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The Law and Economics of Shadow Banking

Law Working Paper N° 339/2017
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Abstract

This essay discusses the economic case for regulating shadow banking. Focusing on systemic risk, shadow banking is defined as leveraging on collateral to support liquidity promises. Regulating shadow banking is efficient because of the negative externality stemming from systemic risk. However, because uncertainty undermines the precise measurement of systemic risk, quantity regulation is preferable to a Pigovian tax to cope with this externality. This paper argues that regulation should limit the leverage of shadow banking mainly by imposing a minimum haircut regulation on the assets being used as collateral for funding.

Keywords: Shadow banking; maturity transformation; safe assets; leverage; liquidity; collateral; haircut; externalities; quantity regulation; Pigovian tax; Money Market Mutual Funds; repo; derivatives; central clearing; Qualified Financial Contracts

JEL Classifications: G01; G23; G28; K22; K23

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The Law and Economics of Shadow Banking

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Abstract

This essay discusses the economic case for regulating shadow banking. It asks three questions. First, what is shadow banking? Second, why shadow banking should be regulated. Third, how to regulate shadow banking efficiently.

Although shadow banking is, like banking, based on maturity transformation, no definition of shadow banking is ideal for regulatory purposes. Focusing on systemic risk, we take an instrument-based approach and define banking as leveraging on collateral to support liquidity promises. For regulation to be effective, however, this definition must be combined with other entity-based approaches.

The economic rationale for regulating shadow banking is the negative externality stemming from systemic risk. Because uncertainty makes any measure of systemic risk imprecise, quantity regulation is preferable to a Pigovian tax to cope with this externality. Regulation should limit the leverage of shadow banking by imposing a minimum haircut regulation on the assets being used as collateral for funding.

In theory, minimum haircuts regulation is an efficient way to constrain shadow banking. However, the practical difficulties of monitoring leverage at the assets level call for an indirect regulation of institutional leverage, too. This is effectively achieved through the regulation of bank leverage, which increases the cost of liquidity puts to shadow banking. Such risk-insensitive restrictions, however, undermine the efficiency of banking, whether official or shadow.

Keywords: Shadow banking; maturity transformation; safe assets; leverage; liquidity; collateral; haircut; externalities; quantity regulation; Pigovian tax; Money Market Mutual Funds; repo; derivatives; central clearing; Qualified Financial Contracts.

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1. Introduction

This paper deals with the economic rationale for regulating shadow banking. It discusses whether the regulatory initiatives proposed by academics and policymakers are consistent with this rationale. We posit that the ultimate goal of financial regulation is to promote financial stability. Therefore, we evaluate shadow banking regulation based on its ability to reduce financial instability efficiently.

Regulating shadow banking is challenging because shadow banking is often defined by reference to what it is not, namely licensed or official banking.[1] However, such an approach does not capture the essence of the shadow banking problem. The official banking system has implicitly or explicitly supported a significant part of what is known today as shadow banking. For instance, the Asset Backed Commercial Paper (ABCP) conduits or the Structured Investment Vehicles (SIV), which were exposed to the U.S. housing market during the Global Financial Crisis (GFC), all enjoyed guarantees by banks – so-called 'put options' – by way of contract or reputation.[2] The remainder of shadow banking was still problematic for financial stability because of the contracts in which shadow banks were counterparty to banks. American International Group (AIG), for instance, was counterparty to a significant part of the banking system relying on Credit Default Swaps (CDS) to insure against the default of Mortgage Backed Securities (MBS).

We start from the observation that shadow banking is effectively banking, albeit carried out in such a way as to avoid regulatory constraints. In order for regulation to be effective in promoting financial stability, shadow banking is to be defined functionally, based on its contribution to systemic risk. We characterize systemic risk as the likelihood of financial system failure, which will impair the financing of production and consumption, and thus will have consequences on the performance of the real economy. There are different definitions of systemic risk, which are geared towards measuring it.[3] Although we agree on the necessity to improve the measurement of systemic risk, we are skeptical that such measurement can ever become so precise as to prevent financial crises. Rather, we prefer to adopt a conceptual approach to systemic risk in order to define shadow banking.

Defining shadow banking in terms of its contribution to systemic crisis implies taking a macro perspective to the economics of banking, and deriving regulatory implications from there. In this respect, our paper

[1] For the definition of licensed banking, *See* for example, Art. 4.1(1) of the Capital Requirements Regulation (CRR) which defines a "credit institution" as "an undertaking the business of which is to take deposits or other repayable funds from the public and to grant credits for its own account." *See* 'Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.

[2] Zoltan Pozsar and others, 'Shadow Banking' (2013), 19(2) Federal Reserve Bank of New York Economic Policy Review 1

[3] *See* Markus Brunnermeier and Arvind Krishnamurthy, *Risk Topography: Systemic Risk and Macro Modeling* (NBER Macroeconomics Annual 2011, Volume 26, University of Chicago Press, 2014).
See also Viral Acharya, Robert Engle and Matthew Richardson, 'Capital Shortfall: A New Approach to Ranking and Regulating Systemic Risks' (2012), 102(3) American Economic Review.

aims at filling an important gap in the law and economics literature, which is the lack of consideration for macroeconomics in the economic analysis of law.[4] This gap reflects the disintegration of finance and monetary economics in the economics profession. Looking at shadow banking from a macroeconomics perspective implies taking a 'money view.'[5] One can define shadow banking by its ability to fund long-term commitments through short-term liabilities. This maturity mismatch creates systemic risk inasmuch as short-term liabilities are considered as safe as money. The implied liquidity of such liabilities make them subject to run.

For purposes of financial stability, regulation of shadow banking should focus on entities and transactions allowing liabilities to be accepted as a substitute for money.[6] For the banking business to be profitable, such safe, liquid, short-term liabilities must be invested in risky, illiquid, long-term assets. Therefore, we define banking – both official and shadow – in connection with maturity transformation. In this paper, maturity transformation is intended broadly, particularly to include also liquidity transformation (financing illiquid assets with liquid liabilities) and credit transformation (enhancing the credit risk of assets in order to fund them), which currently contribute to defining shadow banking.[7] We focus on the money-like character of the liabilities to fund assets that do not have the same feature, regardless of the maturity of both. We adopt such a broad definition because we are skeptical about defining shadow banking based on a list of activities about which we know today. We argue that shadow banking may well evolve into activities that we – and importantly, the policymakers – may not yet know about, while still generating systemic risk. This is, after all, what happened during the global financial crisis. Anchoring the definition of shadow banking to a conceptual framework of systemic risk, instead of to a list of systemically relevant activities, allows identifying shadow banking despite financial innovation and the imperfection of risk models employed by the financial industry and its regulators.

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[4] *See* Richard A. Posner, 'On the Receipt of the Ronald H. Coase Medal: Uncertainty, the Economic Crisis, and the Future of Law and Economics' (2010), 12(2) American Law and Economics Review. Important exceptions in the law and economics scholarships includes Katharina Pistor, 'A legal theory of finance' (2013), 41 Journal of Comparative Economics; and Yair Listokin, 'A Theoretical Framework for Law and Macroeconomics' (2016), Yale Law & Economics Research Paper No. 567. Professors Pistor and Listokin focus on different problems than shadow banking though.

[5] Perry Mehrling, 'Essential hybridity: A money view of FX' (2013), 41(2) Journal of Comparative Economics; Zoltan Pozsar, 'Shadow Banking: The Money View' (2014), Office of Financial Research Working Paper.

[6] Minsky had historically one of the broadest views of money in economics. This is the view adopted in this essay. As Minsky eloquently put it, "everyone can create money; the problem is to get it accepted". *See* Hyman P. Minsky, *Stabilizing an unstable economy* (McGraw-Hill, 1986) 225.

[7] The International Monetary Fund (IMF) defines shadow banking as "nontraditional financial intermediation, which is determined by the funding source used by financial intermediaries to finance a portion of their assets." *See* Artak Harutyunyan and others, 'Shedding Light on Shadow Banking' (2015), IMF Working Paper no. WP/15/1, 7.
Shadow banking can also be measured using a noncore liability approach which attempt to capturing nontraditional funding. *See* International Monetary Fund, *Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth*, October 2014) 91-92; Available at: http://www.imf.org/external/pubs/ft/gfsr/2014/02/index.htm

The remainder of the paper is as follows. Section 2 deals with the problem of shadow banking definition, emphasizing the advantages, but also the limitations, of an instrument-based definition. Section 3 discusses the mapping of shadow banking by the Financial Stability Board (FSB) and the International Monetary Fund (IMF) in light of the challenges in defining and monitoring shadow banking. Section 4 discusses the benefits and the costs of shadow banking for society. Building upon this framework, section 5 argue that the optimal way to regulate shadow banking is to restrict leverage at the assets level, through minimum haircuts regulation. Section 6 evaluates the effectiveness and the efficiency of direct and indirect regulation of shadow banking in two major jurisdictions, the U.S. and the EU. Section 7 concludes.

2. Shadow banking (un)defined

2.1. History of the term

The term shadow banking as we use it today was coined by PIMCO's Paul McCulley in 2007 in a speech at the annual economic policy symposium of the Federal Reserve Bank of Kansas City in Jackson Hole, Wyoming.[8] The origins of the concept, however, can be traced back to an earlier work referring to the shadow banking as the 'parallel banking system.'[9] Following these pristine uses of the term, a whole host of unconventional designations were coined to refer to shadow banking. These include 'securitized finance',[10] 'market-based credit system',[11] 'nonbank credit intermediation',[12] and 'network finance'.[13] These multiple designations and definitions added more confusion to the already complex and convoluted debate on shadow banking. However, despite its elusive name, shadow banking is neither shadowy, nor banking as we know it.[14]

Though the term shadow banking entered the common parlance after the Global Financial Crisis (GFC), shadow banking has a longer history. According to some commentators, shadow banking has existed at least since the late 19th century, when the Bank of England initiated a program to stabilize the private bills

[8] Paul A. McCulley, 'Teton reflections' (2007), 2 PIMCO Global Central Bank Focus.
[9] Jane W. D'Arista and Tom Schlesinger', 'The parallel banking system' (1993), Economic Policy Institute Briefing Paper; Pozsar and others, 'Shadow Banking', 13.
[10] Gerard Caprio and Lawrence H. Summers, 'Finance and its Reform: Beyond Laissez-Faire' in Dimitri B. Papadimitriou (ed), *Stability in the Financial System* (Stability in the Financial System, Palgrave Macmillan UK 1996) 418.
[11] Perry Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance' (2013), Central Banking, and the Future of Global Finance (November 5, 2013) 2.
[12] The Group of Thirty: Working Group on Financial Reform, *Financial Reform: A framework for financial stability*, 2009), Available at: http://www.group30.org/images/PDF/Financial_Reform-A_Framework_for_Financial_Stability.pdf;
See also Financial Stability Board, *Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability: Report of the Financial Stability Board to G20 Finance Ministers and Central Bank Governors*, 2011), Available at: http://www.financialstabilityboard.org/publications/r_110415a.pdf
[13] Robert Guttmann, *Finance-Led Capitalism: Shadow Banking, Re-Regulation, and the Future of Global Markets* (Palgrave Macmillan, 2016) 125.
[14] Eddy Wymeersch, 'Shadow Banking and Systemic Risk' (2017), 1 (European Banking Institute Working Paper Series 2). Although shadow banks do not engage in deposit taking, which is key for the legal definition of a bank or credit institution, as we will show their activity is very similar to the core function of banking.

markets by bailing out bill brokers.[15] These brokers were not banks. However, they were accepting to convert the bills into money,[16] an activity that we would call shadow banking today.

What we know as shadow banking is a multitude of activities that contribute to the vulnerability of the financial system. Therefore, they are being studied by academics and policymakers. In this section, we review different approaches to defining shadow banking, with the goal to identify a suitable definition from a law and economics perspective.

2.2. Approaches to shadow banking definition

The variety of financial instruments, institutions, and activities involved in shadow banking does not lend itself to a classic definition *per genus et differentiam*.[17] Furthermore, searching for an all-encompassing definition would be a futile endeavor. Shadow banking should rather be defined by reference to the purpose for which it is studied. Since the shadow banking system came in the spotlight because of its potential contribution to systemic risk, a useful definition needs to cover the systemic risk implications of shadow banking.[18]

Currently, there are three approaches to defining shadow banking. Shadow banking may be defined by the *activities* constituting shadow banking. These, for instance, include maturity, liquidity and credit transformation so long as they are geared towards performing credit intermediation – namely, taking savings from lenders and channeling them towards borrowers. Activity-based definitions may or may not exclude credit intermediation performed by banks. Alternatively, shadow banking may be defined by the *entities* carrying out credit intermediation, so long as these entities differ from banks. One prominent example of such entities is Money Market Mutual Funds (MMMFs), but there are several others (finance companies, peer-to-peer lenders, hedge funds, and private equity funds, among others). Finally, shadow banking may be defined by the *instruments* through which it is carried out. The repurchase agreement (repo),[19] namely functionally a contract to borrow on financial collateral, is a case in point. Depending on

[15] Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance'. Mehrling draws interesting parallels between the bills market of the late 19th century England and the current functioning of the Shadow banking system.
[16] Walter Bagehot, *Lombard Street: A Description of the Money Market* (H.S. King, 1873).
[17] This is an Aristotelian pattern of definitions in which definitions are provided by determining their genus to which that term belongs and then providing the difference which gives the species and locates the term within that genus. The most famous example is humans are rational animals.
[18] International Monetary Fund, *Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth* 68.
[19] A repo or repurchase agreement is the sale of securities coupled with a commitment to repurchase them at a specified price and at a future date or on demand. *See* Tobias Adrian and others, 'Repo and Securities Lending' (2012), NBER Working Paper Series 2 In the recent financial crisis, the run on repo markets which led to forced deleveraging played a significant role in the GFC. *See* Gary B. Gorton and Andrew Metrick, 'Securitized Banking and the Run on Repo' (2012), 104(3) Journal of Financial Economics; Gary B. Gorton, *Slapped by the Invisible Hand: The Panic of 2007* (Oxford University Press, 2010).

the quality of collateral and its credit enhancement and the term of the repo, it can generate money-like liabilities. There are several other examples of such instruments. Importantly, the list is not finite, but it includes every credit instrument that can generate safe and liquid liabilities, and hence is potentially subject to runs.

An instrument-based definition is a functional definition anchored to a financial instrument which may or may not yet exist. The activity- and entity-based definitions are functional, too, because they reflect the systemic risk concerns stemming from shadow banking.[20] However, these definitions are *static* due to their reliance on a list of entities and/or activities. Activity- and entity-based definitions are useful to identify the object of regulation, whereas an instrument-based approach is more promising for the purpose of adapting regulation to unknown challenges to financial stability.

2.3. Activity-based definitions

Under the realm of activity-based definitions, shadow banking can be defined broadly as "all financial activities, except traditional banking, which require a private or public backstop to operate."[21] A backstop is a last-resort risk-absorption commitment that operates when all other forms of insurance have failed. It is usually in the form of an (explicit or implicit) put option, which can be private or public. An example of private backstop is a credit risk guarantee by a bank, of the kind activated by ABCP conduits during the GLC. An example of public backstop is the liquidity put by central banks, which ranges from traditional lending of last resort facilities to the more recent programmes of distressed assets purchase. A backstop is instrumental to conferring to shadow banking liabilities the money-like features (i.e. safety and liquidity) that, along with a mismatch with the assets, make shadow banking prone to systemic risk.

A definition of shadow banking based on backstops is entirely a functional one. The focus is on the activities that require a backstop to be undertaken irrespective of what type of financial institutions are engaging in such activities. The purpose of this definition is to capture any form of shadow banking, present and future. However, it is doubtful that it may achieve this purpose in practice. Backstops, particularly if implicit, are difficult to identify, whereas systemic risk may build up in their shadow. Shadow banking can be performed formally in the absence of backstops; save that it will indeed require a backstop when the systemic risk materializes.

Moving away from strictly functional definitions, shadow banking can also be defined in the negative, particularly as "bank-like financial activities that are conducted outside the traditional commercial banking

[20] International Monetary Fund, *Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth* 68, 91-92.
[21] Stijn Claessens and Lev Ratnovski, 'What is shadow banking?' (2014), IMF Working Paper 4.

system, many of which are unregulated or lightly regulated."[22] Similarly, the Office of Financial Research (OFR) in the United States defines shadow banking as "credit intermediation outside the insured depository system, involving leverage, maturity transformation, and the creation of money-like liabilities."[23] These definitions are easier to operationalize as they focus on the absence of regulation or relatively light-touch regulation in financial intermediation, rather than on activities being in need of backstop. The disadvantage of a negative definition is that it results in either too narrow or too vague lists of activities. The concrete identification of shadow banking will thus depend on the discretion of the financial supervisors. This is not ideal, if only for reasons of legitimacy and legal certainty. This limitation reveals the challenges stemming from the dynamic character of shadow banking.

A slightly different approach to the trade-off between vagueness and under-inclusiveness of activity-based definitions looks at the root of shadow banking. What has historically differentiated shadow banking from financial intermediation is the reliance on financial markets. In this perspective, shadow banking has been defined as "money market funding of capital market lending"[24] either on the banks' balance sheets or off their balance sheet. This definition captures two crucial features of shadow banking: one is the reliance on capital markets (e.g. mortgage securitizations, derivatives) for risk-taking; the other is reliance on money markets (e.g. repos, commercial paper) for liquidity. It is a small step from markets to the instruments that are traded therein. In a similar vein, the IMF defines shadow banking as "non-traditional financial intermediation, which is determined by the funding source used by financial intermediaries to finance a portion of their assets."[25] To capture (and measure) non-traditional funding, the IMF relies on the notion of *noncore liabilities*, which is an instrument-based approach to defining shadow banking.

Before moving on to discussing the instrument-based definitions, however, it is useful to discuss the entity-based definitions for they have a unique advantage over all other approaches. Whereas the legal basis for regulating the activities of shadow banking and the instruments they rely upon is not obvious, particularly if these activities are identified at the discretion of supervisory agencies, dealing with entities is much easier from a legal point of view.[26] Whether certain institutions are subject to regulation is a policy issue and depends on whether, according to the legislature's assessment, these institutions are in the position to jeopardize financial stability.

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[22] Financial Crisis Inquiry Commission, *Shadow banking and the financial crisis* (2010) 7. Available at: http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/2010-0505-Shadow-Banking.pdf

[23] Office of Financial Research, *Financial Stability Report* (2015) 124. Available at: https://financialresearch.gov/financial-stability-reports/

[24] Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance', 2.

[25] Harutyunyan and others, 'Shedding Light on Shadow Banking', 7.

[26] Willa E. Gibson, 'Are swap agreements securities or futures?: The inadequacies of applying the traditional regulatory approach to OTC derivatives transactions' (1999), 24(2) Journal of Corporation Law 416.

2.4. Entity-based definitions

The earlier definitions of shadow banking were entity-based. McCulley defined the shadow banking system as "the whole alphabet soup of levered up non-bank investment conduits, vehicles, and structures" whose liabilities are similar to bank deposits.[27] According to Morgan Ricks' view, repo-financed dealer firms, securities lenders, Structured Investment Vehicles (SIVs), Asset-Backed Commercial Paper conduits (ABCP), credit hedge funds, and MMMFs can all be considered as shadow banks.[28] Acharya, Khandwala, and Öncü define shadow banking based on their similarity to financial institutions that behave like banks. Although, like banks, these institutions borrow short and use leverage to lend and invest in illiquid assets, they are only lightly regulated.[29]

If one focuses on the perception of shadow banking by investors, a shadow bank is rather "an institution or bank- sponsored special-purpose vehicle that has persuaded its customers that its liabilities can be redeemed *de facto* at par without delay (or can be traded *as if* they will be executed at par without fail at maturity) even though they are not *formally* protected by government guarantees."[30] Within the entity-based definitions of the shadow banking sector, shadow banks might even be given the label of "non-banks performing bank-like functions."[31]

Because they all implicitly rely on a functional approach, entity-based definitions are unhelpful to identify shadow banking. Virtually any entity of the financial industry could perform shadow banking in one way or another. In the European context, a study by the European Systemic Risk Board (ESRB) reveals that most of the 'Other Financial Institutions' (OFI) have little engagement in shadow banking activities.[32] However, a focus on the entities is the ultimate reason why policymakers know anything at all about the shadow banking system.

One big challenge for shadow banking regulation is the lack of granular data. The problem mainly stems from the lack of reporting obligations by the OFIs. This gap makes good economic sense so long as the activities OFIs engage in do not give rise to systemic risk. However, the lack of information creates negative

[27] McCulley, 'Teton reflections', 2.
[28] Morgan Ricks, 'Shadow banking and financial regulation' (2010), 370 Columbia Law and Economics Working Paper 3-4.
[29] International Monetary Fund, *Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth* 91.
[30] Edward J. Kane, 'Shadowy banking: Theft by safety net' (2014), 31Yale Journal on Regulation 776.
[31] The "non-banks credit intermediation" is another term for shadow banking used by the FSB. *See* The Group of Thirty: Working Group on Financial Reform, *Financial Reform: A framework for financial stability.;* Financial Stability Board, *Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability: Report of the Financial Stability Board to G20 Finance Ministers and Central Bank Governors.*
[32] Laurent Grillet-Aubert and others, *Assessing Shadow Banking- Non-bank Financial Intermediation in Europe*, 2016) 40. Available at: https://www.esrb.europa.eu/pub/pdf/occasional/20160727_occasional_paper_10.en.pdf

externalities.[33] As we are going to argue, an instrument-based definition of shadow banking could help identify the entities producing externalities in the form of systemic risk. Having said this, legal obligations, including disclosure obligations, are more effectively imposed on entities than on the instruments they use.

2.5. Towards a workable instrument-based definition

In the policy debate, there is no such thing as an instrument-based definition of shadow banking. A relatively similar approach is to base the definition on a mixture of activities and entities. The definition adopted by the FSB is a case in point. According to the FSB, shadow banking is to be understood as "credit intermediation involving entities *and* activities outside the regular banking system."[34] Academic commentators have dwelled more into the *instruments* connecting entities to the activities of shadow banking. On the legal side, Steven Schwarcz considers shadow banking as "the provision of *any* financial products and services by shadow banks", because "the essential point of shadow banking is that non-banks provide financial products and services."[35] Professor Schwarcz' definition is intentionally broad, "to encompass the inevitable evolution of financial products and services over time." On the economists' side, Gorton and Metrick likewise define shadow banking placing more emphasis on the instruments, such as, for instance, "old contracts (repo)" or "more esoteric instruments" (like ABCP, ABS, CDO).[36] However, the purpose of these instruments should always be to replicate functions of traditional banking.

The above definitions are too vague. They suffer from the lack of a precise connection with systemic risk. Instruments such as repos may not be conducive to systemic risk, for instance when large liquidity reserves are held against them.[37] Conversely, on-balance-sheet securitizations by banks, such as covered bonds, may well lead to systemic risk despite their being excluded from the list of instruments of shadow banking.[38]

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[33] For an overview of information gaps in shadow banking and their implications for shadow banking regulation, *See* Kathryn Judge, 'Information Gaps and Shadow Banking' (2016), 103 Virginia Law Review (forthcoming).

[34] Financial Stability Board, *Shadow Banking: Strengthening Oversight and Regulation: Recommedations of the Financial Stability Board*, 2011) 1. Available at: http://www.fsb.org/wp-content/uploads/r_111027a.pdf?page_moved=1 (Emphasis added).

[35] Steven L. Schwarcz, 'Regulating shadow banking' (2012), 31 Review of Banking and Financial Law 621-622 (Emphasis in the original).

[36] Gorton and Metrick, 'Securitized Banking and the Run on Repo'.
ABCP= Asset-backed Commercial Paper
ABS= Asset-backed Securities
CDO= Collateralized Debt Obligation

[37] Ana Fostel and John Geanakoplos, 'Endogenous Collateral Constraints and the Leverage Cycle' (2014), 6(1) Annual Review of Economics 17.

[38] Since covered bonds subordinate other non-adjusting secured and unsecured creditors, those unsecured creditors would find it in their best interest to run on the issuing bank at the first signs of trouble. By concentrating risk on unsecured debt, the asset encumbrance stemming from covered bonds may deteriorate the liquidity profile of the issuing institution and facilitate a run on financial firms. Moreover, a high level of asset encumbrance would limit the level of unsecured funding to begin with. Therefore, in addition to increasing the likelihood of runs on banks, covered bonds may also reduce market discipline. *See* Toni Ahnert and others, 'Asset Encumbrance, Bank Funding and Financial Fragility' (2016), Deutsche Bundesbank Discussion Paper No. 17/2016; Reimo Juks, 'Asset encumbrance and its relevance for financial stability' (2012), 3) Sveriges Riksbank Economic Review.

If the purpose of regulating shadow banking is to cope with systemic risk, the definition of shadow banking instruments should be linked to *maturity transformation* broadly conceived. All and only the instruments allowing the funding of risky long-term assets (such as a house or exposure to the housing market) with short-term liabilities (such as a repo or a marked-to-market derivative) should define shadow banking. Although an instrument-based definition of this kind is not reflected by the policy debate, the IMF approach to identifying shadow banking comes relatively close to it.

According to the IMF, shadow banking is to be identified based on *noncore liabilities*. Noncore liabilities are defined in contrast to the liabilities of traditional banking, namely demand deposits of ultimate creditors (whether individual or institutional). This definition is obviously over-inclusive. In fact, it is narrowed down to exclude entities such as pension funds and funds other than MMMFs, which do not engage in any form of maturity transformation. The IMF approach has the important advantage to include the forms of shadow banking that are carried out *within* the banking system. The narrow IMF definition of noncore liabilities includes money-like promises by banks and non-banks to ultimate investors. The broad IMF definition includes also noncore liabilities issued between financial counterparties, whose net impact outside the financial sector is zero. Particularly because this measure includes the banks, it gives an important indication of the systemic risk within the financial sector, as matched-book obligations typically fail to net out in a financial crisis.

Conversely, the definition of the FSB includes pretty much all of the financial sector, except regular banks. This approach has been criticized because, by focusing on the non-bank financial sector, the FSB overlooks the possibility that the systemic risk of shadow banking originates from within regular banking.[39] Moreover, the FSB definition covers all entities that, like banks, intermediate credit although they may not give rise to any systemic risk concerns.[40]

Choosing one approach to defining shadow banking is not easy, for they all have shortcomings. Activity-based definitions are under-inclusive or too vague to operationalize in a democratic regulatory system. Entity-based definitions may be sufficiently precise to operationalize, but they are ultimately uninformative about the source of systemic risk. Moreover, both activity-based and entity-based definitions are static and may fail to capture new forms of shadow banking that generate systemic risk. Instruments-based definitions may fare better in connection with systemic risk, and if carefully crafted, can adapt to financial innovation. However, they tend to be over-inclusive, which brings us back to the operationalization problem. The best

[39] Yingmao Tang, 'Shadow Banking or "Bank's Shadow": Reconceptualising Global Shadow Banking Regulation' in Ross P. Buckley, Emilios Avgouleas and Douglas W. Arner (eds), *Reconceptualising Global Finance and Its Regulation* (Reconceptualising Global Finance and Its Regulation, Cambridge University Press 2016) 333.
[40] Claessens and Ratnovski, 'What is shadow banking?'.

way to define shadow banking is, therefore, a combination of the three approaches, with a special focus on the instruments.

As mentioned, systemic risk stems from the promise of cash immediacy against long-term, risky investments (maturity transformation broadly intended). There are not many instruments making such promises credible. These instruments can be characterized as *collateral*, namely assets that may be liquidated to make good on the promise if the borrower defaults. Immediacy promises require the collateral to be liquid. Liquidity implies that the collateral can be turned into cash without losing much of its value.

Banking adds another dimension to the liquidity of collateral, which is *leverage*.[41] Because banks profit from transforming debts (long into short, safe into risky), they tend to have as much debt, or leverage, as possible.[42] Banks can leverage more than any other economic actor because they rely on various liquidity puts – from other banks, and ultimately, from the central bank.[43] However, leverage is a multiplier of losses as well as of gains, as a result of which banks are more fragile than other economic actors. In the absence of regulation, the market liquidity of assets increases the leverage possibilities of banks (funding liquidity), until the asset price bubble bursts and both market and funding liquidity turns in the other direction.[44] Liquidity and leverage are, therefore, the defining features of banking, both official and shadow.[45]

We can then define banking as the business of *leveraging on collateral to support liquidity promises*. This becomes *shadow* banking when it avoids the regulation of liquidly and leverage imposed on banks for the purpose of financial stability. To clarify by way of examples, demand deposits are banking, but not shadow banking, because they are subject to both liquidity (reserve requirements) and leverage (capital adequacy) regulation of banks. By the same token, MMMFs are shadow banking so long as they are not subject to regulatory constraints comparable to those faced by banks. Repos used to be shadow banking, but are increasingly less so because banks are a key player in the repo market and their operation therein has been curbed by the liquidity and leverage restrictions of the Basel III standards.[46] Derivatives were, and still are, a form of shadow banking because they support leveraged liquidity promises, although these are not

[41] Leverage is the amount of debt as a multiple of the equity, which the proportion of collateral that the borrower owns. The reciprocal of the leverage is the margin, or haircut, namely the how much collateral the borrower owns relative to the outstanding amount of debt. *See* John Geanakoplos, 'Leverage, Default, and Forgiveness: Lessons from the American and European Crises' (2014), 39, Part B Journal of Macroeconomics.
[42] Another way to put it is that banks profit from owning as little collateral as possible.
[43] Anat R. Admati and Martin Hellwig, *The Bankers' New Clothes: What's Wrong with Banking and What to Do about It* (Princeton University Press, 2013)
[44] *See* Markus K. Brunnermeier and Lasse Heje Pedersen, 'Market Liquidity and Funding Liquidity' (2009), 22(6) The Review of Financial Studies.
[45] Tobias Adrian and Hyun Song Shin, 'Liquidity and leverage' (2010), 19(3) Journal of Financial Intermediation.
[46] Basel Committee on Banking Supervision, *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems* (Bank for International Settlements 2010, Revised in June 2011), Available at: http://www.bis.org/publ/bcbs189.htm. This is a form of indirect regulation about which *see* infra text accompanying notes 124-139.

obvious. A marked-to-market derivative, which is used extensively in shadow banking operations, is effectively an overnight promise to pay the margin call. Because the liquidity (reserve requirement) and the leverage (minimum haircut) of derivatives are not regulated as such, but only indirectly when derivatives are entered into by banks or other systemically important institutions, derivatives markets are still the realm of shadow banking.[47]

This instrument-based approach has several advantages. First, the definition includes all – past, present and future – activities giving rise to systemic risk, because it does not rely on particular markets. Rather, this definition relies on the core instruments of banking at all times: liquidity and leverage. Second, this definition is functional, but not as vague as a functional activity-based definition. Because financial regulation can embed ex-ante the instruments of liquidity and leverage, it can also confer upon a regulatory agency the mandate to regulate them across the board, without creating legitimacy concerns. Third, the definition is not linked to any particular entity, although this is in fact the practical limitation of this approach. Economists have suggested a number of smart ways to monitor liquidity and leverage,[48] but all these overlook that reporting obligations can only be established effectively on specific entities. You cannot regulate something you cannot measure;[49] but likewise, you cannot measure something you do not know

[47] Exposures created using derivatives are regulated both by the EMIR (Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories, *OJ L 201, 27.7.2012*) and the CRD (Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC; *OJ L 176, 27.6.2013,*) and CRR jointly (the so-called CRD IV Package). The CRD IV package applies to credit institutions (banks) and investment firms, whereas the EMIR applies to counterparties of derivatives contracts (both financial and non-financial counterparties). In the U.S., for the purposes of capital requirements, contingent liabilities created by using derivative instruments should appear on the balance sheet as credit equivalent amounts using the credit conversion factor. *See* 12 CFR 615.5212. Other significant regulations applying to derivatives (including credit derivatives) include, for example, the leverage ratio and the liquidity requirements (LCR) applicable to banks (For the EU, *See* art. 429 and art. 423 of the CRR respectively).
In the EU, the EMIR establishes margin requirements for non-centrally cleared derivatives, but does not set a minimum level for these margins. The EMIR aims to move more and more of derivative contracts from bilateral (so-called OTC) markets to centrally cleared markets. Article 11 of EMIR requires risk-mitigation techniques for non-centrally cleared OTC derivatives. According to the EMIR, although margin requirements are mandatory, it is the Central Counterparty Clearing House (CCP) which sets the margins (*See* Art. 41 EMIR). The regulation does not require setting margins at any specific level. Because the CCP is a prudentially regulated financial institution, regulation expects that the CCP will set the margins at the optimal level. However, the CCP does not internalize the systemic risk. Moreover, being too big to fail, the CCP's incentives are not aligned with society's interest in financial stability. Therefore, this form of incentive regulation is most likely insufficient to curb shadow banking to the optimal level.
This is also the case for collateral requirements. The EMIR only sets standards for collateral to be accepted by the CCP, but in the end, it is the CCP that decides what to accept and what not to accept as collateral. (*See* art. 46 EMIR). Similarly, the EMIR does not regulate the liquidity of derivatives. However, it sets liquidity requirements on CCPs. (*See* art. 44 EMIR).
More recently, EU regulatory technical standards (RTS) have been published on margin requirements for CCP, based on the article 11 of the EMIR. *See* Commission Delegated Regulation (EU) 2016/2251 of 4 October 2016 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council on OTC derivatives, central counterparties and trade repositories with regard to regulatory technical standards for risk-mitigation techniques for OTC derivative contracts not cleared by a central counterparty, C/2016/6329; *OJ L 340, 15.12.2016.*

[48] *See* Brunnermeier and Krishnamurthy, *Risk Topography: Systemic Risk and Macro Modeling,*

[49] This is paraphrased from Pozsar, 'Shadow Banking: The Money View' 65, "We cannot monitor what we do not measure."

of. For this reason, policymakers should rely on entity-based approaches, albeit guided by instrument-based criteria to identify the right entities and adapt this identification with time.

3. Mapping shadow banking through systemic risk

The key to identifying shadow banking is the maturity transformation function. Maturity transformation involves issuing short-term liabilities to finance long-term assets.[50] As such, maturity transformation is beneficial because it ultimately encourages long-term capital investments.[51] Despite providing this benefit, shadow banking endangers the financial system both directly via the credit, market and liquidity risks taken by shadow banking participants, and indirectly through their interconnectedness with the official banking sector.[52] Shadow banking increases systemic risk by undertaking maturity transformation with excessive leverage.[53]

Maturity transformation is inherently fragile.[54] Traditionally, banks had a monopoly on maturity transformation because they were the only institutions licensed to issue demand deposits.[55] With the advent of SIVs, other entities such as investment banks and MMMFs could create deposit-like investment opportunities to compete with commercial banks. This is possible by promising on-demand redemption at par.[56] Such a promise is credible so long as it is backed by collateral widely accepted in liquid markets. However, if a liquidity crisis hits, the issuing financial institution must immediately sell long-term assets to meet redemption requests by investors. Massive redemption requests undermine market pricing because of fire sales of the assets backing the liquidity promise.[57] Because shadow banking is highly leveraged and depends on market liquidity to sustain debt, market illiquidity can make the whole shadow banking system quickly insolvent.

Systemic risk stemming from illiquidity is difficult to be reconciled with finance theory. Illiquidity is by definition a temporary problem, although it may last for some time. Therefore, it should be both privately profitable and socially efficient for arbitrageurs to overcome illiquidity. In reality, however, long-term

[50] Heremans Dirk, 'Regulation of Banking and Financial Markets' in Roger J. Van den Bergh and Alessio M. Pacces (eds), *Encyclopedia of Law and Economics Volume 9*, vol 2 (Encyclopedia of Law and Economics Volume 9, Edward Elgar Publishing 2011).
[51] Financial Services Authority, *The Turner Review: A Regulatory Response to the Global Banking Crisis* (2009) 21; *See also* Gary B. Gorton, *Misunderstanding Financial Crises: why we don't see them coming* (Oxford University Press, 2012).
[52] Swati Ghosh, Ines Gonzalez del Mazo and İnci Ötker-Robe, 'Chasing the shadows: How significant is shadow banking in emerging markets?' (2012), 88) The World Bank- Economic Premise.
[53] Roland Meeks, Benjamin D. Nelson and Piergiorgio Alessandri, 'Shadow banks and macroeconomic instability' (2014), Bank of England Working Paper No. 487.
[54] Tobias Adrian and Adam B. Ashcraft, 'Shadow banking regulation' (2012), 559 Federal Reserve Bank of New York Staff Report 1.
[55] Gorton, *Slapped by the Invisible Hand: The Panic of 2007.*
[56] This is also called 'breaking the buck'.
[57] Authority, *The Turner Review: A Regulatory Response to the Global Banking Crisis, 21.*

assets are risky and risk can only imperfectly be predicted by statistical models. Whenever these models fail, the liquidity of the affected assets is impaired because arbitrageurs can no longer strip risk from the assets to turn them into cash-equivalents. Investors fly to quality, which is to say that cash becomes the only safe asset.[58] In this situation, shadow banks can still avoid insolvency by activating the liquidity puts of the official banking system. However, if the shock to the shadow banking is large enough, the banks' funding liquidity will also dry up quickly in the absence of central bank support.

The fragility of maturity transformation is the reason why banks are protected by a public safety net. Since the introduction of deposit insurance, there has been almost no serious runs by depositors on the banks of the developed world.[59] Formally, shadow banking cannot rely on the banks' safety net. Shadow banking liabilities are not insured. Therefore, they are susceptible to runs. However, even runs on shadow banks can be avoided – as runs on banks were avoided prior to the introduction of deposit insurance – if the central bank acts as lender of last resort (LLR).[60] Lending of last resort is supposed to support illiquid banks, which are not (yet) insolvent.[61] Because illiquidity is tied to (expectations of) insolvency and vice versa, this maxim is conceptually impossible to operationalize. In fact, central banks end up intervening as LLR in practically every systemic crisis.[62]

Therefore, the FSB has mapped shadow banking based on the systemic risk that would warrant ex-post intervention. According to the FSB, shadow banks are the entities engaging in one of the following activities:

1. The management of collective investment vehicles which are prone to runs;
2. Loan provision funded by short-term liabilities;
3. Intermediation of market activities by short-term funding or secured funding of clients' assets;
4. Facilitation of credit creation;

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[58] Ricardo J. Caballero and Arvind Krishnamurthy, 'Collective Risk Management in a Flight to Quality Episode' (2008), 63(5) The Journal of Finance.

[59] *See* Gorton, *Slapped by the Invisible Hand: The Panic of 2007,* 5. However, even in the recent global financial crisis, there were instances of runs on banks such as the run on the Northern Rock.

[60] For more information on the Lender of Last Resort (LOLR) function of central banks, *See Xavier Freixas and others, 'Lender of Last Resort: What Have We Learned Since Bagehot?' (2000), 18(1) Journal of Financial Services Research; See also* Xavier Freixas and Bruno M. Parigi, 'The lender of last resort of the 21st century' in Andrew Felton and Carmen M. Reinhart (eds), *The First Global Financial Crisis of the 21st Century: Part ll June-December 2008* (The First Global Financial Crisis of the 21st Century: Part ll June-December 2008, VoxEU.org Publication 2009) 163-167. Historically, the LOLR function in the market was played by private financial institutions. A bold example of taking up of such a role in the crisis of 1907 was J. P. Morgan's provision of liquidity to markets and institutions in the banking panic of that year. *See* Robert F. Bruner and Sean D. Carr, *The panic of 1907: lessons learned from the market's perfect storm* (John Wiley & Sons, Inc., 2007). However, after the 1913, the year in which the Federal Reserve came into being, it took up such a function.

[61] Bagehot, *Lombard Street: A Description of the Money Market,*

[62] J Bradford DeLong, 'This Time, It Is Not Different: The Persistent Concerns of Financial Macroeconomics' in Alan S. Blinder, Andrew W. Lo and Robert W. Solow (eds), *Rethinking the Financial Crisis* (Rethinking the Financial Crisis, Russell Sage Foundation and the Century Foundation 2012).

5. Securitization-based credit intermediation and funding of financial entities.

From the assets of the non-bank financial entities involved in any of these activities, the FSB has derived a measure of shadow banking.[63] According to the FSB, at the end of 2014, the size of shadow banking in 26 jurisdictions (representing 90% of the global financial assets) was about $36 trillion in the narrow measure (excluding entities that do not provide credit intermediation directly). More than 75% of these assets were located in the U.S., the UK, or the Eurozone.

The FSB relies on a list of activities potentially conducive to systemic risk to identify shadow banking. Crucially, however, the FSB bases the quantitative analyses on the information reported by the entities involved in such activities. As mentioned, the fallacy of this approach is that it is static, thus it may fail to capture new forms of shadow banking. Moreover, the FSB approach deliberately excludes banks regardless of the activities they engage in, which may overlook regulatory arbitrage within official banking. The IMF tries to cope with this limitation by focusing on the noncore liabilities issued by *any* entity, which perform maturity transformation.

Compared to the FSB, the IMF measure includes some part of official banking, but it excludes investments funds such as non-MMMFs. The results of the two estimates, as carried out in 2013, are barely comparable even if we look at the broad measures intended to capture every possible systemic risk implication. In the U.S., where the role of banks is more limited, the IMF broad measure of shadow banking was some $10 trillion lower than the FSB broad measure (about $25 trillion), due to the role of investment funds. The difference for the Eurozone was larger (some $10 trillion, with the FSB broad measure being about $25 trillion), but this is difficult to interpret because the effect of investment funds and banks on the size of shadow banking go in opposite directions. For the UK, the IMF broad measure (about $14 trillion) was some $5 trillion larger than the FSB equivalent to reflect the significant involvement of UK banks in shadow banking activities.

Both the FSB and the IMF acknowledge that their measures of shadow banking may well be over-inclusive. Both institutions seek to stay on the safe side and rather include too much, than too little, in terms of systemic risk. In fact, both measurement exercises suffer from lack of data granularity, which, in turn, stems from the limited information available. While the IMF relies on monetary aggregates provided by central banks, the FSB relies on the reporting obligations imposed on financial institutions by the national

[63] According to the FSB, "This category includes mainly residual OFIs in some jurisdictions that were not classified into a particular economic function, but were assessed to at least partly contain shadow banking activities as described by the five economic functions or for which it was not possible to provide sufficient evidence to warrant their exclusion from the narrow measure of shadow banking." *See* Financial Stability Board, *Global Shadow Banking Monitoring Report 2015*, 2015) 14, Available at: http://www.fsb.org/wp-content/uploads/global-shadow-banking-monitoring-report-2015.pdf

authorities. Particularly the latter vary considerably across jurisdictions. These limitations could be overcome by combining entity-based mapping (and reporting obligations) with a more instrument-based approach. As we will show in section 5, an efficient regulation of shadow banking should be based on the instruments of leverage to support liquidity promises.

4. The simple economics of shadow banking

Because we are concerned about the systemic risk aspects of shadow banking, why not ban those activities that give rise to such risk? In this section, we argue that this would not be a good idea. First, a prohibition will probably not be effective. Because shadow banking caters to a structural demand for safe assets, a ban would not likely be sufficient to deter the private creation of money-like liabilities; it would only marginally increase the cost of accepting them.[64] Second, even if one could prohibit shadow banking, this would not be efficient. Arguably, a limited amount of shadow banking is welfare increasing, which turns the policy question into how regulation can induce the optimal amount of shadow banking.[65]

In recent decades, financial intermediation has become more and more integrated with capital markets.[66] As an adaptive response to the developments of financial intermediation, banks transformed, too. Banks increasingly became closer to a model based on bank holding companies controlling several subsidiaries.[67] In this new framework, traditional commercial banking only represent a fraction of the financial institutions. Banks themselves have expanded their shadow banking activities.[68] The only difference with independent shadow banking is the explicit access to government guarantees, such as the liquidity put by the central bank and the credit guarantees by the public sector.[69]

Shadow banking plays an important role in contemporary finance. As traditional banking, it channels credit to the real economy.[70] The comparison of the assets held by shadow banks with those of the official banking sector reveals that, after a short dip in the aftermath of the global financial crisis, the shadow banking system

[64] As Minsky, *Stabilizing an unstable economy,* 225, argued, it is not difficult to create money: "everyone can create money; the problem is to get it accepted."
[65] A related question is how much shadow banking is optimal for the society. This is a very difficult question to answer, for the answer depends on several circumstances and varies with time (particularly with the economic cycle). The question is akin to how much banking is optimal for a society, which is equally difficult to answer for the very same reasons. This essay rather focuses on how regulators can curb shadow banking to the efficient level, after having figured out what this level is at a given point in time.
[66] Tobias Adrian and Hyun Song Shin, 'The changing nature of financial intermediation and the financial crisis of 2007–2009' (2010), 2 Annual Review of Economics.
[67] Nicola Cetorelli, Benjamin H. Mandel and Lindsay Mollineaux, 'The Evolution of Banks and Financial Intermediation: Framing the Analysis' (2012), 18(2) Economic Policy Review; *See also* Dafna Avraham, Patricia Selvaggi and James Vickery, 'A structural view of US bank holding companies' (2012), 18(2) FRBNY Economic Policy Review.
[68] Nicola Cetorelli, *Hybrid Intermediaries* (Federal Reserve Bank of New York Staff Reports, 2014) 1, Available at: https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr705.pdf
[69] Pozsar and others, 'Shadow Banking'.
[70] Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance', 2.

has been growing at the expense of traditional credit intermediation.[71] Eventually, shadow banking could even overtake traditional banking.[72]

The growth of shadow banking is driven by supply-side as well as demand-side factors. As far as the supply side is concerned, shadow banking relies on financial markets for productive efficiency. Shadow banking has managed to replicate the banking functions at a lower cost, for instance by engaging in securitization and providing diversification services, ample choice among risk levels, and third-party validation of credit risk. In this model, liquidity puts and other explicit or implicit guarantees by the banks sponsoring shadow banking replaced the government safety net, at least so long as the private backstops remained credible.[73]

One major contributor to the rise of shadow banking has been regulatory arbitrage. Capital arbitrage played a major role given the adverse impact of the Basel standards on the profitability of banking.[74] The banking industry used off-balance-sheet structures to mitigate this impact. These off-balance-sheet structures involved many activities, instruments, and entities of the shadow banking system. The new capital adequacy requirements established under Basel III have placed constraints on the off-balance-sheet operations of banks, but have not changed the incentives for regulatory arbitrage, because they increase the cost of doing banking within the regulatory perimeter, as opposed to shadow banking.

On the demand side, the growth of the shadow banking system is attributable to several macroeconomic developments around the world, which created room for new markets. The savings glut starting from 2003,[75] especially from China and the Middle-East, lead to a sizeable demand for safe assets where those savings could be safely invested. This shift of the demand for safe assets, however, happened in a time when the supply of such assets was diminishing, especially in the U.S., where the government debt-to-GDP ratio was shrinking and a considerable amount of the U.S. government debt was retired. This shortage of safe assets prompted the private sector to create such assets, at a profit.[76] A large amount of these assets was created using securitization, repo contracts, and credit derivatives replacing government guarantees by

[71] Gary B. Gorton and Andrew Metrick, 'Regulating the Shadow Banking System' (2010), Brookings Papers on Economic Activity 264-265.
[72] Ibid; International Monetary Fund, *Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth.*
[73] Jeffrey N. Gordon and Christopher M. Gandia, 'Money Market Funds Run Risk: Will Floating Net Asset Value Fix the Problem?' (2014), 2014 (2) Columbia Business Law Review.
[74] The main reason, why capital regulation had an impact on bank profitability is not because the capital is "set aside", but it is because of the subsidies offered to debt finance. *See* Admati and Hellwig, *The Bankers' New Clothes: What's Wrong with Banking and What to Do about It.*
[75] Ben S. Bernanke and others, 'International capital flows and the return to safe assets in the united states, 2003-2007' (2011), 1014) FRB International Finance Discussion Paper.
[76] For the concept of safe assets, *see* International Monetary Fund, *Global Financial Stability Report: The Quest for Lasting Stability*, April 2012) 81-122, Available at: http://www.imf.org/External/Pubs/FT/GFSR/2012/01/index.htm.
Safe assets are also described as "a variety of financial claims on public of private sector entities that are used as if they were risk-free." *See* Anna Gelpern and Erik F. Gerding, 'Rethinking the Law in "Safe Assets"' in Ross P. Buckley, Emilios Avgouleas and Douglas W. Arner (eds), *Reconceptualising Global Finance and Its Regulation* (Reconceptualising Global Finance and Its Regulation, Cambridge University Press 2016) 159.

implicit or explicit private sector guarantees.[77]

In addition to the savings glut, the rise of professional asset management (mutual funds and pension funds) also generated a demand for safe assets for the optimal management of institutional investors' cash balances.[78] Since deposit insurance throughout the globe is capped at amounts too low for institutions,[79] turning to traditional bank liabilities is not an option for institutional investors, even in the presence of brokered deposits.[80] Banks could cater to this demand through a very old financial instrument, the repo, which thanks to over-collateralization (i.e. a haircut on the market value of the collateral) and the short maturity provides an efficient substitute for demand deposit. Because the repos' safety does not depend on the amount of the contract, they are suitable for the cash-management needs of institutional investors.[81]

The ability of shadow banking to supply safe assets in response to the rising demand for them is, in principle, efficient for the financial system as well as for the real economy. Firstly, a shortage of safe assets creates a macroeconomic imbalance where savings exceed investments, which ultimately leads to reduced output and unemployment.[82] Moreover, securitization and securities financing transitions (SFTs), which are at the heart of the shadow banking, are beneficial for the financial markets. The benefits include price discovery, market efficiency, credit creation, and market liquidity. All of this translates into more efficient finance and economic growth.[83] In sum, by providing alternatives to bank deposits for large investors, shadow banking benefits society.[84]

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[77] According to Haldane, the size of the global asset management industry is some $87 trillion. *See* Andrew G. Haldane, 'The age of asset management?' (2014), (Speech at the London Business School). Available at: http://www.bankofengland.co.uk/publications/Documents/speeches/2014/speech723.pdf.

[78] Zoltan Pozsar and Manmohan Singh, 'The nonbank-bank nexus and the shadow banking system' (2011), IMF Working Papers.

[79] Currently, the amount insured by the FDIC is $250,000 and in the EU, it is €100,000. *See* Art. 6(1) of the DGS directive. For an empirical investigation of deposit insurance coverage, and an analysis of its consequences, see: Asli Demirgüç-Kunt, Edward Kane and Luc Laeven, 'Deposit insurance around the world: A comprehensive analysis and database' (2015), 20 Journal of Financial Stability.

[80] Brokered deposits are also called jumbo deposits. FDIC defines a brokered deposit as "any deposit accepted by an insured depository institution from or through a third party, such as a person or company or organization other than the owner of the deposit." *See* Federal Deposit Insurance Corporation (2014), Guidance on Identifying, Accepting, and Reporting Brokered Deposits: Frequently Asked Questions. Available at: https://www.fdic.gov/news/news/financial/2015/fil15002a.pdf
Deposit brokerage has popped up to circumvent the upper limits on covered deposits. *See* Mark D. Vaughan and Timothy J. Yeager, '"Cedars" deposits: will they fly?' (2003), October 2003) The Regional Economist.

[81] Pozsar and others, 'Shadow Banking', 6.

[82] DeLong, 'This Time, It Is Not Different: The Persistent Concerns of Financial Macroeconomics'.

[83] For a brief overview and why some of these expected benefits were overoptimistic, *See* European Commission, *European Financial Stability and Integration Report 2013* (Commission Staff Working Document, April 2014) 107-108, Available at: http://ec.europa.eu/finance/financial-analysis/docs/efsir/140428-efsir-2013_en.pdf. For the benefits of the shadow banking in developing economies, *see* Ghosh, Gonzalez del Mazo and Ötker-Robe, 'Chasing the shadows: How significant is shadow banking in emerging markets?'; Viral V. Acharya, Hemal Khandwala and T. Sabri Öncü, 'The growth of a shadow banking system in emerging markets: Evidence from India' (2013), 39 Journal of International Money and Finance.

[84] For an overview of the benefits of market-based finance (which includes financing through the shadow banking system) as opposed to bank-based finance, *see* European Commission, *Economic Analysis Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Action Plan on Building a Capital Markets Union* (European Commission 2015) 17-25, Available at: http://ec.europa.eu/finance/capital-markets-union/docs/building-cmu-economic-analysis_en.pdf.

The key question is, however, the cost of shadow banking for society. This cost can be substantial because of systemic risk. The same mechanism to meet the demand for safe assets by global investors is responsible for the collapse of the financial system when the promise of safety cannot be honored. In economic terms, this means that safe assets are overproduced due to a negative externality. That is to say, the social cost of the liquidity and leverage produced by shadow banking is higher than the private cost. Similar to banks, the case for regulating shadow banking stems from the circumstance that shadow-banking crises impose negative externalities on the rest of the system.

5. The case for regulating shadow banking

The negative externalities of shadow banking are the cost of a financial crisis. To prevent such a crisis from destroying the financial system, governments support systemically important firms with various forms of safety nets, including bailouts. Since the GFC, these safety nets have notably extended to non-banks, which engaged in shadow banking. Bailouts are perhaps the least important social cost of a financial crisis. The persistent reduction of output stemming from the impairment of the financial system has been historically a much higher cost.[85] Bailouts, however, reveal the weak spots of the financial system in a crisis. Looking at bailouts is thus useful to identify the externalities of shadow banking, with a view to correcting them through regulation.

History reveals that the short-term liabilities of institutions that engage in maturity transformation (whether banks or shadow banks) are most often subject to bailouts when there is a systemic crisis.[86] The rationale for bailouts is to avoid runs, which are self-fulfilling prophecies of insolvency that can bring down an entire financial system. Runs are systemic when the insolvency concerns affect banking as a whole, not the idiosyncratic features of one or more institutions. A perception of systemic insolvency can happen because of the interconnectedness between the banks (credit channel of contagion) or because all banks are invested in the same classes of assets and their value suddenly becomes unclear (market channel of contagion). Both factors are usually at play at the same time. However, we focus on the market channel because it seems to be the starting point for shadow banking.

Shadow banks can credibly promise to convert their short-term liabilities into money by investing their funds in financial assets, which are marketable. Under certain conditions, specified by risk models, these assets can be liquidated safely and deliver the funds necessary to honour the liabilities. One of these conditions is the haircut (or margin), which defines the amount of equity that intermediaries have to

[85] Carmen M. Reinhart and Kenneth S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly* (Princeton University Press, 2009).
[86] Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance'.

maintain to always make good on their liquidity promise. Importantly, when the asset is considered sufficiently liquid, the haircut can be zero – i.e., the collateral itself is sufficient to back the liquidity promise. Moreover, shadow banking often relies on a liquidity put by banks for the very unlikely situation in which the safety conditions do not hold true.[87] Asset safety is based on statistical models that can be proved wrong. When this is the case – as, for instance, was the case for Mortgage-Backed Securities (MBS) during the global financial crisis – liabilities such as repos, as well as the assets backing them, are no longer considered safe. A run on shadow banking ensues. This can spread to the more traditional banking system simply by way of activating the above-mentioned liquidity puts.

A run on shadow banking differs from a run on a traditional bank,[88] but only slightly. In shadow banking, the run tries to recreate the safety of the assets backing the shadow bank liabilities by imposing higher haircuts for refinancing. This is problematic because if the system does not have enough equity to meet the margin call, the price of the collateral will crash. This, in turn, will lead to increasing haircuts making more financial intermediaries insolvent. However, this is not the only way in which a run can occur on shadow banking. A withdrawal from shadow banking can resemble a more 'classic' bank run in two situations. First, the collateral may suddenly become unacceptable (i.e. haircut equal to 100%) and no refinancing be offered.[89] Second, shadow banking liabilities are not always guaranteed by what we would call proper collateral in legal terms. For instance, like demand deposits, MMMF shares are not collateralized. In addition, banks issue other short-term wholesale liabilities, such as commercial paper, which may or may not be collateralized.[90] All of these liabilities are susceptible to runs.

Collateral is still a distinctive feature of banking – both traditional and shadow – if understood in economic, not legal terms. What matters to investors is the assets backing the liquidity promises of a bank. In economic terms, these assets are collateral regardless of whether lenders can seize them to get their money back, which would characterize proper collateral in legal terms. The key issue is whether the assets can be liquidated for a price enabling the repayment of short-term debt. In the event of illiquidity, the credibility of the bank's promises depends on how much of this 'collateral' it owns to absorb the volatility of assets prices. The reciprocal of this equity margin of safety – which is also known as "haircut" – is the leverage.

In principle, shadow banking can create money-like short-term liabilities, and get them accepted, with or without posting collateral in a narrow sense. When collateral is posted, the leverage can be measured

[87] Darrell Duffie, 'The Failure Mechanics of Dealer Banks' (2010), 24(1) The Journal of Economic Perspectives.
[88] Gorton and Metrick, 'Securitized Banking and the Run on Repo'.
[89] This is actually what happened in the crisis and some collateral became suddenly unacceptable. *See* Ibid.
[90] Andrei Shleifer, 'Comments and Discussions (Regulating the Shadow Banking System by Gary Gorton & Andrew Metrick)' (2010), Brookings Papers on Economic Activity.

directly on the asset. This is what lenders do all the time when they set a haircut, which is effectively a constraint on leverage. When no collateral is posted, the leverage can be measured only on the balance sheet of (shadow) banks as a ratio of liabilities to the market value of the equity. In this case, lenders cannot impose a leverage requirement, but can only decide whether to lend or not, given the leverage they observe.

The law and economics debate on shadow banking focuses on collateral because that appears to be responsible for the externalities of shadow banking. Indeed, collateral crises have been the main driver of financial instability in recent times. Shadow banking has promised immediacy (i.e. money) against securities (i.e. collateral) deemed safe according to the prevailing risk models. Upon materialization of tail risk undermining this perceived safety, collateral crises have ensued, triggering withdrawals from all sorts of collateralized lending. The latter typically includes repos, but as illustrated earlier, derivatives follow the same logic. When haircuts go up, asset prices go down because the agents with leveraged long positions lose wealth and must sell, whereas new agents cannot leverage as much as to absorb the forced sales.[91] Haircuts are a measure of leverage, but because we speak about banking, leverage implies liquidity and vice versa. Rising haircuts on several classes of assets mean systemic bank runs that reduce market liquidity and funding liquidity simultaneously.[92] Such runs can only be stopped by a central bank credible enough to recreate the perception of safety that was lost. Showing willingness to buy any quantity of the distressed assets at a given price, the central bank effectively sets an upper limit on haircuts and, by stabilizing the price of the assets being levered upon, stops a financial crisis.

Unfortunately, by stopping a collateral crisis, the central bank suspends market discipline, too. Assets purchased by the central bank cannot be worth less than what the central bank is willing to pay for them. They become 'safe' again precisely for this reason. Although this kind of intervention is supposed to remedy illiquidity, it can conceal insolvency. More important, expectations of such central bank intervention fuel moral hazard. With moral hazard in place, the negative externalities of shadow banking are exacerbated. The overproduction of safe assets by the private sector, which characterizes shadow banking, would be an even bigger problem if central banks guaranteed the safety of collateral at no cost.

In order to address this problem, some commentators have proposed to charge for the prospective liquidity insurance by the central bank. To operationalize this levy, access to collateral for short-term funding should be restricted. This could be done by restricting collateralized borrowing to a special class of financial

[91] Fostel and Geanakoplos, 'Endogenous Collateral Constraints and the Leverage Cycle'.; John Geanakoplos, 'The Leverage Cycle' in Daron Acemoglu, Kenneth Rogoff and Michael Woodford (eds), *NBER Macroeconomics Annual 2009*, vol 24 (NBER Macroeconomics Annual 2009, University of Chicago Press 2010).
[92] Brunnermeier and Pedersen, 'Market Liquidity and Funding Liquidity'.

institutions, which would be regulated, and pay for insurance, like banks do for deposit insurance.[93] Alternatively, the levy could be charged as a condition for collateral to enjoy the bankruptcy law privileges that make it attractive for backing short-term liabilities.[94] Collateral in repos and marked-to-market derivatives can be seized immediately in case of default, by way of exception to the bankruptcy rules. Charging for the use of bankruptcy-exempt collateral is effectively a Pigovian tax to correct the externality, aiming to make shadow banks bear ex-ante the social cost of illiquidity.[95]

Although we agree that regulation of shadow banking should be instrument-based, we think that an approach based on liquidity insurance has the following shortcomings. First, it would be overly difficult to set a price for this insurance accurately. The unavoidable intervention by central banks in collateral crises makes liquidity a public good. The liquidity provided by central banks works because it is unlimited, hence it is non-rival and no-one can be credibly excluded from it when there is a systemic crisis. Setting the price of public goods is always difficult, but pricing a liquidity put can be a daunting task. To avoid moral hazard, the price of insurance should be risk-based. However, the risk of illiquidity is systemic, which as we discussed is difficult to define, let alone to measure. Although we acknowledge the efforts by authoritative economists to measure systemic risk,[96] this measurement will never be precise because of Knightian uncertainty. Because illiquidity stems from the failure of credit risk models, there is no reason why systemic risk models, however sophisticated, should be infallible.

As second problem with charging for the central bank's liquidity put is time inconsistency. The threat to withhold the liquidity put from those who have not paid the insurance premium is not credible. As soon as the collateral becomes systemic, the central bank's liquidity put is the tool of last resort to avoid financial collapse. Note that this problem cannot be overcome ex-ante, for instance by imposing an automatic stay on uninsured collateral in the event of default. Because lenders do not run on the collateral, but on the liabilities backed by it, fire sales of collateral happen much earlier than default. Therefore, the automatic stay may only accelerate default by making lenders more nervous.

Furthermore, as mentioned, the economic definition of collateral is much broader than the legal definition. This leads us to the third problem with a liquidity tax: it can only be imposed on entities or instruments we know of. We do not know how shadow banking will look like in the future. In the future, shadow banking may not rely explicitly on collateral as we know it, but still produce money-like liabilities in such

[93] Gorton and Metrick, 'Regulating the Shadow Banking System'.
[94] Enrico Perotti, 'The roots of shadow banking' (2012), Duisenberg School of Finance Policy Paper Series. Available at: http://www.dsf.nl/wp-content/uploads/2014/10/DSF-Policy-Paper-No-24-The-roots-of-shadow-banking.pdf.
[95] Enrico Perotti and Javier Suarez, 'The simple analytics of systemic liquidity risk regulation' in Dirk Schoenmaker (ed), *Macroprudentialism* (Macroprudentialism, CEPR Press 2014).
[96] *See* broadly, Brunnermeier and Krishnamurthy, *Risk Topography: Systemic Risk and Macro Modeling,*

proportions as to claim the liquidity put by the central bank during a financial crisis. Note that large banks have been playing this strategy for centuries, with and without collateral.

Due to the above concerns, we do not think that restricting access to collateral as a way to charge for liquidity insurance could work. In fact, rather than curbing shadow banking, this approach may miss it altogether. This would be a serious problem in light of the macroeconomic imbalances feeding on shadow banking. Currently, the global excess demand for safe assets pushes yields down, and central banks have been accommodating this to avoid depression. But that cannot be the end of the story. The ultimate consumers of safe assets – the asset management industry measuring some $86 trillion worldwide[97] – need yield too, if only to fund retirement payments, which are increasing due to demographic factors. As we will discuss in the next section, post-GFC regulation has curbed the ability of the official banking sector to leverage, take risks, and provide liquidity. Therefore, the demand for safe assets delivering some yield must be satisfied by some other parts of the financial system. Shadow banking is the natural candidate for this.

To cope with the externalities of shadow banking, we rather advocate quantity regulation. Quantity regulation is preferable to a Pigovian tax when the social cost is difficult to estimate, as the individual contribution to systemic risk by shadow banks.[98] Moreover, quantity regulation is relatively easy to implement via a single-policy variable, which is leverage. Finally, leverage is a straightforward indicator to which regulation can be immediately linked (e.g. as minimum haircut regulation), without need to rely on a complex, thus fallacious, model of systemic risk.[99] Leverage is a necessary condition for shadow banking, so the latter can be identified and cut down in size through the former. Following the economic literature advocating monitoring and curbing leverage on the assets that can be pledged as collateral,[100] we argue that shadow banking should be regulated indirectly, by capping the admissible levels of leverage on these assets. Regulation can constrain leverage at the asset level by setting up minimum requirements in terms of collateral ownership by the borrower, that is to say, minimum haircut regulations.

In our opinion, minimum haircuts should be established on every debt contract generating short-term, money-like liabilities. Apart from the difficulty for regulation to identify the optimal leverage on every

[97] Andrew G. Haldane, 'The age of asset management?' (2014) (Speech at the London Business School).
[98] Law and economics generally favors the corrective taxation of externalities over quantity regulation. *See* Louis Kaplow and Steven Shavell, 'On the Superiority of Corrective Taxes to Quantity Regulation' (2002), 4(1) American Law and Economics Review. This is based on the assumption that social harm can be measured, which does not hold true in the case of shadow banking. If the social harm is measurable, a Pigovian tax is preferable to quantity regulation because it can be adapted to the severity of the harm, for instance by way of a variable tax. This is not an option for shadow banking, because systemic risk can only be imperfectly measured due to model uncertainty. As discussed earlier in the text, this circumstance disallows a risk-based liquidity tax.
[99] John Geanakoplos and Lasse Heje Pedersen, 'Monitoring leverage' in Markus Brunnermeier and Arvind Krishnamurthy (eds), *Risk Topography: Systemic Risk and Macro Modeling* (Risk Topography: Systemic Risk and Macro Modeling, University of Chicago Press 2012).
[100] *See* Geanakoplos, 'Leverage, Default, and Forgiveness: Lessons from the American and European Crises'.; Brunnermeier and Krishnamurthy, *Risk Topography: Systemic Risk and Macro Modeling,*

class of assets being used as collateral for short-term promises, that would not be enough to curb shadow banking. Short-term liabilities could be issued without explicit reference to collateral. Therefore, leverage should be monitored and restricted at the level of the entities making such promises, too. This would seem to put us back into the difficulty of mapping the entities constituting shadow banking at any point in time. However, it is practically difficult to imagine credible liquidity promises which are not backed by marketable assets *or* a robust liquidity put. Banks are able to make unsecured promises because they rely on a web of credit and liquidity puts from the public sector. For this reason, banks' leverage is directly regulated. Such a regulation does extend to shadow banking in as much as it is sponsored by banks. This is another form of indirect regulation, which actually exists already, as we will illustrate in the next section.

The advantage of our approach is that it identifies all the items of the financial system requiring backstops (or bailout) in the event of a crisis. These are the assets being levered upon to promise liquidity and the banks that back up such liquidity promises. Financial innovation must use one of these channels to create private money, but this would lead to increased systemic risk at the same time. Importantly, these channels are defined broadly enough to capture different ways in which shadow baking may play out in different jurisdictions. This is very useful for international cooperation, which is essential to regulate shadow banking effectively. At the same time, asset leverage and bank leverage restrictions are sufficiently specific concepts to embed into legislation. This overcomes the legitimacy concerns that could arise if these restrictions were to be established exclusively by regulatory agencies.

Two challenges remain, however. The first challenge is to set the minimum haircuts (maximum leverage) at the right level, bearing in mind that excessive curbs on (shadow) banking undermine efficiency. The second challenge is to adjust these regulations over time. Dealing with the first problem requires statistical models, similar to those necessary to identify the optimal leverage (and liquidity) ratio(s) for banking institutions. Asset-based models of risk assessment, however, are much simpler than the models used to measure systemic risk. Setting conservative haircuts only requires identifying the worst-case price scenario for each class of assets. The second problem is more difficult to deal with. On the one hand, new classes of assets may be used for leverage. On the other hand, the conservative haircuts will have to be adapted to new circumstances, in one direction or another. The adaptation problem depends on the same reason why, in the end, all preventative regulations for minimizing systemic risk – including shadow banking regulation – will fail and require crisis management. This is a general problem in the pursuit of financial stability as a policy goal. We argue that the regulation of leverage, particularly at the asset level, fares better than alternative approaches to regulating shadow banking. However, the efficient regulation of shadow banking, as of any other source of systemic risk, calls upon financial regulators to exercise some discretion in order to adapt to unforeseen circumstances.

6. Regulatory responses to shadow banking

It is often argued that shadow banking played a key role in the global financial crisis because of lack of regulation. This is not entirely correct. The participants in the shadow banking system were, and still are, regulated individually. However, regulators have failed to see the forest for the trees and concentrated on regulating separate parts of the system, without considering the impact of regulation on shadow banking as a whole.

In this section, we take a different approach to reviewing the regulation of shadow banking. Having identified the roots of shadow banking in leveraging on financial assets, which is instrumental to liquidity promises, we look at the *entities* that perform this activity or support it indirectly. Moreover, to cope with regulatory arbitrage and financial innovation, we focus on how regulation addresses the *instruments* of shadow banking. We take a critical view to existing regulations in light of the conclusion we reached in the previous section regarding the optimal design of shadow banking regulation.

The regulation of shadow banking entities may be direct or indirect. *Direct* regulation of shadow banking focuses on shadow banks as we know them, and tries to address the systemic risk stemming from their operation. MMMFs are a case in point. Direct regulation also tries to adapt to new forms of shadow banking, either by defining new entities based on certain activities (roughly the EU approach) or by giving regulators the authority to include new entities into the regulatory perimeter (basically the U.S. approach). Shadow banking may also be regulated *indirectly*, through its connections with the banks. For instance, because the largest securities dealers are associated with banks, they are affected by the regulation of bank capital. This is important in view of shadow banking's reliance on backstops from the official banking sector (and hence, from the public sector). Other examples of this approach include the regulation of banks' large exposures as well as the structural regulations aimed to separate traditional banking from shadow banking. Indirect regulation of this kind may have unintended consequences. Increasing the regulatory burden on the banking industry tends to push shadow banking towards bank-independent entities that may escape regulation's outreach.

Another form of indirect regulation is based on the *instruments* of shadow banking. Examples include, among others, securitization, securities financing transactions (e.g. repos), and derivatives. These are all instruments of leverage based on liquidity promises. Securitization generates market liquidity for illiquid assets; repos transform market liquidity into funding liquidity; and derivatives allow all kinds of synthetic leverage via the exposure to a notional amount. All of these instruments rely on some sort of collateral. Regulatory reforms aim to improve the transparency of this collateral and to constrain shadow banking by

capping the admissible leverage at the asset level.[101] The advantage of this approach is that, so long as the instruments to be regulated are defined functionally, regulation may remain effective despite financial innovation. Moreover, if collateral is monitored carefully, cutting ties with the banking system would not be an effective strategy for regulatory arbitrage. As a practical matter, both of these conditions for an effective instrument-based regulation are not perfectly attainable. Combining entity-based and instrument-based regulation of leverage is therefore necessary to cope with the systemic risk implications of shadow banking.

There are several ongoing regulatory reforms around the world. We critically review only the regulation of shadow banking in the U.S. and the EU, which are expected to provide the main regulatory models.[102]

6.1. Entity-based regulation

6.1.1. Direct regulation

The EU response to shadow banking includes both entity-based and instrument-based regulation. In March 2012, the European Commission launched a public consultation, after which a two-fold legislative package was proposed.[103] The first part is the Regulation on Transparency of Securities Financing Transactions and of Reuse (SFTR).[104] Because this is an instrument-based approach to shadow banking regulation, we will discuss it in the next subsection. The second prong of the EU response is instead entity-based. It consists of a proposal to directly regulate MMMFs,[105] which by and large follows the U.S. model of MMMF regulation except where the proposal is concerned with idiosyncrasies of the EU MMMFs.[106]

MMMFs are financial intermediaries that connect short-term debt issuers with providers of funds who need daily liquidity. Starting from the 1970s, in the U.S., financial products developed by the MMMFs, called NOW accounts (Negotiable Order of Withdrawal), were widely accepted as a direct substitute for bank deposit. These products were the pioneering examples of shadow banking disintermediating depository

[101] Financial Stability Board, *Transforming Shadow Banking into Resilient Market-based Finance: An Overview of Progress* (2015) 5-13, Available at: http://www.fsb.org/wp-content/uploads/shadow_banking_overview_of_progress_2015.pdf.
[102] Adrian and Ashcraft, 'Shadow banking regulation', 26.
[103] In 2012, the European Commission (EC) published a Green Paper on shadow banking. *See* European Commission, Green Paper: Shadow Banking, COM(2012) 102 final. Further on, the regulation of shadow banking at the EU level was put on the regulatory agenda by European Commission, *Proposal for a Regulation of the European Parliament and of the Council on Money Market Funds* COM(2013) 615 final (4.9.2013).
The communication on shadow banking is the second prong of the EU package. It reviews all existing measures and additional measures that can be considered to regulate shadow banking activities. This proposal basically sets out the policy objectives and timeline for the regulatory reform of shadow banking. *See* European Commission, *European Financial Stability and Integration Report 2013* SWD(2014) 170, *116*. Available at: https://ec.europa.eu/info/system/files/efsir-2013-28042014_en.pdf
[104] Regulation (EU) 2015/2365 of the European Parliament and of the Council of 25 November 2015 on transparency of securities financing transactions and of reuse and amending Regulation (EU) No 648/2012.
[105] Council of the European Union, *Proposal for a Regulation of the European Parliament and of the Council on Money Market Funds. Confirmation of the final compromise text with a view to agreement*, Brussels, 30.11.2016, 2013/0306 (COD). Available at: http://data.consilium.europa.eu/doc/document/ST-14939-2016-INIT/en/pdf.
[106] *See* 17 CFR 270.2a-7.

institutions. Currently, CNAV (Constant Net Asset Value) MMMFs are substitutes for insured deposits. They provide a source of safe assets for those institutional investors having surplus funds who need to keep such funds liquid. MMMFs are supposed to make good on the promise to never 'break the buck.' However, when the Reserve Primary Fund was unable to keep that promise during the GFC, public authorities were forced to intervene and offer a liquidity put to all MMMFs. This circumstance drew attention to the risk of runs on MMMFs, calling for the regulation of such entities.

Although MMMFs provide a functional substitute for a bank's demand deposits, legally speaking they are mutual funds. Formally, MMMFs are not leveraged because their liabilities are equities. The problem is that MMMFs promise to redeem their equities at par. Therefore, regulation should either prohibit such a promise, by imposing a floating NAV, or impose on the funds that offer CNAV leverage and/or liquidity restrictions comparable to those applicable to banks. Although a proposal was made to combine these approaches,[107] on both sides of the Atlantic regulation has chosen to allow MMMFs to offer a stable NAV under strict liquidity conditions.

In the U.S., the Securities and Exchange Commission (SEC) overhauled rule 2a-7, imposing on MMMFs restrictions in terms of investment diversification and liquidity, as well as customer profiling.[108] Today, in order to be able to offer CNAV MMMFs to institutional investors, U.S. funds must invest almost exclusively in government securities.[109] Additional rules are established to disincentivize redemptions in situations of stress. The EU draft regulation is similar to the U.S. regulation. Although the European Commission initially proposed to mandate a 3% capital buffer on all CNAV funds,[110] this proposal was scrapped at the request of the European Parliament. The compromise agreed by the EU institutions allows funds to offer CNAV only if they invest in public debt or in a new class of low volatility assets, which are narrowly defined in terms of liquidity and residual maturity.[111]

The approach by the American and the European regulators seeks to avoid runs on MMMFs by imposing liquidity rules. In principle, this approach cannot rule out runs in the absence of insurance.[112] However,

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[107] Martin N. Baily and others, 'Reforming money market funds: A proposal by the Squam Lake Group' (2011), Squam Lake Group. Some commentators, however, believe that this proposal could not rule out runs. Tobias Adrian and Adam B. Ashcraft, 'Shadow Banking: A Review of the Literature' in Garett Jones (ed), *Banking Crises: Perspectives from The New Palgrave Dictionary* (Banking Crises: Perspectives from The New Palgrave Dictionary, Palgrave Macmillan 2016).

[108] 17 CFR 270.2a-7.

[109] Darrell Duffie, *Financial Regulatory Reform after the Crisis: An Assessment* (2016) Available at: http://www.darrellduffie.com/uploads/policy/duffiesintraJune2016.pdf

[110] European Commission, *Proposal for a Regulation of the European Parliament and of the Council on Money Market Funds.*

[111] Essentially, after a transition period of 2 years, all existing CNAV funds in the EU will have to be invested exclusively in public debt instrument or convert into Low Volatility Net Asset Value (LVNAV) funds. Council of the European Union, *Proposal for a Regulation of the European Parliament and of the Council on Money Market Funds. Confirmation of the final compromise text with a view to agreement*, Brussels, 30.11.2016, 2013/0306 (COD). *See* http://data.consilium.europa.eu/doc/document/ST-14939-2016-INIT/en/pdf.

[112] Adrian and Ashcraft, 'Shadow banking regulation', 45. NAV rule makes runs possible. Stable NAV rule is what distinguishes MMMFS from other mutual funds.

restricting the investments of MMMFs to government securities effectively implies a liquidity put by the central banks dealing in these securities.

Although MMMFs are large (some Euro 3,2 trillion as of 2014),[113] shadow banking includes much more than MMMFs. Including more entities into shadow banking is challenging because while many entities potentially qualify, they do not necessarily create systemic risk.[114] Regulating financial entities in the absence of systemic risk is usually inefficient. Moreover, because the participants in the shadow banking system change with time,[115] entity-based approaches to regulation, however sophisticated, become quickly outdated. Nevertheless, in both the U.S. and the EU, regulation tries to include dynamically new entities into the regulatory perimeter of shadow banking.

In the EU, regulation seeks to capture new forms of shadow banking through the Alternative Investment Fund Managers Directive (AIFMD).[116] This Directive includes hedge funds, private equity funds, real-estate funds, and infrastructure funds as Alternative Investment Funds (AIFs). The AIFMD requires managers of AIFs to report their leverage and liquidity policies to the competent supervisory authorities.[117] Moreover, the AIFMD provides for regulation of both liquidity and leverage in order to reduce systemic risk.[118] On the contrary, no leverage or liquidity requirements are established on such investment funds in the U.S. However, the Dodd-Frank Act grants the Financial Stability Oversight Council (FSOC) the authority to determine whether a non-bank financial company (NBFC) should be supervised by the Federal Reserve and be subject to enhanced prudential standards, possibly even more stringent than those applying to regular banks.[119] To date, the FSOC designated four firms as Systemically Important NBFC including American International Group, Inc., (AIG), General Electric Capital Corporation, Inc. (GE Capital), Prudential Financial, Inc. (Prudential), and MetLife, Inc. (MetLife).[120] MetLife could successfully challenge the constitutionality of its designation[121] and overturned it on the grounds of arbitrariness.[122]

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[113] Deutsche Bank Research, 'Money market funds – an economic perspective' (February 26, 2015). Available at https://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000351452/Money_market_funds_%E2%80%93_an_economic_perspective%3A_Matc.pdf.

[114] Claessens and Ratnovski, 'What is shadow banking?'.

[115] Mehrling and others, 'Bagehot was a shadow banker: shadow banking, central banking, and the future of global finance'.

[116] Directive 2011/61/EU of the European Parliament and of the Council of 8 June 2011 on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010. OJ L 174, 1.7.2011, p. 1–73.

[117] Michael McDonald, 'Containing Systemic Risk: New Developments in Trans-Atlantic Hedge Fund Regulation' (2011), 34 Loyola of Los Angeles International and Comparative Law Review 261-263.

[118] Article 16(1) of the Directive 2011/61/EU.

[119] Such a designation cannot be delegated and requires a vote by two-thirds of the voting members including the Chairperson of the FSOC. The Secretary of the Treasury is the chairperson of the FSOC. 12 U.S.C. § 5323 (a)(1). *See also* 12 CFR § 1310.10.

[120] Financial Stability Oversight Council, *Designations* (2016) Available at: https://www.treasury.gov/initiatives/fsoc/designations/Pages/default.aspx.

[121] MetLife Inc. v. Financial Stability Oversight Council, 15-cv-00045, U.S. District Court, District of Columbia.

[122] *See* Robert C Hockett, 'Oversight of the Financial Stability Oversight Council: Due Process and Transparency in Non-Bank SIFI Designations' (2015), Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2796331.

This U.S.–EU comparison reveals a fundamental trade-off in designing the adaptation strategy of a direct, entity-based regulation of shadow banking. This strategy may rely on a list of entities. Although the precise identification of entities facilitates enforcement, it may be both over-inclusive and under-inclusive with respect to systemic risk, particularly in a dynamic perspective. A strategy relying on the discretion of regulators is preferable to adapt to unforeseen circumstances. However, from a legal perspective, this strategy creates legitimacy concerns, which may be well founded from an economic standpoint in the absence of an incentive-compatible governance of financial regulators.[123] The indirect regulation of shadow banking aims to overcome these problems.

6.1.2. Indirect regulation

Somewhat counterintuitively, a key constraint on shadow banking stems from the regulation of banking proper. In particular, the Basel III standards require banks to fund themselves with more equity of higher quality, impose new liquidity requirements, and overall aim to keep bank size manageable in the event of a crisis (i.e., to avoid the too-big-to-fail problem).[124] Such requirements affect shadow banking, too, to the extent that it is affiliated or otherwise interconnected with banks.

The first consequence of Basel III on shadow banking is the treatment of off-balance-sheet vehicles, such as ABCP conduits. Prior to the GFC, these vehicles were not subject to capital regulation. Today, capital requirements are to be applied to consolidated securitization transactions and ABCP conduits of depository institutions.[125] The on-balance-sheet treatment of securitization will increase the capital requirements of banks.[126] Although shadow banking could avoid those in the absence of affiliation with a bank, this is a rather theoretical scenario. Shadow banking needs collateral or a liquidity put. By imposing capital requirements on the latter, the reform reduces the scope for regulatory arbitrage. The downside is that genuine risk transfer to third parties no longer enjoys regulatory capital relief.[127]

Another important feature of Basel III is the introduction of liquidity requirements, such as the liquidity coverage ratio (LCR)[128] and the net stable funding ratio (NSFR).[129] These requirements aim to stop sudden flights to liquidity, which are disruptive. Liquidity requirements are based on the idea that reliance on short-

[123] Ross Levine, 'The Governance of Financial Regulation: Reform Lessons from the Recent Crisis' (2012), 12(1) International Review of Finance.
[124] Supervision, *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems.*
[125] *See* 12 CFR § 567.
[126] Adrian and Ashcraft, 'Shadow banking regulation', 27-28.
[127] Ibid.
[128] Basel Committee on Banking Supervision, *Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools*, January 2013), Available at: https://www.bis.org/publ/bcbs238.htm. *See also* article 412 of CRR (liquidity coverage requirement)
[129] Basel Committee on Banking Supervision, *Basel III: The Net Stable Funding Ratio*, October 2014), Available at: https://www.bis.org/bcbs/publ/d295.htm. *See also* Art. 413 of the CRR.

term funding can be highly contagious in the event of exogenous shocks to a bank.[130] Liquidity crises are, however, endogenous. In this perspective, liquidity requirements rather matter as a constraint on the growth of (shadow) banking. Neither the LCR nor the NSFR are defined as requirements to hold an amount of cash (or cash-equivalent) against short-term liabilities, as they should be.[131] However, if these were proper liquidity requirements, they would operate in the same fashion as the reserve requirements for demand deposits. Reserve requirements constrain the ability of banks to lever on collateral, because a part of the latter must always be set aside for any amount of short-term liabilities issued. Liquidity requirements for banks constrain shadow banking indirectly. Although independent shadow banks could theoretically do away with these requirements, this would be unthinkable in the absence of a liquidity backstop from a depository institution. One of the purposes of liquidity regulation is indeed to make such backstops from banks more expensive.[132]

Basel III has also introduced a straight leverage ratio, which is invariant to the risk of the banks' investments.[133] In the U.S., this is called Supplementary Leverage Ratio (SLR) and it is more stringent than in the EU. In the U.S., banks need to fund at least 6% of their asset with equity, whereas the European requirement is only 3% and has still to be phased in.[134] Supplementing the traditional risk-weighted capital regulation with leverage restrictions makes regulatory arbitrage more difficult, but it comes at a cost. All else being equal, institutions subject to an SLR will rather choose riskier investments. Moreover, financial institutions will try to avoid the leverage ratio to begin with. Both these issues reflect on shadow banking, as revealed by the experience with the SLR in the U.S.

Recent studies found that pursuant to the introduction of the SLR in 2014, repo borrowing by bank-affiliated broker-dealers has decreased,[135] but the use of repo backed by riskier collateral has increased.[136] In addition,

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[130] Hal Scott, 'Interconnectedness and Contagion: Financial Panics and the Crisis of 2008' (2014), 9-10. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2178475. The alternative to liquidity requirements is the emergency public lending facilities. However, it is argued that such requirements which can protect against the liquidity-driven runs are of limited effectiveness and the role of central banks in providing liquidity will remain essential in guarding against contagion. *See* ibid.

[131] Charles W. Calomiris, 'Getting the Right Mix of Capital and Cash Requirements in Prudential Bank Regulation' (2012), 24(1) Journal of Applied Corporate Finance.

[132] Adrian and Ashcraft, 'Shadow banking regulation', 30.

[133] Basel Committee on Banking Supervision, *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems,*

[134] The CRR entered into force on 27 July 2013. The in-scope institutions are required to apply the rules starting from January 01, 2014. However, full implementation will not take place until January 01, 2019. According to the Basel standards and the CRD IV package, the leverage ratio is to be set at a 3% limit during the testing phase ('parallel run' period = January 01, 2013 to January 01, 2017), with disclosure starting from January 01, 2015.

[135] For the complexities involved in the US bank holding structures, *see* Avraham, Selvaggi and Vickery, 'A structural view of US bank holding companies'.

[136] Meraj Allahrakha, Jill Cetina and Benjamin Munyan, 'Do Higher Capital Standards Always Reduce Bank Risk? The Impact of the Basel Leverage Ratio on the U.S. Triparty Repo Market' (2016), Office of Financial Research Working Paper. As revealed by Gorton and Metrick, a run on repos backed by risky collateral can be highly disruptive of the financial system. *See* Gorton and Metrick, 'Regulating the Shadow Banking System'.

there is indirect evidence that bank-affiliated broker-dealers have been discouraged from borrowing in tri-party repo markets.[137] This development was concomitant with an increase in the activity of non-bank-affiliated dealers entering tri-party repo markets. This suggests that risk-taking in the repo markets is shifting from the banking sector to independent shadow banking.[138] A similar development may be predicted for Europe. Pushing certain risks away from official banking, leverage regulations may increase the overall fragility of the credit intermediation system.[139] Besides, risk-insensitive leverage restrictions undermine efficient risk-taking by both shadow and official banks.

By way of steering banks away from low-risk, low-return strategies, a straight leverage ratio curbs all shadow banking which is affiliated with, or sponsored by, the official banking sector. Banking regulation may indirectly constrain independent shadow banking, too, by limiting the exposure of banks to counterparty risk. In the EU, an exposure is large if it exceeds 10% of an institution's eligible capital.[140] Exposures exceeding 25% of the capital or €150 million are prohibited.[141] Similar rules apply to U.S. depository institutions and under Basel III.[142] These exposure limits are meant to ensure that a bank will not become insolvent upon the failure of one large counterparty. Because large counterparties can be shadow banks, exposure limits may limit the reliance of shadow banks on bank funding or liquidity puts. More in general, focusing on the largest exposures of the largest banks is a good strategy to identify systemic risk without having to rely on particular entities definitions or risk models.[143]

A final way to constrain shadow banking indirectly is to prohibit, by way of structural regulation, banks from engaging in it.[144] Having a tradition of such a structural regulation, dating back to the separation between commercial and investment banking, the U.S. has pioneered this approach with the Volcker Rule.[145] This rule aims to limit the extension of government backstops from depository to non-depository institutions by prohibiting the former from engaging in proprietary trading either directly or by sponsoring

[137] Duffie, *Financial Regulatory Reform after the Crisis: An Assessment.* On the functioning of tri-party repos, *see* below, text accompanying notes 164 to 165.
[138] Allahrakha, Cetina and Munyan, 'Do Higher Capital Standards Always Reduce Bank Risk? The Impact of the Basel Leverage Ratio on the U.S. Triparty Repo Market'.
[139] Samuel G. Hanson, Anil K. Kashyap and Jeremy C. Stein, 'A Macroprudential Approach to Financial Regulation' (2011), 25(1) Journal of Economic Perspectives 25.
[140] Article 392 CRR.
[141] Art. 395 CRR, EBA has recently published guidelines on limits on exposure to shadow banking (03/06/2016); https://www.eba.europa.eu/regulation-and-policy/large-exposures/guidelines-on-limits-on-exposures-to-shadow-banking
[142] 12 CFR § 206.4 (a)(1). Similar requirements exist in Basel III. For Basel standards on large exposures, *see* Basel Committee on Banking Supervision, *Standards: Supervisory Framework for Measuring and Controlling Large Exposures* (Bank for International Settlements, Basel April 2014) https://www.bis.org/publ/bcbs283.pdf
[143] Darrell Duffie, 'Systemic Risk Exposures: A 10-by-10-by-10 Approach' in Markus Brunnermeier and Arvind Krishnamurthy (eds), *Risk Topography: Systemic risk and macro modeling* (Risk Topography: Systemic risk and macro modeling, University of Chicago Press 2014).
[144] John C. Coates IV, 'The Volcker Rule as structural law: implications for cost–benefit analysis and administrative law' (2015), 10(4) Capital Markets Law Journal.
[145] Section 619 of the Title VI of the Dodd-Frank Act (12 U.S.C. § 1851).

hedge and private equity funds.[146] Although the Volcker Rule limits the interconnectedness between traditional and shadow banking, it is necessarily imprecise in defining the latter and may have other unintended consequences. In particular, the Volcker Rule may increase systemic risk by incentivizing financial institutions to shift their proprietary trading to "a frailer part of the financial system.[147] Similar considerations apply to the EU version of the Volcker Rule, which has been proposed by the European Commission along similar lines.[148] The UK approach to structural regulation is slightly different. Acknowledging the difficulties in identifying shadow banking for the purpose of separation, the UK regulation rather defines core banking services and mandates their ring-fencing of their liabilities from any other activity carried out within the group.[149]

Structural reforms may do more harm than good. They tend to decrease market liquidity and to push credit intermediation into independent shadow banking. Moreover, they are unlikely to be as effective in curbing the government support as the prudential regulations that indirectly affect shadow banking, such as the consolidation obligations and the new rules on liquidity and leverage that we have reviewed at the beginning of this subsection. These rules affect the banks' operational choices via the pricing of their liquidity put to shadow banking. Finally, whether prudential or structural, banking regulation can only partly reach out to independent entities engaging in shadow banking. In order for regulation to restrict this kind of shadow banking, an instrument-based approach is required.

6.2. Instrument-based regulation

Regulation can curb shadow banking by restricting its instruments. This is another form of indirect regulation. As we argued in Section 5, this approach to regulating shadow banking is effective and may be efficient so long as it covers all the instruments of shadow banking and for each of them identifies the optimal leverage. The most important instrument of shadow banking addressed by regulation is the collateral, which underlies shadow banking activities such as securitization, repos, and derivatives.

After the GFC, securitization has been regulated extensively. As discussed earlier, banks investing in securitizations even indirectly face enhanced capital requirements. In addition, the post-GFC regulation of

[146] Hossein Nabilou, 'Bank Proprietary Trading and Investment in Private Funds: Is the Volcker Rule a Panacea or Yet Another Maginot Line?' (Forthcoming 2017), 32(2) Banking and Finance Law Review.
[147] Kern Alexander and Steven L. Schwarcz, 'The Macroprudential Quandary: Unsystematic Efforts to Reform Financial Regulation' in Ross P. Buckley, Emilios Avgouleas and Douglas W. Arner (eds), *Reconceptualising Global Finance and Its Regulation* (Reconceptualising Global Finance and Its Regulation, Cambridge University Press 2016) 153. (Arguing that the Volcker Rule may not only increase systemic risks, but also it may impair efficiency because commercial banks have to forgo the revenue from prop trading).
[148] European Commission. Proposal for a Regulation of the European Parliament and of the Council on structural measures improving the resilience of EU credit institutions, COM(2014), 43 final.
[149] *See* Part 1 'Ring-fencing' of the UK Financial Services (Banking Reform) Act 2013.

securitization mandates a minimum risk retention at the source of securitization. Section 941 of the U.S. Dodd-Frank Act requires that originators retain an interest of at least 5%.[150] Similar rules are established by Article 405 of the CRR. The EU has extended the risk retention requirement to non-banks via the AIFM Directive.[151] Risk retention requirements limit leverage in securitizations. However, they are invariant to the risks underlying securitization. This can lead to regulatory arbitrage. Moreover, the risk retention requirements may be too high for certain loans, which would then cease to be securitized. Assuming that regulation can cope with regulatory arbitrage, the cap on leverage stemming from such requirements may make some securitizations uneconomical.[152] Over-regulation might have contributed to securitization essentially disappearing from financial markets after the GFC.

Securitization has been instrumental to shadow banking by providing suitable collateral for short-term funding.[153] Collateralized short-term funding remains a key feature of shadow banking. Shadow banks fund themselves mainly, albeit not exclusively, through repos. Repos are collateralized loans on the global money markets, typically with a maturity of one or a few days. Repos are exposed to run. The regulation of collateral addresses this core vulnerability of shadow banking.[154]

One issue about collateral is that the lender can reuse it to obtain financing. This practice is called rehypothecation and is particularly troublesome for systemic risk.[155] Volatility in collateral prices may lead to a run on the liabilities backed by such collateral.[156] Not knowing where the collateral initially posted ended up, borrowers would run as well and close their positions to repossess the collateral.[157] Brokers with matched books on both sides of such transactions, which technically face no risk, may suddenly get in trouble.

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[150] 15 U.S.C. 78o–11.

[151] Article 17, Directive 2011/61/EU. AIFs cannot invest in securitization products unless the originator, the sponsor, or the original lender continuously retains a material net economic interest of no less than 5%. *See also* Article 51(1), Regulation (EU) No 231/2013.

[152] Stijn Claessens and Laura Kodres, *The regulatory responses to the global financial crisis: some uncomfortable questions* (International Monetary Fund, 2014).

[153] Gorton, *Slapped by the Invisible Hand: The Panic of 2007,* . But *see*, *contra*, Shleifer, 'Comments and Discussions (Regulating the Shadow Banking System by Gary Gorton & Andrew Metrick)', 300.

[154] Viktoria Baklanova, Adam Copeland and Rebecca McCaughrin, *Reference guide to US repo and securities lending markets* (Federal Reserve Bank of New York Staff Reports, 2015) 33-37. Available at: https://www.newyorkfed.org/research/staff_reports/sr740.html.

[155] Steven L. Schwarcz, 'Distorting Legal Principles' (2010), 35(4) Journal of Corporation Law 699.

[156] Scott shows how hedge funds can face a prospect of becoming unsecured creditors under UK legal treatment of rehypothecated collaterals. *See* Scott, 'Interconnectedness and Contagion: Finanial Panics and the Crisis of 2008', 76-79.

[157] Christian A. Johnson, 'Derivatives and Rehypothecation Failure: It's 3:00 pm, Do You Know Where Your Collateral Is?' (1997), 30 Arizona Law Review 969.

Regulation of collateral in the U.S. is entity-based and focuses on prime brokers as the key players in collateral intermediation. Federal Reserve Regulation T[158] and SEC Rule 15c3-3[159] allow prime brokers to rehypothecate collateral up to 140% of their clients' liabilities. The EU has chosen instead an instrument-based approach, adopting a regulation of collateral in securities financing transactions (SFTR), which is set to take effect from 2018.[160] This regulation requires any firm engaging in repos or securities lending to report such transactions to trade repositories. The information to be reported notably includes leverage.[161] Moreover, the SFTR sets out limits on rehypothecation, by requiring prior consent for the reuse of collateral by the counterparty, who must be duly informed about the consequences of such reuse.[162]

The European instrument-based approach has two advantages. First, it generates the information and the data that is needed to monitor the systemic risk stemming from shadow banking directly at the source, which is leverage. Second, because regulation applies to the transaction level, it is much more difficult to circumvent, at least so long as short-term funding is collateralized. This is also the limitation of this approach. Although this is difficult to imagine today, shadow banking might come up with innovative sources of funding that have nothing to do with securities financing. The U.S. entity-based approach would cope better with this circumstance so long as the funding still had to be channelled through prime brokerage firms, or through an affiliation with a Bank Holding Company (BHC). As shown in the previous section, the official banking system is constrained by leverage and liquidity restrictions, which indirectly affect the amount of shadow banking that banks can sponsor or simply participate in.

Another important channel of transmission of systemic risk is the market infrastructure. For instance, repo contracts differ in the way they are settled. During the GFC, increases in the haircuts for certain asset classes were documented in the bilateral setting, where parties directly trade collateral against cash.[163] However, no significant haircut increase was observed in tri-party repo markets.[164] In tri-party repo markets the collateral is managed by two global dealer banks – Bank of New York Mellon and JP Morgan Chase – that basically act as clearinghouses. During the GFC, runs on tri-party repos followed the more classic pattern of sudden refusal to lend to specific counterparties.[165]

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[158] 12 CFR §220.
[159] 17 CFR 240.15c3-3.
[160] Regulation (EU) 2015/2365 of the European Parliament and of the Council of 25 November 2015 on transparency of securities financing transactions and of reuse and amending Regulation (EU) No 648/2012.
[161] European Systemic Risk Board, 'EU Shadow Banking Monitor' (2016), 1.
[162] Article 15, Regulation (EU) 2015/2365 (SFTR).
[163] Gorton and Metrick, 'Securitized Banking and the Run on Repo'.
[164] Adam Copeland and others, *Mapping and sizing the U.S. repo market* (Federal Reserve Bank of New York 2012) Available at: http://libertystreeteconomics.newyorkfed.org/2012/06/mapping-and-sizing-the-us-repo-market.html.
[165] Viral V. Acharya and T. Sabri Öncü, 'A Proposal for the Resolution of Systemically Important Assets and Liabilities: The Case ofthe Repo Market' (2013), 9(S1) International Journal of Central Banking 322.

This suggests that the central management of collateral is more efficient. Not only counterparty risk management is improved by netting, but also the clearing institutions have strong incentives to get collateral pricing and margins right. Moreover, clearing institutions can be made subject to reporting requirements and other obligations instrumental to monitoring and regulating leverage. For these reasons, there is broad academic support for central clearing of repos,[166] which has not yet been picked up by policymakers. One of the disadvantages of central clearing is that the clearinghouses may become too big to fail.[167] This is no different from the current situation of the U.S. tri-party repo market. On the other hand, because the bulk of repos is still intermediated by official banks, the size of the repo market is indirectly constrained by the bank regulation of liquidity and leverage.[168]

Both in Europe and in the U.S.,[169] certain classes of OTC derivatives are to be settled centrally. This is another important piece of instrument-based regulation because, as mentioned, derivatives are a sneaky way to build up leverage, and hence systemic risk, through the obligation to pay margins. Effective June 2016, the European Market Infrastructure Regulation (EMIR)[170] requires certain derivatives to be cleared through central counterparties (CCPs). Not only will this improve the transparency of shadow banking, but it will also allow, in time, to constrain it via minimum haircut regulation.

As discussed in section 5, minimum haircut regulation can be very effective to constrain the externalities of shadow banking. In fact, this is the form of shadow banking regulation that we advocate across the board. Implementing such regulation only requires that the management of collateral be restricted to specific entities. In this perspective, the EMIR may also be used as a tool for macroprudential regulation, allowing to set countercyclical margin requirements on derivative transactions and, in the future, on all the leverage instruments of shadow banking.[171] Establishing such regulation of shadow banking remain challenging. As mentioned earlier, for haircut regulation to be efficient, regulators must be able to identify leverage restrictions across several classes of assets being used by shadow banking, and to adapt this regulation over time. Still, we believe that a quantity regulation of shadow banking via minimum haircuts is preferable to other forms of collateral regulation.

Another way to regulate collateral is via its bankruptcy law regime, which was also discussed in section 5. The collateral of repos and derivatives transactions (so-called Qualified Financial Contracts) is exempted from the automatic stay on the borrower's assets in case of bankruptcy. After the GFC, this exemption has

[166] Adrian and Ashcraft, 'Shadow banking regulation', 42.
[167] Duffie, *Financial Regulatory Reform after the Crisis: An Assessment.*
[168] For the distortions stemming from this circumstance, *see* ibid.
[169] *See* Title VII of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.
[170] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories, OJ L 201, 27.7.2012.
[171] European Central Bank, *Financial Stability Review* (May 2016) 106-108.

come under fire on the grounds that if fuels fire sales and collateral crisis.[172] And yet, this exemption has advantages, too.[173] In general, removing the automatic stay exception would act as a curb on repos by reducing the liquidity of the collateral, particularly in tri-party markets.[174] This could be a sensible regulatory measure to reduce the reliance on lower-quality collateral, akin to setting minimum haircuts. However, it would be probably unwarranted for higher-quality collateral, such as most government-guaranteed securities.

Scrapping the bankruptcy law exception may be as effective in curbing repos and derivatives as the minimum haircut regulation that we advocate, but because it affects indistinctively high-quality and low-quality collateral, it is less efficient.[175] The proposal to make the QFC regime conditional on the payment of a tax, or liquidity insurance, could overcome this problem so long as the tax rate would vary with the quality of collateral. However, as we argued in Section 5, this is not possible because the quality of collateral cannot be precisely measured in terms of systemic risk contribution. Moreover, the threat not to backstop collateral that is not explicitly insured would not be credible. Finally, proposals to curb shadow banking by restricting access to collateral all face a fundamental problem: Shadow banking is not necessarily operated via repos or derivatives, and may well rely on collateral that is not bankruptcy remote. Think, for instance, of commercial paper, which is not exempt from bankruptcy law and yet has funded shadow banking. And, financial innovation might come up with other transactions for which the bankruptcy regime is irrelevant. If reliance on bankruptcy-remote collateral is not essential to shadow banking, the proposals to regulate the latter by restricting access to the former are unlikely to be effective.

7. Conclusion

In this essay, we have analyzed the economics of shadow banking and the case for its regulation. We have noted an important challenge in addressing shadow banking, which is to define it. After reviewing the main approaches to defining shadow banking – based on its activities, entities, and instruments – we have concluded that all of them have shortcomings. In order to connect shadow banking with systemic risk, we have argued in favour of an instrument-based approach, defining banking as leveraging on collateral to support liquidity promises. Such form of banking qualifies as shadow banking if it is not subject to the same leverage and liquidity regulation as official banking. Having said that, an instrument-based regulation

[172] Carolyn Sissoko, 'The legal foundations of financial collapse' (2010), 2(1) Journal of Financial Economic Policy. *See also* Steven L. Schwarcz, 'Derivatives and collateral: Balancing remedies and systemic risk' (2015), 2015(2) University of Illinois Law Review 699.
[173] For why the derivatives contracts should be treated differently on efficiency-based grounds, *See* Franklin R. Edwards and Edward R Morrison, 'Derivatives and the bankruptcy code: Why the special treatment' (2005), 22 Yale Journal on Regulation.
[174] Nathan Goralnik, 'Bankruptcy-Proof Finance and the Supply of Liquidity' (2012), 122 Yale Law Journal.
[175] For an alternative proposal to differentiate between high-quality and low-quality collateral, see Acharya and Öncü, 'A Proposal for the Resolution of Systemically Important Assets and Liabilities: The Case ofthe Repo Market', 322 335.

presupposes that the entities having access to the relevant instruments are subject to reporting obligations.

Furthermore, we have discussed the optimal regulation of shadow banking from a law and economics perspective. Shadow banking is beneficial for society because it caters to a demand for safe assets. However, because of negative externalities, shadow banking is overproduced. We have argued that, because uncertainty makes any measure of systemic risk imprecise, quantity regulation is preferable to a Pigovian tax to cope with the externalities of shadow banking. Regulation should limit the leverage of shadow banking by way of minimum haircuts regulation on assets being used as collateral.

Finally, we have reviewed the regulation of shadow banking in the U.S. and the EU based on the insights from economic analysis. We found that such regulation is both entity-based and instrument-based. Although the latter is to be preferred in theory, the practical difficulties of monitoring leverage at the assets level imply that the regulation of financial collateral should be combined with an indirect regulation of institutional leverage, through the prudential regulation of banks providing explicit or implicit liquidity puts to shadow banking. Unfortunately, risk-insensitive restrictions of leverage undermine the efficiency of banking, whether official or shadow.

We acknowledge that the implementation of an optimal regulation of shadow banking faces two important challenges. First, it is difficult to identify the optimal levels of asset and institutional leverage. Second, it is even more difficult to adapt these levels to new circumstances. These challenges, however, apply as well to banking in general. A way to address them may be to provide financial regulators with some discretion under incentive-compatible regulatory governance. This is an interesting avenue for future research.

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