Literature review of past crises

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LITERATURE REVIEW OF PAST CRISES
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Financial crises – A review of literature
Abstract

This paper is part of a series of discussion papers that have been prepared by the International Institute for Labour Studies (IILS) within the framework of the joint project “Addressing European labour market and social challenges for a sustainable globalization”, which has been carried out by the European Commission (EC) and the International Labour Organization (ILO). The discussion paper series provides background information and in-depth analysis for two concluding synthesis reports that summarize the main findings of the project. This paper relates to first part of the project “Addressing the short- and medium-term labour market and social challenges of the current economic and financial crisis” and the concluding synthesis report “Building a sustainable job-rich recovery”.

There is a robust modern literature on financial crises that policy makers in newly affected countries can potentially draw from. The existing literature has yet to fully account for the large size of the crises and the long run effects, but still there are a number of findings that may help guide policy in the context of the current crisis. This paper is an attempt to draw the main lessons from this literature, with a special focus for the macro-economic impact of financial crises.
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Main Findings

- While a major financial crisis is a novelty for policy makers in the US and major European Countries, other parts of the world, mainly emerging economies, have been regularly hit by financial crises since at least the 1980s (see chapters 2 and 3).

- These crises have had severe impacts on labour markets, mainly through the capital allocation channel but also because financial crises are larger versions of usual economic downturns. Available empirical evidence suggests that labour market outcomes during financial crises are worse than in regular downturns, even after controlling for the size of the recession. In particular, studies of past crises show that when cost of financing goes up, job creation suffers.

  - In terms of empirical evidence for misallocation, studies show that there is a relatively large drop in manufacturing and mining, which have high productivity, compared to services and agriculture, which tend to have low productivity. Furthermore, misallocation can persist in the medium term, especially if the problems in the financial system are not properly addressed.

  - The recent crisis (2007-09) showed that both during financial crises and in the recovery phase, unemployment is lower than what would usually be warranted by the observed drop in output. Furthermore, studies from past crises show that while in the normal business cycle, old jobs were kept in place, but in financial crises there was a large degree of job destruction without a commensurate increase in job creation.

  - The large impact of financial crises on the labour market can generate structural adjustments, like increase in long-term unemployment. Since it is difficult
to reintegrate these workers back into the labour force (skills erosion, labour market detachment, etc.), it could lead to “hysteresis,” that is, the tendency of large cyclical unemployment outcomes to translate into a permanent increase in the natural rate of unemployment.

- Not surprisingly, there is a vast literature on financial crisis and one story that emerges clearly is that financial crisis is a reasonably well-defined economic problem, and it is avoidable with the right set of policies. In order to understand a financial crisis, it is important to look at the “boom” period that usually precedes a crisis – two main strands of the literature on crises that attempt to account for this period. The first view states that the “boom-bust” cycle is evidence of excessive investment and risk taking (facilitated by easy monetary policy). The second perspective presupposes that inflated prices in assets increases liquidity – rather than excessive investment – and facilitates investment.

- Whichever strand of the literature one subscribes to, what is clear is that “boom” periods are usually followed by “bust”. That is, “bubbles” tend to ultimately lead to “bust” when asset prices drop precipitously and financial markets are no longer functional. Financial markets become dysfunctional because of liquidity problems (when firms cancel good projects in the face of liquidity constraints) and the problem of contagion (financial institutions and markets are interconnected, hence become the carrier of the crisis). These problems suggest that government has a role to play in mitigating the fall from a “bust.”

- The primary role of financial markets is to direct resources to their most productive uses, and when this ability is compromised, productivity suffers and could have long-term impact. The most direct real effects of disruptions in financial markets are on capital (re)allocation during and after the crisis. The potential role of misallocation in delaying the recovery in Japan and Mexico in the 1990s underscores the need for authorities to intervene quickly and thoroughly in the banking system. Furthermore, Sweden in 1991-93 serves as an example of swift government intervention that held banks accountable while providing much needed government support.

- In order to prevent the potential problem of moral hazard that comes with bank bailouts, government should lend freely to only the solvent banks, but only do so against good collateral and high interest rate. If interest rates are high, banks are incentivized to repay the government as quickly as they can, withdraw from risky projects, and attract private capital. Effective government policies will revive the credit markets, restore confidence in the financial system, and enable the financial sector to perform its task of allocating scarce resources to their most productive usage.

- In this respect, financial regulation can play an important role. Boom-bust cycles often follow periods of financial liberalization reforms. This is consistent with the excessive risk taking view of booms, as financial de-regulation reforms have
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typically facilitated risk taking. But returning to the previous regulatory frameworks is probably not advisable either, as the heavy intervention of the government in the allocation of credit was also distortionary. Regulatory reforms were successful in generating higher growth, and now the challenge is to retain these gains while recovering the stability that existed before the reforms.

○ In light of the recent crisis, studies suggest that financial regulation should become "macro-prudential," that is, capital adequacy ratios should respond not only to the individual risk of securities held by banks, but by how they correlate with macroeconomic variables and, in particular, with how they behave during financial crises. Macro-prudential regulation should also be cyclical, tighter in the boom and weaker in the downturn.

○ Even well designed financial regulations are constrained by a boundary. Any financial regulation has to specify which assets and institutions fall into its rules and which ones do not. This creates an incentive for funds to flow towards the unregulated institutions in the boom periods and back to the regulated ones in the crisis, potentially amplifying the cycle. Finding the balance thus in terms of excessive or inadequate financial regulation is challenge for policy makers.

Introduction

Financial markets are a crucial part of a well functioning economy. They enable the real economy to function properly by channelling capital resources to its most productive use. They provide insurance against idiosyncratic shocks by allowing for pooling of risks. Furthermore, the combination of financial intermediation and risk sharing allows for liquidity transformation, that is, individuals can place their savings in the bank knowing that they can use it whenever they please, while getting the high returns only available for long term, illiquid investments. The benefits of well-developed financial markets are not just theoretical. King and Levine (1993) and Rajan and Zingales (1999) provide empirical evidence that countries with highly developed financial markets grow faster and that financial development is particularly helpful in enhancing the growth of industries that, for technological reasons, rely heavily on external funds to enable their investment. In short, financial markets are important to the well-being of the real economy, especially businesses and enterprises.

The past few decades leading up to the crisis were characterized as a period of relative macroeconomic stability, especially in the United States and major European countries. What became known as the “Great Moderation” – the combination of credible monetary policy with rapid development of the financial system – seemed to have delivered a persistent drop in the volatility of inflation and output (Bernanke, 2004). While crises were a possibility, the key to managing their macroeconomic impact appeared to be well understood, given the successful recovery engineered by the Federal Reserve
after the dot-com bubble (Blinder and Reis, 2005). However, the events in the last two years (2008-2010) have made it clear that the outlook was too optimistic.

While a major financial crisis is a novelty for policy makers in the US and major European Countries, other parts of the world have been regularly hit by financial crises (see chapters 2 and 3). For example in Chile, Finland, and the Republic of Korea, output collapsed by 14 per cent (1982-1983), 10 per cent (1991 and 1992) and 7 per cent (1998) respectively – losses that proved fairly persistent (Cerra and Saxena, 2005; IMF 2009). The effects of crises on growth are often persistent. For example, following the banking crisis in 1990, the Sweden went into a major recession, with GDP falling for three consecutive years, a total of –5.1 per cent in 1991–3, and private investment plummeting by 35 per cent during the same period. Furthermore, unemployment rate quadrupled from 3 per cent in 1990 to around 12 per cent in 1993.

As a consequence, there is a robust modern literature on financial crises that policy makers in newly affected countries can potentially draw from. The existing literature has yet to fully account for the large size of the crises and the long run effects, but still there are a number of findings that may help guide policy in the context of the current crisis. This chapter is an attempt to draw the main lessons from this literature, with a special focus for the macro-economic impact of financial crises.

A. Defining and identifying financial crises

The downturn that started in 2007 and was amplified by the bankruptcy of Lehman Brothers in September 2008. The current downturn is distinct from a normal downturn for two notably reasons. First, it was a crisis, i.e. it was sudden, unexpected and with particularly large consequences in so far as key economic variables are concerned. Second, it was financial in nature meaning that it was triggered or amplified by a disruption in the financial sector, the key event being the bankruptcy of Lehman Brothers (see Eichengreen, 2008 for how real variables in the current crisis tracked the Great Depression and Zingales, 2008 on the Lehman Brothers collapse).

The literature has used different criteria to identify crisis episodes, many of which fit directly or indirectly in parts of the definition proposed above. A full and uncontroverisal identification is difficult, since it involves a counter-factual exercise: what would have happened in each particular episode if the financial sector had remained intact throughout? Instead, literature has identified episodes in which there are signs of disruption in the financial system, in financial variables, in macroeconomic variables or in some combination of these without a stronger causal claim. For example, a direct sign of a large-scale disruption in financial markets is the presence of widespread bank runs,

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1. The crisis episode of the Republic of Korea is examined in more detail in Chapter 3.
2. Chapter 4 will demonstrate that there are also a number of other intrinsic factors that lie behind the onset of the current financial crisis.
bank failures or bank insolvencies. While it is easy to determine whether there was a bank run or a bank failure, insolvencies are much harder to spot. For this reason, the identification of banking crises often relies on the assessments of specialists (Caprio and Klingebiel, 1999; Laeven and Valencia 2008).

Another way to detect disruptions in financial markets is to look at the behaviour of financial flows and stocks (see also Chapter 4). An important example of this strategy is Calvo (1991), who looks for sudden stops in the inflow of foreign capital. Mendoza and Terrones (2008) focus instead on credit booms, defined as large departures of credit to the private sector from its long-term trend. As it turns out, the peak of these booms often coincides with financial crises, especially when they happen in less developed countries.

A third approach is to look for loss in the value of important classes of assets such as government debt (Reinhart and Rogoff, 2010), stocks and housing (Bordo and Jeanne, 2002). These are assets that represent an important part of the balance sheet of households and firms, so that a drop in their value may lead to an interruption in the flow of finance as lenders fear for the value of the collateral that the borrowers have to offer.

Exchange rate crises can trigger or amplify a financial crisis if financial institutions have liabilities in foreign currency (Díaz-Alejandro 1984; Calvo and Talvi 2008). However, not all exchange rate crises turn into financial crisis. For instance, while the collapse of the European Exchange Rate Mechanism in the early 90’s was something policy makers at the time did not desire, in most cases there was no spill over to the broader financial system. In this respect, Kaminsky and Reinhart (2000) propose that it is useful to focus on episodes in which an exchange rate and a banking crisis take place simultaneously. The combination of criteria filters out episodes such as the ERM crisis as well as episodes in which banking crises did not have any real effect.

Lastly, Kehoe and Prescott (2007) define episodes that they call "Great Depressions of the 20th Century". These are occasions in which a country has suffered a precipitous and persistent output drop. Their definition lacks any reference to disruptions in the financial sector but, as it turns out, there is a substantial degree of overlap with financial crises identified in other studies.

In spite of the different definitions, there is a striking amount of agreement on the relevant events. Apart from the Great Depression, most studies include observations from the Latin American sovereign debt crisis in the early 80s, the Scandinavian collapse in the early 90s, Japan throughout the 90s, the Asian crisis in the late 90s and Argentina in 1998-2001 (see Chapter 2). This coincidence strengthens the presumption that financial crisis represent a reasonably well-defined economic problem, which is amenable to data collection and systematic research. This is the subject of the remaining sections.

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3. Exchange rate crises are defined with reference to price of an asset.
B. The boom before the bust

Before discussing what happens during a crisis, it is important to understand the period preceding a crisis. As the literature shows, this proves to be crucial in designing and implementing the right set of policies. The identification of clear antecedent patterns can provide a warning signal to policy makers and suggest corrections to be taken in order to avoid the worse. Figure 1.1 illustrates the origins of the financial and economic crisis of 2007-09, and while there are several factors that led to the crisis, the most notable pattern is a period of “boom” in economic and financial activity that gave rise to stock-market and housing bubbles. This section explores this “boom” period in detail.

A stylized account of the “typical” boom can be reconstructed from the findings of different papers in the literature. There are regulatory changes, which allow banks to lend more freely and take more risk (Kaminsky and Reinhart, 2000; Tornell and Westermann, 2002). What follows is an increase in the supply of credit by banks, as they lend more relative to their assets and to their capital (Mendoza and Terrones, 2008). To this increased supply of credit there is a matching increase in the demand as firms increase their leverage and the government borrows more heavily (Rogoff and Reinhart, 2010). At the aggregate level, these trends are apparent in an increase in domestic credit (Mendoza and Terrones, 2008) and in capital inflows from abroad (Rogoff and Reinhart, 2010). Prices of key assets react as house and equity prices increase (Bordo and Jeanne, 2002; Rogoff and Reinhart 2010) and as the exchange rate appreciates (Tornell and Westermann, 2002). All the while there is a boom in economic activity, with an increase in output and investment. As the real economy starts to lose steam, these trends revert abruptly, and the boom turns into a crisis (Kaminsky and Reinhart, 2002; Mendoza and Terrones 2008). Figure 1.1 illustrates these findings by examining the financial and economic crisis of 2007-09.

Two main strands of the literature on crises attempt to account for the boom preceding the bust. The first view states that the boom-bust cycle is evidence of excessive investment and risk taking. In the second view, asset price boom increases liquidity and facilitates investment. In particular, the boom in asset prices may stem from self-fulfilling expectations about their value, rendering the boom fragile. Examining both these strands of economic literature provides a more balanced view of boom periods. However, it should be noted that both strands of the literature point out that booms eventually lead to busts.

1. Overinvestment

The first set of theories suggests that there is overinvestment and excessive risk taking in the boom phase. Excessive investment and risk taking may take place because of (i) distorted incentives put in place by bail-out guarantees and other forms of limited liability or (ii) externalities induced by limitations in the workings of credit markets; or
(iii) because of bounded rationality which sophisticated investors cannot or will not arbitrage away.

- Distortive incentives: Agents may overinvest if government guarantees or limited liability protect them from the worse consequences of their risk taking behaviour. The theoretical case is simple enough (see Ranciere et al. for an example of a model with that feature) and there is some compelling empirical evidence about the association between banking crises and the existence of deposit insurance or other forms of government guarantees to banks in distress.  
  
  For example, Kane (1989) points to deposit insurance as a key driver of the Savings and Loans crisis in the 1980s and Demirguc-Kunt and Detragiache (2002) find a correlation between the availability of such schemes and the probability of banking crises. Lastly Calomiris (2009) makes a forceful case, based on historical accounts, that banking crises in 19th century U.S. and England were associated with some form of deposit insurance or liquidity guarantee to financial institutions.

- Credit market externalities: Even if banks and firms do not expect to be rescued in case their investment projects turn bad, they may not realize that their actions

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4. Demirguc-Kunt and Detragiache (2002) find that deposit insurance schemes are, in most countries, run and/or funded by the government.

5. Calomiris (2009) distinguishes “banking crises”, situations in which banks go broke, from “banking panics”, situations in which there are bank runs but no bankruptcies. He also distinguishes these episodes from broader financial crises in which financial variables other than bank’s balance sheets show signs of reversals.
have negative repercussions on others. This may occur if credit markets are incomplete, so that firms depend on the current market value of their assets to finance new investment. If there is a crisis, large investment will lead to larger drops in asset prices and hence less new investment. In addition, because firms will not realize the impact of their decisions on asset prices, generating the possibility of an inefficiently large crash (Stiglitz, 1982; Geanakoplos and Polemarchakis, 1985; Lorenzoni, 2008).

- Irrational exuberance: Investors may overinvest because they underestimate risks or overestimate returns. Individuals can miscalculate because they base their economic decisions on current prices, with little regard to future evolutions. In such a setup, by keeping interest rates artificially low, overly lax monetary policy can lead to large, persistent but ultimately unsustainable booms in investment and consumption (Garrison, 2001). As Figure 1.2 shows, long-term interest rates decreased sharply in the last 25 years, and that the price to earnings ratio increased sharply in the same period. The increase in P/E ratio signals the boom period that was marked by over-investment, when leverage among financial institutions exploded (see figure 1.3). More generally, the behavioural finance literature has been successful in explaining a variety of asset price bubbles with appeal to bounded rational
behaviour. One example emphasized by the literature is for funds to be directed to assets that appear to have performed particularly well in the recent past (see Shiller, discussion of this strand of the literature), thus propagating booms and busts.

That some investors do not behave in a fully rational pattern is not surprising given the complexities involved in financial investing. The question is why the more sophisticated investors do bet against these “naïve” investors, thus bringing the price of various assets in line to their fundamental value. One answer is that it is hard to bet against an asset by selling it short. Indeed, it is often hard to find third parties willing to lend an asset, those who do charge a fee and demand protections for their risk (see d’Avollio, 2002 for a thorough account of the market for shorting stocks). The short sale of other, more complex assets is even harder to do, as it may involve the design of new, derivative securities (see Lewis 2010 for a journalist account of the difficulties faced by contrarians who wanted to short CDO’s in the run up to the current crisis). Without short sales, when investors disagree about the value of a security, pessimists are unable to bet against it and the price of the asset reflects the view of the optimists (Miller, 1977; Hong and Stein, 2003).

Figure 1.3: Ratio of debt to GDP among select advanced economies

Note: In percent, GDP-weighted, 1987=100.
Source: IMF.
Speculation can become destabilizing if sophisticated investors hold on to what they perceive as overpriced assets in the expectation of future price increases (Scheinkman and Xiong, 2003). In fact, even if they perceive an unsustainable bubble, they may choose to “ride the bubble” and count on the probability that they will be able to exit before the crash, reaping the capital gains along the way (Abreu and Brunnermeier, 2003). Executive pay practices coincide with this, as increasingly a higher share of CEO salaries comes from stock gains, and bonus is dependent on quarterly returns (see figure 1.4). In Minsky (1986) financiers are willing to pump credit into firms even as these have to run Ponzi schemes, acquiring new loans in order to pay for old ones. A “musical chairs” situation ensues, where everyone plays but in the end not all can find a place. Eventually the system unravels, leading to a crisis.

2. Enhanced liquidity: enabler of rapid growth?

It is possible that the boom is not fuelled by overinvestment, but rather enhanced liquidity which stems from rising asset prices. In particular, a firm or a household may need to have immediate access to funds because of, e.g. (i) an investment or acquisition opportunity, (ii) unexpected cost that has to be paid in order to ensure its continued existence or because in order for the business to continue it requires uninterrupted

Figure 1.4: CEO compensation based on Forbes annual survey

![Figure 1.4: CEO compensation based on Forbes annual survey](Note: Includes 500 largest firms in the US. Source: Forbes, 2009.)
investment. But importantly, liquidity is a state in which this demand for immediacy is satisfied without much cost. For example, frictionless models feature funding liquidity, since households can borrow as much as they like at a given rate of interest. There is also liquidity if the firm or the household has assets in its books that can be marketed immediately at little loss (“market liquidity” or “outside liquidity”, see Brunnermeier and Pedersen, 2009).

A boom in asset prices increases liquidity. In particular, it increases funding liquidity by increasing the value of assets that firms hold as collateral. Furthermore if the booming assets are relatively easy to market, asset price booms increase the availability of market liquid assets. As such, with higher asset prices there are more available means to store value for a given capital stock and, hence, higher market liquidity.

It is possible that assets are valued above their intrinsic value without sustainability being an issue. In other words, rational bubbles can emerge. Agents will hold a seemingly overpriced asset because they rationally expect other agents to do so in the future (Tirole, 1985). The purest example of such an asset is fiat money (see Samuelson 1958), but other assets could acquire similar properties. Rational bubbles can be welfare enhancing in that they facilitate intergenerational transfers (Samuelson, 1958; Tirole, 1985), international asset flows (Ventura, 2004; Hellwig and Lorenzoni, 2008) and the direction of real resources to highly productive but credit constrained entrepreneurs (Caballero and Krishnamurthy, 2005; Farhi and Tirole, 2008; Martin and Ventura, 2010).

Of course, to compete, bubbles have to grow at rate higher than prevailing interest rates but if the value of a bubble rises too fast it may eventually become much larger than what agents are willing to hold and a collapse ensues (Blanchard and Watson, 1982). Importantly, the growth of bubbles may itself lead to higher interest rates, as savings are increasingly channelled to feeding its growth as opposed to the growth in alternative assets, potentially fuelling its own demise. In fact, they might deviate resources away from other more productive investments, such as research and development (Saint Paul 1992; Grossman and Yanagawa, 1993; Olivier, 2001). They may also compete with assets commonly used as collateral, thus reducing their value and constraining further investment (Farhi and Tirole, 2010) and they can fuel excessive risk taking (Caballero and Krishnamurthy, 2005). In sum, while there is a theoretical case that bubbles enhance liquidity and facilitate investment, they can also be distortionary by competing with other, more socially desirable assets. As such bubbles may enhance liquidity and fuel a boom, but they can equally well lead to overinvestment and misallocation of resources.

C. The bust in the financial sector

No matter what strand of literature one subscribes to, booms are followed by busts. Financial crises occur when the financial market is disrupted and, as a consequence,
become unable to function appropriately. This section describes two important ways in which financial markets can become dysfunctional. First, liquidity problems may force good projects to be discontinued. Second, there is the problem of contagion given that financial markets bring together other, e.g. trade, key components of economic growth. Both of these problems provide rationales for government action. The last section closes with some considerations about the care that policy makers have to take when doing these interventions.

1. Distinguishing insolvent from illiquid institutions

The difference between solvency and liquidity problems is best understood in the context of the Diamond and Dybvig’s (1983) model of bank runs. In this model, banks direct funds to the construction and operation of long term, illiquid projects. A bank is solvent if the projects are worth more if they are allowed to mature than if they are liquidated. The Diamond-Dybvig (1983) framework allows for the liquidation of solvent banks if there is a run. Depositors may decide to withdraw from the bank because they lose confidence on its ability to honour the deposits. If the liquidation value of the projects is less than their continuation value, the bank may find itself short on liquidity and unable to honour the deposits. The run is self-fulfilling and the liquidation inefficient.

While Diamond and Dybvig’s (1983) paper centred specifically on bank runs, the logic of the argument applies to alternative contexts. The potential for self-fulfilling creditor runs is possible whenever an entity has liabilities which are of shorter maturity than its assets and its assets cannot be liquidated without paying a fire-sale cost. For example, some interpretations of the Asian crisis view it as a liquidity crisis (Chang and Velasco, 1998). As a second example, the widespread use of overnight loans by financial institutions meant that Diamond-Dybvig logic could be at play in the current crisis episode, even if actual run of depositors to the banks were not an important part of the picture (Brunnermeier, 2009).

The bank-run view of banking crises is not without controversy. For example, Gorton (1988) finds that banking panics in the 1863-1913 period took place when leading indicators of recessions were strong. In his interpretation, depositors were rationally anticipating that the downturn would bring insolvencies and were withdrawing their deposits to make sure they did not get lost. In contrast, the Diamond-Dybvig model allows for bank runs as one of multiple equilibria, without any reference to fundamentals. He and Xiong (2009) provide a theoretical reconciliation between Gorton’s (1988) results and the Diamond-Dybvig worldview. In their paper, heterogeneity between creditors imply that there is a single equilibrium in each point in time, with runs only occurring if fundamental values are low enough. Still, the Diamond-Dybvig logic applies and the model allows for runs in fundamentally healthy banks. What the model and Gorton’s results point to is that it may be, in practice, hard to distinguish liquidity
problems from solvency problems, as liquidity may become scarce exactly when there are reasons for doubts about solvency.

2. Contagion

The focus on the solvency or liquidity of individual institutions may be too narrow. Financial crises are often systemic events, spreading over multiple markets and regions. “Contagion”, the spread of financial difficulties from one group of debtors to another is a distinct possibility. There are, broadly speaking, four sources of contagion. The first is contagion through real linkages. If Thailand suffers a crisis, South Korea is bound to experience a drop in its exports, with negative consequences on its domestic economy. The second is through information problems. A collapse in one part of the system may be a signal to investors that other parts are also in danger, leading to a decline in confidence and ensuing consequences. Third, contagion can occur if financial links are relatively sparse, so that the disappearance of key nodes may lead to a collapse in the network. The last is through the wealth of decision makers. A bank whose capital is depleted by a crisis may become reluctant to give new loans and sell part of its assets, both of which can result in reductions in the capital of all banks.

- **Real linkages:** modern economies are characterized by a multitude of buyer and supplier linkages. If the collapse of a financial institution affects an important node in this supply chain, the impact could spread. Trade links between countries can have a similar effect, as Glick and Rose (1999) argued was the case in the Asian crisis. If real linkages are the only source of problems, then policy makers may be justified in ignoring contagion. After all, if a certain business is a bad proposition, then the same is true for those businesses whose viability depend on it. On the other hand, if businesses linked by trade are also linked by financial relationships that cannot be easily substituted, then the disruption of these trade links may lead to financial problems that will lead otherwise healthy businesses to go under, possibly affecting other businesses still through the credit chain (Kiyotaki and Moore, 1997b).

- **Communication or information problems:** For example, in Calvo (1999), a few informed investors pick where to invest and a large number of less informed investors free ride on their information by replicating their choices. If informed investors face some liquidity problem and for that reason disinvest in a certain market, the less informed investors may erroneously conclude that this disinvestment reflects some bad information on their part and that they are better off following suit. Furthermore, once they see the drop in asset prices in one market, uninformed investors may decide to withdraw from other markets as well if they think there
are linkages between them (King and Wadhani, 1990; Kodres and Pritsaker, 2002) or if they do not discriminate between information about various risky assets in order to economize on information acquisition costs (Mondria and Quintana-Domeque, 2009).

Key financial links: Firms or countries may not be linked to each other by trade relationships, but by common lenders. For example, when Russia collapsed in 1998, Latin American countries were affected even though the trade links were minimal. The Russian collapse led to the LTCM default, which in turn put the U.S. credit market into distress, affecting Latin American countries. Apart from links through common lenders, financial institutions are themselves linked to each other, so that distress in one institution may lead to distress in others. If each institution only has a limited number of counterparties, a domino effect can ensue, where the failure of one institution depletes the wealth of its counterparties, and so on (Allen and Gale, 2000). In such a system, individual financial institutions do not realize that, by preserving their links to other players, they provide a valuable service to the system as a whole – thus ignoring the important externality (see Zawadowski, 2010).

Wealth of decision makers: Crises can spread and propagate through its effect on asset prices and, consequently, on the wealth of firms and banks. This channel was emphasized in Kiyotaki and Moore (1997a) and applied specifically to financial crises in emerging markets by Mendoza (2010). A negative shock that reduces the value of some fixed asset such as real estate may spread over the economy as firms use real estate as collateral to secure loans. As the value of collateral drops, firms are forced to reduce their investment in real estate, leading to a further drop in the value of their collateral. There is a "pecuniary externality" (Stiglitz, 1982; Lorenzoni, 2007), as firms do not realize that, by investing when times are good they are increasing the stock of capital that will have to be liquidated when times are bad.

Many of these interact with one another during a crisis, e.g. wealth and information. In Brunnermeier and Pedersen (2009) for example, when sophisticated investors borrow from brokers they need to come up with some capital of their own (the haircut). If brokers perceive an increase in volatility, they will demand higher haircut. The requirement leads investors to reduce their positions, bringing prices down and volatility up. The increased volatility generates an increase in the haircut and further price drops. The spiral occurs because lenders cannot differentiate liquidity shocks from changes in fundamental values and withdraw their funds, further increasing the liquidity problem.

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6. Some studies have found evidence for this kind of channel at the country level (Kaminsky and Reinhart, 2000), and among hedge funds (Boyson et al., 2008), although the authors themselves admit that the evidence is not conclusive.
D. Supply side effects: Misallocation in capital and labour markets

The most direct real effects of disruptions in financial markets or on the supply side, most specifically are on capital (re)allocation. This is because one of the main functions of financial markets is exactly to direct resources to their most productive uses. If this ability is compromised, then productivity suffers. This is especially problematic since it can have persistent, long-term effects, with large welfare consequences.

Financial crises also have an impact on labour markets. In part this is an expression of the allocation problems in capital markets, but also in part due to the fact financial crises are simply larger versions of the “usual downturns”. In this regard, there is a substantial body of theory discussing efficiency and frictions in labour markets and how financial markets can both amplify the usual frictions and create new ones.

1. Capital misallocation

The economic environment changes after a crisis, as credit availability, foreign capital inflows and investment become persistently depressed relative to their pre-crisis levels (Calvo, 2006). The now scarcer capital needs to be reallocated in order to reflect the new environment. Accordingly, Dell’Ariccia et al. (2009) and Kroszner et al. (2007) find that during banking crises the industries that require large up-front fixed investments are more severely affected; and Schwartzman (2010) finds a similar effect during emerging market crises for industries whose production processes require them to hold inventories for long periods of time. Recent evidence from the EU and the US shows that the corporate spreads have sky-rocketed during the crisis and they remain elevated (see figure 1.5). This underscores the problem of high uncertainty and risk in the corporate sector, hence probability of default, which makes direct borrowing costly for firms.

It is not clear, however, that the reallocation is necessarily in the right direction or in the right order of magnitude. For example, industries that require little up-front investment will do better over and above what is justified by the shorter duration of their capital because they are able to self-finance. More broadly, a breakdown in financial markets is costly exactly because financial markets are responsible for distributing resources efficiently across firms and sectors. Capital may end up being directed to inferior uses and high productivity firms left underfinanced. Moreover, financial crises can affect the high productivity firms most heavily, since these are the ones that received most credit before the crisis and have least debt capacity left (see Kiyotaki 1998; Rampini and Visnawathan, forthcoming).

In terms of empirical evidence for misallocation, Ohanian (2001) investigates cross-sectoral reallocation during the Great Depression and Benjamin and Meza (2009) during the Korean crisis. Both find that there was a relatively larger drop in manufacturing and
mining, which have high productivity, relative to services and agriculture, which have low productivity (for more detail see Chapter 3). Moreover, misallocation can persist in the medium term, especially if problems in the financial system are not properly addressed. Caballero et al. (2008) suggest that, after the crisis, Japanese banks had incentives to keep on lending to otherwise insolvent firms in order to avoid recognizing losses and to enjoy government support. They find that, because of this “zombie lending”, non-favoured firms did not improve their productivity or create jobs as quickly as they would otherwise. Bergoeing et al. (2009) make a similar point when comparing the performance of the Chilean and the Mexican economies after the 1980’s crisis. Chile recovered faster, they suggest, because it was quicker to return banks nationalized during the crisis to the private sector. Also, Chile reformed bankruptcy procedures to make default easier. Mexico avoided these policies, reaping benefits in the short run, but compromising the recovery in the medium term.

While the sources of productivity loss during crises and afterwards are still not fully understood (Ohanian, 2001), there are enough grounds to believe that misallocation of resources is a major concern, especially in so far as the recovery is concerned. The potential role of misallocation in delaying the recovery in Japan and Mexico underline the need for authorities to intervene quickly and thoroughly in the banking system.
2. Labour reallocation

Even in the course of normal business cycles, standard models of labour markets cannot fully account for the high variability of unemployment. In previous episodes of crisis, labour market adjustment has often occurred via employment, hours worked and/or wages. In some cases, wages may not have fallen because the government intervenes in downturns to protect the jobs and the income of employed workers (McGrattan and Prescott, 2007; Mertens and Ravn, 2008). Even during the Great Depression, the Hoover administration pursued policies to keep nominal wages from dropping (Ohanian, 2009); and in the Japanese crisis in the 90’s, with a mandatory decrease in working hours (Hayashi and Prescott, 2000).

Interestingly, Bernanke and Carey (1996) find evidence that nominal wage rigidity played an important role during the Great Depression, with the highest real wage and the lowest output prevailing in countries that suffered most from negative demand shocks. As additional evidence for a role for nominal wage rigidity, Fallon and Lucas (2002) find that among the emerging market crises in the 90’s, real wages dropped more in countries where exchange rate depreciation was highest.

Some labour market problems are specific to financial crises. One reason why firms may be reluctant to hire new workers during a crisis is that part of the wage bill has to be paid in advance because of a preference for liquidity by the workers or of time lags in the production process (Neumeyer and Perri, 2004; Schwartzman, 2010). Thus, when the cost of finance goes up, firms become reluctant to hire. Hiring is also a credit intensive activity so that job creation suffers if the cost of financing goes up (Weismer and Weil, 2004). Finally, the allocation problems in capital markets may spill over into labour markets, with the most productive firms not being able to hire the best workers (Caballero, 2007).

The available empirical evidence does suggest that labour market outcomes during financial crises are worse than in regular downturns, even after controlling for the size of the recession. A recent World Economic Outlook report (IMF, 2010) finds that both during financial crises and in the recovery phase, unemployment is lower than what would usually be warranted by the observed drop in output. Furthermore, Caballero (2007) shows that, while in the normal American business cycle old jobs are kept in place, in financial crises there was a large degree of job destruction without a commensurate increase in job creation. In the latest crisis, Elsby et al. (2010) confirmed that this same pattern also holds for the United States. Lastly, Schwartzman (2010) finds that during emerging market crises the industries with high labour share have underperformed compared to their usual cyclical behaviour, a pattern that also points to a particularly large increase in labour costs.

The large impact of financial crises on the labour market can also generate structural adjustments in the labour market, e.g. increased long-term unemployment (Elsby et al., 2010). It is difficult to reintegrate such workers into the labour force, as skills erode
and labour market detachment rise. This gives rise to hysteresis, i.e., the tendency of large cyclical unemployment outcomes to translate into a permanent increase in the natural rate of unemployment (see Ball, 2009 for a recent survey of the literature). There are also issues with respect to role of deregulation and job creation. For example, in Korea, “flexibilization” of the labour market to spur job growth lead to increased labour market duality (see Chapter 3 and Chapter 6).

E. Demand side channels and macroeconomic policy

On top of the direct supply effects, financial crises can feed back into the economy through the demand side. In part, financial crises cause drops in aggregate demand and important problems emerge if the interest rate is constrained to be equal to zero. This is more than a theoretical possibility, as zero interest-rate was a feature of two prominent past episodes, the Great Depression and the Japanese crisis, and is a feature of the current episode.

Not only there are changes in aggregate demand, but also there are shifts in the composition of demand, generating large shifts in relative prices. The most prominent example is the exchange rate, which can have a negative impact if firms have a mismatch between the denomination of their debt and that of their cash flow. However, there are also shifts in the relative price of capital, which can be problematic if capital is used as collateral.

1. Aggregate demand and the zero lower bound on interest rates

Financial crises can induce a drop in aggregate demand. Increased uncertainty induces precautionary savings and a portfolio shift away from risky investment towards safe monetary assets (Keynes, 1936). Also, because of the crisis, borrowers face a higher interest rate, so they consume less and invest less (Bernanke, 1983). Finally, corporate debt becomes less liquid relative to cash, increasing the cost of investing (Del Negro et al., 2010). In all of these cases, a lower interest rate is needed for the goods market to be in equilibrium. In Woodford’s (2003) terms, there is a reduction in the natural rate of interest.

If the drop in this natural rate of interest rate is so low that it becomes negative, it can throw the economy in a liquidity trap: the nominal interest rate is constrained to be zero and cannot go any lower because the return on bonds cannot be lower than the return on cash. In such circumstances, a perverse feedback loop can occur: because of the bound on the interest rate, it is higher than what is consistent with equilibrium in the goods market, leading to deflation. But, given the nominal rate, deflation raises the real interest rate even more, leading to an even greater disequilibrium.
In a liquidity trap there is no opportunity cost of holding cash, so agents satiate their demand for liquidity. Without the liquidity channel, additional cash injections in the economy (quantitative easing) can still have a real effect because at some point agents will not want to hold any more cash for fear of being under-diversified. However, this is a much weaker trade-off than the traditional liquidity margin, and the quantities involved have to be an order of magnitude larger. Alternatively, central banks can intervene directly in the market for long maturity bonds, as they recognize that these are the ones that affect real decisions. Again, the central bank has to rely on agent's desire for diversification to change the relative returns on short and long-term bonds and, similarly, large quantities need to be traded given that bonds of different maturities are close substitutes (see Bernanke and Reinhart, 2002, for a discussion of these policies). As a result, the existing evidence for the effectiveness of this kind of policy is mixed, with Bernanke et al. (2004) finding that in the U.S. the term structure reacts to changes in the composition of treasury bills outstanding but it does not happen in Japan. On the other hand, Bernanke et al. (2004) do find that the quantitative easing policy in Japan was successful in both changing asset prices and increasing inflation expectations.

The policies just described increase the short-term interest rate consistent with equilibrium in the goods markets, bringing it closer to the zero lower bound. A second set of proposals focuses on decreasing all nominal interest rates by increasing expected inflation. This can be achieved if agents believe that the Central Bank will keep interest rates low even after inflation has picked up. Simple Central Bank announcements may help, as they seem to have an impact on market prices (Bernanke et al, 2004). However, there is a credibility problem, as Central Banks usually have a preference for low inflation. One alternative is to engineer monetary expansions or an expansion of government debt so large that the government cannot plausibly take them back without recourse to inflation (Auerbach and Obstfeld, 2005; Eggertson and Woodford, 2002). But just with the policies exploiting the portfolio channel, large interventions are needed. Svensson (2003) notes that the commitment problem would not arise if Central Banks do not commit to an inflation target, but to a “price level target”. This means that if inflation is below the long-run target in a given year, then in the next year the Central Bank should seek inflation above the long-run target. With sustained deflation, Central Banks need even higher inflation rates in order to reach their proposed target. If the policy is credible, agents would come to expect these, and inflation would rise accordingly. Svensson (2003) suggests that a “Fool-Proof Way” of implementing such a price level target is through targets for nominal exchange rates.

A final alternative is to use fiscal stimulus. Christiano et al. (2009) use a quantitative model to argue that fiscal policy is likely to be most potent in liquidity trap situations. If nominal interest rates are equal to zero, fiscal policy can increase inflation without increasing the nominal rate, thus decreasing the real interest rate, in a reversal of the textbook crowding-out effect. This gives some ground for optimism that fiscal expansion multipliers under liquidity traps are above the usual estimates, which are typically low (see: Barro, 2009; Ramey, 2009; and Mountford and Uhlig, 2009). Still, care is needed. Giavazzi et al. (2000) find that fiscal multipliers are most likely to be negative if the...
fiscal intervention is large, presumably because this involves higher and more immediate tax increases (for a more detailed examination of fiscal multipliers see Chapter 6).

2. Shifts in the composition of demand and relative price changes

Financial crises affect not only aggregate demand, but also its composition. While such compositional shifts may seem to be relatively less relevant, they can have big aggregate impacts on aggregate output if they change the relative prices in a way that makes it hard for firms to pay their debts or to issue new one. Two relative prices are of particular importance: the relative price of foreign goods relative to domestic goods (also known as the real exchange rate) and the price of capital goods relative to consumer goods.

Consider first shifts in the relative price of foreign goods (Aghion et al., 2002). Suppose firms and/or banks are constrained in their ability to raise funds so that they rely partly on cash flow for investment. Furthermore, suppose they borrow heavily from foreigners, who only accept liabilities denominated in foreign currency. If there is an exchange rate devaluation, firms will see their liabilities rise but will not see a commensurate increase in their cash inflows. Given a constraint in their ability to borrow, they will be forced to reduce their investment and output. In this context, increasing the interest rates in order to attract foreign investment and to defend the currency may turn out to be the best course of action. A robust, country level, observation that lends support to this channel is that financial crises are more probable and/or more severe in countries where dollarized liabilities are more prevalent (Calvo et al., 2004; Bordo, 2006; Eichengreen et al., 2005). At the firm level, however, the evidence is more mixed. While Aguiar (2005) and Desai et al (2008) do find an important firm level effect, the quantitative relevance of the mechanism is questionable. Gilchrist and Sim (2007) estimate and simulate a structural model of firm behaviour for South Korea and find solid evidence for a currency mismatch effect, but find that its impact on aggregate investment was relatively minor. Rather, they argue, the largest drop in investment occurred because of the combination of low cash flows with high interest rates and debt overhang, irrespective of the actual denomination of the debt.

The quantitative role of balance sheet effect matters because there are trade-offs. For example, if firms have short-term capital needs, the high interest rate needed to defend the currency may end up doing more harm than good by affecting firm’s ability to raise working capital (Christiano et al, 2004). Also, higher interest rates may amplify the drop in the relative price of capital, including real estate. This can exacerbate the crisis, since firms use capital as collateral. Mendoza (2010) and Gertler et al. (2007) construct quantitative models to explore the relevance of fluctuations in the relative price of capital and find large effects. In particular, Gertler et al. (2007) argue that an uncompromising defence of the currency may make things worse. In their simulation of the Korean economy, they find that on net it was best to let the currency depreciate. However, the gain is quantitatively small and it could be reverted for different parameter values. The best decision has to be made on a case-by-case basis, with countries
where the extent of foreign currency indexation of liabilities is extreme likely to be benefit most from a strict defence of the currency.

F. Policy considerations and rationale for the next chapters

This chapter so far has provided a comprehensive look at the literature on financial crises. More specifically, it has looked the period preceding the crisis (“boom”), crisis period itself, and the dislocations prevalent during the recovery phase, mainly supply-side effects on capital and labour. Monetary policy has an important role to play in avoiding the crisis, and/or mitigating the fall during the crisis. There is a lot that policy makers can draw from the macroeconomic literature. This section looks at two periods when economic policy is most important: 1) “boom” period that can be tamed by a right set of policies, and 2) recovery phase during which policy measures can address dislocations in the capital and labour markets.

1. Role of policy during “boom” period

Monetary policy clearly plays a role in facilitating excessive growth in asset prices. Indeed, easy monetary policy has been associated with higher asset prices (Taylor, 2009) and over-leverage in the financial sector (Adrian and Shin, 2010) – both hallmarks of the boom phase. Conversely, monetary policy can, if tightened, reverse these trends, especially where there is a tendency to overinvest (Cechetti et al, 2000).

The problem is that monetary policy may be too blunt an instrument and difficult to manage. As evidence in the literature, asset price booms generate risks and distortions but also enhance liquidity and facilitate investment. Bernanke and Gertler (2000, 2001) address the trade-off. While tight monetary helps keep prices from rising unsustainably, these reductions affect the value of assets used as collateral, potentially leading to an unnecessary recession. Furthermore, policy makers may not have enough information to discern the sources of the asset price movements and how dangerous they are. Bubbles are hard to identify empirically (Gurkaynak, 2008) and it is often the case that booms that do not end in a financial crisis (Tornell and Westermann, 2002). Finally, even if central bankers are able to perfectly understand how sustainable and dangerous a boom is, the optimal monetary policy is likely to be highly non-linear in the state of the economy, as the trade-off between liquidity and risk of crash is likely to change with economic conditions (Bordo and Jeanne, 2002). Lastly, the literature on rational bubbles suggests that interest rate hikes may bring about almost discontinuous drops in asset prices – facilitating the onset of the crisis.

In this respect, financial regulation can play an important role. Boom-bust cycles often follow periods of financial liberalization reforms (Kaminsky and Reinhart, 2000; Tornell and Westermann, 2002), implying that financial regulation does matter. This
is consistent with the excessive risk taking view of booms, as financial de-regulation reforms have typically facilitated risk taking (See Barandiarán and Hernandez, 1999; and Drees and Pazarbaşioglu, 1998 for detailed descriptions of the financial deregulation reforms in Chile and the Nordic countries and their aftermath). Returning to the previous regulatory frameworks is probably not advisable either, as the heavy intervention of the government in the allocation of credit was likely very distortionary. Reforms were successful in generating higher growth (Ranciere et al., 2003) and the challenge is to retain these gains while recovering the stability existent before the reforms.

Brunnermeier et al. (2009) investigate some options in light of the recent events. They suggest that financial regulation should become "macro-prudential". By this the authors mean that capital adequacy ratios should respond not only to the individual risk of securities held by banks, but by how they correlate with macroeconomic variables and, in particular, with how they behave during financial crises. As an example, highly rated, e.g. AAA securities, are generally very safe or riskless. However, they fail exactly when there is a crisis and liquidity is scarcest. From a macro-prudential perspective, this may make them more risky than lower rated but diversifiable BBB securities. Macro-prudential regulation should also be cyclical, tighter in the boom and weaker in the downturn. This is the opposite of what the Basel II rules do, as they require banks to increase their capital ratios exactly when a crisis leads to the downgrade of their securities.

Even well designed financial regulations are constrained by a boundary problem (see the appendix by Charles Goodhart in Brunnermeier et al., 2009). Any financial regulation has to specify which assets and institutions fall into its rules and which ones do not. This creates an incentive for funds to flow towards the unregulated institutions in the boom periods and back to the regulated ones in the crisis, potentially amplifying the cycle. Finding the balance thus in terms of excessive or inadequate financial regulation is challenge for policy makers.

2. Addressing dysfunction in the financial markets

The problems of lack of liquidity and of contagion suggest that governments have a role to play in ensuring that financial institutions do not fail. This generates an immediate contradiction: bailout guarantees provide incentive for bankers to take excessive risk and for depositors to not monitor banks appropriately. Before any intervention takes place banks will invest in projects with excessively high risk of failure (see above) and after it does, the banks under intervention may perceive a "soft budget constraint" (see Kornai et al. 2003), since the government has an increased stake in their survival, and will start taking even more risky positions.

In order to avoid banks taking advantage of government help, it is advisable to avoid helping insolvent banks and to make bailouts costly for the ones that do receive it. These two insights underpin Bagehot’s (1894) classic prescription: First, Central Banks
should lend freely during crises, but not to insolvent banks. Second, they should lend only against good collateral and at a punitively high interest rate. If interest rates are high, banks will want to make sure they repay the government loan as quickly as they can, having an incentive to withdraw from risky projects and attract private capital.

Distinguishing which banks are illiquid and which are insolvent is not a simple matter. As discussed above, banking crises occur when fundamentals suggest that banks might be insolvent (Gorton, 1988) but theory implies that liquidity problems may induce inefficient liquidations (He and Xiong, 2009). One possibility, suggested by Demirgüç-Kunt; and Serven, 2010, is that the government could mobilize the knowledge of the private sector by insisting that any loans to banks in distress must be in part privately financed, and that its equity in the recapitalized bank be senior to that of private agents. The government should also try to make sure it has as much information about the position of financial institutions before the crisis (Demirgüç-Kunt and Serven, 2010). The information available to the regulators is improved if in normal times transactions are transparent and that regulators focus on detecting problems early on. Ex-post, it helps if the government is capable of intervening on short notice in the event of a crisis (Kane and Klingebiel, 2000).

While some level or form of government intervention therefore seems to be a foregone conclusion, the effectiveness of government intervention is in itself a matter of dispute. One form of intervention that has received some attention is the use of blanket guarantees. Laeven and Valencia (2008) find that blanket guarantees are successful in reducing the pressure on banks by depositors, although Honohan and Klingebiel (2003) find that are not correlated with smaller losses in aggregate output. On the cost side, Honohan and Klingebiel (2003) find a correlation between the use of blanket guarantees and large increases in government debt, although Laeven and Valencia (2008) argue that this may be a reflection of the severity of the crises in which blanket guarantees are used.

Given how costly and uncertain are the instruments to facilitate the recovery, perhaps the main lesson is that it is best to avoid financial crises rather than wait for them to happen. During booms fuelled by large expansion in credit, policy makers should enforce a macro-prudential focus on financial regulation while avoid overly complex regulatory frameworks that constrain economic agents. Once the crisis hits, policies should address the dislocations and capital and labour market.

As this chapter pointed out, financial crises are a fairly common phenomenon in emerging and developing economies, but not so in developed economies. For EU wide policy to respond better to the current crisis, especially in terms of medium to longer-term policies, it is vital to look at the cause of the crisis. One of the causes of the 2008-09 crisis is the global savings imbalance, where massive inflow of capital from emerging countries has removed the liquidity constraint for corporations and private households in the U.S. and a few other industrial countries, building up large asset price bubbles. Chapter 2 contributes to the debate on the role played by global savings
imbalance, focusing in particular on domestic policies related to social security and wage developments.

References

Christiano L., M.S. Eichenbaum and S. Rebelo, ”When is the Government Spending Multiplier High?”, 2009.
Eichengreen, B. “From Great Depression to Great Credit Crisis: Similarities, Differences and Lessons.” Presented at the 50th Economic Policy Panel Meeting, held in Tilburg on October 23-24, 2009


Financial crises – A review of the literature


Zingales, L., "Causes and Effects of the Lehman Brothers Bankruptcy", Written Testimony Before the Committee on Oversight and Government Reform, United States House of Representatives, October 6, 2008.