Symmetric Ignorance is Bliss: When does Transparency Reduce Liquidity?*

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Abstract

In markets in which liquidity provision is key, more information could reduce liquidity by distorting symmetric ignorance. To shed light on the role of symmetric ignorance in the link between transparency and liquidity, we examine the secondary-market liquidity effects of asset-level disclosures of mortgage-backed securities (MBSs). We find that enhanced disclosures reduce liquidity in the MBS market by about 15%. This liquidity-reducing effect is stronger when the information asymmetry among investors is higher and when the MBSs are more complex. However, this inference flips or disappears when investors have greater incentives to seek information. Specifically, asset-level disclosures enhance liquidity when the security has an equity-like payoff, i.e., for junior and equity tranches, and when the underlying collateral performance is poor.

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1. Introduction

Does the liquidity of debt-type claims improve with an increase in the transparency of the underlying assets? Trading in financial markets requires liquidity, or the ability to trade securities quickly without the transaction moving prices and without an uninformed party losing money to a privately informed party. A long-standing literature examines the impact of transparency of asset values on liquidity. Prior theoretical research, such as Verrecchia (1983), Diamond (1985), and Diamond and Verrecchia (1991), discusses how increased disclosure reduces information asymmetry among investors and improves liquidity. Supporting this view, researchers provide empirical evidence that transparency is associated with improved liquidity (e.g., Balakrishnan, Billings, Kelly, and Ljungqvist 2014; Lang and Maffett 2011; Lang, Lins, and Maffett 2012; Welker 1995). While this may be true, an argument that has received relatively little attention is that symmetric ignorance, too, is a type of symmetric information and can facilitate a liquid trading environment.[1] This study provides evidence that for debt-type claims symmetric ignorance is important in driving liquidity and transparency can hurt liquidity.

In contrast to equity markets, for which continuous information gathering for price discovery is of key importance, debt markets are characterized by liquidity provision. When the objective is liquidity provision, private information production could create adverse selection and hamper trade (Dang, Gorton, and Holmstrom 2015; Dang, Gorton, Holmstrom, and Ordonez 2017).[2] However, when the incentive to produce private information is low and it is common knowledge that no

[1] Symmetric ignorance occurs when investors have little information about the underlying asset but this lack of information applies similarly to trading parties, in that neither side has an informational advantage.

[2] Consistent with this notion, investors in funding markets, such as treasuries, repos, asset-backed commercial papers, mortgage-backed securities, and money market fund shares, trade hundreds of millions of dollars quickly without the need to conduct due diligence about the underlying fundamental value of the security (Holmstrom 2015).

agent will pay to produce private information about the security, the trading in that security is maximized. Debt is unique in that it provides the smallest incentive for private information production. It is designed to preserve symmetric ignorance and to be information-insensitive (Dang et al. 2015; Holmstrom 2015).[3] In such a setting, enhancing information about fundamentals of the assets that back the debt increases incentives for sophisticated investors to generate private information about the performance of the debt for the purpose of making profitable trades.[4] Even if transparency does not actually trigger more sophisticated investors to collect private information, it could still alter the beliefs of relatively unsophisticated investors and induce these traders to pull out of the market. Accordingly, both informed and uninformed agents face difficulty in reselling these assets, and thus, efficient trade is inhibited by transparency.

The above conclusions from theory suggest that the net effect of disclosures on liquidity is an open question. An empirical investigation of this issue is challenging because the positive and negative effects of transparency on liquidity could be at work simultaneously. To investigate the impact of transparency on liquidity and to shed light on how these effects vary with the fundamental features of the underlying assets, we focus on the asset-backed securities (ABSs) market and exploit a major disclosure regulation in the Eurozone. Specifically, we utilize the European Central Bank's (ECB) Loan-level Disclosure (LLD) Initiative, which requires banks that pledge as collateral their ABSs in their repo borrowings to provide periodic loan-by-loan disclosures. Consistent with the European Commission's move to a "simple, transparent, and

[3] Similarly, any security that uses debt as the underlying collateral is also designed to be information insensitive. This would include asset-backed instruments, such as asset-backed securities, covered bonds, asset-backed commercial papers. Moreover, the complexity of these structures further raises the cost of producing private information relative to vanilla debt instruments.

[4] Kim and Verrecchia (1994) make a similar argument in the context of equity markets to suggest that sophisticated/informed traders are able to exploit their ability to process public information.

structured" securitization landscape, the LLD Initiative constitutes a substantial expansion on investors' information set about the characteristics of the loans underlying ABSs.

The ECB LLD Initiative provides an economically meaningful and empirically sound setting, offering several unique advantages. First, asset-level disclosures reveal an unprecedented amount of information on the underlying collateral, as the securitization markets in Europe had been inherently opaque. Thus, the relevance and complexity of the LLD setting put certain players in the market at a relative advantage in processing this information.[5] Second, the changes in disclosure requirements are enacted in the form of the ECB regulation and are plausibly exogenous to individual banks' performance. The regulation applies to Eurozone banks; however, banks are affected only if they borrow from the Eurosystem and pledge ABS as collateral. While the choices to obtain central-bank financing and to pledge a specific asset class as collateral are not made randomly, disclosure requirements apply to banks that had already been in the ECB repo financing program. In other words, in a difference-in-differences sense, endogenous selection at the time of the disclosure regulation is muted. Third, the requirements are implemented over a relatively short and pre-determined window and apply to individual securities/structures rather than banks. Put differently, a specific bank with multiple ABSs in a given period is required to provide asset-level disclosures only on the pledged securities. This feature allows us to use bank-time fixed effects to remove any confounding factors at the bank level even if they are time-varying (e.g., banks' portfolio choices, lending quality, provisioning practices, risk profiles, managerial talent).

[5] For instance, insurance companies and treasury departments of banks employ ABSs largely for liquidity management. Consequently, these entities do not actively gather information about the underlying collateral and do not need to make efforts to process such detailed data. In contrast, hedge funds are equipped to use the detailed data to gain information advantage to trade on ABSs.

Asset-backed securities (rather than bonds and other debt securities) are particularly suitable to our study as well.[6] ABSs are backed by a specific pool of assets. The most important driver of their values is the quality and performance of the underlying collateral. This feature of ABSs renders the establishment of treatment effects more credible and the investigation of the underlying mechanism much more direct. In contrast, traditional corporate/bank bond spreads are driven by a number of factors including the overall performance of the issuer—in this case, issuing banks. While the role and reputation of sponsors and originators are undeniable, these effects are not of primary importance for ABSs, relative to traditional corporate bonds of these entities. Second, ABSs have tranches, allowing us to work with multiple notes of varying seniority. In other words, for our cross-sectional tests that examine seniority and riskiness, we are able to compare two tranches (e.g., senior tranche and equity tranche) of the same ABS in the same period.

We conduct our investigation on a sample of 56,377 security-months, pertaining to 1,930 distinct tranches coming from 12 European countries. We limit our investigation to mortgage-backed securities (MBSs), which constitute over 95% of the initial sample of ABSs with secondary-market data. As the basis of our analysis, we focus on the implementation of the ECB LLD Initiative in January 2013 and conduct a series of difference-in-differences (DiD) analyses around this date. We define our main measure of security illiquidity as the number of trading days in a month without a trade divided by the total number of trading days in that month (Lesmond, Ogden, and Trzcinka 1999; Chen, Lesmond, and Wei 2007; Adrian, Boyarchenko, and Sachar 2017). This model-free metric is a sensible measure of illiquidity that maximizes our sample size and an accurate representation of the sparse trading structure of the secondary ABS markets. For

[6] The value of collateral is important in the above arguments because debt, which is backed by that collateral, can become information-sensitive due to the shock to the collateral value. And if debt becomes information sensitive, so would be the securities that are backed by this debt. This would impair liquidity.

instance, the average (median) number of non-trading days in a given month is eight (three). In additional tests, we also use a number of other measures, including bid-ask spreads and model-based metrics (Roll 1984; Fong, Holden, and Trzcinka 2017).

We find that transparency reduces liquidity in the secondary MBS markets. By utilizing a difference-in-differences framework, we find a 4.8% increase in illiquidity in treatment MBSs relative to control MBSs. For context, our measure of illiquidity (i.e., the relative proportion of non-trading days in a month) has a sample mean of 31.5% and standard deviation of 34.4%. These findings hold for alternative measures mentioned above and after controlling for pre-treatment parallel trends. Moreover, we continue to observe economically and statistically meaningful reductions in liquidity after adding lender-month fixed effects, which remove any confounding effects at the originating bank level, even if they are time-varying.

While our main finding is economically plausible and statistically robust, it is an average assessment. To better understand the mechanism, and, more specifically, to shed light on the role of symmetric ignorance in the liquidity effects of transparency, we perform a variety of cross-sectional analyses. We first focus on information sensitivity. Although debt securities are information-insensitive, information becomes desirable when the debt may default. Thus, even though symmetric ignorance is valuable when the debt is safe, as the information sensitivity of the debt increases, the liquidity-enhancing role of information should dominate. To test this argument, we focus on the cross-sectional variation in the quality of the underlying collateral. Consistent with symmetric ignorance being the main mechanism at work, we find that transparency reduces liquidity by 9.3% for ABS with well-performing collateral but *increases* liquidity by 7.6% for MBSs with poorly performing collateral. We further these insights by benefiting from a novel feature of MBSs. Specifically, we compare the liquidity of safe tranches (which are of highest

seniority and information insensitive) to risky tranches (which are of lowest seniority and information sensitive). Our inferences are equally striking. Revealing underlying collateral reduces the liquidity by 8.5% for safe tranches but increases liquidity by 5.0% for risky tranches.

Next, we shift our focus from information sensitivity to information asymmetry. We explore this construct in two respects: (*i*) information asymmetry between the originating bank and investors, (*ii*) and information asymmetry among investors. As for the former, we predict that more information is valuable (i.e., symmetric ignorance is less valuable) when the originating bank has a low reputation, which is a proxy for the information asymmetry between the bank and investors. Consistent with this prediction, we find that transparency reduces liquidity by 6.7% for deals made by high-reputation originators but enhances liquidity by 5.5% for deals made by low-reputation originators.

Regarding information asymmetry among investors, we expect that symmetric ignorance is less likely to dominate when investors are similar in their levels of sophistication. In such settings, an increase in information may not induce investors to pull back from the market. This is because there will not be an imbalance in the use of information across investors. Consistent with this expectation, we find that transparency does not impair liquidity for MBSs of which investors are similar to one another, in terms of skill and expertise (our empirical proxies for investor sophistication). By contrast, there is a 15% increase in illiquidity for cases with greater disparity among investor sophistication. Importantly, we observe no difference in our results for subsamples constructed based on *average* investor sophistication. This inference also supports our narrative. The average sophistication could be high or low, but what matters is the variance of investor sophistication.

In additional cross-sectional tests relating to symmetric ignorance, we examine complexity. We anticipate relatively large illiquidity effects for more complex deals and in more uncertain situations because, for such deals, new information would be processed more differently by existing investors. Our empirical proxies for this analysis are the number of loans in the security and remaining life. We presume that deals with more loans would be comparatively more difficult to evaluate. Likewise, MBSs that are close to maturity would be associated with an additional layer of complexity, i.e., the uncertainty about the repayment of the principal. In keeping with our prediction, we find that liquidity-decreasing effects of transparency are stronger when the number of underlying loans is greater and when the remaining maturity is shorter. For less complex deals, however, we observe statistically and economically insignificant effects.

Related Literature and Caveats

Our paper contributes to several strands of the literature. To the best of our knowledge, ours is the first empirical study that examines and provides evidence on the role of symmetric ignorance and the effect of transparency on liquidity in debt markets. Brancati and Macchiavelli (2019) explore the dynamics of information for bank debts around the Great Recession. The objective of their paper is to provide estimates on the amplification effect of information precision on banks' default risk. Benmelech and Bergman (2018) draw inferences about information sensitivity of debt by documenting a positive link between bond liquidity and bond price. In contrast, in our empirical investigation, information is not inferred but explicitly examined. Moreover, the outcome variable we are interested in is liquidity.[7]

[7] In the equity markets, studies such as Coller and Yohn (1997) and Amiram, Owens, and Rozenbaum (2016) show a result that is similar in spirit to information asymmetry rising subsequent to news events possibly because of superior processing skills of sophisticated investors. However, the role of liquidity provision under symmetric ignorance does not apply to equity markets.

Further, we make contributions to the literature that examines the effect of increasing bank transparency. Examining the ECB LLD Initiative as a shock to securitization transparency, Ertan, Loumioti, and Wittenberg-Moerman (2017) find that securitized loans that are originated under the transparency regime are of better quality, which is consistent with greater transparency incentivizing banks to improve their credit practices. In a similar spirit to our paper but focusing on bank deposits, Chen et al. (2018) find that increasing transparency in banks increases the sensitivity of deposits to performance (in keeping with Diamond and Dybvig 1983). Our paper also relates to the broader literature that examines or considers the cost of transparency (Goldstein and Sapra 2014; Acharya and Ryan 2016; Neilson et al. 2018). Different from this literature, we focus on the liquidity effects of informational transparency. Furthermore, the insights we provide in this paper are more than an average effect. Specifically, we enrich our understanding of the value of asset disclosures by showing that the liquidity effects of transparency could differ or even flip, depending on the level of symmetric ignorance.

Our findings should be of interest to regulators as well. Understanding the nature of liquidity provisions for financial institutions and corporations is central to regulating the banking and financial system. To enhance transparency and thereby promote market discipline, regulators enacted detailed loan-level disclosure regulations for the ABS markets, including the Regulation AB II under the Dodd-Frank Act in the US and the Securitisation Regulation in the European Union (i.e., Regulation (EU) 2017/2402). However, the effects of these far-reaching reforms on liquidity are not well explored or understood. In this context, our study provides evidence that can facilitate regulators' decisions of when and how to implement asset-level disclosure regulations.

We note that our findings are not without limitations. First, our findings do not suggest a uniform effect of transparency on ABS markets. As our cross-sectional analyses indicate,

transparency may enhance or impair liquidity depending on other forces at work. Even though we are reasonably confident about the credibility of the short- and medium-term effects we propose, we cannot argue that our evidence is long-lasting. In particular, Holmstrom (2015) points out that the accumulation of liquidity in good times could result in bigger crashes later on. Therefore, our specific conclusions must be interpreted with caution. Furthermore, we are unable to provide direct insights into macro-finance or make any welfare statements or general equilibrium predictions. In these respects, we recognize the possibility that adverse effects of a partial reduction in the liquidity in ABS markets could be offset by improvements in securitization (Mersch 2014, 2017; Ertan et al. 2017; Balakrishnan and Ertan 2019).[8] Finally, albeit economically significant, our evidence is based on a single experiment. In this sense, our evidence may not apply to other markets or periods.

2. Institutional Background and Empirical Predictions

2.1. *Overview of Securitization and the ECB Loan-Level Disclosure Initiative*

Securitization allows lenders to package their illiquid loans and sell them as liquid notes to investors of differing risk appetites (see Figure 1 for an exemplary diagram depicting the basics of securitization). For a pool of loans of similar risk, often of medium creditworthiness, securitization allows the production of safer as well as riskier securities in the form of senior and junior tranches. In this sense, securitization allows (1) lenders to make greater gains and better utilize their balance sheets, (2) institutional investors of differing risk appetites to invest in a variety of new securities

[8] Governor Yves Mersch's speeches on European securitization markets and regulation can be found here: https://www.ecb.europa.eu/press/key/date/2014/html/sp140611_1.en.html and here https://www.ecb.europa.eu/press/key/date/2017/html/ecb.sp171116.en.html.

with decent yields, and (3) borrowers to get credit at better rates, since institutional investors' demand for securitization products reduces yields.[9]

It is hardly surprising that, given these benefits, securitization became the poster child of banking, financial engineering, and debt-fueled economic growth in the 2000s. However, when housing prices fell, money market investors worried about the quality of ABSs used as collateral for repo and asset-backed commercial papers, running on the entire shadow banking system (Gorton 2015; Geithner and Metrick 2018). The grave experiences during the recent financial crisis, however, made one thing clear: the understanding of securitization was very limited at best. Because of the significant and unexpected damages inflicted by securitization products, regulators and policymakers identified securitization as the main cause of the crisis (or at least of its tremendous scale) and pointed out that securitization was inherently opaque.[10] According to this view, this lack of transparency exacerbated originator banks' incentives to properly screen and monitor borrowers, resulting in a deterioration of loan quality. Coupled with considerable levels of conflicts of interest and inadequate credit risk models affecting the input of other parties involved (e.g., credit rating agencies), securitization products were priced without accounting for key risk factors, such as correlated defaults.[11]

[9] There is an extensive literature on securitization. Securitization unlocks a substantial amount of funds for banks and makes them less vulnerable to cost of funds shocks (Loutskina 2011). More generally, asset securitization could prevent inefficient continuation of projects (Ayotte and Gaon 2010). However, prior work also reports evidence of banks' lower screening and monitoring efforts (e.g., Keys et al. 2010, Keys, Seru, and Vig 2012, Kara, Marques-Ibanez, and Ongena 2015) even though these problems do not necessarily apply to all kinds of securitization (see, for example, Benmelech, Dlugosz, and Ivashina 2012).

[10] For an extensive discussion of these issues, please see the Third Hearing of the US Congress on the financial crisis on Wall Street, which focuses on credit rating agencies. The full text can be accessed here: https://democrats-oversight.house.gov/sites/democrats.oversight.house.gov/files/documents/20081022102221.pdf

[11] For an insightful first-hand discussion of these practical issues, see "Shareholder Report on UBS' Write-Downs": http://maths-fi.com/ubs-shareholder-report.pdf.

The global financial crisis resulted in an immediate economic reaction and an inevitably lumpier regulatory response. The economic reaction was a freeze in securitized credit. In the US, a substantial decline in securitization is followed by a steady upward trend, while the recovery in Europe has been less impressive. Total securitization issuance in Europe is stabilized at around $300 billion/year, compared to the trillion-dollar issuance figures in 2007/2008. As for outstanding collateral, residential MBS in Europe hovers around $1 trillion, which is similar to the amounts in 2005–2007 but substantially smaller than the values at the peak of the financial crisis, which was about $2 trillion.

The regulatory reaction has multiple facets. For example, the Dodd-Frank Act (2010) establishes relatively stringent risk-retention rules, requiring in virtually all securitizations that the originating party must hold at least five percent of the risk exposure (e.g., Demiroglu and James 2014). Regulation (EU) 2017/2402 introduces a similar framework in the European Union. The objective of these initiatives is to enhance the securitizing party's screening and monitoring efforts by increasing its so-called skin in the game (Keys et al. 2010; Bord and Santos 2015). On the accounting side, FAS 166/167 shakes up the originate-the-distribute model by significantly reducing the scope for non-consolidating special purpose entities (SPEs). In particular, these new rules remove the notion of qualifying SPEs (FAS 140) as well as bright-line quantitative approaches (FIN 46(R)), both of which kept securitization off originating banks' balance sheets. Effective from January 2010, FAS 167 requires a party to consolidate if it has an obligation to absorb losses and/or power to direct the activities of the SPE.[12] Likewise, IFRS 10, starting from 2011, introduces power and exposure concepts for consolidation. Collectively, both reporting

[12] See Oz (2018), Dou, Ryan, and Xie (2018), and Bonsall, Dou, and Vyas (2018) for recent papers examining the consequences of these rules.

frameworks shift from a form-based bright-line approach to a substance-based qualitative approach in which control and variable interests play a key role.

Another critical item in the post-crisis agenda for reforming securitization is enhanced transparency (Jackson 2010; Gilson and Kraakman 2014). In particular, asset-level disclosures have been a common theme in the post-crisis transparency regulations around the globe. The US implemented AB II from November 2016, which apply mainly to real estate and auto loans.[13] In Europe, the disclosure of underlying collateral has been implemented in two steps. The ECB LLD Initiative (which took effect in 2013) applies to ABSs that are pledged by banks as collateral in ECB repo financing. The EU's Securitisation Regulation 2017/2402 extends these requirements to all European securitizations.[14] Overall, the aforementioned asset-level disclosure regulations are an effort to promote greater transparency, better stability, and enhanced investor protection in the ABS market. The extensive information is intended to provide investors with timely and sufficient information, to reduce over-reliance on credit ratings, and to better monitor the quality of underlying securities.

The LLD rules require that a group of banks disclose details about individual loans on a monthly or quarterly basis. The disclosure requirements constitute a significant increase in informational transparency.[15] They share a similar format, which includes more than 100 fields

[13] For details, see https://www.sec.gov/oit/announcement/regabii-asset-level-requirements-compliance.html.

[14] For details: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017R2402&from=EN.

[15] In fact, the Dodd-Frank Law (Title VII on Wall Street) and Regulation AB II, as well as the ECB Loan-level Disclosure Initiative along with ESMA's expansion of asset-level disclosure to the entirety of asset-backed securities all directly use the word "transparency".

Dodd-Frank Title VII: https://www.law.cornell.edu/wex/dodd-frank_title_VII

Regulation AB: https://www.sec.gov/rules/proposed/2010/33-9117.pdf

ECB LLD Initiative: https://www.ecb.europa.eu/paym/coll/loanlevel/html/index.en.html

comprising mandatory and voluntary inputs. Prior to asset-level disclosures, existing investors received sporadic and non-standardized reports based on aggregate figures. In this sense, the new rules do not only inform a much larger group of investors (i.e., including potential investors, information intermediaries, competitors, and regulators) and provide comparability across securitization entities.[16] They also reveal a substantial amount of detailed information that can be used to better assess the underlying risks, exposures, and opportunities, which would not be present in stale and simplified aggregate reports, such as risk barbelling and risk layering (Ryan 2018).

Two identification questions arise about asset-level disclosure regulations. First, are these rules implemented in tandem with other reforms? Second, even if the LLD Initiative is the correct treatment effect, has the regulation changed anything other than transparency for treatment banks? We answer these questions in the specific case of the LLD Regulation, since we focus on this very rule. Regarding the first question, even though there are a number of events and reforms took place in Europe during the 2011–2014 period (e.g., the ECB's unconventional monetary policy interventions, developments relating to Basel III, Solvency II, IFRS 9, as well as national banking regulations and local economic trends), our design is essentially a within-country-time design, alleviating these concerns significantly. Further, we are able to perform within-bank-time tests, which effectively compare the liquidity effects of a transparency ABS to a non-transparency ABS of a given bank in a given period.

EC and ESMA: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2402&from=en and https://www.esma.europa.eu/press-news/esma-news/esma-defines-disclosure-standards-under-securitisation-regulation

[16] According to the European DataWarehouse, more than 160 institutional investors use the loan-level data.

Regarding the second question, we have conducted an extensive search to verify that disclosure is the only shock that affects transparency ABSs. The major issue would be whether the ECB's repo funding takes place simultaneously with the disclosure rules. The key point here is that when the LLD Initiative started in January 2013 for MBSs, all of the affected banks had already been in the repo program; i.e., the disclosure and funding shocks did not occur in the same period.[17] On the flipside, some banks may have dropped out of the repo program right before the implementation of the LLD Initiative to avoid providing asset-level disclosures. While this empirical irregularity would not affect the validity of our conclusions, it would certainly limit their scope and external applicability. Even though we do not have access to this data, our conversations with practitioners suggest that this behavior was not common. In keeping with these arguments, we do not observe a decline around January 2013 in the MBSs pledged to the ECB as repo collateral. We supplement these arguments using statistics from the ECB. As can be seen in Figure OA1, the overall volume of collateralizable ABSs remains similar around the first quarter of 2013. Figure OA2 displays a very similar pattern for securities that are actually pledged as collateral to the Eurosystem. We would expect substantial changes in Figure OA1 if the ECB LLD Initiative has transformed the overall securitization landscape in Europe. Similarly, Figure OA2 would show a significant decline in pledged (and thus disclosed) ABSs had the ECB LLD regulation made a significant number of banks drop out of the program.[18]

In addition to these identification concerns, we verify whether loan-level "data" is actually utilized as "information" by investors. Our conversations with the European DataWarehouse (ED),

[17] By comparison, for ABSs, whose underlying collateral was disclosed in 2014 onwards, funding and disclosure took place simultaneously.

[18] For details, see https://www.sifma.org/resources/research/europe-structured-finance-issuance-and-outstanding.

the regulatory body that collects and administers loan-level disclosures, indicate that ED has about 160 institutional investors subscribers that download and process loan-level data files.

Extant literature has assessed the efficacy of the ECB LLD Initiative. For instance, Ertan et al. (2017) report evidence that transparency increases the quality of loan underwriting. The main channel the authors point out is increased monitoring by bank managers as a result of market discipline. Balakrishnan and Ertan (2019), on the other hand, focus on the quantity of bank lending and find that loan-level disclosures increase bank lending to small businesses, conditional on borrowers' demand for credit. The mechanism at work in Balakrishnan and Ertan (2019) is that enhanced transparency allays banks' financing frictions and reduce the cost of capital, which allows them to raise more funds and ultimately supply more credit to the real sector. These papers focus on improvements at the bank level but do not speak to the secondary ABS markets, which are directly impacted by transparency regulations. Our paper focuses on the liquidity effects of enhanced disclosure and asset-level information on the ABS markets. We believe that transparency would influence these markets and investors in various and potentially unexpected ways.

2.2. *Effects of Increased Transparency on Liquidity*

The effect of disclosure on market liquidity has been a long-standing question in accounting and finance literature. The conventional message in this line of work has been typically positive. Prior analytical research, including Verrecchia (1983), Diamond (1985), and Diamond and Verrecchia (1991), discusses why and how disclosure facilitates trade by decreasing information asymmetry among investors. The essence of this narrative is symmetric information. Supporting this view, empirical research documents a positive association between informational transparency and liquidity (Balakrishnan et al. 2014; Lang, Lins, and Maffett 2012). Moreover, based on these arguments, many papers use liquidity as an outcome variable to understand the economic

consequences of disclosure regulations (e.g., Bushee and Leuz 2005; Leuz and Verrecchia 2000; Bischof and Daske 2013).

More recently, however, analytical research points out that the argument above applies to equity securities and contends that the effects of transparency on liquidity might differ in credit markets. This difference arises from different needs for information to value these securities. As Holmstrom (2015) points out, equity markets aim to share and allocate aggregate risk. For them to perform this function effectively, price discovery is essential, and information should be quickly reflected in prices. In equity markets, investors always actively gather information to value stocks and realize the highest risk-adjusted return possible. On the other hand, debt markets aim to provide liquidity. The cheapest way to do so is to use (over-) collateralized debt that obviates the need for collecting private information and for price discovery. A debt contract simply states that if the borrower pays the face value of the debt at maturity, there are no further obligations and the collateral is returned. This feature makes investors avoid a precise assessment of collateral value at inception and a costly price discovery until maturity (Townsend 1979). Debt is information insensitive as long as it is paid in full. Only default will trigger a value assessment, usually through a bankruptcy process, making debt information-sensitive. The conclusion here is that enhanced disclosures could distort the balance of "symmetric ignorance" in credit markets, reducing investors' willingness to trade.

In our setting, the rationale for liquidity-reducing effects of transparency is as follows. If detailed and complex information about ABSs is publicly released, it can create an adverse selection problem among investors and threaten market liquidity. The reason is twofold. First, only sophisticated investors could understand the pricing implication of the information, given that ABSs are complex products that are hard to value (e.g., it is known to be difficult to assess the

systematic risk of ABSs and the correlation of collaterals' performances). Second, as public information lowers the cost of information gathering, sophisticated investors would be more incentivized to process the information to extract rents from unsophisticated investors. Relatively unsophisticated investors, who have limited ability to process the information, would worry about being exploited by sophisticated investors.[19] Consequently, they might prevent adverse selection by reducing the amount of trade below the expected value of the debt collateral or give in to adverse selection by not trading at all. This fear of adverse selection would lead to a reduction in market liquidity à la Akerlof (1970). This prediction—which mirrors the theoretical insights from Dang, Gorton, and Holmstrom (2010, 2015), Dang et al. (2017), Pagano and Volpin (2012), Gorton (2010, 2013), and Milgrom and Roberts (1990)—is formalized as follows:

H1 (Null). Transparency does not reduce market liquidity in the ABS markets.

According to the narrative above, information sensitivity is essential for the impact of transparency on liquidity. We predict that a plausibly exogenous increase in asset transparency could reduce liquidity in the secondary ABS markets. This claim is a statement about averages. Securitized credit securities tend to be information insensitive, on average, because most of the securities in this market are well performing.

When does transparency have no adverse effect on liquidity or even increase it? The graph in Figure 2 suggests that when the probability of default is low, investors do not care much about the value of collateral and are thus not incentivized to gather information about it. In other words, *safe* debt securities are information insensitive and the market liquidity benefits from "symmetric

[19] ABS markets are complex, and hardly any individual investor participates in these markets. Nevertheless, there is a significant variation in the sophistication, skill, and resources of the institutions that trade in these markets (Dang et al. 2015). By relative sophistication, we refer to this variation.

ignorance." In contrast, as the probability of default rises, all investors would be incentivized to gather information to assess tail risks. In these situations, even without public information, sophisticated investors would be able to and be incentivized to produce private information to minimize losses from default. Unsophisticated investors, who are incapable of producing private information would fear more about adverse selection, and as a result, might reduce trade or leave the market. In such cases, enhanced public disclosures could increase liquidity by alleviating the adverse selection problem.

We operationalize information sensitivity and the role of safe payoffs in two respects: the quality of underlying collateral (i.e., loans packaged in the ABS) and tranche seniority. Information is valuable to investors if it helps them avoid a loss in low payoff states (Bouvard, Chaigneau, de Motta 2015). Riskier collateral makes debt more information sensitive as it reduces the information insensitive region because it would make the market value of debt closer to its final payoff. Likewise, for junior claimants who are paid last and face a higher risk of not being paid back in low payoff states, the expected loss is highest. Thus, the value of information and the incentive to acquire information is high, resulting in higher information asymmetry, which is resolved by enhanced transparency. Accordingly, we put forward the following empirical predictions:

H2.1. Transparency increases (decreases) ABS liquidity when the underlying collateral is poor (good) quality.

H2.2. Transparency increases (decreases) ABS liquidity for risky and junior (safe and senior) tranches.

Symmetric ignorance is likely to play a weaker role when information asymmetry is high. That is, asymmetric information is another critical factor that could mediate the relationship between informational transparency and market liquidity. We consider two variants of this

phenomenon: information asymmetry between the originator and investors and information asymmetry among investors.

Extant literature suggests that loan-level disclosures reduce information asymmetry between banks and external capital providers and enhance banks' securitization practices (e.g., Ertan et al. 2017; Balakrishnan and Ertan 2019). These improvements could well translate into greater liquidity when secondary-market participation is limited due to a lack of trust in the originator (Nier and Baumann 2006). To this end, we utilize originator reputation as a suitable conditioning variable, in that ABS market participation would be relatively limited for low-reputation originators.

To evaluate the role of information asymmetry among investors, we also utilize the variation in investor sophistication. This is because the illiquidity effects of greater disclosure should be more pronounced especially when there is a greater degree of skill and information asymmetry among investors. Accordingly, we test whether enhanced disclosures could hamper trade especially when investor profiles of a given ABS are disparate.

H3.1. Transparency increases (decreases) ABS liquidity when the originating bank has a low (high) reputation.

H3.2. Transparency increases (decreases) ABS liquidity when the disparity in investor sophistication is low (high).

In the final part of our cross-sectional tests, we extend our investigation to complexity. Holding aside our above discussions relating to payoff sensitivity and information asymmetry, the nature of disclosed information should also be relevant for market liquidity (Miller 2010). Consistent with the theoretical inferences discussed at the beginning of this section, we expect that

unsophisticated investors worry more about adverse selection for more complex deals because these are specifically the instances in which sophisticated investors would find private information production particularly profitable.

Empirically, we capture information complexity using the number of deals and remaining life of the deal. We anticipate deals with a greater number of loans to be harder to evaluate. As for remaining life, we predict disclosure to have a grea ter negative effect on liquidity when the security is due relatively soon because when maturity (i.e., the final resolution of uncertainty) is imminent, investors need to process more information. (Unlike in H2 and H3, in these cases, we do not necessarily expect an opposite effect for deals with lower complexity and longer remaining life.) More formally, we test the following empirical predictions.

H4.1. Transparency decreases ABS liquidity to a greater extent when the deal is more complex.

H4.2. Transparency decreases ABS liquidity to a greater extent when time to maturity is shorter.

3. Data and Research Design

3.1. Data

We collect data on European ABSs from three sources: EuroABS, European DataWarehouse, and Bloomberg. The population of the European ABSs comes from the EuroABS website. Established in 1999 by ex-market professionals, EuroABS collects and contains deal and tranche-level data—such as issuance date and amount, participants, ratings, and coupon or spread—for the entire European ABSs that have been issued since 1995. As of 2017, the EuroABS website stores 7,120 deals comprising 23,448 tranches (ISINs).

Next, we identify ABSs subject to the LLD Initiative using data we obtain from the European DataWarehouse (ED). Since the launch of the LLD regulation in January 2013, loan-level data has

been provided in a standardized template at least on a quarterly basis. The processing, verification, and handling of the data are administrated by the European DataWarehouse (ED). As of October 2018, the ED stores about 64 million loans underlying 1,223 active and redeemed deals. Residential MBSs are by far the largest asset class regarding the number of deals, constituting 55% of all deals (N = 678).[20]

Data on time-varying ABS characteristics come from Bloomberg. Specifically, for ABSs contained in the EuroABS and ED, we collect issue prices, daily trading prices, and bid and ask quotes. For the asset (collateral) side of ABS deals, we collect monthly (amortizing) collateral balances and the number of underlying loans as well as collateral quality information such as non-performing loan portion and default and recovery rates. For the liability (tranche) side, we collect monthly (amortizing) principal balances, interest payments, and expected maturities. In addition, bond quality data, such as principal and interest shortfalls, loan-to-value ratio, and credit support information, are collected. We also collect other key information, such as investor identities.

Tables 1 shows a breakdown of our sample by country. Great Britain, Spain, Italy, and the Netherlands represent the bulk of our sample, consistent with active mortgage securitization and marketable ABSs in these countries. There are more observations in the later periods (aside from 2015, which at best includes only one month due to our sample restrictions).

3.2. *Research Design and Measurement*

[20] Source: https://eurodw.eu/wp-content/uploads/ABS-Market-Coverage.pdf.

See https://www.ecb.europa.eu/paym/coll/loanlevel/html/index.en.html for a more detailed explanation of the regulation and data. To perform our empirical analyses, we identify and download individual submissions using the interface provided by the ED. The entire population of loan-level data can be collated via complex query-based analyses of more than 21,000 submissions.

As the basis of our analysis, we first compare liquidity of ABSs subject to the ECB LLD Initiative ("transparent ABSs") with that of ABSs not subject to the initiative ("opaque ABSs") for the period of 2011–2014, i.e., two years surrounding the implementation of the ECB LLD Initiative (January 2013). To do so, we estimate the following OLS regression model at the security-month level:

$$Illiquidity_{st} = \beta_0 + \beta_1\, Transparent\ Security_s \times Post_t + \beta_2\, Transparent\ Security_s + \beta_3\, Post_t + \Gamma\, X_{st} + \mu_l + \nu_c + \omega_r + \sigma_t + \varepsilon_{st}, \quad (1)$$

In this model, *s* denotes an ABS tranche (i.e., security) and *t* denotes a calendar month. We work at the tranche level since security liquidity is defined at the tranche (i.e., ISIN) level and because allowing multiple tranches for a given ABS enables us to make necessary seniority comparisons to pin down the information sensitivity channel. That said, our conclusions hold if we run our main tests at the ABS (i.e., SPE) level. We observe our observations monthly because our main liquidity measure is defined at the monthly level.[21]

Illiquidity is measured as the number of trading days in a month without a trade divided by the total number of trading days in that month. This definition is easy to construct (given the data restriction in the secondary ABS markets in Europe) and has a well-behaved distribution (equals zero for perfectly liquid securities and one for perfectly illiquid securities). It is also used in the literature extensively (e.g., Lesmond, Ogden, and Trzcinka 1999; Schestag, Schuster, and Uhrig-Homburg 2016). Nevertheless, in additional sensitivity tests, we use three alternative metrics for

[21] The European MBS markets (or at least their Bloomberg coverage) do not have a significant level of daily trades, and working at annual level would be too coarse to infer the effects of transparency

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Illiquidity: (*i*) bid-ask spreads, (*ii*) a model-based definition from Roll (1984), which relies on the negative auto-covariance of trade prices, and (*iii*) a model-based definition from Fong et al. (2017), which utilizes non-trading days to compute implicit bid-ask spreads.

Transparent Security is a time-invariant indicator variable that switches on only for securities whose underlying collateral is disclosed on an asset-by-asset basis under the ECB LLD Initiative. We obtain this information from the European DataWarehouse, i.e., the data repository that contains loan-level data and provides information on the ISINs of the securities it includes. *Post* is also an indicator variable. It equals one for months on or after January 2013 and zero otherwise.

X_{st} consists of the following control variables that are included in our estimation models to account for security characteristics that could affect the secondary-market liquidity and may be correlated with the likelihood of being a transparency security: *Collateral Balance Factor, Collateral Balance Amount, Tranche Balance Factor, Tranche Amount, Number of Loans, Nonperforming Collateral, Yield, Rating, Loan-to-value, Age, Remaining Life, and Return* and *Volatility*. The balance amounts and factors include information about how much of dollar amount and relative collateral amount remains at the security for a given month. *Rating* is a numerical translation of Moody's rating (Aaa=1 and C=21). *Age* is the time since issuance in years. *Remaining life* is the security's time to maturity in years. *Nonperforming collateral* is the percentage of nonperforming loans in the underlying asset base. *Loan-to-value* is the average loan to value ratios of the collateral group, a common proxy for over-collateralization. Common control variables like issuance amounts, issuance ratings, and stated maturity date at issuance are not identified due to collinearity in the models with security fixed effects. In the main models, these regressors are accounted for by their time-varying definitions.

Finally, in our analyses of cross-sectional attributes, we introduce and examine several other dimensions. In these tests, we partition our main estimation sample based on information sensitivity and payoff asymmetry, investor sophistication and originator reputation, as well as deal complexity and remaining maturity. We detail the definition of these variables in the discussion of the cross-sectional results.

With regard to the univariate attributes of our regressions variables, we observe that *Illiquidity* has a mean (median) of 0.315 (0.13), meaning that the average (median) security remains untraded 31.5% (13%) of the month. About 38% of our observations are coded as *Transparency Security*, while 60% of them come from January 2013 onward. The median MBS in our sample has a nonperforming loan ratio of 4.3%, yield of 1.37%, age of 7.02 years, and remaining life of over 30 years.

4. Empirical Results

In this section, we present the results of our analyses. We begin by exploring the findings from baseline regressions and proceed with the robustness of these inferences. We then report evidence on the drivers of the relationship between transparency and liquidity.

4.1. Baseline Findings

To shed light on the average effect of transparency on liquidity, we estimate the regression equation (1). Panel A of Table 3 reports the pertinent results. The main coefficient of interest, *Transparency Security* × *Post*, is highlighted in grey. Without time-varying controls and fixed effects, asset-level disclosures increase *Illiquidity* (i.e., reduce liquidity) by 7.4%. This effect is economically meaningful, given the sample average and standard deviation of *Illiquidity*, which are 31.5% and 34.4%, respectively. The coefficient estimate on *Transparency Security* × *Post*

increases to 8.4% after the inclusion of country (of collateral) and month fixed effects and decreases to 4.4% when we also add indicators for originators (i.e., lender) and tranche classes. Column (4) presents the results of a regression model that also includes time-varying control variables. (We use this model in our subsequent cross-sectional analyses and suppress the estimates on the control variables for brevity.) This specification yields the estimate we mention in the abstract and introduction: a 4.8% decline in liquidity as a result of asset disclosures, which translates to about 15% of the sample standard deviation. The negative (positive) association between illiquidity and tranche amount and volatility (yields) is consistent with prior work (e.g., Bao, Pan, and Wang 2011).

Next, we perform additional tests to further verify the positive association between disclosure and illiquidity. In the first of these tests, the results of which are shown in Panel B of Table 3, we enhance our estimation models with further fixed effects. In column (1), we interact originator and month fixed effects. The two-dimensional lender × month fixed effects account for all time-invariant and time-varying characteristics of the originator. Therefore, this specification permits the comparison of two securities (one disclosed and one non-disclosed) of the same bank, in the same month. Consistent with tighter identification, the main effect in these specifications rises to 6.8%. This estimate, however, goes back down to 4.2% when we also add ABS fixed effects, which renders a within-security research design. Overall, these estimates suggest that our conclusions hold (if not get stronger) within-ABS and within-bank-month.

We also estimate a propensity-score-matched (PSM) model and run our main regression model with a more formal control for pre-treatment trends. The objective of these models is to alleviate lingering concerns relating to potentially confounding differences between ABSs whose underlying assets have been disclosed and those whose assets remain unrevealed. As can be seen

in Panel C of Table 3, our main finding quantitatively holds in a PSM-based sample (column (1)).[22] As for the formal test of the parallel trends assumption, we add a pre-treatment dummy (*Pre1*), which switches on for the year of 2012, and interact it with *Transparency Security*. This specification further strengthens our main estimate—the average treatment effect goes up from about 4% to 5.9% (column (2)). Importantly, we note that the pre-treatment trend in outcome variable was not statistically different between transparency and non-transparency ABSs.

Finally, in the tests that are shown in Panel D of Table 3, we estimate equation (1) for alternative measures of liquidity. This analysis aims to ascertain the extent to which our conclusions are driven by the specific liquidity proxy we adopt, i.e., the proportion of days without trading. As discussed in the preceding section, in this robustness analysis, we use three common liquidity proxies that we believe are less suitable for our analysis but still have a sensible connection to true liquidity: Bid-ask spreads, the illiquidity proxy by Roll (1984), and the illiquidity proxy by Fong et al. (2017). As can be seen in each of the three columns in Panel D of Table 3, the main takeaway from these tests is that irrespective of the proxy we choose, we observe a significant average increase in illiquidity.

Overall, our empirical findings provide support for our first empirical prediction, H1. Under symmetric ignorance, debt markets operate smoothly without severe information asymmetry among investors. By contrast, transparency can enhance the capabilities and incentives of sophisticated investors to value ABSs, thereby increasing the information asymmetry between sophisticated and unsophisticated investors. Fearing adverse selection, unsophisticated investors

[22] Note that the PSM-based sample has significantly fewer observations. This is mainly because of using a restrictive 0.01 caliper in matching, which ensures that the treatment and control samples be statistically indistinguishable at the time of the regulation, January 2013. The first stage of our PSM model includes the entirety of the controls vector we employ in our tests.

would be incentivized to reduce or stop trading. As a result, the liquidity in the ABS markets would fall.

4.2. *Information Sensitivity and Asymmetric Payoffs*

Having established a mean estimate of the effect of transparency on liquidity, we next tackle the mechanism through which this effect works: symmetric ignorance. In the core of our symmetric ignorance argument are information sensitivity and asymmetric payoffs, which we test by re-estimating our main regression model across various subsamples. Table 4 explores the results of these regressions and provides support for our predictions (H2.1 and H2.2)—information sensitivity is crucial for the illiquidity effects of disclosure.

We observe in columns (1) and (2) that our main estimates are more than twice as large (9.3%) for a subsample of ABSs with well-performing collateral but negative and significant (-7.6%) for ABSs with poorly performing collateral. (We determine these subsamples based on the top and bottom quartile of the nonperforming loan ratios of sample ABSs.) F-tests for testing the differences between coefficients from two independent regressions also reject the equality between 9.3% and -7.6% at 0.01 level.

Likewise, the average effect appears to be driven solely by the illiquidity of safe (class “A” and class “B”) tranches. Note that our findings for securities with poorly performing collateral or for risky (class “C”, class “D”, and “Equity”) tranches are not only statistically and economically weaker. The sign of the main effect flips for these subsets, suggesting that asset-level disclosures *increase* liquidity when the payoff of the security is information sensitive, or, according to our interpretation, when investors are information-seeking (columns (3) and (4) in Table 4).

4.3. *Information Asymmetry and Adverse Selection*

Another critical component of symmetric ignorance is adverse selection and investor sophistication. A common theme in prior literature is that greater disclosure induces enhanced discipline in the banking sector (Granja 2018; Balakrishnan and Ertan 2018). We anticipate that transparency hurts less (or even helps) in cases in which the ABS originator's monitoring efforts need to be enhanced. We capture this construct by utilizing originating banks' reputations and expect that high-reputation originators need external discipline to a lesser extent. We proxy for originator reputation using the number of deals the originator arranged during the sample period. We code the bottom quartile as low-quality originator reputation.

In addition, we analyze the mediating role of investor sophistication. We predict that asset-level disclosures are complex enough that the degree to which sophisticated investors could process them would be different from that of unsophisticated investors. In turn, we suspect that disclosure hurts liquidity more for ABSs in cases in which the variation in investor sophistication is greater. On the flipside, we do not have any particular prediction relating to the *average* level of investor sophistication in an ABS. Nonetheless, we extend our tests to shed light on this parameter as well. We measure sophistication as the number of distinct ABS deals invested by the investor. We then take the standard deviation and average of these values.

Tables 5 and 6 present the relevant results. Akin to the inferences we discuss above, we find that the average DiD estimate becomes negative for low-reputation originators (Table 5). Namely, disclosure, in fact, increases ABS liquidity when the originator has a low reputation, helping potentially the entirety of the investor base by enhancing market discipline. Unsurprisingly, however, we observe that the average illiquidity effect of disclosures is particularly stronger (6.7%) in the case of high-reputation ABS originators.

The results from the cross-sectional tests of investor sophistication also support our main arguments (Table 6). As shown in Panel A of Table 6, when the variation in investor sophistication is low, we do not find a liquidity-reducing effect of transparency. By contrast, the coefficient of the DiD estimator almost quadruples (up to 19.8%) among a subsample of securities among which there is a large variation in investor sophistication. Note also that we report a nil result when we partition our sample based on the average value of investor sophistication (Panel B of Table 6). Specifically, we observe economically large and statistically significant illiquidity effects of transparency when average investor sophistication is high as well as when it is low. This insignificant finding underscores the crucial role of the asymmetry among investors rather than the average level of sophistication. Collectively, we view these inferences as consistent with the "symmetric ignorance" hypothesis (H3.1 and H3.2).

4.4. *Information Complexity*

In the final part of our analysis, we shift our focus to deal complexity. The underlying rationale here is that for more complex deals, holding all else constant, the room for differential interpretation and processing of disclosure will be higher. We use the number of loans as a proxy for deal complexity, in that we code a deal as more complex if it includes more loans (top quartile). We complement this prediction by examining the remaining maturity of sample MBSs (treatment and control) at the time of the disclosure regulation. In particular, we expect maturity as a significant resolution of uncertainty, in that the overall uncertainty surrounding the deal grows as the maturity date of the deal gets closer. In other words, information uncertainty and information asymmetry are more relevant when time to maturity is small (Duffie and Lando 2001; Lu, Chen, and Liao 2010). Accordingly, we anticipate the disclosure regulation to have stronger illiquidity

effects when the ABS has a relatively short time before maturity. Again, we determine these subsamples based on the top and bottom quartiles of the distribution of remaining maturity.

We present our empirical findings in Tables 7 and 8. Even though there are economically meaningful effects for securities with fewer loans and longer remaining life, we report statistically and quantitatively more significant effects for securities with a greater number of loans and, especially, those with a shorter remaining life. These estimation results underscore the relative importance of deal complexity. In summary, the inferences we obtain in this subsection provide empirical support for the last set of our empirical predictions (H4.1 and H4.2).

5. Conclusions

Prior literature finds that greater disclosure improves liquidity by reducing information asymmetry. More recently, analytical researchers argue that transparency might reduce liquidity by distorting symmetric ignorance. To shed light on this recent debate and the role of information sensitivity on the liquidity effects of transparency, we exploit a recent European disclosure regulation. In particular, we examine the secondary-market liquidity effects of asset-level disclosures of mortgage-backed securities (MBSs). We find that enhanced disclosures reduce liquidity in the MBS market by a relative 15%. We also find strong evidence that this average finding holds in the information-sensitive region of the payoff structure.

We document that symmetric ignorance mediates the relationship between informational transparency and liquidity. We get at this mechanism along three dimensions: information sensitivity, information asymmetry, information complexity. Specifically, disclosures increase liquidity when the MBS is information sensitive, i.e., for junior and equity tranches and when underlying collateral performance is poor. As for information asymmetry, transparency reduces

liquidity especially when information asymmetry among investors is high and when the reputation of the MBS originator is low. With regard to deal complexity, we find no result for less complex deals, while our estimates of the main treatment effect quadruple for most complex deals in our sample. Overall, these inferences support that unsophisticated investors are discouraged from trading (or from participating in the MBS market) when they are particularly worried about adverse selection and losing to sophisticated traders.

Our conclusions hold for a variety of liquidity proxies and rely on a within-security and within-bank-time design. Nevertheless, there are some issues that our paper is unable to shed light on. First, is the cost of a reduction in secondary-market liquidity significant enough to offset the benefits obtained through more transparent securitization practices? This question deserves attention from a regulatory perspective since securitization markets are in the process of adopting asset-level disclosures globally. Second, do the conclusions we draw apply in bad times? Third, does disclosure reduce liquidity in other transparency settings, such as Regulation AB II in the US? Future research could explore these questions and attempt to provide more direct insights into welfare effects.

References

Acharya, V.V. and Ryan, S.G., 2016. Banks' financial reporting and financial system stability. *Journal of Accounting Research*, *54*(2), pp.277–340.

Adrian, T., Boyarchenko, N. and Shachar, O., 2017. Dealer balance sheets and bond liquidity provision. *Journal of Monetary Economics*, *89*, pp.92-109.

Akerlof, G., 1970. The market for lemons: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics*, *84*(3), pp.235–251.

Amiram, D., Owens, E. and Rozenbaum, O., 2016. Do information releases increase or decrease information asymmetry? New evidence from analyst forecast announcements. *Journal of Accounting and Economics*, *62*(1), pp.121-138.

Ayotte, K. and Gaon, S., 2010. Asset-backed securities: costs and benefits of "bankruptcy remoteness". *Review of Financial Studies*, *24*(4), pp.1299–1335.

Balakrishnan, K., Billings, M.B., Kelly, B. and Ljungqvist, A., 2014. Shaping liquidity: On the causal effects of voluntary disclosure. *The Journal of Finance*, *69*(5), pp.2237–2278.

Balakrishnan, K. and Ertan, A., 2018. Banks' financial reporting frequency and asset quality. *The Accounting Review*, *93*(3), pp.1–24.

Balakrishnan, K. and Ertan, A., 2019. Bank asset transparency and credit supply. Working paper.

Bao, J., Pan, J. and Wang, J., 2011. The illiquidity of corporate bonds. *The Journal of Finance*, *66*(3), pp.911–946.

Benmelech, E. and Bergman, N., 2018. Debt, information, and illiquidity. Working paper.

Benmelech, E., Dlugosz, J. and Ivashina, V., 2012. Securitization without adverse selection: The case of CLOs. *Journal of Financial Economics*, *106*(1), pp.91–113.

Bischof, J. and Daske, H., 2013. Mandatory disclosure, voluntary disclosure, and stock market liquidity: Evidence from the EU bank stress tests. *Journal of Accounting Research*, *51*(5), pp.997–1029.

Bonsall, S., Bozanic, Z., Dou, Y., Richardson, G. and Vyas, D., 2018. Have FAS 166 and FAS 167 improved the financial reporting for securitizations? Working paper.

Bord, V.M. and Santos, J.A., 2015. Does securitization of corporate loans lead to riskier lending? *Journal of Money, Credit and Banking*, *47*(2-3), pp.415–444.

Bouvard, M., Chaigneau, P. and Motta, A.D., 2015. Transparency in the financial system: Rollover risk and crises. *The Journal of Finance*, 70(4), pp.1805–1837.

Brancati, E. and Macchiavelli, M., 2019. The information sensitivity of debt in good and bad times. *Journal of Financial Economics*, forthcoming.

Bushee, B.J. and Leuz, C., 2005. Economic consequences of SEC disclosure regulation: Evidence from the OTC bulletin board. *Journal of Accounting and Economics*, *39*(2), pp.233–264.

Chen, Q., Goldstein, I., Huang, Z. and Vashishtha, R., 2018. Bank transparency and deposit flows. Working paper.

Chen, L., Lesmond, D.A. and Wei, J., 2007. Corporate yield spreads and bond liquidity. *The Journal of Finance*, *62*(1), pp.119-149.

Coller, M. and Yohn, T.L., 1997. Management forecasts and information asymmetry: An examination of bid-ask spreads. *Journal of Accounting Research*, *35*(2), pp.181-191.

Dang, T.V., Gorton, G. and Holmström, B., 2015. Ignorance, debt and financial crises. Working paper.

Dang, T.V., Gorton, G., Holmström, B. and Ordonez, G., 2017. Banks as secret keepers. *American Economic Review*, *107*(4), pp.1005–1029.

Demiroglu, C. and James, C. M. (2014). The Dodd-Frank Act and the Regulation of Risk Retention in Mortgage-Backed Securities. In Schultz, PH, editor, *Perspectives on Dodd-Frank and Finance*, pages 201–216.

Diamond, D.W., 1985. Optimal release of information by firms. *The Journal of Finance*, *40*(4), pp.1071–1094.

Diamond, D.W. and Dybvig, P.H., 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, *91*(3), pp.401–419.

Diamond, D.W. and Verrecchia, R.E., 1991. Disclosure, liquidity, and the cost of capital. *The Journal of Finance*, *46*(4), pp.1325–1359.

Dou, Y., Ryan, S.G. and Xie, B., 2018. The real effects of FAS 166/167 on banks' mortgage approval and sale decisions. *Journal of Accounting Research*, *56*(3), pp.843–882.

Duffie, D. and Lando, D., 2001. Term structures of credit spreads with incomplete accounting information. *Econometrica*, *69*(3), pp.633-664.

Ertan, A., Loumioti, M. and Wittenberg-Moerman, Regina, 2017. Enhancing loan quality through transparency: Evidence from the European Central Bank Loan-Level Reporting Initiative. *Journal of Accounting Research*, *55*(4), pp.877–918.

Fong, K.Y., Holden, C.W. and Trzcinka, C.A., 2017. What are the best liquidity proxies for global research? *Review of Finance*, *21*(4), pp.1355–1401.

Geithner, T. and Metrick, A., 2018. Ten years after the financial crisis: A conversation with Timothy Geithner. Working paper.

Gilson, R.J. and Kraakman, R., 2014. Market efficiency after the financial crisis: It's still a matter of information costs. *Virginia Law Review*, pp.313–375.

Goldstein, I. and Sapra, H., 2014. Should banks' stress test results be disclosed? An analysis of the costs and benefits. *Foundations and Trends in Finance*, *8*(1), pp.1–54.

Gorton, G.B., 2010. *Slapped by the invisible hand: The panic of 2007*. Oxford University Press.

Gorton, G., 2013. The Development of Opacity in US banking. Working paper.

Granja, J., 2018. Disclosure regulation in the commercial banking industry: Lessons from the National Banking Era. *Journal of Accounting Research*, *56*(1), pp.173–216.

Holmström, B., 2015. Understanding the role of debt in the financial system. Working paper.

Jackson, H.E., 2010. Loan-level disclosure in securitization transactions: A problem with three dimensions. Working paper.

Kara, A., Marques-Ibanez, D. and Ongena, S., 2015. Securitisation and lending standards: Evidence from the European wholesale loan market. Working paper.

Keys, B.J., Mukherjee, T., Seru, A. and Vig, V., 2010. Did securitization lead to lax screening? Evidence from subprime loans. *The Quarterly Journal of Economics*, *125*(1), pp.307–362.

Keys, B.J., Seru, A. and Vig, V., 2012. Lender screening and the role of securitization: Evidence from prime and subprime mortgage markets. *Review of Financial Studies*, *25*(7), pp.2071–2108.

Kim, O. and Verrecchia, R.E., 1994. Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics*, *17*(1-2), pp.41-67.

Lang, M., Lins, K.V. and Maffett, M., 2012. Transparency, liquidity, and valuation: International evidence on when transparency matters most. *Journal of Accounting Research*, *50*(3), pp.729–774.

Lang, M. and Maffett, M., 2011. Transparency and liquidity uncertainty in crisis periods. *Journal of Accounting and Economics*, *52*(2-3), pp.101–125.

Leuz, C. and Verrecchia, R.E., 2000. The economic consequences of increased disclosure. *Journal of Accounting Research*, pp.91–124.

Lesmond, D.A., Ogden, J.P. and Trzcinka, C.A., 1999. A new estimate of transaction costs. *Review of Financial Studies*, *12*(5), pp.1113–1141.

Loutskina, E., 2011. The role of securitization in bank liquidity and funding management. *Journal of Financial Economics*, *100*(3), pp.663–684.

Lu, C.W., Chen, T.K. and Liao, H.H., 2010. Information uncertainty, information asymmetry and corporate bond yield spreads. *Journal of Banking & Finance*, *34*(9), pp.2265-2279.

Milgrom, P. and Roberts, J., 1990. The economics of modern manufacturing: Technology, strategy, and organization. *The American Economic Review*, pp.511–528.

Miller, B.P., 2010. The effects of reporting complexity on small and large investor trading. *The Accounting Review*, 85(6), pp.2107-2143.

Neilson, J.J., Ryan, S.G., Wang, K.P. and Xie, B., 2018. Asset-level transparency and the (e)valuation of asset-backed securities. Working paper.

Nier, E. and Baumann, U., 2006. Market discipline, disclosure and moral hazard in banking. *Journal of Financial Intermediation*, *15*(3), pp.332–361.

Oz, S., 2017. Did SFAS 166/167 decrease information asymmetry of securitizing banks? Working paper.

Pagano, M. and P Volpin 2012. Securitization, transparency and liquidity. *Review of Financial Studies*, 25(8), pp 2417–53.

Roll, R., 1984. A simple implicit measure of the effective bid-ask spread in an efficient market. *The Journal of Finance*, *39*(4), pp.1127–1139.

Ryan, S.G., 2018. Recent research on banks' financial reporting and financial stability. *Annual Review of Financial Economics*, *10*, pp.101–123.

Schestag, R., Schuster, P. and Uhrig-Homburg, M., 2016. Measuring liquidity in bond markets. *Review of Financial Studies*, *29*(5), pp.1170–1219.

Schroth, E., Suarez, G.A. and Taylor, L.A., 2014. Dynamic debt runs and financial fragility: Evidence from the 2007 ABCP crisis. *Journal of Financial Economics*, *112*(2), pp.164–189.

Townsend, R., 1979. Optimal contracts and competitive markets with costly state verification. *Journal of Economic Theory*, 21, pp. 265–93.

Verrecchia, R.E., 1983. Discretionary disclosure. *Journal of Accounting and Economics*, *5*, pp.179–194.

Wittenberg-Moerman, R., 2008. The role of information asymmetry and financial reporting quality in debt trading: Evidence from the secondary loan market. *Journal of Accounting and Economics*, *46*(2-3), pp.240–260.

Appendix A. Variable Definitions

Variable Name	Definition
Age	Difference between issue date and current date in years.
Collateral Balance Amount	Natural logarithm of month-end face value balance of collateral in Euros.
Collateral Balance Factor	Month-end face value balance of collateral divided by the original face amount of collateral.
Illiquidity	Non-trading days in a given month, divided by the number of total trading days in that month.
Loan-to-value	Weighted average loan to value ratios of the collateral group to which the current security belongs (in %).
Nonperforming Collateral	Nonperforming balance of collateral divided by collateral balance,
Number of Loans	Number of loans outstanding in the whole loan pool.
Post	Indicator that switches on only if the observation pertains to January 2013 or after.
Rating	Average initial rating of S&P, Moody's, and Fitch (1 to 22).
Remaining Life	Expected average life in years, provided by Euro ABS.
Return Volatility	Monthly standard deviations of daily returns.
Tranche Amount	Natural logarithm of the original issue amount of the tranche in euros.
Tranche Balance Factor	Natural logarithm of the ending face balance of collateral in euros.
Transparency ABS	Indicator that switches on if the observation pertains to an ISIN covered by the European DataWarehouse.
Yield	Monthly yield in percentage points, including coupon.

Sorted alphabetically. The data source is Bloomberg unless stated otherwise. Test-specific variables are defined in table captions.

Table 1. Sample Composition

This table details the country and year distribution of our sample. Each observation is an ISIN-month.

Country / Year	2011	2012	2013	2014	2015	Total
Spain (ES)	1,797	4,053	4,608	4,941	401	15,800
Great Britain (GB)	3,000	6,993	8,321	8,439	644	27,397
Ireland (IE)	399	426	434	412	22	1,693
Italy (IT)	920	1,044	1,019	961	73	4,017
Netherlands (NL)	716	1,378	1,866	2,457	160	6,577
Other	223	255	226	176	13	893
Total	7,055	14,149	16,474	17,386	1,313	56,377

Table 2. Descriptive Statistics

This table presents the sample statistics. Each observation is an ISIN-month. For indicator variables, we present the average values only. All variables are defined in Appendix A.

	Mean	stdev	p10	p50	p90	N
Illiquidity	0.315	0.344	0.043	0.130	1.000	56,377
Transparency ABS × Post	0.235					56,377
Transparency ABS	0.378					56,377
Post	0.600					56,377
Collateral Balance Factor	0.525	1.936	0.171	0.393	0.894	56,377
Collateral Balance Amount	20.154	1.714	18.183	19.906	23.464	56,377
Tranche Balance Factor	0.712	0.321	0.206	0.857	1.000	56,377
Tranche Amount	18.275	1.754	16.148	17.921	20.744	56,377
Number of Loans	8.764	1.584	6.936	8.416	11.943	56,377
Nonperforming Collateral	0.083	0.106	0.002	0.043	0.251	56,377
Yield	2.227	4.519	0.470	1.370	4.160	56,377
Rating	4.340	3.651	1.000	3.333	9.333	56,377
Loan-to-value	67.008	18.039	40.850	72.490	83.470	56,377
Age	6.864	2.322	4.175	7.024	9.543	56,377
Remaining Life	31.644	8.895	23.149	30.195	41.805	56,377
Return Volatility	0.013	0.025	0.000	0.003	0.034	56,377

Table 3. Transparency and Illiquidity—Main Results

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. Panel A presents the main treatment effect, and Panels B and C presents robustness tests. The main dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. Panel B includes models with restrictive fixed effects at the lender-month and ABS levels. In Panel C, shown are the results from the estimation of the main model on a sample that is constructed using a PSM model that uses all of the control variables in the first stage and a caliper value of 0.01. In this panel, we also present a variant of the main model that includes a control for pre-treatment parallel trends, in which *Pre1* is defined as an indicator variable that switches on for the year preceding the ECB LLD Treatment. In Panel D, we employ three alternative proxies for illiquidity. *Illiquidity (Bid-ask)* is the monthly average of the difference between ask and price, divided by the sum of the bid and ask prices. Illiquidity (FHT) is based on Fong, Holden, and Trzcinka (2017) and computed as 2 × σ × std-normal - cdf^(-1) [(1 + zeros) / 2]. Finally, *Illiquidity (Roll)* is based on Roll (1984) and calculated as 2(−Cov(R t ,R t−1))^(1/2) if Cov < 0, or 0 otherwise. All control variables are defined in Appendix A. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Bond Transparency and Illiquidity—Baseline Results

	(1)	(2)	(3)	(4)
	Illiquidity	*Illiquidity*	*Illiquidity*	*Illiquidity*
Transparency ABS × Post	0.074***	0.084***	0.044**	0.048**
	(3.35)	(3.97)	(2.36)	(2.34)
Transparency ABS	-0.087	-0.064***	-0.027*	-0.023
	(-1.57)	(-3.03)	(-1.90)	(-0.90)
Post	-0.184***			
	(-10.67)			
Collateral Balance Factor				-0.001
				(-0.59)
Collateral Balance Amount				-0.010
				(-0.47)
Tranche Balance Factor				-0.063
				(-1.50)
Tranche Amount				-0.027**
				(-2.02)
Number of Loans				0.039
				(1.04)
Nonperforming Collateral				-0.114
				(-0.82)
Yield				0.003***
				(2.84)
Rating				-0.005
				(-1.41)
Loan-to-value				0.001
				(0.91)
Age				0.001
				(0.14)
Remaining Life				-0.003*
				(-1.70)
Return Volatility				-0.856***
				(-3.01)
Observations	56,377	56,377	56,377	56,377
Adjusted R-squared	0.057	0.120	0.271	0.281
Tranche Code and Lender FE	N	N	Y	Y
Country and Month FE	N	Y	Y	Y

Panel B. Specifications with Bank-Month Fixed Effects

	(1)	(2)
	Illiquidity	*Illiquidity*
Transparency ABS × Post	0.068***	0.042**
	(3.09)	(2.01)
Observations	56,377	56,377
Adjusted R-squared	0.325	0.380
Lower order terms and Controls	Y	Y
Tranche Code and Country FE	Y	Y
Lender-month FE	Y	Y
ABS FE	N	Y

Panel C. Propensity-Score Matching and Pre-Treatment Parallel Trends

	(1)	(2)
	PSM-based Model	Parallel Trends
	Illiquidity	*Illiquidity*
Transparency ABS × Post	0.043*	0.059**
	(1.65)	(2.29)
Transparency ABS × Pre1		-0.046
		(-1.46)
Observations	16,428	55,880
Adjusted R-squared	0.295	0.281
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y

Panel D. Alternative Measures of Illiquidity

	(1)	(2)	(3)
	Illiquidity (Bid-ask)	*Illiquidity (FHT)*	*Illiquidity (Roll)*
Transparency ABS × Post	0.121***	0.138**	0.139**
	(6.34)	(2.37)	(2.05)
Observations	44,952	27,030	26,746
Adjusted R-squared	0.432	0.568	0.570
Lower order terms and Controls	Y	Y	Y
Tranche Code and Lender FE	Y	Y	Y
Country and Month FE	Y	Y	Y

Table 4. Asset Transparency and Bond Illiquidity: The Role of Asymmetric Payoff

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. The regression models are identical to the main specification presented in Panel A of Table 3. The dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. *Well-performing collateral* and *Poorly performing collateral* denote subsamples constructed based on the quality of underlying roles, top and bottom quartile of *Nonperforming Collateral*. The *Risky Tranche* subsample (*Safe Tranche* subsample) includes ISINs that are "A" or "B" tranches ("C" or "D" or equity tranches). All control variables are defined in Appendix A. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Illiquidity	*Illiquidity*	*Illiquidity*	*Illiquidity*
	Well-performing collateral	Poorly performing collateral	Safe Tranche	Risky Tranche
Transparency ABS × *Post*	0.093***	-0.076*	0.085***	-0.050*
	(2.65)	(-1.76)	(3.39)	(-1.80)
Observations	14,100	14,075	36,503	19,874
Adjusted R-squared	0.226	0.484	0.238	0.464
Lower order terms and Controls	Y	Y	Y	Y
Tranche Code and Lender FE	Y	Y	Y	Y
Country and Month FE	Y	Y	Y	Y
p-value for differences in coefficients	0.037		<0.001	

Table 5. Asset Transparency and Bond Illiquidity: Originator Reputation

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. The regression models are identical to the main specification presented in Panel A of Table 3. The dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. *Low-reputation Originator* and *High-reputation Originator* denote subsamples constructed based on the reputation of ABS originator, operationalized as the number of ISINs packaged. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Illiquidity	*Illiquidity*
	Low-reputation Originator	High-reputation Originator
Transparency ABS × *Post*	-0.055*	0.067***
	(-1.88)	(3.10)
Observations	11,403	44,974
Adjusted R-squared	0.299	0.304
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y
p-value for differences in coefficients	<0.001	

Table 6. Asset Transparency and Bond Illiquidity: Investor Characteristics

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. The regression models are identical to the main specification presented in Panel A of Table 3. The dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. In Panel A, *Low information asymmetry* and *High information asymmetry* denote subsamples constructed based on the standard deviation of investor sophistication. In Panel B, *Low information sophistication* and *High information sophistication* denote subsamples constructed based on the average investor sophistication. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Information Asymmetry

	(1)	(2)
	Illiquidity	*Illiquidity*
	Low info asymmetry	High info asymmetry
Transparency ABS × *Post*	0.011	0.153***
	(0.23)	(4.98)
Observations	9,951	14,243
Adjusted R-squared	0.419	0.319
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y
p-value for differences in coefficients	0.003	

Panel B. Average Investor Sophistication

	(1)	(2)
	Illiquidity	*Illiquidity*
	High investor sophistication	Low investor sophistication
Transparency ABS × Post	0.097**	0.131**
	(2.35)	(2.58)
Observations	12,295	11,804
Adjusted R-squared	0.357	0.357
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y
p-value for differences in coefficients	0.785	

Table 7. Asset Transparency and Bond Illiquidity: Deal Complexity

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. The regression models are identical to the main specification presented in Panel A of Table 3. The dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. *Low number of controls* and *High number of loans* denote subsamples constructed based on the number of underlying loans, bottom and top quartiles of *Number of Loans*. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Illiquidity	*Illiquidity*
	Low number of loans	High number of loans
Transparency ABS × *Post*	0.063	0.131***
	(1.14)	(3.65)
Observations	14,108	14,093
Adjusted R-squared	0.400	0.347
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y
p-value for differences in coefficients	0.194	

Table 8. Asset Transparency and Bond Illiquidity: Remaining Maturity

This table presents the results of the OLS estimation of the impact of the ECB's LLD requirement on secondary-market liquidity of mortgage-backed securities. Each observation is an ISIN-month. The regression models are identical to the main specification presented in Panel A of Table 3. The dependent variable, *Illiquidity*, is the number of non-trading days in a bond-month divided by the total number of trading days in the month. A higher value signifies greater illiquidity. *Transparency ABS* and *Post* are indicator variables that switch on respectively for ISINs that are associated with loan-level disclosures and for months January 2013 and after. *Short remaining life* and *Long remaining life* denote subsamples constructed based on the expected remaining maturity, bottom and top quartiles of *Remaining Life*. *T*-statistics (reported in parentheses) are robust to within-originator correlation and heteroscedasticity. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
	Illiquidity	*Illiquidity*
	Short remaining life	Long remaining life
Transparency ABS × *Post*	0.134***	0.027
	(2.71)	(0.59)
Observations	13,145	12,969
Adjusted R-squared	0.439	0.271
Lower order terms and Controls	Y	Y
Tranche Code and Lender FE	Y	Y
Country and Month FE	Y	Y
p-value for differences in coefficients	0.0975	

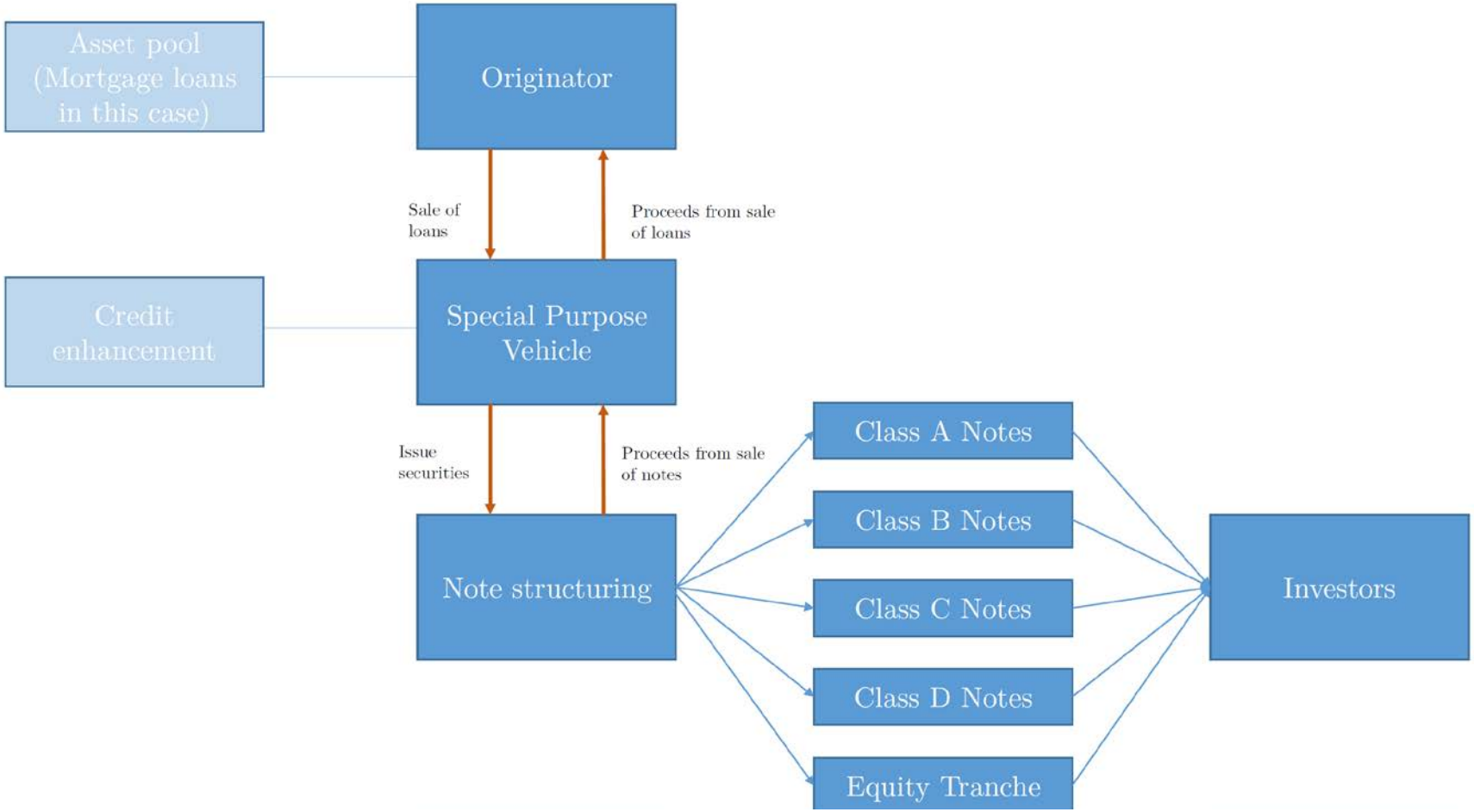


Figure 1. Securitization Process

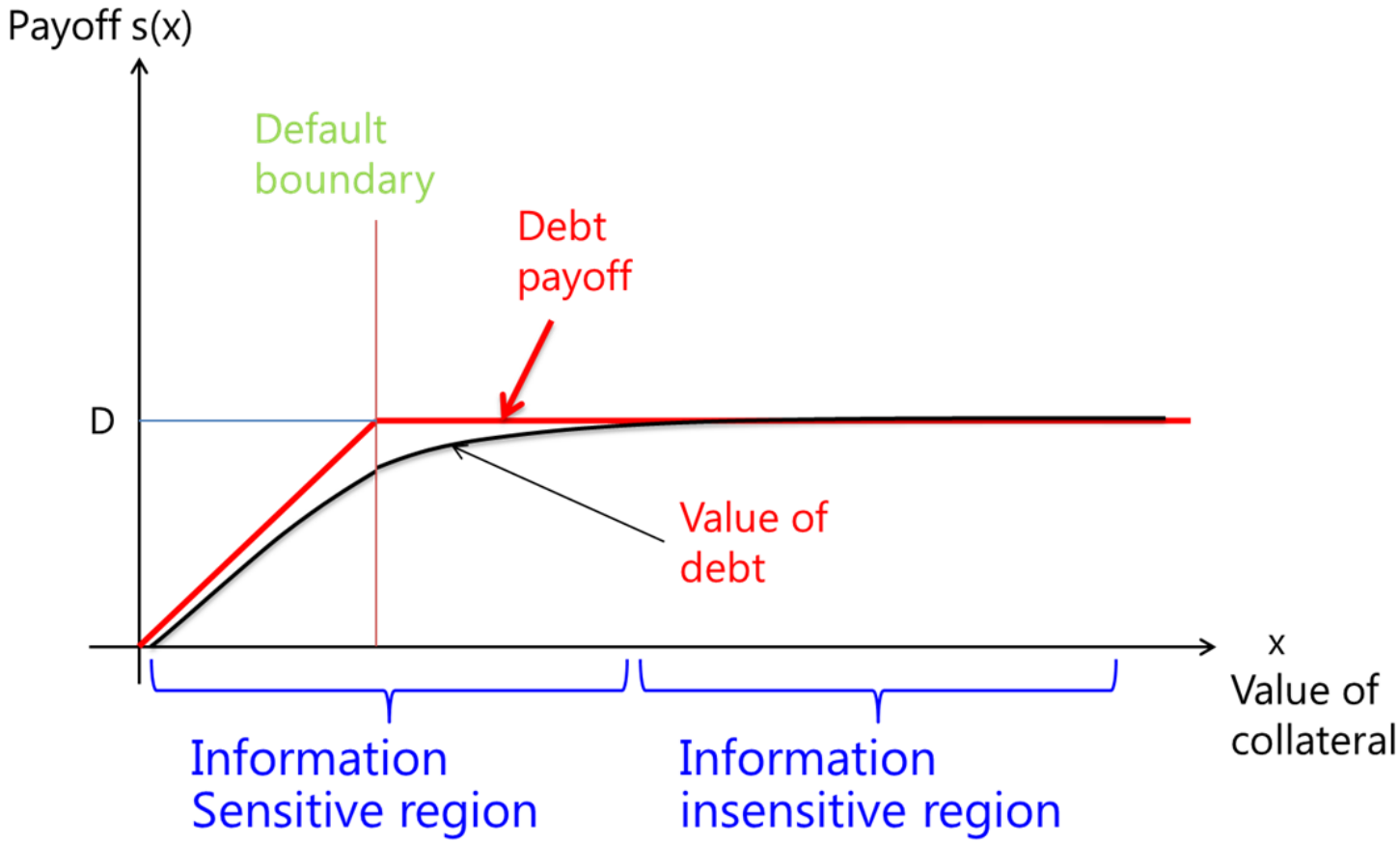
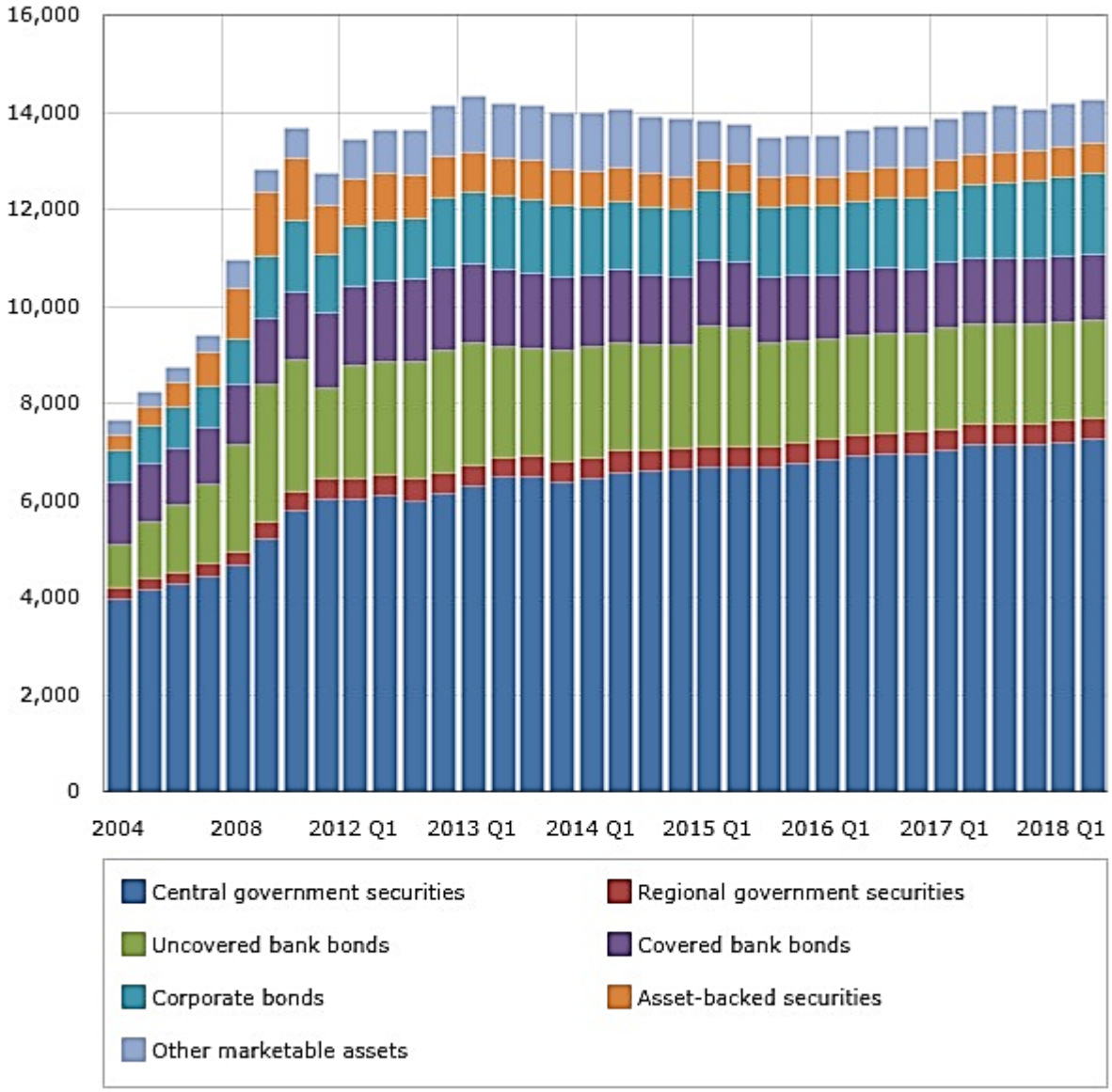
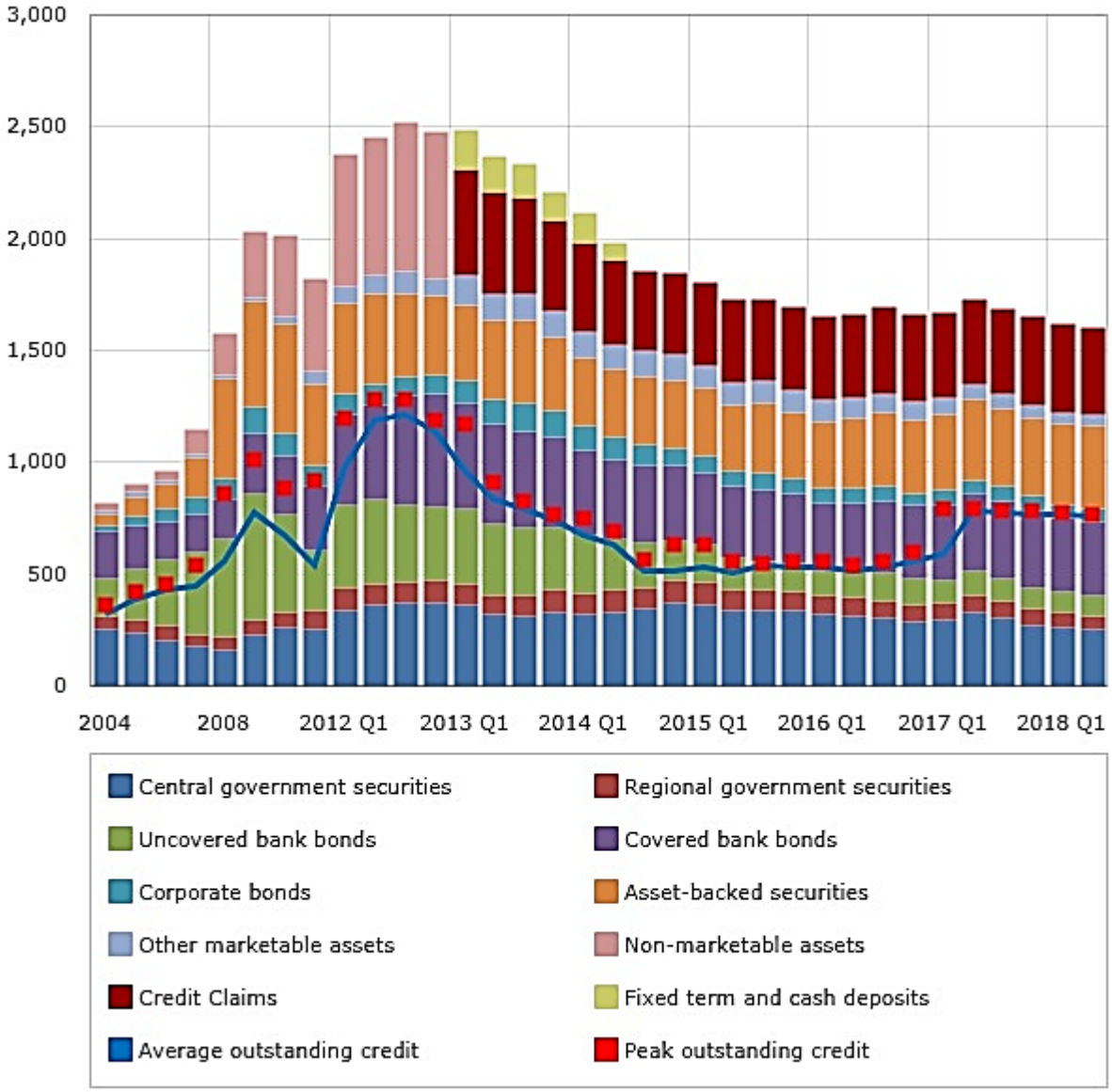


Figure 2. Information Sensitivity and Payoffs



Source: ECB

Figure OA1. Eligible Marketable Assets



Source: ECB

Figure OA2. Use of Collateral and Outstanding Credit