the period over which the averages are computed. Financial (banking) system assets to GDP are measured as the ratio of financial (banking) system assets to GDP for the initial year of the period over which the averages are computed. All estimates include country dummies. Robust standard errors are in parentheses. Significance at the 1/5/10% level is indicated by ***/**/*. For country sample and sources, see data appendix.

Overall, the lesson is that big and fast-growing financial sectors can be very costly for the rest of the economy. They draw in essential resources in a way that is detrimental to growth at the aggregate level.

4. Conclusion

In this paper, we study the complex real effects of financial development and come to two important conclusions. First, financial sector size has an inverted U-shaped effect on productivity growth. That is, there comes a point where further enlargement of the financial system can reduce real growth. Second, financial sector growth is found to be a drag on productivity growth. Our interpretation is that because the financial sector competes with the rest of the economy for scarce resources, financial booms are not, in general, growth-enhancing. This evidence, together with recent experience during the financial crisis, leads us to conclude that there is a pressing need to reassess the relationship of finance and real growth in modern economic systems. More finance is definitely not always better.

Data appendix

Data sources for Graphs 1–2 and Tables 1–2:

Penn World Tables: real GDP per worker, working population, ratio of imports and exports to GDP, ratio of government consumption to GDP and CPI.

World Bank Financial Structure and Development database: ratio of private credit to GDP.

50 countries: Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, China, Colombia, the Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Morocco, the Netherlands, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Poland, Portugal, Russia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, the United States, Venezuela and Vietnam.

Data sources for Graphs 3–4 and Tables 3–4:

Penn World Tables: real GDP per worker, working population, ratio of imports and exports to GDP, ratio of government consumption to GDP and CPI.

World Bank Financial Structure and Development database: ratio of private credit to GDP, ratio of private credit by banks to GDP, financial system assets to GDP and banking system assets to GDP.

OECD Structural Analysis database: financial sector's share in total employment.

21 countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

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