Iacoviello (2005)

This topic considers the role of a financial sector in the economy. Later, we will augment a New Keynesian model with a housing sector and show that this leads to greater short-term volatility. But it is also worth examining the long-term effects of a larger financial sector. To do so, I rely on the following empirical working paper:
Cecchetti, S. and E. Kharroubi. July 2012. "Reassessing the Impact of Finance on Growth."

Background

As developed economies have become increasingly financialized, the finance sector is now over 8% of U.S. GDP, there has been increased attention paid to the relationship between aggregate macroeconomic performance and the size of the financial sector. This interest was only heightened by the clear connections between the Great Recession and the financial sector. This paper discusses some of the evidence between finance and long term macroeconomic performance (growth).

Until recently, most of the literature believed that there was a strong strong casual relationship, running both ways, between finance and growth. That is growth caused finance and finance caused growth with these effects providing positive feedback. At first glance, the causal relationship running from finance to growth is obvious– because GDP includes financial services (but not financial transactions such as the sale of a stock), a $1 increase in finance, all else equal, increases GDP by $1 in a direct, and largely uninteresting way. But theory suggests other channels. Financial activities may match borrowers and lenders more efficiently, allowing capital to be better directed to its most productive uses. Finance (*e.g.* insurance or market research) may also mitigate risk which, under the common assumption that agents are risk averse, may incentivize greater economic activity.

The basic idea of this paper is that the relationship is more complicated. The authors regularly find an upside down U-shaped relationship where more finance initially leads to growth, but where at empirically relevant levels, the effect reverses and additional financialization reduces growth. There are good reasons why finance could reduce growth. Finance consumes resources, including highly skilled labor. The paper provides an example where smart people choose to become hedge fund managers instead of rocket scientists or dazzling economics professor. If the latter leads to larger productivity gains to society than the former, then finance might take resources from more useful fields and thus reduce growth.

Data

The authors face two initial challenges: correctly defining their dependent and key independent variables. For the former, you might be tempted to use the growth rate of real per-capita GDP as many empirical growth papers do. The problem here is that GDP includes financial services. Because the authors want to test whether additional finance has indirect effects on growth, they instead use a measure of productivity as their dependent variable. They do so by using output per worker.

Output per worker is not a flawless measure. If more finance increases the labor force participation rate, then it does not correct the problem that output includes finance. If the steady state labor force participation rate is invariant to finance, then it is a decent measure.

Conceptually, financial services are economic activities related to risk management or credit. It is not obvious, however, how to beast measure this variable fir an econometric study. The authors consider several variables for their key financial independent variable. Initially, they focus on the aggregate ratio of private credit to GDP.

The authors collect data for 50 countries. The dataset includes both developed and non-developed economies. Because they are studying growth, they use the common tactic of dividing data into 5 year blocks. The hope is that this will wash out business cycle effects.

They begin by presenting a simple histogram that presents average GDP per-worker growth fir the different quartiles of private credit per GDP. The most striking feature is that the 25% of observations with the highest levels of credit have growth closer to 1% instead of 2% which is close to the average for the lower 75%. This does not tell us much. Very wealthy economies have both high levels of credit and grow slowly due to other factors such as convergence. Rigorous regressions analysis is a more promising tool.

The authors employ the following specification:

$$\Delta_{k,t+5,t} = \alpha + \beta_k + \gamma_0(fd_{k,t+5,t}) + \gamma_0(fd_{k,t+5,t})^2 + \gamma_2 X_{k,t+5,t} - \delta y_{k,t} + \epsilon_{k,t} \tag{1}$$

The dependent variable is the change in output per-worker over the five year period. The term β_k is a country *fixed effect*. It allows the authors to estimate country specific effects that are not captured by any of the other independent variables. This is common when one is estimating using *panel data* which exhibits variation both over time and across some cross

section(countries in this case). The authors do nt explain why they do not use fixed effects for each time period.

$fd_{k,t+5,t}$ is financial development. The existing literature suggests that this will have a positive effect. The authors also include the square of financial development. If γ_0 is positive while γ_1 is negative, then financial development will have a U-shaped relationship with growth. X is a vector of controls. These include population growth, government consumption, inflation, and openness to trade. Their inclusion has only small effects on γ_0 and γ_1. $y_{k,t}$ is the initial level (not growth rate) of productivity. A negative coefficient implies convergence where richer countries go slower. $\epsilon_{k,t}$ is the error term.

Table 1 shows the first major results. $\gamma_0 = 0.048$ and $\gamma_1 = -0.022$ and both are statistically significant with 99% confidence. We can then differentiate (1) with respect to financial development and (after pretending to check second-order conditions), calculate the level of financial development that maximizes growth.

$$0.048 - 2 * 0.022 fd = 0 \tag{2}$$

Solving, this yields $fd = 1.08$. A level of private credit to GDP of 108% maximizes growth (assuming one buys the results of the paper, of course). This is a high level, but one that countries sometimes exceed. the paper provides the example of Thailand which ran its private debt up to 150% of GDP prior to the East Asian Financial Crisis of 1997. According to this result, this reduced Thai trend growth by 0.5%.

The authors are careful to note that 108% should not be interpreted as a policy target. Although growth is important, there are other considerations, such as business cycle effects (more on tehse later), that impact welfare. Also, debt tends to increase during financial crises and the authors suggest that countries should give themselves some slack so that they do not dramatically exceed 108% during crises because doing so would be a drag on growth which would make recovery harder.

Unresolved Econometric Issues

1. Endogeneity. Although financial development may cause growth, growth could also cause financial development. This is endogeneity that makes it risky to make causal statements from the regression results. As in much of the empirical growth literature, the authors here do not make much of an effort. In my opinion, this is a weakness that has held back much of empirical growth. Many papers ignore it and just seem to hope for the best.

Part of the problem is that a good instrument, a common way of dealing with this problem, is not readily available. We would need something correlated with financial development but but nit caused by growth. It is hard to think of one. The best candidate would be lagged financial development, but this is far from perfect. Another option would be to employ more complicated time-series techniques.

2. Omitted Variables. The growth literature has found that many variables may be connected to growth. X cannot include all of them. But it is not obvious that the authors have included all of the important controls.

3. Alternate Shapes. Including squared financial development allows the authors to find a U-shape relationship. That they find an upside down shape suggests diminishing returns to financialization that eventually turn negative. An alternate hypothesis is that financial development asymptotes to having no marginal effect (think of a production function). The authors' specification does not allow them to discriminate between these two types of diminishing returns.

Alternate Measures of Financial Development

Because financial services is not defined by a single variable, the authors check their results for robustness to other measures. They find similar results.

1. They first use the ratio of banking credit to GDP. They again find the upside down U-shape. With all of the controls, they find that productivity growth peaks when banking credit equals 104% of GDP. The biggest difference here is that countries exceed this threshold more often than the peak result for private credit.

2. They next use the fraction of the workforce employed by the financial sector. Here, they find that growth peaks when 2.69% (with all controls) of the workforce is in finance. Notably, quite a few countries in the sample exceed this threshold. For the United States, over 4% of the workforce is in the financial sector.

Using the growth rate of financial development

As a final check, the authors switch to using the change in financial development (measured using financial sector employment) as the key independent variable. This is especially important if we are concerned that financial development is non-stationary. This seems quite possible and would render the previous results biased.

The authors include each of the other measures of financial development (which is problematic if non-stationarity is an issue). The authors consistently find that a 1% increase in the financial sector leads to a 0.3% decline in productivity. They thus conclude that financial sector growth is a drag on productivity. Because of the concerns over non-stationarity, I find this the most striking result in the paper.

Conclusions

This paper illustrates that the relationship between finance and growth is not well established empirically, and that it may be more complicated than a simple positive or negative linear effect. We will next turn to a theoretical, and short-term, examination of this relationship.

Iacoviello (2005)

This paper adds a housing sector to our basic New Keynesian model. The main result is that doing so leads to a more volatile economy. Before looking at the model, we consider a few features of housing:

1. Housing partly acts as a consumption good by providing utility to households. Nevertheless, new housing is officially classified as investment while existing housing does not enter into GDP at all.

2. Housing is known as an especially good leading economic indicator. Declines in housing construction tends to predict that economic conditions are set to worsen.

3. Housing also acts like a financial variable. For most homeowners, their home is their biggest source of wealth, In the model, housing will also act as collateral on loans. Higher housing prices will have the effect of access to credit, which will improve economic conditions This is an example of *financial acceleration*.

4. Declines in asset prices are a frequent catalyst for U.S. recessions. Collapsing stock prices, especially in the technology sector, led into the 2000 recession. Declines in housing prices led into the much worse Great Recession in 2008. Notice that this paper was published at the height of the housing bubble preceding the Great Recession.

To the model itself...

Recall in our basic model, that households did not borrow or lend in equilibrium ($b_t = 0$). This was because their was only one type of household so they all made the same choice, one

could not choose to be a lender while another a borrower. We change that here by adding heterogeneity.

Lenders in the model are known as "patient households." They are defined by a relatively high discount factor, β. Because this is close to one, they have a strong incentive to save which they do buy holding bonds:

$$Max_{B_t,C_t,N_t} \;\; E_0 \sum_{t=0}^{\infty} \beta'^t [ln(c'_t) + jln(h'_t) + \frac{L'^{\eta}_t}{\eta} + \chi ln(M'_t/P_t)] \tag{3}$$

s.t

$$c't + q_t \Delta h_t + \frac{R_{t-1} b'_{t-1}}{\pi_t} = b't + w'_t L'_t + F_t + T'_t - \Delta M'_t/P_t \tag{4}$$

Note that "primes" indicate that the variables refer to patient households.

This problem is mostly the same as the basic New Keynesian Model. It yields an Euler equation, a labor supply equations, and a money demand equation that serve the same purpose as the basic model. In addition, there is a housing demand equation that incorporates housing serving as a consumption good by providing utility and as a means to save. To derive, it consider the following argument:

1. Suppose that a patient household buys an extra unit of housing. This increases their utility by $\frac{j}{h'_t}$.

2. They could pay for this by reducing their current consumption. If the relative price of housing (to consumption) is q_t (which is not the price of bonds in this model), then lost utility is $\frac{q_t}{c'_t}$

3. When the next period arrives, the household could sell the unit of housing. This increases their consumption by $E_t[q_{t+1}]$ units. This increases utility by $\beta E_t[\frac{q_{t+1}}{c'_{t+1}}]$.

Putting the terms together, if the patient household is optimizing, then it cannot improve utility. Thus:

$$q_t = \frac{j}{h'_t} + \beta E_t[\frac{q_{t+1}}{c'_{t+1}}] \tag{5}$$

The borrowers in the model are called "entrepreneurs." The key difference is that they are relatively impatient, discounting using $\gamma < \beta$. Because they are impatient, they borrow from the patient households.

Like patient households. entrepreneurs consume. They also, however, hire labor (from the patient households) and rent housing to produce output that is then sold in the monopolistically competitive setting of Gali with Calcvo pricing.

By appearing in the production function, housing also acts like a capital good. Importantly, its financial purpose also appears in the entrepreneur's problem. It acts as collateral. Specifically, entrepreneur's debt (b_t) cannot exceed some fraction (m), of their expected housing stock in the next period:

$$b_t \leq mE_t[\frac{q_{t+1}h_t\pi_{t+1}}{R_t}] \tag{6}$$

m reflects the availability of credit.
Finally, the Central Bank sets policy by responding to inflation and the output gao as in Gali. Likewise, there is an error term that allows for monetary policy shocks.

Mechanisms

Suppose that there is a reduction in demand. In the model, this is a shock to interest rates. More generally, we can consider other shocks as well, including a reduction in asset prices unrelated to fundamentals. There are three effects.

1. The first one is the standard one from Gali. Reduced demand is deflationary and with flexible prices, firms would lower their prices. Sticky prices prevents this and keeps prices too high, reducing the quantities demanded, Output falls.

2. A reduction in demand reduces consumption, raising the marginal utility of consumption. This then causes households to substitute from housing to consumption, lowering housing prices. When housing prices fall, however, entrepreneurs have less ability to borrow. This reduces aggregate demand, amplifying the initial impact. Iacoviello calls this the "collateral effect."

Figure 2 in the paper quantifies these effects through a simulation:

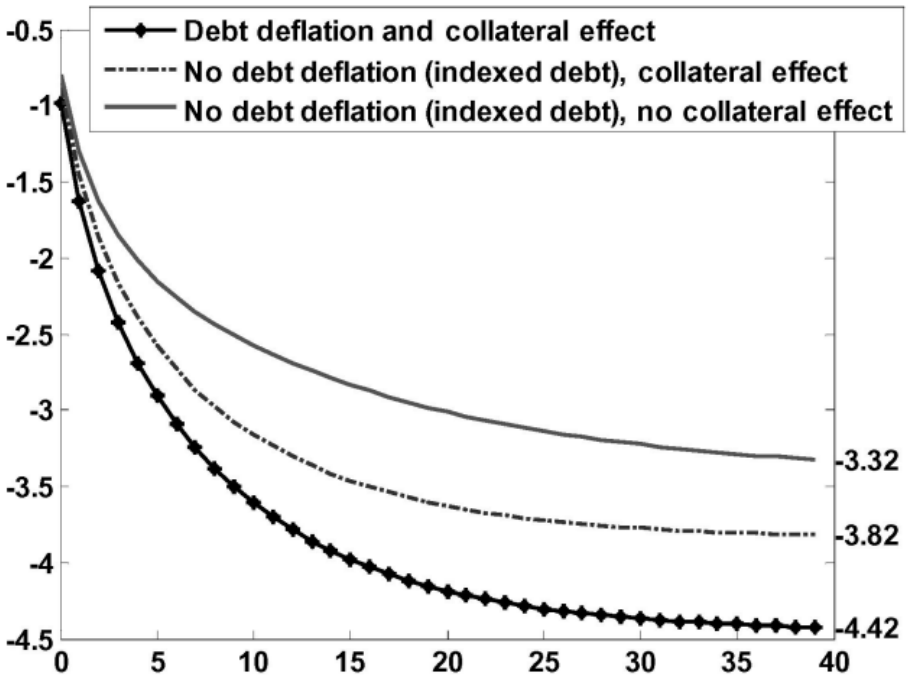

FIGURE 2. TOTAL OUTPUT LOSS IN RESPONSE TO A MONETARY SHOCK IN THE BASIC MODEL: COMPARISON BETWEEN ALTERNATIVE MODELS

Notes: Ordinate: time horizon in quarters. Coordinate: percent deviation from initial steady state.

A shock that would ordinarily reduce GDP by 3.3% now reduces GDP by 3.8%.

3. In the model, we are assuming that debt is not indexed to inflation. This means that if inflation is higher than expected, debt is NOT adjusted upwards. This is realistic. It captures, for example, that most mortgages are fixed rate rather than adjustable rate.

. Iacoviello introduces a second source of amplification, known as "debt-deflation." When demand falls, the real value of debts increases This reduces the ability of entrepreneurs to borrow, which further reduces aggregate demand. This channel can be shut down by indexing debt so that the real interest rate is the nominal rate less actual, rather than expected, inflation.

Debt-deflation is not new to this model. It remains a popular explanation for the Great Depression. This is, however, the first paper to show that it occurs through housing. Soon after publishing, in 2005, this problem would materialize during the Great Recession. Unlike the Great Depression, however, the Fed would combat it through aggressive expansionary monetary policy.

returning to Figure, allowing for debt-deflation now increases the total lost GDP by 4.4%.

Other Results and Takeaways:

1. This is a highly influential paper. The author shows that financial factors cause the impact of demand shocks on the economy to be one-third larger. Given our earlier empirical results that financialization (up to a point) leads to higher longer-run performance, this introduces an important tradeo-ff between the level of output and the business cycle.

2. in Figure 1, Iacoviello presents some empirical results that generally support the validity of the theoretical model that follows.

3. In Figure 3, Iacoviello simulates a rise in housing prices by temporarily raising the parameter j. Usually, we would expect that households would substitute away from consumption to housing, causing consumption to fall. If $m = 0$, so households do not borrow, then this is the case. If m is big enough, however, then the opposite occurs. Higher housing prices means that entrepreneurs can borrow more. This raises aggregate demand by enough that consumption increases. This is important, because, in the data, housing prices and consumption tend to move together.

4. Finally, should the Central Bank try to smooth housing prices by targeting q_t. The answer is no. Once again, aggressively targeting inflation is optimal policy. The intuition is that if prices are fully stable, then debt-deflation cannot occur, no does the collateral effect matter.