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The Evolution of the Finance Growth Nexus

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Modern growth theory dates back to the mid 1950s, only a little more than 50 years ago, to the contributions made by Robert Solow and others. Solow's neoclassical production function approach attributes growth to the quantity of capital and labor inputs and a catchall residual factor called total factor productivity. Early productivity studies tended to attribute growth to capital deepening, improvements in labor quality (human capital investments) and the adoption of new technologies.

The approach reached its zenith in the early 1990s with a controversial literature on the rapid growth of the East Asian economies. Page (1994) distinguishes between the fundamentalist and the mystic explanation for the 'East Asian miracle'. The fundamentalists stress the role of factor accumulation; they attribute growth to high savings rates and capital accumulation, and human capital development as an educated population moved into the active labor force. The mystics place greater emphasis on the acquisition and mastery of technology that leads to growth in total factor productivity. The controversy goes beyond the analytics of the sources of growth. The mystics, unlike the fundamentalists, were likely to support interventionist government development policies. The fundamentalist view of growth in East Asia seems to have won the debate although the argument regarding the efficacy of interventionist industrial policies remains unsettled.

Over time, empirical applications of the Solow framework tended to focus more and more attention on total factor productivity (TFP). The great American productivity slowdown in the 1970s and 1980s (the period between the oil shocks and the high tech boom) was attributed to many factors but most analyses concluded that there was a decline in TFP growth (Baily and Gordon, 1988). Such a conclusion was very disquieting because it attributed changes in growth rate to a great unknown, the residual. So, it comes as no surprise that economists began to think about the sources of differences in TFP growth. For example, the fundamentalists understood that East Asian resource accumulation was very different than the similarly large levels of accumulation in the Soviet Union and other planned economies. It is now clear that the Soviet system had an uncanny ability to misallocate enormous amounts of capital goods. But, the ability to allocate resources efficiently is hard to measure and, as an omitted variable, would be reflected in differences in TFP growth.

Although the efficiency of allocation may be hard to measure, some of its determinants are known. Specifically, financial intermediaries bring savers and investors together in a way that directs savings into the most productive investments. The pooling of information and the creation of financial instruments both induces more investment activity and promotes efficient allocations. Thus, a country with a more developed or more extensive financial system is likely to grow more. A market oriented financial sector promotes the efficient allocation of resources. And, clearly this element was missing in the Soviet system.

Although the role of the financial sector was not a new idea, it was largely forgotten by development economists who often called for explicit manipulation of financial markets through subsidies, directed credit, interest rate controls and other means in order to achieve development objectives. However, over time, more market oriented discussions of the role of the financial sector, such as Goldsmith (1969) and McKinnon (1973), began to attract attention.

This new understanding of the role of the financial sector in economic growth began to take root in the early 1990s with a growing empirical literature on the role of financial sector development in economic growth. Later in the decade, a broader literature began to emerge that related economic growth to the quality of institutions generally. Financial intermediaries and the quality of intermediation are only one of many institutional features that are assist growth (Acemoglu, 2008). Legal structures that reduce transactions costs, defined property rights, reliable governance and social norms all contribute to the institutional structure that encourages growth. In this broader literature, financial institutions are just one part of the puzzle. Nevertheless, given the role of the financial sector in capital accumulation, it is worthwhile to focus attention on this particular set of institutions.

To explore the role of financial institutions, the empirical literature needed an available measure of the extent of financial development. Quickly, and perhaps mistakenly, the role of financial institutions came to be defined by the size of the sector's activity. That is an economy with more intermediary activity was assumed to be doing more to generate efficient allocations. Increases in the quantity of intermediation were assumed to be synonymous with increases in the quality. The size of the financial sector is usually measured by the quantity of intermediation relative to GDP.

Using World Bank World Development Indicators data, there are 97 countries with a population over 1 million and financial depth data (ratio of domestic credit to the private sector to GDP) for both 1985 and 2005. We will use this sample here to look at the data underlying the finance growth nexus. Table 1 groups the countries by financial depth quartiles in 1985. The relationship to the average growth rate in the subsequent 25 year period is striking; countries with more intermediation grew more rapidly. The mean growth rate of countries in the highest depth quartile is almost six times larger than that for countries in the lowest quartile. The medians do not differ as much but the nexus relationship is clear. However, there are some other things that come out this table as well. Countries with greater initial financial depth are also richer and experience more deepening of their financial markets over the period.

Table 1. Averages for countries in financial depth quartiles in 1985

	Financial depth, 1985 (Domestic credit to private sector to GDP)	Financial deepening 1985-2005 (Change in financial depth)	GDP per capita 1985 (in 2005$)	Growth rate, 1985-2005 (median in parentheses)
1	82.2	30.4	15870	2.40 (1.95)
2	41.9	20.8	11307	1.68 (1.74)
3	22.2	9.8	5040	1.38 (1.37)
4	10.2	4.1	1698	0.42 (1.02)

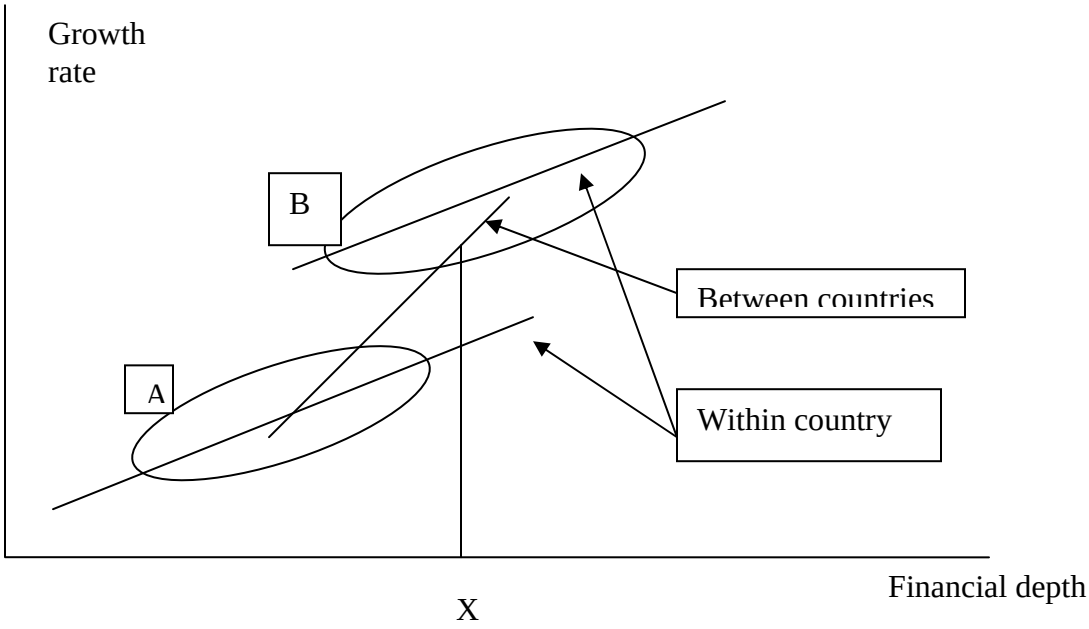
There is now an extensive econometric literature emerged that examines this finance growth nexus with other determinants of growth held constant and with the most sophisticated techniques to control for the simultaneity of growth and financial depth. Robert Barro (1991) and Robert King and Ross Levine (1993) pioneered the use of cross country panel data to examine the relationship while Paul Wachtel and Peter Rousseau (1995) developed evidence based on long time series for the few countries with available data. The literature grew rapidly and has been eloquently summarized by its champion and major contributor, Ross Levine, at least three times (1997, 2005, and 2008). By the end of the 1990s, the finance-growth nexus was a well established part of the economic canon.

Typical results from the cross section or panel studies indicate that the effect of credit deepening on economic growth is quite large. Although Rousseau and Wachtel (2011) show that the strength of the relationship has diminished in recent years, strong results are found for the period from 1965 to 1990. A regression of the real per capita GDP growth on private credit as a percent of GDP typically yields a coefficient of about .02. To understand the impact of deepening, compare Greece with a credit ratio of 77.7% in 2005 to Australia with 103.7%. If financial markets in Greece were as deep at those in Australia, its growth rate would have been about 0.5 percentage points higher. Looking over time, Greek credit markets deepened from 37.8% to 77.7% from 1985 to 2005 which increased its growth rate by about one percentage point. That is, credit deepening accounted for about one-half of the Greek growth rate over this 20 year period. Similar calculations are found in Demirguc-Kunt and Levine (2008).

My concern here and in earlier work (Wachtel 2001, 2004) is that the empirical literature might have over stated the strength of the nexus. Much of the literature relies on cross country studies to draw causal inferences from financial deepening to growth. There is wide country to country variation in the credit to GDP ratios, even for countries at similar levels of economic development, which are probably due to differing institutional structures in the financial industry and in patterns of enterprise financing. Moreover, the cross country variation in financial depth is much larger than the within country variation over time for most countries.

Figure 1 illustrates the potential problem. There are two countries each with a positive relationship between financial depth and the growth rate over time, shown by the distribution of data within each oval. If the cross country panel studies do a poor job of correcting for country differences, then the overall slope is given by the between country line rather than the within country line. Financial deepening in country A to (level X) is likely to have a moderate effect on the growth rate rather than the effect suggested by the cross country regression slope. In this case, it would be wrong to draw any causal inferences from the estimated cross country effects of substantial financial deepening on economic growth. The issue is whether the finance growth nexus is driven by within country relationships or the comparison between countries. The large effects of deepening on growth found in the literature might indicate that the econometric results do not adequately account for reverse causality. Perhaps, following Joan Robinson, enterprise leads and finance follows.

Figure 1



Looking at the experiences of individual countries may provide a better understanding of the issue. To begin, Table 2 presents some summary statistics for the sample of 97 countries. The table below provides summary statistics which indicate that there has been large variation cross countries in the change in financial depth. There is wide variation in the financial depth of countries; the 25th percentile is just 17% while the 75th percentile is 88%. There is also a great deal of variation in the amount of financial deepening experienced over the 20 year period, either measured by the percentage point change or the proportional (percent) change in the ratio. However, we see that the median financial depth in 2005 is about the same as in 1985. Many countries experience financial deepening but 26 have less financial depth in 2005 than in 1985. The deepening is concentrated among developed countries many of which have increased debt levels substantially. This last observation raises some questions about the finance growth nexus. If most of the financial deepening in the last 20 years reflects increased use of leverage by businesses and households in already developed countries, then it might not be offering strong support for the nexus.

Table 2. Summary statistics

	Financial depth ratio 1985	Financial depth ratio 2005	Change in financial depth 1985-2005	% change in financial depth 1985-2005	Annual Growth rate real per capita GDP 1985-2005
25th percentile	15.63	16.58	-3.26	-16.64	0.24
Median	29.82	30.83	6.72	22.54	1.69
75th percentile	57.44	87.82	25.98	80.81	2.38
Mean	38.82	54.95	16.13	41.55	1.46
Standard deviation	30.39	51.21	33.45	94.15	2.03

A further step to examine the deepening experiences is to look at individual countries. Five countries in the sample experienced large deepenings over the 20 year period; that is, increases in the financial depth ratio over 100 percentage points and another five exhibited increases between 50 and 100 percentage points (Table 3). The average growth rate for these countries is 2.21% (2.43% if we exclude South Africa) which is only slightly larger than the average for all high income countries, 2.07%. Some of these countries exhibited growth spurts, using the definition in Babych (2010). However, half of these spurts started before the financial deepening (in the 1980s) while only the other half (starting in the 1990s) might be considered as the consequence of financial deepening.

Table 3. Countries with largest absolute deepening

Countries with largest increases in credit to GDP ratio	Growth rate, 1985-2005	Growth Spurt (Babych)
Denmark	1.67	NA
Ireland	5.25	1994
United Kingdom	2.38	1982
Canada	1.69	1996
New Zealand	1.37	-
United States	1.93	-
Spain	2.71	1984, 1996
Portugal	2.80	1980
Australia	2.09	-
South Africa	0.24	NA

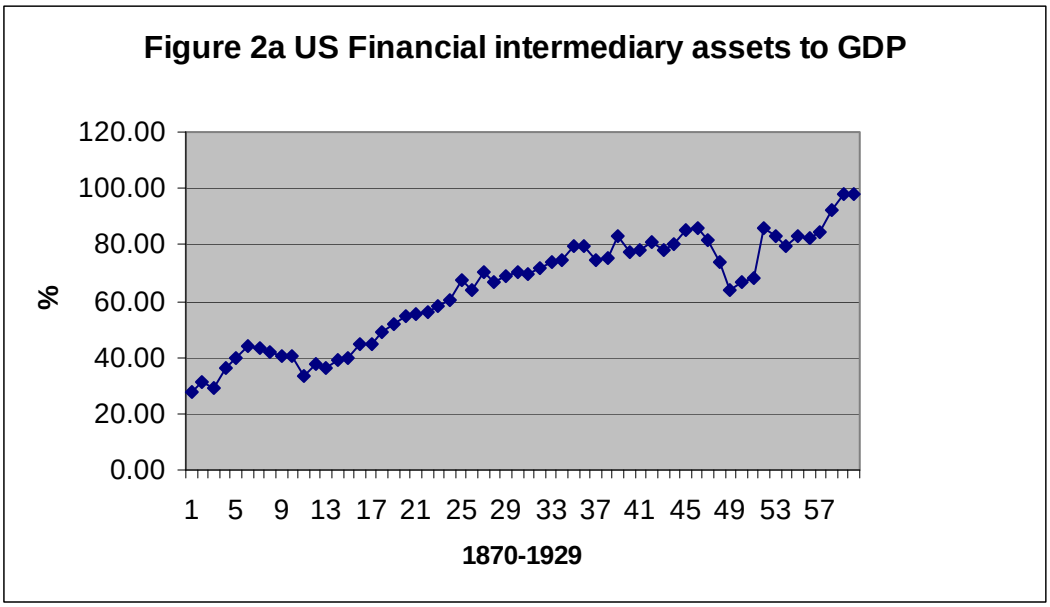
Many less developed countries and even some developed countries start the period with shallow financial markets, very small credit to GDP ratios. Thus, it is also interesting to look at the 20 countries where the credit to GDP ratio more than doubled between 1985 and 2005. This list includes many of the developed countries shown above with large absolute increases in financial depth. In Table 4 we eliminate those countries (and also two additional relatively high income countries, Belgium and Greece) and show the less developed countries that had the largest proportional increases in financial depth. The average growth rate among these countries was 2.17%, substantially more than the average for all low income countries which was 1.54%. In summary, it appears that among more developed countries, financial deepening is just as likely to be a cause as an effect of growth. Among less developed countries significant deepening is associated with above average growth.

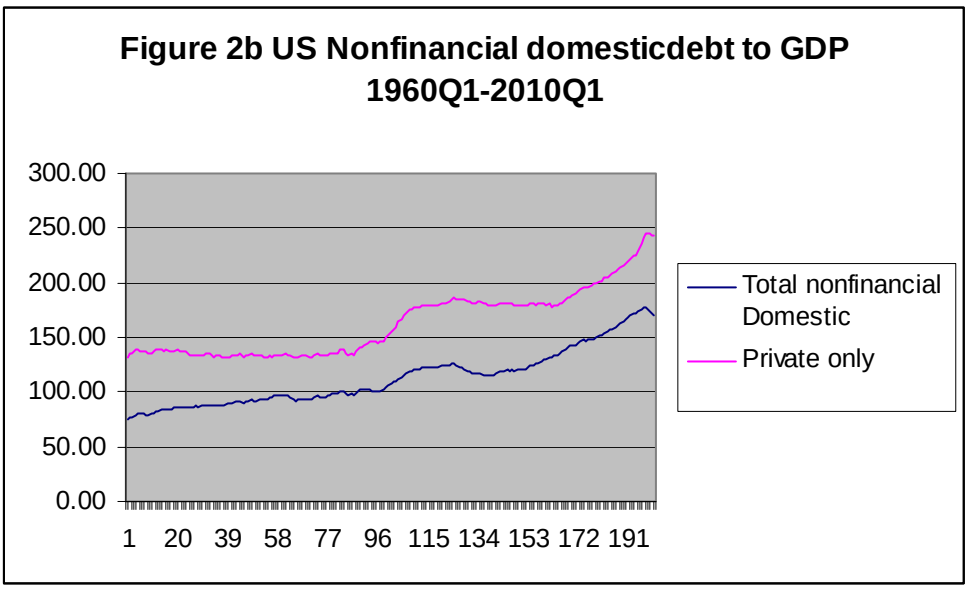
Table 4 Countries with largest proportional deepening

Less developed countries with largest proportional increase in financial depth ranked	Growth rate, 1985-2005
Ghana	1.92
Burundi	-1.59
Nepal	2.02
Mauritius	4.21
Uganda	2.74
Bangladesh	2.63
Bolivia	1.24
Ethiopia	1.19
Botswana	4.86
Costa Rica	2.46

Looking at the experiences of individual countries over time may shed some more light on how the finance growth nexus operates. There are several econometric studies of causality with long run time series data including Rousseau and Wachtel (1998) and Rousseau and Sylla (2002). These papers make a convincing case for the hypothesis that financial deepening causes growth and that reverse causality is minimal. But, a look at some of the actual data might be additionally informative. Figure 2a shows a broad measure of financial depth for the US from 1870-1929. The doubling of financial depth that took place from 1880 until the First World War coincides with the industrial

development of the US economy. But the additional quick spurt in deepening starting in 1925 is associated with the credit boom and increasing stock prices.





More recent US data is shown in Figure 2b. Flow of funds data is used to show the total debt of the domestic non-financial sectors to GDP (upper line) and with private domestic non-financial debt to GDP (lower line).[1] There have been three distinct episodes of financial deepening in the US in the last 50 years. The private debt ratio increased by about a quarter between 1960 and 1974 though the total debt ration was about constant.

[1] The data are from the Federal Reserve Bank of St. Louis FRED database.

Larger deepening episodes occurred between 1980 and 1988 and since the mid 1990s when both measures increased by almost half. The first episode is associated with a period of growth but also inflation in the last few years which encouraged greater use of debt. The latter two periods of financial deepening ended with financial crises, the stock market crash in 1987 and a recession in 1990 in the first instance and the recent financial crisis in the latter case.

How should we interpret these episodes of financial deepening in the US? Do they represent periods of financial innovation and deeper financial activity which improved resource allocation and contributed to the growth of the economy? Or do they represent periods of increased leverage and risk taking which may have temporarily increased growth and may also have precipitated financial crises. Most observers would be hard pressed to associate that these episodes of financial deepening with improvements in the efficacy of the financial system or with particular financial innovations.

The link between financial deepening and financial crises is made clear in recent work that examines crisis episodes. In particular, the recent global financial crisis has brought the role of financial deepening or credit booms under scrutiny. Reinhart and Reinhart (2010) look at fifteen late 20th century severe financial crises (including emerging markets, the Asian financial crises in 1997 and advanced economies such as Japan and the Scandinavian banking crises). They describe the commonalities of the 10 year pre-crisis periods. In each instance there was a surge in the ratio of domestic bank credit to GDP prior to the crisis. The median increase was 38.4 percentage points and the deleveraging in the post-crisis decade was about the same proportional size. The run up of the credit to GDP ratio in the decade prior to 2007 in the 9 countries that experienced systemic crisis was even larger, about 60 percentage points.

The role of credit deepening as a possible cause of crisis is found earlier in Sachs and Radelet (1998) in their analysis of financial crises in emerging market countries. A significant variable in their probit model to predict severe reversals in capital flows is the 'private credit buildup,' the increase over three years in the ratio of private sector

financial claims to GDP. Of course, examining financial crises, still relatively rare events, does not preclude the finance growth nexus. It only goes to show that financial depth is a bit of a chameleon; in some contexts it is a determinant of economic growth and in others it is a precursor of crisis. One person's salubrious financial deepening is another person's financial crisis in the making.

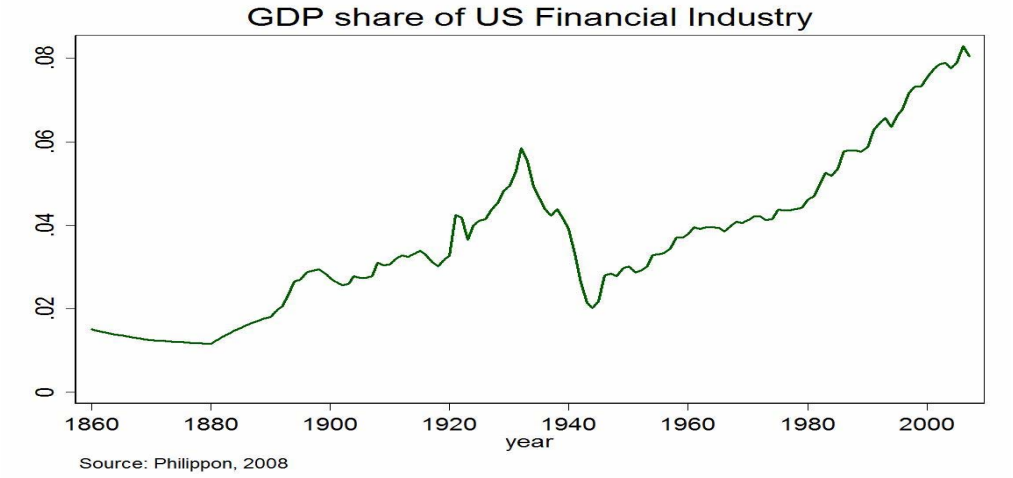
Even without a financial crisis, there are difficulties in interpreting financial deepening experiences. Consider the case of Croatia where monetary stabilization and the end of hostilities led to rapid growth in intermediation in the late 1990s (see Kraft and Jankov, 2005). By all accounts, this was viewed as a desirable deepening. However, a banking crisis in 1998-99 led to a contraction of credit. The banking crisis was short-lived and within a year there was a consolidation of the banking sector and privatization to foreign owners. A second credit boom ensued and by 2006 domestic credit to the private sector exceeded 70% of GDP, more than double the level of decade earlier but still not unusually high for a middle income country. Mindful of the earlier experience, the Croatian National Bank responded to the credit boom by putting a tax on rapid lending growth and a marginal reserve requirement on foreign borrowing. In this instance policy makers tried to distinguish between the gradual deepening of the financial sector and a credit boom and were able to prevent the formation of a credit bubble.

The financial sector's influence on economic growth is a complex phenomenon. At the very least an understanding of the finance-growth nexus requires better measurement as well as better theory. Aggregate data on credit to GDP ratios are useful because it is possible to abstract from national institutions and make formal cross country and historical comparisons. But, the recent experiences described here make abundantly clear that the financial depth ratios are a poor description of the finance growth nexus. The use of financial depth ratios in the vast empirical literature (and generalizations such as adding the ratio of equity market capitalization to GDP) are a matter of convenience more than choice.

Theoretical arguments about the role of the financial sector relate to the amount or quality of intermediary activity which need not be the same as the extent to which an economy is leveraged. With this in mind, Thomas Philippon (2008) examines the share of the financial sector in GDP in the US going back over 100 years. Figure 3 from Philippon shows that there have been several periods of rapid increase in the share. With one exception, Philippon associates these bursts in activity with periods of innovation when young, cash-poor firms require finance:

> "The financial industry was around 1.5% of GDP in the mid-19th century. The first large increase between 1880 to 1900 corresponds to the financing of railroads and early heavy industries. The second big increase between 1918 and 1933 corresponds to the financing of the Electricity revolution, as well as automobile and pharmaceutical companies…After a continuous collapse in the 1930s and 40s, the GDP share of finance and insurance industries was down to only 2.5% of GDP in 1947. It recovered slowly and was mostly stable at around 4% until the late 1970s, and then grew quickly to reach 8.3% of GDP in 2006. The third large increase, from 1980 to 2001, corresponds to the financing of the IT revolution."

Figure 3



The one exception of course is the rapid after 2002. Philippon's modeling suggests that a bubble in this period resulted in a financial sector that was about 10% larger than justified by economic fundamentals.

It is reasonable to ask why the literature on the finance growth nexus has leaned so heavily on financial depth ratios to measure intermediary activity. The answer is most likely the availability of the data. A debt to GDP ratio can be defined unambiguously and data are available across countries and over time. More nuanced data on the activities of financial intermediaries, the patterns of enterprise and household financing and the nature of innovations in the industry would be hard or impossible to gather. Looking at the specific activities of the financial sector that contribute to growth would be very difficult. Financial innovations (e.g. derivatives, securitization, etc.) are valued because they facilitate the functioning of the sector but they are hard to measure. So, the literature relies on what is essentially the lowest common denominator in the data.

Moreover there is considerable skepticism about the value of financial innovation. A comment made by Paul Volcker in December 2009 has been widely quoted in this regard:

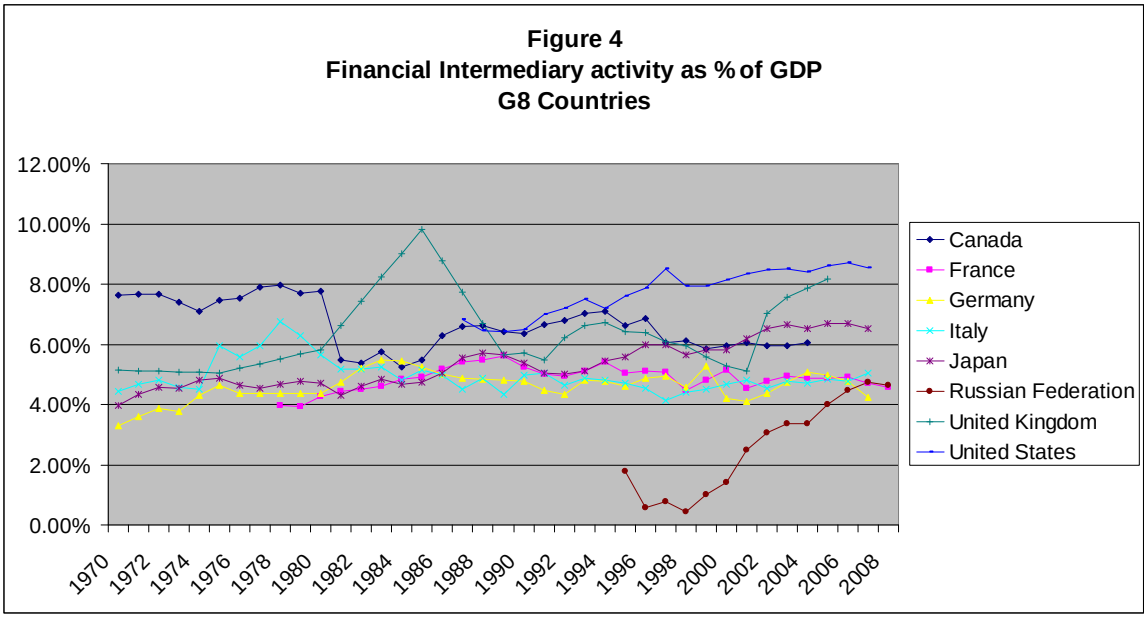
> "I wish somebody would give me some shred of evidence linking financial innovation with benefit to the economy."

The ATM is the one innovation in the past 25 years that he was willing to cite:

> "It really helps people. It's useful."

There is one type of data that might be additionally informative. That is, as suggested earlier, the contribution of the financial services industry to GDP. The UN national accounts provide data for 121 countries but data availability is limited prior to the 1990s. Nevertheless, it is worthwhile to see which countries and which type of countries have larger financial sectors as measured by their relative contribution to output and further to see whether the financial sector activity by this measure is increasing.

Start with Figure 4 which shows the financial intermediary sector as a fraction of GDP for the G8 countries. There is considerable variation in the size of the sectors among the G8. On average it is largest in the US, followed by the UK and Japan. The average ratio in the US is 7.74% and slightly below 5% in France, Germany and Italy. There is a positive linear trend, significant at the 5% level, in Germany, Japan, Russia and the US.



Differences in the size of financial sectors across all countries are summarized in Table 4. For countries in each income group, we examine the median of the ratio of intermediary activity to GDP.[2] The role of financial intermediation in GDP increases with the level of income in a country. Further, it is increasing over time in wealthy and poor countries. Some of the variation among countries is related to inflation shocks; the financial sector balloons in countries experiencing very inflation as resources are diverted to cope with the costs of inflation. The relationship between the size of the financial industry measured in this way and economic growth remains to be examined.

Table 4

Country income group (number)	Dates	Mean of medians	5% significant Positive trend
High (34)	1970-2007	5.10	Yes
Upper middle (30)	1989-2008	4.13	No
Lower middle (31)	1988-2008	3.87	No
Low (26)	1990-2008	1.65	Yes

Two years past the global meltdown, where does the finance-growth nexus stand? All in all, it is relatively unscathed but it appears to stand on much shakier ground that was

[2] The median is a better measure than the mean because the composition of countries included can vary from year to year and the mean is effected by outliers. The sample begins when there are at least 5 countries in the group with available data.

thought. Although the econometric evidence is convincing, our understanding of how and when a growing financial industry translates into better growth prospects is very limited. Thus, increasing credit should not be viewed as a policy prescription for growth since increased leverage might just as soon be associated with credit bubbles and increased risk. The development of the financial sector needs to be embedded into a broader story of developing institutions, the legal structure that makes the financial system work more effectively. Thus there is a need for better measurement of financial sector activity that might be related to growth.

All in all, what we have learned is not that finance is unimportant but, instead, how difficult it is to measure financial sector activity properly.

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