Too big to manage: Innovation and instability from regulated finance to the megabanking era

Hasan Cömert, Carmela D'Avino, Gary Dymski, Annina Kaltenbrunner, Eirini Petratou, and Mimoza Shabani

10 June 2016

> "In our market-making function, we are a principal. We represent the other side of what people want to do. We are not a fiduciary. We are not an agent. Of course, we have an obligation to fully disclose what an instrument is and to be honest in our dealings, but we are not managing somebody else's money"
>
> - Lloyd Blankfein, Goldman Sachs CEO, February 2010 statement to the Financial Crisis Investigation Commission.

1. Introduction

Hyman Minsky (1956) highlighted the close connection between financial innovation and financial crises in his first model of macroeconomic instability: he argued that banks engage in financial innovations as a means of avoiding efforts by central banks to constrain their credit creation. In his *Stabilizing the Unstable Economy* (1986), Minsky reasserted this view: financial innovations permit banks to over-expand credit, feeding systemic financial fragility; but central banks' lender-of-last-resort interventions, combined with countercyclical fiscal policy, would first stabilize the economy and then restore its prosperity. A decade later, however, Minsky's last published paper ended by suggesting "a need for rethinking the system of intervention in capitalist economies that evolved out of the New Deal." (Minsky 1996, pp. 358, 367).

This paper makes two contributions to Post Keynesian scholarship about financial instability by focusing on the relationship between banking firms and financial innovations, with special attention to the emergence and mature form of large, complex banking firms. While this journal has devoted many pages to explorations of financial crisis and Minsky's framework, only four papers have highlighted the links between financial innovation and financial crisis or instability (Leathers and Raines 2004, Crotty 2009, Perez 2009, Wray 2009); [1] of these, none have explored the role of bank behavior per se; nor defined financial innovation.

Our first contribution is to suggest a definition of financial innovation consistent with claims made in Post Keynesian economics – and specifically with Leathers and Raines' (2004) insight that innovation is more likely be used to facilitate speculation than Schumpeterian (job-creating) growth. Our second contribution, using this definition, is to identify new sources of financial instability. This results from a reexamination of the post-War period with special attention to banking-firm evolution. In the late 1950s and 1960s, large banks' behavior and innovations resulted in financial instability processes as Minsky (1975) characterized them. Here, we show how the cumulative effect of this period's innovations – once combined with adverse macroeconomic conditions – led in the 1980s to economy/financial disorganization – that is, to

[1] According to the Web of Science, the term "Minsky" appears 20 times as a topic word in the *Cambridge Journal of Economics*, "financial crisis" 52 times, and "financial innovation" only three times. The 2007 CJE paper by Alves, Paula, and Dymski demonstrated that 'follower' banks' behavior can be altered endogenously by shifts in the behavior of 'leader' banks; but the link to financial crisis was only suggested, not developed.

financial instability - due to institutional fragility and incoherence. Banking dysfunctionality in this era accelerated financial deregulation and a regulator-sanctioned bank merger wave.

These developments resulted in a definitive organizational outcome: the emergence of "too big to manage" megabanks, both in the US and elsewhere. The term 'megabank' refers here to banking firms whose size makes them systematically important in their home markets, and whose activities encompass commercial banking, investment banking, and trading activities.[2] These institutions' huge growth in size and complexity have, in turn, created a new source of financial instability. Specifically, megabanks cannot be understood as optimizing objective functions centrally determined by well-informed managers; they are comprised of decentralized, competing sub-units disciplined, at best, by ex-post rate-of-return or loss criteria. Even while these banking firms are an unreliable source of credit for the overall economy – and thus help to lock in the stagnationist regime – their preeminence and size imposes new constraints on bank regulators and central banks. The architecture of global and national banking systems is being reshaped by these firms' solvency criteria and by national governments' capacity or willingness to offer too-big-to-fail protection. Our argument has implications for the endogeneity of money and financial fragility, and it also implies that central banking and financial regulation are endogous insofar as they are shaped, in part, by the continuing evolution of megabanks.

Sections 2 and 3 summarizes the institutional changes that necessitate rethinking the model of banking and innovation: section 2 describes the period from the early 1960s to the late 1970s, and then section 3 shows how institutional instability in finance reached a critical point in the 1980s, opening the way to regulatory changes and market innovations which provided preconditions for the emergence of megabanking by the end of the 1990s. Section 4, drawing heavily on Luyendijk (2016), sets out a model of megabanks' behavior which offers a stark contrast with previous understandings of these institutions' operations. That these megabanks are embedded in a shadow-banking system that has grown symbiotically with them only highlights the need to explore these institutions' contributions to systemic fragility. Section 5 sets out empirical evidence supporting the view of banking behavior and innovation set out here. Section 6 summarizes our argument and explores the implications of 'too big to manage' banks for the endogeneity of money, financial instability, and central-banking intervention.

2. Financial instability and banking innovation: from the late 1950s to the late 1970s

This section summarizes the links between bank behavior, financial innovations, and macrodynamics from the early 1960s to the end of the 1970s, as well as summarizing mainstream and Post Keynesian approaches to this subject.[3] We first require a definition of financial innovation appropriate to our purpose. As shown in three recent overview papers of the literature on this topic, this term can refer to anything from technological advance to market creation.[4] This paper focuses on banking innovations, defined as product, process, or market

[2] We define 'banking firms' as entities that provide means of exchange and create credit.
[3] This discussion of banking evolution is almost entirely US-centric; this might be justified, if not excused, by noting that US financial deregulation preceded that in almost all other countries, and that only the US has made an explicit 'too big to fail' guarantee, for reasons discussed in Dymski and Kaltenbrunner (2016).
[4] Frame and White (2004), for example, define financial innovation as a cost- or risk-reducing or service-improving response to market demand for financial services; Lerner and Tulano (2011), as the creation and popularization of new financial instruments; Solans (2003), as both of the above, plus both new forms of organization and technological advances.

innovations specifically created by banking firms.[5] While a wide range of actions can qualify under this term – the creation of new instruments, the linking of previously-unconnected markets, and so on – the defining criterion is banks' protagonism. Of course, after one bank creates, others adopt. Technological changes adopted by banks do not qualify. Market innovations, in turn, refer here to those created by non-bank firms operating in financial markets.

Two categories of bank innovations can be identified based on their underlying motivations: 'opportunity' and 'adversity' innovations.[6] The former are driven by the efforts of banking firms – or subunits therein – to increase profits by either expanding revenues or cutting costs; the latter, by threats to cash-flow or even solvency due to the realization of risks associated with the bank's (or banks') asset commitments. The notion of 'adversity' innovation locates Redmond's (2013) assertion that financial innovations are linked to financial crises in a broader scale of risk realizations, with insolvency at one end and diminished firm operational autonomy at the other.

Three categories of opportunity innovations, in turn, can be identified: 'Schumpeterian' innovations that enhance net employment and output growth in non-financial sectors of the economy; 'speculative' innovations aimed at enhancing bank revenues without affecting employment or growth in the non-financial economy; and 'predatory' innovations, which enhance bank revenues by creating instruments or practices that appeciably increase risks of loss for non-financial units. The first two categories reproduce those of Leathers and Raines (2004); the second and third encompass definitions implicit in Crotty (2009) and Wray (2009). Our approach to financial innovation is arguably Keynesian and institutionalist: the latter, because of its focus on what banking firms do; the former, because it takes into account that banking firms can be thrown into circumstances which force adaptation. Economic agents (and not just banks) as understood in Keynesian theory do not operate in probabilistic pre-given and stable universes, in which mean-reversion over the long run precludes panic, and in which – in consequence – innovations will be adopted only if they offer superior long-run risk/return trajectories.

Explorations of banking within economics have generally either focused on the behavior of the individual or representative banking firm, or on the role played by banks in overall economic dynamics. In the post-war era, renewed attention to banking began with attention to its macro-level impacts; of particular importance is the work of Gurley and Shaw (1955, 1960) on the role of finance in economic development. These authors' work, building on Schumpeter (1934), opened the doors to research both on financial repression in developing economies and on the links between the portfolio equilibrium theory of finance with models of macroeconomic dynamics. The inattention to individual banking behavior is not surprising in light of both the heavy regulations imposed on banks in the wake of the Great Depression, the subsumption of banking to financing the War, and then the post-War "lock-in" caused by the glut of public debt on bank balance sheets.

James Tobin was a leader in integrating macroeconomic and portfolio-choice considerations within a unified equilibrium model. In Tobin (1969), his definitive effort, both the portfolio-equilibrium and aggregate features are very simplified; indeed, the q-theory of investment is first proposed in this paper as a way of linking 'real' and 'financial' assessments of the value of capital via a single ratio. Neither production nor labor nor labor markets are introduced. Banking is also left out of the core model. When banking is introduced, in a subsequent section, its

[5] The financial innovation literature, almost without exception, views banks as adopting, not creating, innovations: using our definitions, it emphasizes market innovations and disregards banking innovations. See Freixas and Rochet (2008, pp. 1-2) and the sources cited in footnote 4.
[6] The notions of 'adversity' and 'opportunity' innovation are drawn from Dymski (1987).

primary effect is to give wealthowners another asset-holding choice; equilibrium is only affected if regulators specify a maximum deposit rate that forces portfolio shifts. It was left to Fama (1980) to draw out the core result regarding whether bank activities affects outcomes in efficient market settings: banks can have no impact on credit allocation; optimizing wealth-owners will offset whatever choices are made by bank managers.

Whilst efficient-market theory may have written them off as irrelevant, banking institutions in the real world were undergoing a shift: the passivity of super-regulated '3-6-3' banking was being replaced by the reemergence of bank strategy. A cat-and-mouse game emerged between US money-centre banks and the Federal Reserve: the latter sought to rein in inflationary pressure by restrictive monetary policy aimed at the former. Even by the late 1950s, some of these banks' corporate customers were liquidating deposits and relend them in the then-emerging corporate paper market. Facing robust credit demand, the large banks fought back by seeking out innovative liability sources. This strategy was termed "liability management" – they set asset (credit) growth targets, and then sought either deposits or borrowed funds to finance their positions. As Minsky (1957) had already observed, the big banks became habitual borrowers in the Federal Funds (interbank) market, and they entered the repurchase agreement (RP) market by using government securities as collateral. In 1961, Citibank sponsored the creation of the negotiable CD market so as to attract large wealth-holders away from money markets. Subsequently, big banks borrowed more aggressively in interbank markets, and also tapped the Eurodollar market (Theilman 1970, Dymski 1991). The Federal Reserve undertook various restrictive measures, especially rate-maxima on instruments, to rein in these efforts. This move-countermove scenario ended in victory for the big banks, when the Federal Reserve found itself without adequate mechanisms of extending lender-of-last-resort support to New York financial markets during the April 1970 Penn Central crisis; thereafter, the rates on jumbo (over-$100,000) CDs were deregulated. This crisis marked a turning point: it exposed large banks' central place in the overall financial system, and thus the dependence of the Federal Reserve on maintaining these banks' operability, no matter the circumstances. As Wojnilower (1980, p. 286) put it:

> The banks had always served as lenders of last resort to the rest of the financial community, while the Federal Reserve, although disciplining the use of the discount window, acted as lender of last resort to the banks. Both relations were profoundly altered by the introduction of CDs. Compared to other financial institutions, the role of the banks was greatly enlarged. It now made sense for banks to open much larger credit lines for other lenders …

The Federal Reserve's concession on jumbo-CD rates, in turn, created the basis for bundling smaller deposits together as shares and purchasing jumbo CDs (and other high-valued paper) – that is, for money-market mutual funds (MMMFs). Pioneered in 1972, MMMFs provided both a savings vehicle and transactions services – both outside of the deposit-insurance umbrella set up to insure the stability of the economy's payments mechanism. MMMFs provided a channel for the disintermediation of savings, even as banks' corporate borrowers made a new surge into the commercial paper market. The rise of savings and transactions vehicles outside of banks' deposit-holdings, as well as the growth of non-bank credit channels, created major problems for monetary control (Porter, Simpson, and Mauskopf 1979). It also exposed divisions within the ranks of the Classical economists. Mayer (1982), a traditional Monetarist, argued that a conflict had arisen "between micro and macro optimality:" the expanded choice sets available to households and firms were being achieved at the expense of the utter decimation of monetary authorities' control over the money supply, and hence over price-inflation (per the Monetarist doctrine). A view termed "the New Monetary Economics" (Cowen and Krozner 1987), however,

took a post-Monetarist stance: the demise of government-regulated banks and the rise of more financial-market efficiency meant that any asset could qualify as money. These developments brought free-market nirvana far closer.

Post Keynesians shared a critical perspective on the core assumptions underlying these Monetarist and efficient-market approaches to understanding the role of banking and financial innovation in economic dynamics: in particular, the notion that economic units can use probabilistic calculation to decode uncertainty, and that market processes can be understood by focusing on equilibrium points or dynamic trajectories. However, Post Keynesian micro- and macro-focused models of financial innovation and banking have taken very different paths.

The bank-behavior (micro)-centred approach focused – as had Klein (1971) and Monti (1972) in pioneering models – on the optimization problem of the banking firm. But the stationary stochastic environment used in those models had to be changed, as this was not the setting that banks – especially money-center banks – now confronted, if they ever had. Banks moved, in these years, between periods of credit expansion and what Wojnilower (1980) termed credit crunches – that is, periods during which money-market rates ratcheted up and interest margins were squeezed. It was precisely on the basis of non-financial firms' balance-sheet experience in these periods that Minsky (1975), whom Wojnilower cited, developed his financial instability hypothesis. Tobin (1982) incorporated this fluctuating pattern into a model of the banking firm patterned on Klein (1971); he highlighted the importance of net defensive position – defined as the difference between short-term assets and liabilities – in banking strategy.[7] Dymski (1988) took Tobin (1982) a step further; he showed how liability-managing large banks, whose reliance on borrowed funds meant a chronically negative net defensive position, were as exposed to financial instability as were non-financial firms. The implication of this approach was that the supply of bank credit was itself fragile.

Moore (1972, 1979, 1985) took the lead in setting out the macro based Post Keynesian approach. In his view, a correct reading of the macro data suggest that money supply growth responds to money demand, and the monetary authorities must necessarily accommodate that demand. So money is endogenous, and the money-supply curve is always and everywhere horizontal, not vertical as in Monetarist theory. So the loss of monetary control is nothing more than the demise of a false doctrine. From this perspective, the 'micro-based' Post Keynesian approach is not Keynesian (Wray 1988). Goodhart (1989) objected, on behalf of the former 'structuralist' view, that "Moore has become too horizontalist." A lengthy debate ensued (Fontana 2002), with some issues – the relationship of micro and macro levels of analysis, and the relationship between financial instability and the endogeneity of money – yet unresolved.

3. Institutional instability, consolidation, and securitization: the 1980s and 1990s

One reason for the inconclusiveness of the horizontalist/structuralist debate is that the institutional context of banking itself became so unstable in these years. The well-ordered world in which big banks innovated to support their credit growth – already described by Minsky in the 1950s – had dissolved, replaced by a chaotic context that would by the mid-1980s put the

[7] What amounts to a disequilibrium micro-based approach to banking here is methodologically inconsistent with Tobin's macro model (described earlier in this section). Tobin (1972) defended the view that a combination of micro disequilibrium and macro equilibrium approaches represented the best way to depict economic processes. The rational expectations revolution took dead aim, of course, at this methodological position. Tobin never declared himself a Post Keynesian, but frequently visited the Levy Institute during Minsky's years there.

entire banking system in danger of collapse. As regulated banking firms – big and smaller banks, as well as the savings and loans (thrifts) that provided most housing finance – lost deposits, these had to be replaced by borrowed funds at rates exceeding their earnings on longer-term loans. Big banks, most exposed to loss of blue-chip borrowers to direct credit markets, compensated by making loans to commodity-rich Latin America. From the late 1970s into the early 1980s, regulators facilitated banks' creation of money-market-like instruments that could hold savings within banks and/or win back funds from MMMFs. Once Paul Volcker's anti-inflationary monetary policy bit and short-term interest rates climbed to unprecedented levels – that, from 1980 on, and well into 1982 – then regulated banks with fixed-interest-rate, longer-term assets – savings and loans and smaller banks, in particular – began to suffer losses. Since authority over banks and thrifts was distributed between federal and state-level regulators, no uniform response ensued. Some states' bank and (especially) thrift regulators deregulated asset-side activities, going so far as to allow thrifts to engage in property development – especially in parts of the country that had enjoyed oil- and gas-price driven booms.

These gambits came crashing to earth in the severe recession of 1981-2: most debt-laden Latin American economies defaulted, the "oil-patch" states' property markets collapsed, and mortgage portfolios remained upside down. By the mid-1980s, the large banks that had turned to offshore and commodity-boom markets to make asset commitments, and relied on borrowed funds to support them, were insolvent or close to it; much of the thrift system that provided housing finance was insolvent, or soon to be so. Wojnilower (1985, revisiting his 1980 analysis, found that episodes of credit crunch had evolved into an uncontrolled financial crisis.

This situation can be described as one of institutional instability. It generated financial instability not because of the unstoppable momentum of credit growth, but because of the realized fragility and even collapse of institutions that had provided credit for portions of the US economy reliably until then. A governmental response was called for. The one on offer was further deregulation and consolidation. The Reagan administration transformed the regulatory approach to banking structure soon after taking office. Regulatory staffs were radically cut, and existing anti-trust laws were ignored in favor of the "contestable markets" doctrine. Members of these staffs and of the Federal Reserve, as well as the financial experts advising them – in particular, the Shadow Financial Regulatory Committee – maintained the view that the nation was overbanked. A bank merger wave was set in motion (Dymski 1999).

The money-centre banks' solvency crisis demanded special treatment. Most had extended so much credit to Latin America that, collectively, these banks' non-performing Latin American loans exceeded their capital. The same was true for Continental Illinois – a special case because of its heavy dependence on bought funds. When in September 1984 a run on the borrowed-funds market threatened to pull both this bank and the entire US banking system under, Comptroller of the Currency John Conover declared that 11 money-centre banks were "too big to fail."

The problems of savings and loan insolvency and of bank failures in "oil-patch" states gave further momentum to the emerging bank merger wave. That these flew in the face of existing prohibitions on interstate banking was overlooked given the need to overcome the present threat to the taxpayer. A group of "superregional" banks specializing in commercial banking emerged through aggressive merger and acquisition activity. In Texas, for example, the four largest commercial banks all failed in the late 1980s; these were purchased by Bank America, Nations Bank (soon to acquire Bank America), First Interstate (soon to be acquired by Wells Fargo) and Citibank – three of the current "big four" US commercial banks. Mergers involving firms in the collapsing savings and loan industry often led to their conversion to commercial banks. To replace the credit flow that had previously flowed to mortgages, the two government-sponsored

enterprises charged with underwriting and stabilizing housing finance – Fannie Mae and Freddie Mac – vastly expanded their intake of home-mortgage loans from the entities originating them.[8] The governing criterion was whether these loans met "plain vanilla" criteria guaranteeing their safety. By the end of the 1980s, plain-vanilla securitization had filled in the gap left by the collapse of the savings and loan industry, and the mortgage market became a securitized market. And while responses to this decade's crisis had been to let banks get bigger and undertake more activities, the Glass-Steagall wall between commercial and investment banking remained.

Viewed from the perspective of traditional banking activities, permitting larger banks did not improve operational efficiency. Large diversified banks provided no "competitive advantages" (Pilloff and Rhoades 2000) for their customers, and indeed seldom made any gains in deposit holdings in markets they did not enter by merger. However, mergers increased these banks' "profit efficiency" – the profits they earned per unit of cost, though without affecting their "cost efficiency" per se (Akhavein *et al*., 1997). The many mergers involving large diversified banks in the 1980s and 1990s, which coincided with the removal of restrictions on banks' interstate expansion, created "the potential for multimarket interdependence among large banks that meet one another in numerous markets" (Rhoades 2000). Pilloff (1999) found that increased multimarket contact among large, diversified banking organizations reduced competition and increased these banks' profits, at their customers' expense.

Nonetheless, the pressure for further deregulation continued to mount, due to the emergence of what Charles Sanford, CEO of Bankers Trust, termed the "era of particle finance" (Sanford 1994). He argued that financial services that had previously been bundled together would be broken into their constituent parts and priced separately: a cross-border loan previously supported by deposits, for example, could be separated into cash-flow commitments to be paid over time, the borrowed funds permitting the holding of the rights to those cash-flows, security), and the exchange, liquidity, and default risks arising from these commitments at any point in time and across time. These parts could be disassembled and reassembled so as to best match market participants' preferred risk/return and holding-period profiles. Securitization offered a more flexible means than had liability management of eliminating institutional tie-ins between specific borrowers and specific savings pools.

The extent of the threat posed by securitization to traditional borrower-lender banking case became clear as private-label securitization spread. By the end of the 1980s, eight private-sector underwriters were underwriting the securitization of non-standard housing; as the 1990s unfolded, more and more classes of credit were incorporated into market-based securitization processes (Tymoigne 2009). In the same time-frame, hedge funds and private-equity funds, whose existence was premised on their ability to exceed the market rate of return, emerged to provide new sources of demand for these (above-market-rate) assets. The existence of these entities pushed insurance companies, trust funds, and other intermediaries in the same direction.

These developments threatened banks' central role in the provision of financial services; and it was the largest banks, who serviced the largest non-financial firms, that were at the greatest risk of being made redundant in the credit market. Ironically, the 1984 "too big to fail" declaration had been premised on the centrality of the money-centre banks in the very financial markets that were now eroding the institutional bases of banking activities. Something had to give: either the

[8] Fannie Mae is the familiar name for the Federal National Mortgage Association (FNMA), and Freddie Mac, for the Federal Home Loan Mortgage Corporation (FHLMC). FNMA was founded in 1938 to securitize mortgages; it was made a publicly-traded company in 1968. FHLMC was originated in 1970 to expand the secondary market for mortgages.

markets' incursions onto banks' turf or banks' inabilities to freely operate in financial markets. The view that market restrictions in banking were atavistic was so widely held in the corridors of industry and regulatory power that the outcome was never in doubt. All that remained was to erase the barriers to financial firms' mobility across spatial and industry lines.

The trigger for permitting banks more freedom of action was the announced merger, in 1998, between Citibank and Travellers Insurance companies. This flew in the face of laws that had prevented banks from providing financial services unrelated to core banking functions since the 1930s. The merging partners were given an 18-month window to secure the necessary legal changes. Thus incentivized, the Financial Services Modernization Act of 1999 removed market barriers between commercial banking, investment banking, and insurance, and also denied financial-markets regulators any discretionary oversight over over-the-counter derivatives and off-balance sheet financing vehicles.

This 1999 deregulation legislation permitted bank holding companies to convert themselves into financial holding companies and then freely pursue non-banking activities, subject to safety-and-soundness constraints evaluated on a firm-by-firm, not market-by-market, basis. Regulators' expectations that significant challenges would emerge to the existing multi-market, multi-product firms were disappointed (Mester 2008): it was the largest bank holding companies, already contending for industry leadership, that took most advantage of the new financial holding company law. There was a dual reason for this concentrated use of the new legal framework. For one thing, large banking firms were most exposed to "particle finance." For another, the growth of superregional banks and the revival of money-centre banks had put forward several contenders for industry leadership. The largest of the superregional banks were merging furiously in the mid-late 1990s and early 2000s, and acquiring investment-banking capabilities, primarily by acquisition. Surviving money-centre banks were also consolidating rigorously in this time period.

Since eliminating market-based alternatives to traditional banking activities was not feasible, the alternative for banks seeking to retain a leadership role was to make themselves central within the logic of the emerging post-banking model. And while the very largest firms had the operational scale to benefit directly from performing "particle finance" unbundling themselves, most borrowers and savers lacked this scale. Banks, if sufficiently sophisticated and centrally positioned, could provide the new lending/saving infrastructure to such firms, and sell them the auxiliary risk-reduction services. In effect, the expansion of securitization permitted deeper linkages between the megabanks originating credit with non-bank financial firms in need of higher-return assets to purchase.

Megabanks became increasingly adept at bundling diverse underlying loan contracts into homogenized cash-flow commitments.[9] The supply side of the securitization complex developed in tandem with increasing fee-based income for originators, while the uniformity in terms and conditions promoted these instruments' globalization, as Minsky had foreseen (Minsky 1987). On the eve of the 2008 crisis, a small number of superregional banks and money-centre banks were positioned to acquire either their large competitors or key non-bank financial-service firms. The crisis itself, in determining winners and losers, bound these banks more tightly together. The "big four" commercial banks that remained as of January 2009 shared hybrid characteristics: all encompassed former money-centre bank and superregional bank operations,

[9] Tymoigne (2009, p. 29) provides a useful primer on securitization processes; Figure 16 in his text llustrates the many categories of credit being securitized by 2008, and shows that securitized credit grew from a total of $400 billion in 1995 to $2.7 trillion in 2008.

all had substantial investment banking capacity. These banks, with the remaining megabanks (including the two surviving large investment banks), received lender-of-last-resort support in the crisis period, and deepened their links in asset-backed lending and borrowing markets. The result of the crisis was, ironically, to consolidate the dominance of the megabanks that had nearly brought the system down: by 2009, the "big four" held nearly half of all loans on the balance sheets of US commercial loans (Dymski and Kaltenbrunner 2016); this imbalance would be even greater were securized loans to be included.

In sum, the institutional instability that resulted from the crisis of regulated banking led to a securitization-centred system of financial intermediation. While securitization improved banks' balance sheets and improved their profitability in the shorter run, it hid vulnerabilities that were brutally exposed by the subprime crisis.[10] These have not disappeared, but instead remain, given that securitization-based credit is, if anything, more dominant now than before 2008. In particular, the increased importance of shadow banking and non-transparent financial transactions has made the credit process as a whole more opaque: loans that are securitized disappear from bank balance sheets, and the process is more reliant on short-term non-deposit funding (Kroszner and Strahan, 2011). Banks' liquidity risk – a key source of vulnerability under regulated banking – is apparently less, although banks' exposure to risk remains due to recourse risk (Dymski 2010). Further, the extent of banks' leverage and maturity mismatch is not evident until the outbreak of crisis, reducing market or depositor pressures on managers and owners to stay disciplined. In addition, securitization processes tend to systematically underassess risk (Coval *et al*., 2009). In this securitization-centred system of intermediation, bank risks appear to be far less than they are until the outbreak of crisis; indeed, it seems that banking firms themselves are no longer important in this process. But as the next section shows, too-big-to-manage megabanks are at the heart of the financial system's fragility and instability.

4. The "too big to manage" megabank and financial instability in the 2000s

Minsky, in 1996, characterized the new institutional phase of financial capitalism as " 'money manager capitalism,' in which the proximate owners of a vast proportion of financial instruments are mutual and pension funds. The total return on the portfolio is the only criteria used for judging the performance of the managers of these funds" (Minsky 1996, pp. 358-9). Minsky was prescient in describing how how bottom-line short-term performance – and not the financial sector's performance of any designated 'role' in the overall economy – would dominate the new banking landscape. But it is megabanks, not mutual and pension funds, that have emerged as the dominant institutions therein. Minsky's final decade, after all, was one in which US money-centre banks were recovering from catastrophic losses; the "too big to fail" declaration of 1984 codified their weakness even while recognizing their centrality in financial markets. And Minsky did not live to see the final 1999 repeal of the Glass-Steagall Act, much less the subprime era and subsequent crisis.[11]

The steady pace of financial deregulation across virtually all banking markets since 1980, combined with the steady increase in securitization and cross-border trade and finance, has fed innovations in the practices and organizational logic of these firms that have consequences even

[10] See Blankenburg and Palma (2009) and the special July 2009 issue of the *Cambridge Journal of Economics*.

[11] Minsky's archive at http://digitalcommons.bard.edu/hm_archive/ contains no references to the term "too big to fail." It should be noted that in recentering Minsky's money-market capitalism on megabanks, we are making an argument that converges with Wray's (2009) description of the 'fall' of money-market capitalism.

beyond the short-termism highlighted by Minsky. These banks, surrounded by what Minsky termed as "fringe banks," no longer innovate so as to expand their credit creation capacity. They undertake innovations unrelated to credit creation; these have, among other things, built shadow-banking webs that now account for much credit growth, and permit banks to earn fees and place bets in contingent-outcome markets. The result has been a huge growth in the complexity and size of these institutions, and these developments, in turn, have transformed both the character of financial instability and the role of banking firms in economic dynamics.

The past three decades have produced several well-known eyewitness accounts of everyday practices inside various departments within large financial firms. *Liar's Poker* (Lewis 1989), presents the bond-trading floor of Salomon Brothers, a large Wall Street brokerage, as a chaotic, testosterone-charged pit far removed from efficient-market theory. Nearly two decades later, MacKenzie (2006) argued that while the trading activity in the Chicago commodities-market trading pits is apparently disordered, its results embody the underlying logic of abstruse theorems in finance theory. Ho (2009), an investment banker-turned-anthropologist, in a book published just after the 2008 subprime crisis, describes how investment banking feeds boom-bust cycles, in part through practices of job insecurity and arbitrary treatment that desensitize the employees involved to the human costs of their decisions. These cacophonous worlds within Wall Street firms seem remote from the premise of securitization, which requires that all the multiple dimensions of the risks taken on by lenders in making loans be reduced to simple numbers through the use of formulas.

Nonetheless, as a result of the 1999 deregulation act and of successive mergers, the banking firms engaged in securitization also housed trading departments and securities brokers who celebrated opportunities for zero-sum successes based on short-term position-taking. The premise of the 1999 act – permitting large banks to be more competitive by attaining economies of scope as well as scale, and through activity diversification – was that the management of large Wall Street and City of London firms would keep a firm grip on their sub-managers' portfolios of financial activity. It did not occur to banking experts that securitization might be as fertile a site for zero-sum short-term trading games as equities, or that the parameters on which pricing was based might be corrupted. Indeed, the very opacity of securitized instruments was taken as proof of markets' superiority in pricing (Oldfield 2000). Only cautious doubts were registered about credit-rating agencies' accuracy prior to the crisis (Fender and Mitchell 2005).

The subprime crisis and its aftermath, of course, exposed all these problem areas, at great cost: large banks' managements often had had at best a tenuous grip on what their employees were doing; anything that could be gamed was being gamed; seemingly objective numbers had been pulled out of the air; and risk had been systematically mispriced. Exploitative mispricing permeated subprime lending itself: as many as half of minority borrowers who had taken on subprime loans should have received prime loans (Brooks and Simon 2007).

The Dodd-Frank Act and the EU's Banking Union represent efforts to avoid crises on the basis that properly-structured incentives – enough skin in the game, for banks' owners – will suffice to avoid any repeat of this crisis. However, a new and more comprehensive account of megabanks' behavior throws doubt on such a conclusion. Journalist Joris Luyendijk (2016) has written a book that attempts to characterize not just the behaviors of particular departments within megabanks, but the logic of these institutions' overall operations. His argument is that megabanks can no longer be understood as optimizing objective functions centrally determined by well-informed managers (and/or owners); they increasingly consist of decentralized, competing sub-units disciplined, at best, by ex-post rate-of-return or loss criteria. His analysis is

based on extensive interviews with City of London bankers, but applies more generally to global financial centres. He writes:

> … when facing questions from the media or parliamentary commissions, banks are very good at creating the impression of being run like an army or an airport. You assume they are structured around efficient hierarchies with a steady flow of commands, information, and feedback from top to bottom. But look beyond the façade at the perverse incentives, at the silos and the climate of fear, at how zero job security breeds zero job loyalty and at their unmanageable size and complexity and you do not see a rationally organized command structure. You see a cluster of islands in the fog, staffed by mercenaries. (Luyendijk 2016, p. 145)

Jamie Dimon, CEO of JP Morgan Chase, recently affirmed this "too complex to manage" view of the banking firm. In a *Financial Times* interview (McLannahan 2016), he is quoted as saying:

> "The US financial services industry does not conform to simple narratives. It is a complex ecosystem that depends on diverse business models coexisting because there is no other way to effectively serve America's vast array of customers and clients."

Interviews conducted in 2016 with City of London bankers by one member of the authorial team (Petratou) verify this view. The intense competition between firms feeds the too-big-to-manage problem. Financial innovations are undertaken in the context of this competition. In some cases this involves imitative products or opening new geographic markets. However, innovation often involves creating new markets or linking existing markets via the use of advanced mathematical and/or the exploitation of technological advances. Not to keep up with the continuous stream of technical and computational advances is to be left behind. This means that these competing institutions have to continually develop new job positions and even new departments based on highly specialized labour. Megabanks are more likely to be interested in recruits with backgrounds in engineering and computing than in economics, as may have been the case two decades ago. Further, these interviews indicate that megabanks often do not want their employees to have control over more than one area within a department.[12] That means they end up with more employees, each specialised in one particular area; and, as Luyendijk (2016) emphasizes, a code of silence prevails: employees are not allowed to exchange information. The clear result of these measures, taken in response to the need to both exploit information-intensive niches in markets without taking on firm-level risk, is a "too big to manage" firm; in the context of evolving financial innovations, escalation of dysfunctional management in megabanks from any starting (reset) point is obvious.

The implication of this style of information management, in conjunction with the nature of financial innovation and hiring, is that ex ante top-down management is an impossibility. Luyendijk describes the ex post or arbitrary methods used in lieu of such management: firing the least productive 10% of firm employees annually, regardless of overall firm performance; arbitrary re-assignments; and so on. Financial innovation becomes so complex that trading cannot be efficiently monitored; and managers are not aware of all the tasks that take place within their departments, much less controlling or even understanding them. So the successfully

[12] One respondent commented that the bank is worried that if employees who knew the firm's business model could counter-trade and game the firm. An example arose in the UBS scandal of 2011, in which "quant" Kweku Adoboli, a back-office employee who moved into a front-office trading position, use his knowledge of how UBS' models worked to take – and hide – excessive risks. He was arrested for rogue trading that cost the bank $2 billion in losses.

innovating megabank is continually hiring people whose skills its managers cannot assess, taking risks they do not understand, to enter new markets whose parameters are unknown.

The case of subprime securitization demonstrates that loan-making has become as prone to these problems as derivatives or futures trading. Section 3 argued that securitization, by replacing the traditional borrower-lender model, salvaged a role for banks – and especially megabanks – in an increasingly market-based system. Insofar as securitization generates raw material for zero-sum speculation, hedging, and so on, it has also enhances these firms' riskiness in ways that are difficult, if not impossible, to know in advance of the next crisis. We conclude, then, that megabanks, as defined here, embody and multiply banking instability.

The best way to demonstrate the scope and implications of our argument is to systematically list the characteristics of banking firms as conventionally understood, and then to show point-by-point how these characteristics differ in the "too big to manage" model:

- (1) All government-backed banking firms historically provided depository services, savings options, and extended credit. Government backing took the form of deposit insurance.
- (2) Banks were centrally run. They maximized either profit, size, or a preferred mix of risk and return, on behalf of a well-informed controlling centre. Two symbiotic strategies dominated the banking landscape: some banks pursued liability-management – that is, profit maximization – and relied on bought funds; others were risk averse, exercising caution in credit extension and avoiding liquidity risk.
- (3) Banks were information-based, and their managers used command-control relationships to maximize the institutional value of the firm they controlled, given the information available.
- (4) Banks' activities were closely tied to traditional banking: their operations were relatively transparent and on the balance sheet.
- (5) There was a tendency for banks to become financially fragile, triggering bouts of credit crunch/financial instability, linked in turn to financial and non-financial firms' competitions to (respectively) provide credit to expanding non-financial corporations and to take on more leveraged balance-sheet positions. This tendency would be undercut when an asset price crash occurred, leading to banks' being forced to rein in credit, and then central banks acting as lenders of last resort and stabilizing the system through 'big-bank' interventions.
- (6) Banks' long-term survival depended on controlling default risk in loans and not taking on excessive or uncontrollable liquidity risk, as central banks would trigger liquidity risk and loan defaults when the economy overheated. These central-bank interventions often involved reactions to excessive financial fragility, and were aimed at puncturing asset bubbles.

These characteristics have been systematically unwound by the megabanking model, as follows:

- (6') Megabanks' long-term survival is guaranteed, and is unrelated to the risks they have taken previously. Central banks have been following unconventional policy: maintaining interest rates at or near zero for extended periods, and buying huge amounts of bad debt. Both policies have minimized capital losses on fixed-income positions – helping banks – but the former has left banks starved for interest income, and fed bubble-driven investment.
- (5') Banks' financial fragility is now linked primarily not to credit commitments to non-financial firms, but to credit made to households (subprime mortgages, credit card, student-loan, and automobile-purchase debt), directly or indirectly. Liquidity risk has risen to historical highs as many more banks are financing their asset positions with purchased funds, which in turn are often rehypothecated – based on multiply-pledged collateral.
- (4') Megabanks' activities now are increasingly remote from traditional banking; they provide fee-based services and seek returns on asset positions they hold on their own account or for others. The value of each depends, often, on its remaining opaque.

- (3') Information remains a currency in the bank, but it does not flow to the top. It is captured locally in subunits of the bank, which operate independently and are each accountable for generating profits that meet a hurdle rate of return. Since information is valuable for subunits, and banks' overall position has to be kept obscure, members of each banking subunit maintain a code of silence, the penalties for breaking which are banishment from future industry employment. Further, 'information' now pertains less to the creditworthiness of borrowers (since this can be read off of credit-score reports), than to contacts. It's who you know, who trusts you and thinks you are reliable, and hence will do deals with you.
- (2') In consequence of (3'), the centre - which is only partially aware of what the 'bank' is doing - uses rule-of-thumb management - "every year, fire the least profitable 10% of all employees" – to maintain discipline among the bank's subunits, which can be thought of as mutually hostile, competing armed camps. They do not work together but may work at cross purposes.
- (1') In consequence of (3'), there are no core banking activities. Credit-provision is offloaded to shadow-bank affiliates. Unprofitable activities are simply cut or offloaded.

5. Empirical evidence

This section investigates the extent to which financial innovation of US megabanks, as proxied by non-interest income, has evolved over the last two decades, and its implications for banking business models. Figure 1 depicts total income and its components, namely interest and non-interest income, aggregated for the ten largest US banks for the past 20 years.[13] Total income for these banks more than doubled during the period 2003-2007, reaching a 2007 peak of almost $580 billion; it then experienced a short-lived contraction in 2008,falling by just over $100bn, and then remained remaining well above $440 billion through 2015. The composition of total income has shifted significantly within the 1996-2015 time period shown. Before 2007, interest and non-interest income were both increasing consistently; after 2007, interest income declines but non-interest income continues to increase. This evidence suggests that financial innovation before the crisis grew alongside core banking activities; after the crisis, it became the principal contributor to total income, while core banking activities contracted. Indeed, non-interest income has reached historically high levels for the largest US banks since 2009.

Figure 2 complements these findings by depicting the relative contribution to total income of non-interest income, averaged over the 10 largest US banks. The contribution to total income of non-interest income post-crisis has increased notably and has reached over 50% of total income. The large drop in the relative share of income contributed by non-interest income in 2004-07 is due to the large increase in these institutions' interest income, due to the massive subprime-related credit expansion in these years.

One of the claims made here is that megabanks have relatively 'flat' organizational structures, and that occasional reorganizations represent one response to the informational/control dilemma faced by these banks' central managers. Figure 3 illustrates precisely both patterns for Bank America, showing 'snapshots' of this megabank's operating units in 2006 and 2015. A further step in analysing the financial innovation activities of megabanks is to examine the different income-generating activities that contribute to their non-interest income. The Federal Reserve Board collects data on different components of non-interest income for individual bank holding companies; the segmentation available is shown in Table 1. We have obtained data for 6 US banks covering the period between 2002-2014 (for Goldman Sachs and Morgan Stanley, data are only available from 2009 onwards). In line with the definition of financial innovation

[13] All figures and Table 1 appear after the bibliography below.

employed in this paper, the income-generating activities that can qualify as financial innovation are as follows: other non-interest income; net securitization income; net servicing fees; investment banking fees and commission and trading revenue. Figure 4 shows the evolution of those components, averaged over Bank of America, Citigroup, Wells Fargo and JP Morgan. As can be seen trading revenue declined significantly in 2007 and 2008 on average for all banks in the sample. However this decline was short lived; the income generated from trading activities has not only reverted to the post crisis level, but has exceeded it. The same pattern can be observed for the investment banking fees and commissions income. The income generated from "other non-interest activities" increased during the crisis and has continued to do so, reaching its peak in 2011. In contrast net securitization income declined in 2007 and has remained low thereafter.

Figure 5 displays the composition of net non-interest income for the individual banks shown in Figure 4 in the 2002-14 period; these data are shown for Goldman Sachs and Morgan Stanley for the 2009-2014, as these institutions became the fifth and sixth largest US banks as of 2009. Some of the banks shown have generated more income from non-core banking activities in the post-crisis period. For example, Bank of America prior to the crisis was less reliant on trading revenue; then income from this activity nearly tripled in 2008 and 200; investment banking fees and commission income also tripled, while other non-interest income also increased substantially. Overall, Bank of America relied heavily on income generated from trading activities and investment banking activities during the crisis (2007-9). The same pattern can be observed for Wells Fargo; for that institution,investment banking fees and commissions, net servicing fees and other non-interest income have increased substantially since 2007. Note that these two banks' income profiles were profoundly affected by crisis-period mergers - Bank of America with Merrill Lynch, and Wells Fargo with Wachovia. JP Morgan also shows increased non-interest income over time, with the exception of a slight decline in 2008. The opposite, however, has occurred for Citigroup: its non-interest income has declined substantially since 2007. Note that non-interest income for Citi depended heavily on trading revenue in 2008. The components of non-interest income for both Morgan Stanley and Goldman Sachs have remained constant since they began reporting as banks in 2009.

Figure 6 shows asset totals for the six largest US bank holding companies between 1996 and 2015. Asset size has increased substantially since the mid-1990s, with a nearly five-fold increase registered by JP Morgan and Bank of America. The crisis impacted asset size at four of the six banks, the exceptions being the merger-augmented Bank of America and Wells Fargo. After the crisis, half of these banks' asset size continued to grow, while Citigroup, Morgan Stanley and Goldman Sachs experienced asset-size declines.

6. Conclusion: theoretical and policy implications of "too big to manage" megabanking

The too-big-to-fail megabanks that triggered the global financial crisis are operating on the basis of an institutional design that we have termed here the 'too big to manage' model. This model represents the endpoint of a transition process, in which banking was transformed from a sector that performs functions for the real economy – none more so than the largest banks – to a sector whose leading firms arguably have a tenuous relationship to core banking activities (payments-provision, savings storage, and credit-creation) and that serves itself (as the frontispiece quote from Blankfein signals). This model, like financial deregulation itself, results from the interplay between banking innovations, regulators' efforts to limit these innovations' impact, followed by further banking innovations. Three moments in this protracted interplay have been especially crucial: the first was the 1970 elimination of rate restrictions on jumbo CD's as a consequence of the Penn Central crisis of April 1970, affirming large banks' use of borrowed funds to support

their asset positions; next, the 1984 declaration that 11 money-centre banks in danger of insolvency were "too big to fail"; the third moment was the passage of the Financial Services Modernization Act of 1999, which freed large banks to pursue commercial and investment banking, as well as insurance activities, with minimal oversight of their individual lines of business. As a consequence, a set of megabanks emerged that is both intertwined with the financial markets that constitute the circulatory system of globalized capitalism, and protected by "too big to fail" guarantees.

Financial innovations were designed in the 1960s and 1970s to permit greater synergistic use of the bank's primary function of credit creation. But now, financial innovation more often involves bank expansion into new areas, in which informational advantages and market position can be used to generate fees and to engage in zero-sum position taking via derivatives and other markets. Consequently, these firms' activities have become uncoupled from the core banking activities of creating credit, providing means of payment, and underwriting the financing of investment. Indeed, there are no core processes. The price paid by megabank managers for this freedom to pursue profits in fast-moving global markets solely on the basis of prospective rate-of-return considerations is a loss of control. The knowledge core of these institutions resides in subunits whose behavior and risk-taking can be monitored only on the basis of ex-post results, and not ex-ante. Ex post results are policed ruthlessly, creating an atmosphere of fear and insecurity among the firm's workers that breeds disloyalty.

This way of understanding the banking firm has several huge implications for our understanding of financial instability and for some key elements of Post Keynesian theory. Regarding financial instability, we have reaffirmed the importance of the financial innovation-instability link first identified by Minsky in 1957. By specifying a more precise definition of financial innovation, we have suggested two new sources of financial instability: institutional instability and banking instability. The former, which reached a peak in the 1980s, led to the latter, a condition that describes contemporary megabanking behavior.

Since the structure of financial intermediation – the mechanisms by which credit is or is not created, and by which unspent income is allocated among savings vehicles is an inescapable component of macroeconomic models – whether by its presence or its absence – we might briefly consider the implications era of too-big-to-manage banking for Keynesian theory. One cornerstone of Keynesian macroeconomic theory is that money is endogenous; another key concept is monetary circuit theory, the idea that endogenous money creation is linked in capitalist economies to efforts to generate profits via surplus-extraction in production. It is clear that while megabanking decenters the money-creation process, involving shadow banks in holding and circulating it – and even, arguably, in creating it (Michell 2015), money remains endogenous in a megabank-dominated system. However, arguably the monetary circuit may work differently, as money may be created for different reasons than under production-centred capitalism; the credit-creation process that drives money creation is now funneled through securitization processes that prioritize asset bubbles over productive credit.

Second, the impacts of the central bank on the economic growth process are fundamentally different than before. Previously, lender-of-last-resort intervention by the central bank would rescue the on-balance-sheet credit commitments of banks; now, they rescue the money market positions by which the bank funds itself, so as to protect the interwoven circuits of borrowing and lending that support derivative and repurchase-agreement positions. Mehrling (2012) has argued that this 'dealer-of-last-resort' approach is now the best description of how central banks must operate. Mehrling's point, of course, does not encompass the problems of whether the

purposes for which credit flows have changed, nor does he consider the social cost of megabanks' banking fragility once their circumstances pass the critical point.

Some commentators have emphasized that megabanks' size generates immense risks for their host economic systems, while others have argued that the market-based system nurtures fraud.[14] Megabanks' size and the fraud that thrives under opacity could be controlled in principle through capital requirements for banks, 'skin in the game' capital standards for shadow-banking subsidiaries or affiliates, greater transparency, and more diligent reporting. Actually, all these reforms are being implemented, if less than whole-heartedly, under the Dodd-Frank reform act. But beyond these elements is the very business model itself that megabanks have installed at the heart of contemporary global finance. The lack of any base-line function within the broader economic system and the blind insistence on above-average rates of return are, quite simply, an explosive combination, given that the megabanks have become too-big-to-fail and have largely resisted efforts to rein in their behavior to date. This will explain why shadow banking occurs partly inside the boundary of megabanks, and partly outside it.

BIBLIOGRAPHY

Akhavein, Jalal D., Allen N. Berger, and David B. Humphrey, "The effects of megamergers on efficiency and prices: evidence from a bank profit function," *Review of Industrial Organization* 12, 1997: 95-139.

Blankenburg, Stephanie, and José Gabriel Palma, "Introduction: the global financial crisis," *Cambridge Journal of Economics* 33(4), July 2009: 531-8.

Brooks, Rick, and Ruth Simon, **"**Subprime Debacle Traps Even Very Credit-Worthy," *Wall Street Journal,* December 3, 2007. A1.

Coval, Joshua, Jacob Jurek,, and Erik Stafford, "The economics of structured finance", *Journal of Economic Perspectives*, 23(1), 2009: 3-25.

Cowen, Tyler, and Randall Kroszner, "The development of the New Monetary Economics," Journal of Political Economy 95(3), June 1987: 567-590.

Crotty, James, "If financial market competition is intense, why are financial firm profits so high? Reflections on the current 'golden age' of finance," *Competition and Change* 12(2), June 2008: 167-83.

Crotty, James, "Structural causes of the global financial crisis: a critical assessment of the 'new financial architecture'," *Cambridge Journal of Economics* 33(4), 2009: 563-80.

Dymski, Gary, *On the role of uncertainty and illiquidity in financial markets: post war banking innovation in the United States*, PhD dissertation supervised by James Crotty, University of Massachusetts, Amherst, 1987.

Dymski, Gary, "From Schumpeterian credit flows to Minskyian fragility: The transformation of the US banking system, 1927-1990," mimeo, University of Southern California, 1991.

Dymski, Gary, *The bank merger wave*. Armonk, NY: M.E. Sharpe, 1999.

Dymski, Gary, "Why the subprime crisis is different: A Minskyian approach," *Cambridge Journal of Economics,* 34(2), March 2010: 239-55.

Dymski, Gary, and Annina Kaltenbrunner, "How finance globalized: A tail of two cities," in

[14] Two prominent examples are, respectively, Johnson and Kwak (2010) and Galbraith (2015).

Ismail Erturk and Daniela Gabor, co-editors, *Routledge companion to banking regulation and reform*, Routledge, forthcoming, 2016.

Fama, Eugene, "Banking in the theory of finance," *Journal of Monetary Economics* 6, 1980: 39-57.

Fender, Ingo, and Janet Mitchell, "Structured finance: complexity, risk and the use of ratings," *BIS Quarterly Review*, June 2005: 67-87.

Fontana, Giuseppe, "Rethinking endogenous money: a constructive interpretation of the debate between horizontalists and structuralists," *Metroeconomica* 55(4), 2002: 367-85.

Frame, W.Scott, and Lawrence J. White, "Empirical studies of financial innovation: lots of talk, little action?" *Journal of Economic Literature* 42(1), March 2004: 116-144.

Freixas, Xavier, and Jean-Charles Rochet, *The microeconomics of banking, 2nd edition*. Cambridge, MA: MIT Press, 2008.

Galbraith, James, *The end of normal.* New York: Simon and Shuster, 2014.

Goodhart, Charles, "Has Moore become too horizontal?" *Journal of Post Keynesian Economics* 12(1), Autumn, 1989: 29-34.

Gurley, John G., and Edward S. Shaw (1955), "Financial aspects of economic development," *American Economic Review* 45(4), September 1955, pp. 515-38.

Gurley, John G., and Edward S. Shaw (1960), *Money in a theory of finance*. Washington, DC: The Brookings Institution, 1960.

Ho, Karen, *Liquidated: An ethnography of Wall Street*. Durham, NC: Duke University Press, 2009.

Johnson, Simon, and James Kwak, *13 Bankers: The Wall Street takeover and the next financial meltdown*. New York: Pantheon, 2010.

Klein, Michael A., "A theory of the banking firm," *Journal of Money, Credit and Banking* 3, 1971: 205-18.

Kroszner, Randall, and Philip Strahan, "Financial regulatory reform: challenges ahead" *American Economic Review* 101(3), 2011: 242-46.

Leathers, Charles G., and J. Patrick Raines, "The Schumpeterian role of financial innovations in the New Economy's business cycle," *Cambridge Journal of Economics* 28(5), 2004: 667-81.

Lerner, Josh and Peter Tufano, "The consequences of financial innovation: A counterfactual research agenda," *Annual Review of Financial Economics* 3, 2011: 41-85.

Lewis, Michael, *Liar's Poker*. New York: W.W. Norton, 1989.

Luyendijk, Jorin, *Swimming with Sharks: My Journey into the World of Bankers*. London: Guardian Faber Publishing, 2016.

MacKenzie, Donald, *An engine, not a camera: How financial models shape markets*. Cambridge, MA: MIT Press, 2006.

Mayer, Thomas, "Financial innovation-the conflict between micro and macro optimality," *American Economic Review* 72(2), May 1982: 29-34.

McLannahan, Ben, "JPMorgan chief Dimon warns on dangers of undermining US banks," *Financial Times,* April 7, 2016.

Mehrling, Perry, "Three principles for market-based credit regulation," *American Economic Review Papers and Proceedings* 102(3), 2012: 107-12.

Mester, Loretta, "Optimal industrial structure in banking," *Handbook of financial intermediation and banking*, edited by Anjan Thakor and Arnoud Boot. Amsterdam: North-Holland, 2008: 134-164.

Minsky, Hyman P., *John Maynard Keynes*. New York: Columbia University Press, 1975.

Minsky, Hyman P., *Stabilizing the unstable economy*. New Haven: Yale University Press, 1986.

Minsky, Hyman. P., 1987, "Securitisation: Notes prepared for discussion, Washington University, St. Louis" in ed. Wray, L., R., 2008, "Securitisation: H. P. Minsky", The Levy Economics Institute of Bard College, Policy note, 2

Minsky, Hyman P., "Uncertainty and the institutional structure of capitalist economies," *Journal of Economic Issues* 30(2), June 1996: 357-69.

Monti, Mario, "Deposit, credit and interest rate determination under alternative bank objective functions," in *Mathematical methods in investment and finance*, edited by Georgio Szego and Karl Shell. Amsterdam: North-Holland, 1972: 430-454.

Moore**,** Basil J., "Optimal monetary policy," *Economic Journal* 82(325), March 1972: 116-39.

Moore**,** Basil J., "The Endogenous Money Stock," *Journal of Post Keynesian Economics* 2(1), Fall 1979: 49-70.

Moore**,** Basil J., "Unpacking the Post Keynesian black box: bank lending and the money supply," *Journal of Post Keynesian Economics* 5(4), Summer 1983: 537-56.

Oldfield, George S., "Making markets for structured mortgage derivatives," *Journal of Financial Economics* 57(3), 2000: 445-71.

Perez, Carlota, "The double bubble at the turn of the century: technological roots and structural implications," *Cambridge Journal of Economics* 33(4), 2009: 779-805.

Pilloff, Steven J., "Multimarket contact in banking," *Review of Industrial Organization* 14, 1999: 163-82.

Pilloff, Steven J., and Stephen A. Rhoades, "Do large, diversified banking organizations have competitive advantages?" *Review of Industrial Organization* 16, 2000: 287-302.

Porter, Richard, Thomas Simpson, and Maureen Mauskopf, "Financial innovation and the monetary aggregates," *Brookings Papers on Economic Activity* 1, 1979: 213-29.

Redmond, William, "Financial Innovation, Diffusion, and Instability," *Journal of Economic Issues* 47(2), June 2013: 525-32.

Rhoades, Stephen A., "Retail commercial banking: an update on a period of extraordinary change," *Review of Industrial Organization* 16, 2000: 357-66.

Sanford, Charles, "Financial markets in 2020," *Economic Review*, Federal Reserve Bank of Kansas City, First quarter 1994: 19-28.

Schumpeter, Joseph A., *The theory of economic development: an inquiry into profits, capital, credit, interest and the business cycle*, trans. Redvers Opie, London: Transaction, 1934.

Solans, Eugenio Domingo, "Financial innovations and monetary policy," Speech delivered in Manila, 13 February 2003. Frankfort: European Central Bank. Available at https://www.ecb.europa.eu/press/key/date/2003/html/sp030213.en.html.

Theilman, Ward, "Commercial Bank Liability Management and Monetary Control," *Journal of Financial and Quantitative Analysis* 5(3), September 1970: 329-39.

Tobin, James, "The commercial banking firm – a simple model," *Scandanavian Journal of Economics*, 1982, 495-530.

Tobin, James, "Inflation and unemployment," *American Economic Review* 62(1), 1972: 1-18.

Tobin, James, "A general equilibrium approach to monetary theory," *Journal of Money, Credit and Banking* 1(1), February 1969: 15-29.

Tobin, James, "Financial innovation and deregulation in perspective," *Bank of Japan Monetary and Economic Studies* 3(2), September 1985: 19-30.

Tymoigne, Éric, "Securitization, Deregulation, Economic Stability, and Financial Crisis, Part I: The Evolution of Securitization," *Working Paper No. 573.1*. Annandale-on-Hudson: Levy Economics Institute of Bard College, August 2009.

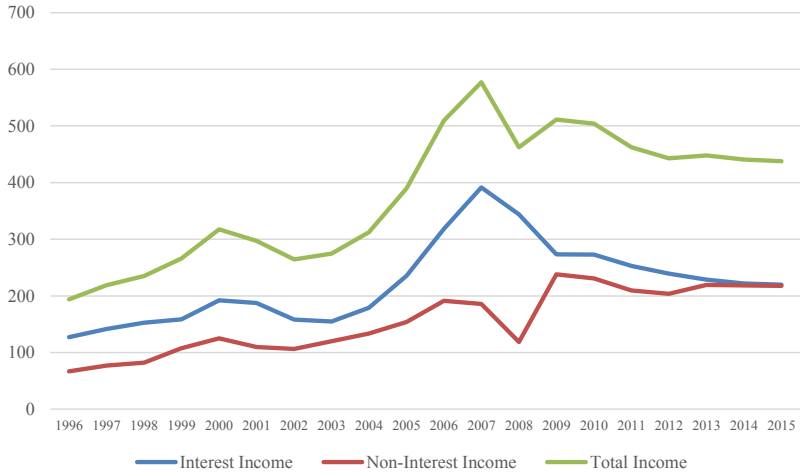
Wojnilower, Albert M., "The Central Role of Credit Crunches in Recent Financial History," *Brookings Papers on Economic Activity* 2, 1980: 277-326.

Wojnilower, Albert M., "Private credit demand, supply, and crunches-how different are the 1980's?" *American Economic Review* 75(2), May 1985: 351-56.

Wray, L. Randall, "A Keynesian theory of banking: a comment on Dymski," *Journal of Post Keynesian Economics* 12(1), Fall 1989: 152-7.

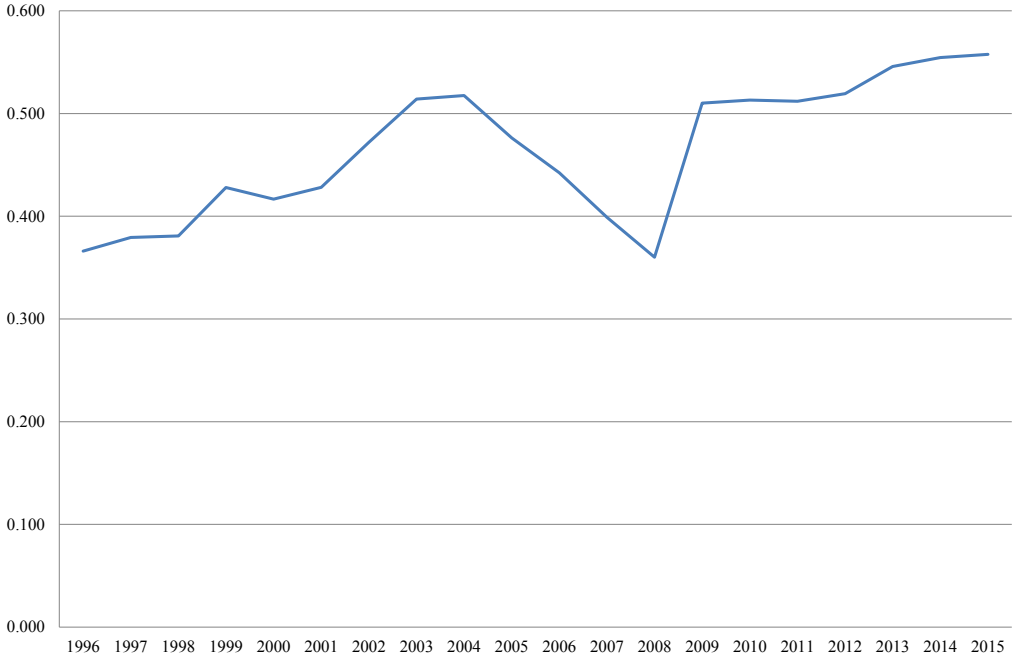
Wray, L. Randall, "The rise and fall of money manager capitalism: a Minskian approach," *Cambridge Journal of Economics* 33(4), 2009: 807-28.

Figure 1. Non-interest, interest and total income at 10 largest US megabanks, 1996-2015 ($bn)



Source: Bloomberg.
Notes: Banks included in the sample are: Bank of America, Citigroup, Morgan Stanley, JP Morgan, Wells Fargo, Goldman Sachs, CapitalOne, NY Mellon, Bancorp, PNC. Figures refer to the sum of the variables across banks.

Figure 2. Non-interest income to total income, average for 10 largest US megabanks, 1996-2015



Source: Bloomberg.
Notes: Banks included in the sample are: Bank of America, Citigroup, Morgan Stanley, JP Morgan, Wells Fargo, Goldman Sachs, CapitalOne, NY Mellon, Bancorp, PNC.

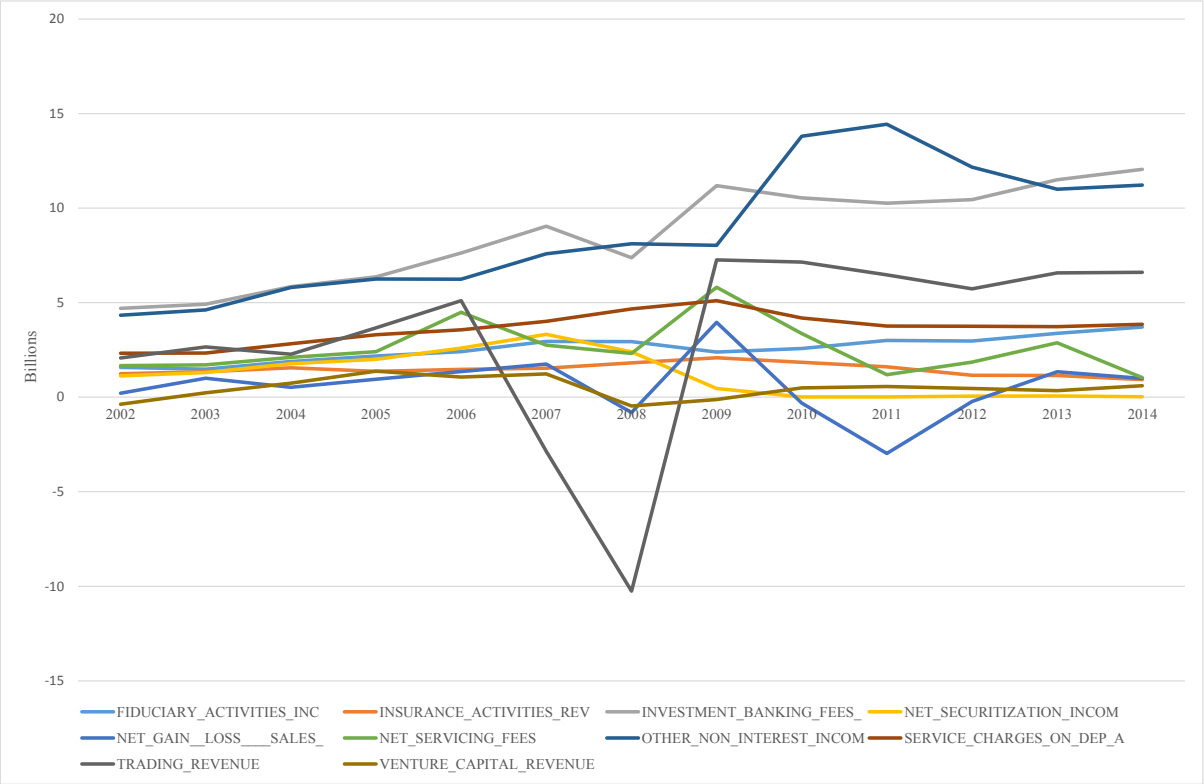
Figure 3. The business model of Bank America in 2006 and 2015

2006

2015

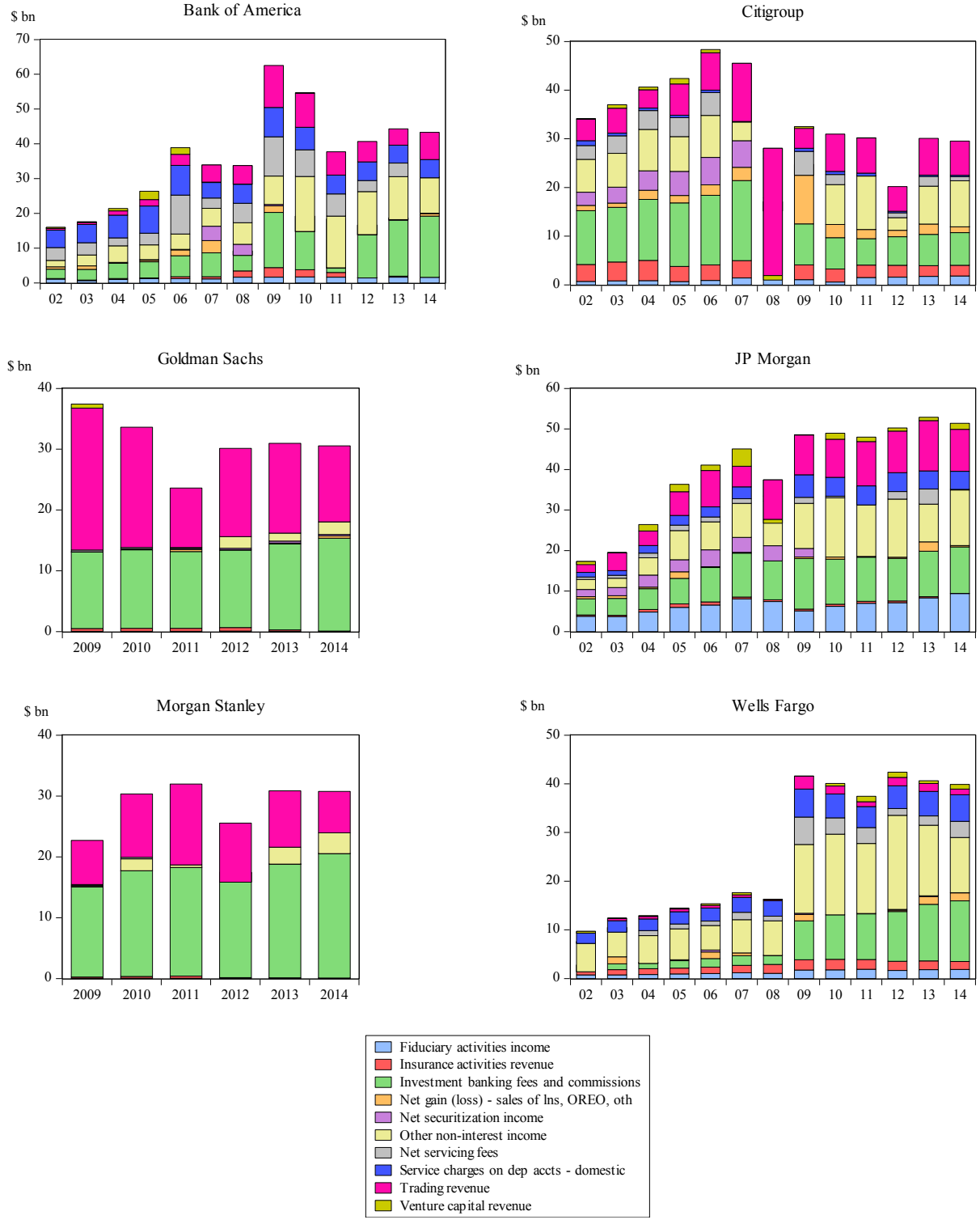
Table 1. NII decomposition
Other non-interest income
Net gain (loss) - sales of lns, OREO, oth
Net securitization income
Net servicing fees
Venture capital revenue
Insurance activities revenue
Investment banking fees and commissions
Trading revenue
Service charges on dep accts - domestic
Fiduciary activities income

Figure 4: Components of non interest income at the "big four" US commercial banks, 2002-2014 (averaged)



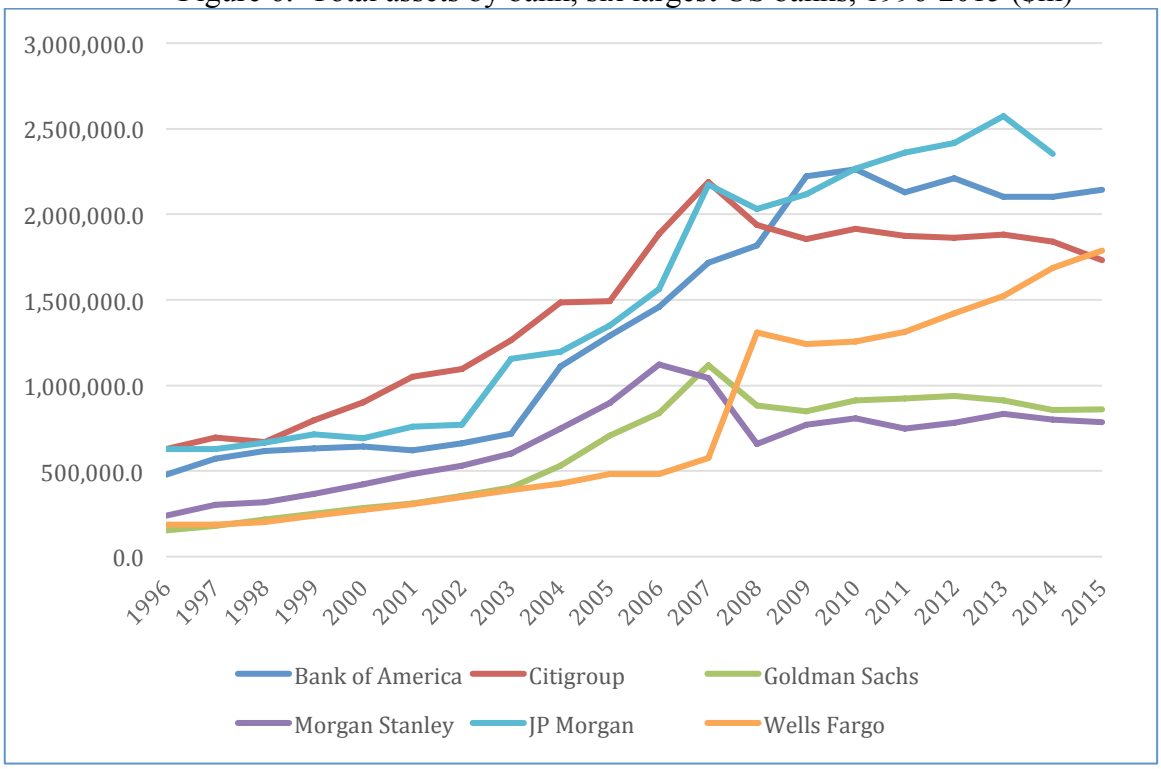
Source: Bank holding company reports filed with the Federal Reserve Board; the banks for which data are shown are: Bank America, Citigroup, JP Morgan Chase, and Wells Fargo.

Figure 5. Non-Interest Income Composition by bank, six largest US banks, 2002-2014



Source: Bank Holding Company Performance Reports, Board of Governors of the Federal Reserve System.

Figure 6. Total assets by bank, six largest US banks, 1996-2015 ($m)



Source: Bloomberg

Notes: Data coverage is from 1996-2015 apart from JP Morgan, for which data coverage starts in 1997.