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Asset-Level Transparency and the (E)valuation of Asset-Backed Securities

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ABSTRACT

As of November 2016, SEC Regulation ("Reg") AB II requires issuers of certain types of asset-backed securities ("ABS") to disclose the credit-risk attributes of each asset in the underlying pool, a substantial expansion of prior disclosure requirements. We examine how ABS issuers' asset-level disclosures under Reg AB II affect the (e)valuation of ABS by investors and credit rating agencies. Using difference-in-differences models that compare affected and unaffected types of ABS, we find that these disclosures improve the ability of initial ABS yields and credit ratings to predict the performance of the underlying assets. These results are concentrated in deals with above-median risk layering in the underlying assets and complexity in the tranching of credit risk. We further find that asset-level disclosures are associated with lower yields.

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Lastly, we provide evidence that most prospective ABS investors download asset-level information during the price formation period prior to ABS issuance.

JEL codes: G21, G24, G28, L1, M41, M48

Keywords: asset-backed securities; asset-level disclosures; Reg AB II; transparency; risk layering; credit rating quality

"Sunlight is said to be the best of disinfectants."
Louis Brandeis, Other People's Money and How the Bankers Use It
[1914, Ch. V]

1. Introduction

We examine the impact of transparency about the credit-risk attributes of individual underlying assets on the (e)valuation of asset-backed securities ("ABS") by investors and credit rating agencies. We focus on the ability of initial yields and credit ratings to predict the future credit performance of the underlying assets. This research question is important because the opacity of the assets underlying ABS is widely cited as a primary cause of the 2007–09 financial crisis (Acharya et al. [2009], Scott and Taylor [2009], Gorton [2010]). The Financial Crisis Inquiry Report [2011, p. xix] concludes that "a combination of excessive borrowing, risky investments, and lack of transparency put the financial system on a collision course with crisis." Ashcraft and Schuermann [2008] explain how information about the underlying assets is lost in each step of the securitization process: at asset origination, when originators sell assets to the issuers, and when issuers package the assets in complex structured deals and sell the ABS to investors. Owing to their position at or near the end of this chain, ABS investors have a poor understanding of underlying asset quality and the risks of ABS (Coval, Jurek, and Stafford [2009], Gorton [2010]).

As part of the post–financial crisis effort to reform the securitization process, the Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank Act") directed the SEC to adopt regulations requiring ABS issuers to provide asset-level disclosures (section 942[b]). To implement this mandate, the SEC developed Regulation AB II ("Reg AB II"), which it issued in September 2014. Reg AB II requires issuers of certain types of ABS to disclose asset-level credit-risk attributes as of November 23, 2016 (SEC [2014]).

Reg AB II's asset-level disclosure requirements represent a promising setting to address our research question for two reasons. First, these requirements constitute the first and most significant postcrisis expansion of public information about the assets underlying ABS. The prior Regulation AB ("Reg AB") only required ABS issuers to provide ABS investors with pool-level summary statistics for relatively few individual credit-risk attributes,

such as borrower FICO credit scores and loan-to-value ratios. Although useful, such one-dimensional pool-level statistics suppress multiattribute features of the underlying assets, notably risk layering (Ryan [2018]). Under Reg AB II, issuers disclose the exact values of more numerous credit-risk attributes of each asset in the pool, thereby revealing these features.[1] Second, Reg AB II's asset-level disclosure requirements substantially increase disclosures for only certain types of ABS.[2] The limited scope of these requirements enables us to employ a difference-in-differences research design.

Prior empirical research finds that investors did not fully appreciate the risks of ABS prior to the financial crisis, and as a consequence bore substantial losses during the crisis (Coval, Jurek, and Stafford [2009]). Disclosure theory generally predicts that public disclosure improves price efficiency by driving prices closer to fundamental values (Gao [2008]) and improving investors' prediction of future payoffs (Goldstein and Yang [2017]). Based on this prior research, we expect ABS issuers' asset-level disclosures under Reg AB II to improve the accuracy of investors' valuations of the subject ABS. However, such improvement might not materialize owing to the immateriality of individual loans (Ally Financial Inc. et al. [2011]), the highly disaggregated nature of asset-level disclosures, and investors' information-processing constraints (Richardson, Ronen, and Subrahmanyam [2011], p. 482).

Prior research identifies overly optimistic credit ratings of ABS as a key contributor to the financial crisis (Duyn and Chung [2008], Jones, Tett, and Davies [2008], Ashcraft, Goldsmith-Pinkham, and Vickery [2010], Jiang, Wang, and Wang [2018]). Asset-level disclosures may not directly improve rating quality because rating agencies already had unrestricted access to granular nonpublic information from the issuers, and none of the big three rating agencies substantially changed their rating methodologies after the enactment of the asset-level disclosure requirements.[3] However, public disclosure of asset-level information can indirectly improve credit ratings through enhanced market discipline, as these disclosures improve

[1] Appendix A provides examples of auto ABS issuers' disclosures before and after the effective date of Reg AB II's asset-level disclosure requirements.

[2] As discussed below, the limited effect of Reg AB II's asset-level disclosure requirements to date is attributable to (1) only certain types of ABS deals being subject to these requirements, (2) inactive public markets for some of the subject deal types after the effective date of the requirements, and (3) issuers providing asset-level disclosures in practice for subject commercial mortgage-backed securities (CMBS) deals prior to this effective date.

[3] Our discussions with auto ABS credit analysts at one of the big three credit rating agencies confirm that, prior to Reg AB II, these analysts had access to more granular data (including asset-level data) than was publicly available, because they could request and expect to receive such information from auto ABS issuers. The analysts further state that they were given all the information that they felt was necessary to analyze auto deals prior to Reg AB II. Of the big three credit rating agencies (S&P, Moody's, and Fitch), only Fitch updated its auto ABS rating methodologies after the effective date of the asset-level disclosure requirements, and even it states that "this updated criteria report is substantially unchanged from the prior criteria" (Fitch [2017]).

investors' ability to conduct their own credit-risk analysis and thereby detect inaccurate ratings of ABS. This is consistent with the SEC's prediction that, upon the provision of asset-level information, "investors will have the ability to better assess the rating performance" (SEC [2014, p. 57203]). If rating agencies face heightened market scrutiny when asset-level information is publicly disclosed, they have greater incentives to issue accurate ratings because of reputational concerns (White [2010]). Hence, it is an empirical question whether Reg AB II's asset-level disclosure requirements improve rating quality.

The main aspects of our research design are as follows. The treatment group consists of SEC-registered auto ABS deals, the only deal type for which (1) Reg AB II's asset-level disclosure requirements substantially increased publicly available information and (2) there is public market issuance during our sample period. The control group includes all SEC-registered nonagency ABS deals not subject to these disclosure requirements (e.g., credit card deals). We proxy for the (e)valuation of ABS by investors (credit rating agencies) using yield spreads (credit ratings) at issuance. Following He, Qian, and Strahan [2016] and Badoer and Demiroglu [2019], we measure future asset performance, the dependent variable in our primary models, as the percentage of the principal balance of the underlying assets in the deal that has been written off because of defaults as of six months after the ABS issuance date ("the default rate"). Following prior literature (Becker and Milbourn [2011], He, Qian, and Strahan [2016], Bonsall, Koharki, and Neamtiu [2017]), we infer yield informativeness and rating quality from the difference-in-differences slope coefficients on deal-level weighted-average yields and ratings, respectively, in these models. Following Becker and Milbourn [2011], we corroborate these inferences by examining the incremental R^2s of yields and ratings.

We find that initial yield spreads more strongly predict the future default rate for the treatment ABS deals than for the control ABS deals after the effective date of Reg AB II's asset-level disclosure requirements than before that date, consistent with these disclosures improving yield informativeness. When initial yield spreads increase by one standard deviation (0.21%), the default rate on average increases by 0.23% for the treatment ABS relative to the control ABS after the asset-level disclosure requirements. The incremental R^2 tests yield the same inferences.[4]

We find that initial ratings more strongly predict the future default rate for the treatment ABS than for the control ABS after the effective date of the asset-level disclosure requirements than before that date, consistent with these disclosures improving rating quality. When initial credit ratings

[4] In the online appendix, we also provide evidence that subsequent yield spreads based on secondary-market ABS trade prices deviate less from initial yield spreads for the treatment auto ABS group relative to the control group in the post–Reg AB II period relative to the pre-period.

deteriorate by one standard deviation (0.57 notches), the default rate increases by 0.12% for the treatment ABS relative to the control ABS after the adoption of the asset-level disclosure requirements. The incremental R^2 tests yield the same inferences.

To support the inference that our results are attributable to ABS issuers' asset-level disclosures under Reg AB II, we partition the sample period into subperiods and plot the coefficients on and the incremental R^2s of yield and rating in each subperiod separately for the treatment and control ABS. For both the yield informativeness and rating quality tests, we find that the coefficients and incremental R^2s increase sharply for treatment ABS relative to the control ABS after the effective date of Reg AB II's asset-level disclosure requirements.

We examine two mechanisms by which we expect ABS issuers' asset-level disclosures under Reg AB II to increase yield informativeness and rating quality beyond that provided by pool-level statistics for individual credit-risk attributes under Reg AB. First, the key incremental information provided by asset-level disclosures is the proportion of the underlying assets that exhibit multiple high credit-risk attributes (i.e., the extent of risk layering) and hence have high default risk. Pool-level statistics for individual credit-risk attributes reveal nothing about risk layering; the same statistics can be generated regardless of the proportion of risk-layered loans in the asset pool. We thus expect asset-level disclosures to be more incrementally useful in deals with more risk layering. We proxy for the extent of risk layering using the proportion of the underlying assets that exhibit three or more of five key high credit-risk attributes. We first document the construct validity of this proxy by showing that it has incremental explanatory power for the default rate, initial yield spreads, and initial credit ratings beyond pool-level average credit risk metrics. We then partition the treatment sample on the extent of risk layering and find that our primary findings are concentrated in deals with above-median proportions of risk-layered assets.[5]

Second, prior studies find that higher deal complexity, as typically proxied by the number of tranches in the deal, increases the difficulty of assessing the risk of ABS for market participants (e.g., He, Qian, and Strahan [2012], Furfine [2014], Efing and Hau [2015], Ghent, Torous, and Valkanov [2019]). Based on these findings, we expect asset-level disclosures to be more incrementally useful to market participants for deals with more complex tranching of credit risk. Partitioning the treatment sample on the usual proxy, we find that our primary findings are concentrated in deals with above-median complexity.

We conduct two additional substantive analyses. First, motivated by prior theory showing that transparency reduces uncertainty about future payoffs

[5] In the online appendix, we also provide evidence that in the pre–Reg AB II period risk layering has a significantly positive incremental association with the subsequent default rate but is not associated with the initial yield spread, consistent with ABS investors being unable to measure risk layering in the pre-period.

and thus lowers expected returns (Diamond and Verrecchia [1991], Easley and O'Hara [2004], Lambert, Leuz, and Verrecchia [2007]), we find that yield spreads fall more for the treatment ABS than for the control ABS after the effective date of Reg AB II's asset-level disclosure requirements.[6] We observe no significant improvements in credit ratings or future default rates for the treatment ABS, suggesting that the decrease in yield spreads is not attributable to increases in the quality of the underlying assets. These results support the SEC's claim that "enhanced ABS disclosures and the potential for improved pricing accuracy of the ABS market should ultimately benefit issuers in the form of a lower cost of capital" (SEC [2014, p. 57194]).

Second, we attempt to quantify the proportion of prospective investors in auto ABS deals who obtain ABS issuers' asset-level disclosures during the price formation period between the issuance of the preliminary prospectus and ABS issuance. Using data on downloads of both these prospectuses and asset-level disclosures by IP address from EDGAR, we estimate that between 52% and 85% of prospective auto ABS investors access asset-level disclosures during the price formation period prior to ABS issuance. This result is consistent with most investors using asset-level data in valuing auto ABS at the time of ABS issuance, which should reduce the information asymmetry between issuers and investors.[7]

We conduct several robustness tests. We conduct a falsification test, the results of which support the parallel trend assumption underlying our difference-in-differences research design. We replicate our primary analyses (1) measuring the default rate over alternative horizons of four months or eight months after ABS issuance or as the sum of the original default rate and 60- or 90-day delinquency rates and (2) including commercial mortgage-backed securities (CMBS) in the control sample.[8] These robustness tests yield the same inferences as our primary tests.

The above interpretations of our results are subject to the following caveat. From the pre- to the post–Reg AB II periods, the average default rate rose by 72% for auto ABS but by only 24% for the control ABS. This differential increase in the default rate, although economically sizable, is weakly significant in univariate analysis and becomes insignificant after controlling for deal-level variables. We show that this differential increase is not attributable to changes over time in observable loan underwriting criteria (e.g., FICO scores) for auto ABS. However, we do not have a specific explanation for the increase, which suggests that a shock other than Reg AB II may have disproportionately increased the default risk of auto ABS, possibly increasing the association between yields and default rates for those ABS.

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[6] We thank the editor and associate editor for suggesting this analysis.

[7] In the online appendix, we also provide evidence that the number of prospective investors increases for treatment auto ABS deals relative to control deals in the post–Reg AB II period relative to the pre-period. We thank the reviewer for suggesting this analysis.

[8] In the online appendix, we also replace credit card ABS deals with CMBS deals in the control sample and find that our inferences are not affected.

As discussed in section 7.4, this possibility is reduced by several features of our research design and additional tests we conduct.

Our study contributes to the literature on the effects of transparency and disclosure regulation on the efficiency of financial markets and the stability of the financial system. Most of the prior literature examines either the relatively liquid equity or corporate bond markets (e.g., Yu [2005], Lang, Lins, and Maffett [2012], Firth, Wang, and Wong [2015]) or the highly regulated banking system (e.g., Bushman and Williams [2012], Goldstein and Sapra [2013], Granja [2013, 2018], Balakrishnan and Ertan [2018]). In contrast, like Ertan, Loumioti, and Wittenberg-Moerman [2017] and Schmidt and Zhang [2020], we examine the relatively opaque and unregulated ABS markets, also referred to as the "shadow banking system." Ertan, Loumioti, and Wittenberg-Moerman [2017] find that loan-level disclosure requirements for banks that pledge ABS as collateral to borrow under the European Central Bank's repurchase financing operations increase the quality of loans to small- and medium-sized enterprises. Schmidt and Zhang [2020] find that the asset-level disclosures reduce the pledgeability of AAA-rated ABS, as reflected in the securities' convenience yield in the secondary ABS market. Our study is the first to show that asset-level disclosures improve the (e)valuation of ABS by investors and credit rating agencies. Our findings suggest that the disclosures enhance the efficiency of ABS markets, and they may thereby have implications for financial system stability.

Our study also has implications for policy makers and future research. The primary objective of Reg AB II's asset-level disclosure requirements is to address the concern that "investors and other participants in the securitization market did not have the necessary information and time to be able to fully assess the risks underlying asset-backed securities and did not value asset-backed securities properly or accurately" (SEC [2014, p. 57186]). Our study provides empirical evidence that the regulation has made measurable progress toward this objective. Still, many opportunities for future research remain that we discuss in the conclusion.

2. *Institutional Background*

2.1 REG AB II'S ASSET-LEVEL DISCLOSURE REQUIREMENTS AND THE CONSTRUCTION OF THE TREATMENT AND CONTROL SAMPLES

The SEC first issued comprehensive rules governing public offerings of ABS and disclosure requirements for ABS issuers in Reg AB, which became effective on January 1, 2006. Reg AB II, which amended these requirements, was published in the Federal Register on September 24, 2014 (SEC [2014]) and nominally became effective on November 24, 2014. However, Reg AB II's asset-level disclosure requirements became effective after a two-year transition period on November 23, 2016. All of its other requirements (e.g., regarding shelf registration eligibility, other disclosures in the securitization prospectus, and filing forms) became effective after a one-year

transition period on November 23, 2015. ABS issuers must file the required asset-level disclosures in a standardized and tagged XML format using Form ABS-EE on the SEC's EDGAR system. They must provide these disclosures with securitization prospectuses at ABS issuance and in subsequent periodic reports.

Reg AB II's asset-level disclosure requirements apply to the following types of SEC-registered (i.e., publicly offered, not private placement) nonagency (i.e., issued by private firms, not by government-sponsored entities) ABS: Auto ABS, CMBS, residential mortgage-backed securities ("RMBS"), and resecuritizations of these ABS or debt securities ("CDO"). However, our search of Form ABS-EE filings on EDGAR during the post-Reg AB II sample period yielded only issuances of auto ABS and CMBS,[9] leaving only these two types of ABS deals available to be included in the treatment sample. ABS backed by other types of assets (e.g., credit card receivables, student loans, equipment loans and leases, and floorplan financings) are not subject to Reg AB II's asset-level disclosure requirements and are available to be included in the control sample. Reg AB II's other requirements apply to all SEC-registered nonagency ABS.

We find that the prospectuses for auto ABS deals do not contain asset-level information prior to the effective date of Reg AB II's asset-level disclosure requirements, consistent with a statement by the Structured Finance Industry Group [2014, p. 13] that "Public auto loan transactions…have not traditionally included asset level disclosure." Appendix A provides representative examples of auto ABS issuers' disclosures before and after the effective date of the requirements. We thus expect that Reg AB II's asset-level disclosure requirements substantially increase the transparency of auto ABS.

In contrast, we expect that Reg AB II's asset-level disclosure requirements do not appreciably increase the transparency of CMBS, because CMBS prospectuses and periodic reports typically included detailed asset-level disclosures prior to the effective date of the requirements. The SEC [2014, p. 57197] states that "[f]or CMBS, we note that issuers commonly provide investors with asset-level disclosures at the time of securitization and on an ongoing basis pursuant to industry developed standards."[10] The SEC

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[9] Relatedly, the SEC states in Reg AB II that "over the past several years there have been no registered resecuritizations of RMBS, CMBS or Auto ABS" (SEC [2014, p. 57202]). In a March 2016 speech, SEC Commissioner Michael S. Piwowar said that "during the last two years, there has not been a single public RMBS offering registered with the SEC" (Piwowar [2016]). Although SIFMA reports that $176.5 billion of non-agency RMBS was issued from January 2017 to May 2018 (which spans almost our entire post-Reg AB II sample period), the absence of Form ABS-EE filings and the above-mentioned statements indicate all non-agency RMBS deals during this period are private placements not subject to Reg AB II.

[10] We randomly selected 10 CMBS deals issued in 2013, the first year of our sample period, and found that the issuers disclosed asset-level information in "Annex A" of the prospectus supplement for all of these deals. The CRE Finance Council, the trade association for the commercial real estate finance industry, formulated Annex A.

[2014, p. 57222] further states that, in setting Reg AB II's asset-level disclosure requirements for CMBS, it "made efforts to align our requirements, as much as possible, with pre-established industry codes, titles and definitions to allow for the comparability of future offerings with past offerings and to minimize the burden and cost of reporting similar information in different formats." For this reason, we exclude CMBS from the treatment sample, leaving only SEC-registered auto ABS in that sample. We include all SEC-registered ABS not subject to Reg AB II's asset-level disclosure requirements (e.g., credit card ABS and equipment ABS) in the control sample.

2.2 ABS INVESTORS' DEMAND FOR ASSET-LEVEL DISCLOSURES

ABS investors' comment letters on the proposals for Reg AB II generally indicate that they desired disclosure of asset-level information to enable them to more accurately evaluate the risks and future performance of the underlying assets, thereby improving their valuation of ABS. For example, asset-level information for ABS such as auto ABS "will provide investors with greater insight into the underlying ABS collateral mix and will enable them to better predict asset performance" (MetLife [2010, p.11]). For auto ABS, "[l]oan-level information allows an investor to develop more refined risk estimations by removing any opacity created by pool-level data and permitting the investor to use his own assumptions and risk indicators…Greater granularity in disclosure will permit an investor to produce a more refined set of assumptions, which will enable a better understanding and pricing of risk" (American Securitization Forum [2010, pp. 31–32]).[11]

Some ABS investors further emphasize that asset-level information enables them to assess risk layering in the underlying assets, and that this is critical for understanding the credit risk of ABS. For example, "aggregated pool or group level statistics are insufficient to properly assess risk layering… [because] small changes in the collateral pool composition may not be evident in average or pool level disclosures but the subtle effects of risk layering can add materially to the expected loss of a collateral pool and on the riskiness of a given tranche of a securitization" (Prudential Investment Management [2014, p. 3]). Risk factors such as FICO score and loan-to-value (LTV) "must be evaluated in conjunction with each other" (Prudential Investment Management [2014, p. 4]). "[D]ue to risk layering, not all auto loans with 680 FICOs can be assumed to have the same net loss expectations" (American Securitization Forum [2010, p. 31]).

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[11] Similar statements are made by other ABS investors. For example, "as an investor in the ABS market, we believe greater loan-level and pool-level transparency is needed" and will lead to "improved pricing" (Vanguard [2010, p.1]). Asset-level disclosures allow investors to "more accurately assess the risk of ABS" and are "critical to an investor's ability to analyze the performance, risks, and potential returns of an ABS offering" (Investment Company Institute [2010, pp. 1–2]). "[I]nvestors at deal inception and in the resale market *need* asset level detailed disclosure in order to evaluate securitized product"; such disclosure "is essential for investors to evaluate properly the risk profile of securities offered for purchase," and "though granular, this information is critical" (Association of Mortgage Investors [2010, pp. 9–11]).

Although we expect auto ABS issuers' asset-level disclosures under Reg AB II to improve auto ABS investors' investment decisions and thus yield informativeness, this expectation exhibits tension primarily because these disclosures may be too granular given investors' (limited) processing capabilities and the small size of individual loans relative to the asset pool. Richardson, Ronen, and Subrahmanyam [2011, p. 482] conclude that "it is not clear how investors or regulators can use this voluminous information." In a joint comment letter, 17 auto ABS issuers state that "a single receivable is simply immaterial in a pool with the number of assets we typically securitize" (Ally Financial Inc. et al. [2011, pp. 10–11]).

2.3 CONCERNS THAT LIKELY DETERRED ABS ISSUERS' VOLUNTARY PROVISION OF ASSET-LEVEL INFORMATION PRIOR TO REG AB II

Given the investor demand for asset-level information discussed above, it may seem puzzling that auto ABS issuers did not voluntarily disclose asset-level information prior to Reg AB II. Below, we discuss concerns raised by auto ABS issuers in their comment letters on the proposals for Reg AB II that likely deterred them from voluntarily providing such disclosures.

2.3.1. Litigation Costs. Auto ABS issuers stated that asset-level disclosures would reveal private consumer information, thereby creating legal liability for the issuers under federal and state privacy laws. For example, asset-level disclosures "run a significant risk of revealing private information about consumers and, as a result, may put auto loan and lease ABS sponsors at risk of violating their obligations to protect consumer privacy under the Gramm-Leach-Bliley Act and various state consumer privacy laws" (American Securitization Forum [2010, p. 15]). "[C]ertain asset-level information may reveal private consumer information even in the absence of obvious personal identifiers like name, address, and zip code. Any breach in the security of consumers' personal information, let alone any misuse of such information, could have severe consequences to issuers, as well as to consumers" (SIFMA [2014, p. 2]). "[L]oan-level disclosure would publicly release very substantial amounts of sensitive data that could be combined with other data sources and then used by third parties for harmful purposes, such as targeted marketing, or illegal purposes, such as identity theft" (Ally Financial Inc. et al. [2010b, pp. 7–8]).

2.3.2. Proprietary Costs. Auto ABS issuers stated that asset-level disclosures could cause competitive harm to their proprietary credit scoring models that they have developed over the years through making "considerable investments in technology and human capital" to capture and analyze internal loan-level data. They were "extremely concerned that disclosure of too much data could cause irreparable harm to our businesses, both by compromising our proprietary know-how and by releasing information that is competitively sensitive," and they consider "our data and our ability to use it one of our most important business assets" (Ally Financial Inc. et al. [2010a, pp. 21–22]). They assert that asset-level disclosures "would allow competi-

tors immediate access to large amounts of data that would otherwise take them years to accumulate in their own business…a competitor could take granular data on values such as FICO, LTV and PTI, combine it with other information (e.g., make, model, interest rate, loan maturity) and ascertain the sponsor's proprietary scoring model. Or, even if a competitor did not reverse engineer our scoring models, a competitor could use our data to build its own models or greatly improve the performance of its existing models" (Ally Financial Inc. et al. [2010a, p. 22]).

2.3.3. Implementation Costs. Auto ABS issuers were concerned that asset-level disclosures would impose significant implementation costs (J.P. Morgan [2010, p. 12]), as they "do not have the infrastructure in place to provide loan-level data as currently proposed" (American Securitization Forum [2010, p. 16]). Producing and providing asset-level data "is enormously burdensome and expensive," and interest rates may be increased to recoup these costs (AmeriCredit [2010, p. 7]). The SEC acknowledges that ABS sponsors and issuers could incur "significant start-up costs" to disclose asset-level information under Reg AB II (SEC [2014, p. 57203]).

2.3.4. Summary. ABS issuers' comment letters on the SEC's proposals for Reg AB II indicate that the issuers were aware that asset-level information would provide certain benefits to investors and other users, but they argued that the costs they would bear from providing this information were very substantial and would outweigh its benefits to users. For example, asset-level disclosure mandates for auto ABS "would result in increased costs that would not be outweighed by sufficient benefits to issuers or investors" (Capital One [2014, p. 4]). This view likely explains why auto ABS issuers did not voluntarily disclose asset-level information prior to the effective date of Reg AB II's asset-level disclosure requirements.

3. Research Design

We use the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements as a positive shock to the transparency of publicly offered auto ABS, but not of other types of publicly offered nonagency ABS.[12] This setting enables us to employ a difference-in-differences research design. For reasons discussed in section 2.1, our treatment sample consists of SEC-registered auto ABS deals that are subject to Reg AB II's asset-level disclosure requirements. Our control sample consists of all other types of SEC-registered nonagency ABS deals that are not subject to those

[12] The Dodd-Frank Act's risk-retention rules came into effect on December 24, 2016 (Department of the Treasury et al. [2014]), approximately one month after the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements. The risk retention rules apply to all types of nonagency ABS, and hence do not affect the validity of our use of the asset-level disclosure requirements as a positive shock to the transparency of auto ABS.

requirements, including ABS backed by credit card receivables, equipment loans, and student loans.

In both the yield informativeness and rating quality tests, we use the default rate as of six months after ABS issuance as the dependent variable. We focus on the difference-in-differences slope coefficient on the initial yield spread or credit rating for the treatment sample versus the control sample in the Reg AB II (post) period versus the Reg AB (pre) period. It might be thought that these slope coefficients should not vary across the two periods, because the coarser information provided by auto ABS issuers under Reg AB than under Reg AB II may only yield less variation in initial yields or credit ratings, not a lower sensitivity of the default rate to whatever variation exists in those yields or ratings. This intuition would apply if yields and ratings noiselessly incorporated all available information *and* the additional information provided under Reg AB II simply refined the available information about the credit losses of the individual loans in the pool, thereby increasing the signal in noiseless yields and ratings. However, we do not expect this intuition to apply in our setting, because we expect that yields and ratings exhibited both limited signal and considerable noise prior to the effective date of Reg AB II's asset-level disclosure requirements. As is well known, (white) noise in explanatory variables attenuates the slope coefficients on those variables, more so the lower the signal (Roberts and Whited [2013, p. 503]). We expect the additional information provided under Reg AB II to substantially increase the signal-to-noise ratio in yields and ratings, thereby reducing the attenuation bias in the slope coefficients on yields and ratings, for the following two reasons.

First, ABS issuers' asset-level disclosures under Reg AB II reveal the exact values of many credit risk attributes (e.g., an FICO score of 610, a loan-to-value ratio of 97%, a payment-to-income ratio of 42%, and no documentation of borrower income), whereas their pool-level disclosures under Reg AB indicated only fairly wide buckets of a considerably more limited number of attributes (e.g., FICO score from 600 to 625, loan-to-value ratio from 91% to 100%). The more precise information provided by ABS issuers after the effective date of Reg AB II's disclosures increases the signal in yields and ratings for auto ABS.

Second, and more importantly, the pool-level disclosures of the distribution of individual credit risk attributes of the auto loans and leases (loans) underlying auto ABS under Reg AB provided no information about the extent of risk layering of the underlying loans. Holding the distributions of the individual credit-risk attributes of the auto loans in a pool constant, increasing the risk layering of the loans increases the default risk of the pool. In setting initial yields and ratings, investors and credit rating agencies implicitly or explicitly had to make some assumption about the extent of risk layering, that is, about how the dollar amounts and proportions of auto loans falling in the fairly wide buckets based on a limited number of individual credit-risk attributes, would translate into the exact levels based jointly on all credit-risk attributes. Because auto ABS investors had no

access to asset-level information before Reg AB II, their judgments about risk layering inevitably contained substantial noise as well as minimal, if any, signal.

Although asset-level information was available to the credit rating agencies upon request prior to Reg AB II, these agencies may have lacked the incentives to make the costly effort to obtain and analyze the voluminous asset-level information. Moreover, credit rating agencies were subject to limited investor scrutiny of inaccurate ratings because of investors' lack of access to asset-level information. As a result, the rating agencies' judgments about risk layering of auto ABS deals likely also contained substantial noise and minimal signal prior to the effective date of Reg AB II's asset-level disclosure requirements. Auto ABS issuers' asset-level disclosures under Reg AB II enabled investors to readily assess the extent of risk layering, substantially increasing the signal and reducing the noise in yields, and putting pressure on the rating agencies to incorporate this information into ratings to provide more accurate ratings.

Our yield informativeness and rating quality tests, which regress the future default rate on initial yields or ratings and examine the difference-in-differences slope coefficient on yields or ratings for the treatment sample versus the control sample in the post-period versus the pre-period, closely follow the primary approach used in all of the prior studies on yield informativeness and rating quality of which we are aware (e.g., Becker and Milbourn [2011], He, Qian, and Strahan [2016], Bonsall, Koharki, and Neamtiu [2017], Badoer and Demiroglu [2019]). These studies examine the slope coefficients on yields or ratings in models with measures of future defaults as the dependent variable. To estimate the impact of a shock on yield informativeness (rating quality), they estimate the slope coefficient on the interaction of yields (ratings) with an indicator variable for the shock.[13]

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[13] Specifically, He et al. [2016] regress default rates on initial MBS yields and assess yield informativeness using the slope coefficient on yields. They interact yields with a boom period indicator, and interpret the positive coefficient on the interaction term as evidence that the predictive power of yields "strengthens" during booms (p. 476). Badoer and Demiroglu [2019] examine the effect of mandatory public dissemination via TRACE of over-the-counter transactions in corporate bonds on yield informativeness and rating quality. They interact yield spreads and ratings with an indicator for dissemination via TRACE. They interpret the positive slope coefficient on spread times the indicator as evidence that "spreads become more powerful predictors of future defaults after dissemination" (p. 67). They interpret the slope coefficient on ratings times the indicator similarly. Becker and Milbourn [2011, section 5.4], examine the effect of increased competition in the credit rating market from Fitch's entry on the ability of ratings to predict defaults. They interact ratings with Fitch's market share and interpret the slope coefficient on this interaction term as indicating whether rating quality improves with competition. Bonsall et al. [2017] regress defaults on prior credit ratings and assess ratings quality using the slope coefficient. They interact ratings with an indicator for credit ratings issued by Egan-Jones Ratings and a proxy for information uncertainty. They interpret the positive coefficient on this triple interaction term as evidence that Egan-Jones' rating quality declines relative to S&P's when information uncertainty is high.

3.1 IMPACT OF ASSET-LEVEL DISCLOSURES ON YIELD INFORMATIVENESS

To test whether asset-level transparency improves yield informativeness, following prior literature we test whether these disclosures are associated with an increase in the ability of initial yield spreads to predict the future default rate of the underlying assets using the following model:

$$\begin{aligned} \textit{Default Rate}_i = {} & \alpha_0 + \alpha_1(\textit{Yield}_i \times \textit{Treat}_i \times \textit{Post}_t) + \alpha_2 \textit{Yield}_i \\ & + \alpha_3(\textit{Yield}_i \times \textit{Treat}_i) + \alpha_4(\textit{Yield}_i \times \textit{Post}_t) \\ & + \alpha_5(\textit{Treat}_i \times \textit{Post}_t) + \sum \alpha_k \textit{Deal-level Control Variable}_i^n \\ & + \textit{Issuer Fixed Effects} + \textit{Asset-type Fixed Effects} \\ & \times \textit{Issuing Year-quarter Fixed Effects} + \varepsilon_i. \end{aligned} \tag{1}$$

The dependent variable, *Default Rate*$_i$, is the cumulative write-offs of deal *i's* underlying assets as of six months after ABS issuance divided by the initial principal balance of those assets.[14] *Yield*$_i$ is the value-weighted average of the initial tranche-level yield spreads across the tranches in deal *i*. For tranches with floating coupon rates, we measure the tranche-level yield spread as the specified fixed markup over the specified reference rate. For tranches with fixed coupon rates, we measure the tranche-level yield spread as the initial tranche coupon rate less the yield on a Treasury security with maturity closest to the disclosed weighted average life of the tranche (He, Qian, and Strahan [2016]).[15,16] The main explanatory variable of interest is the three-way interaction of *Yield*, *Treat*$_i$, an indicator for an auto ABS deal, and *Post*$_t$, an indicator for ABS issued after the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements. A significantly positive coefficient α_1 on *Yield* × *Treat* × *Post* would indicate that asset-level disclosures improve the informativeness of the yields, as reflected in the ability of initial yield spreads to better predict the subsequent performance of the underlying assets.

In equation (1) and our other regression models, we control for five deal characteristics following prior empirical studies examining ABS. We control for the *Number of Tranches* in the deal, a widely used proxy for deal complexity, based on findings that this proxy is positively associated with future default rates (Jiang, Wang, and Wang [2018]). As is standard in this prior

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[14] Our results are robust to the use of windows of four or eight months after ABS issuance; see table 9, panel A.

[15] Bloomberg classifies some tranches as having "variable" coupon rates. Inspection of selected deal prospectuses indicates that these coupon rates vary with the unamortized principal balances of the underlying assets, not with reference rates, and that the assets are fixed rate. Hence, we treat these tranches as having fixed coupon rates.

[16] Following prior literature (e.g., He et al. [2012]), we calculate initial yield spreads assuming that ABS tranches are issued at their par values of $100, because the actual issuance prices fall between $99.9 and $100 for over 99% of the sample tranches. Our results are virtually identical if we instead calculate initial yield spreads using actual issuance prices.

research, we control for *Deal Size*, *Weighted Average Life*, and *Floating*; these controls have direct analogues in research on corporate bonds and other traditional debt instruments. We also control for the *Number of Ratings*, as one rating is characteristic of rating shopping by the issuers of riskier deals (He et al. [2016]). Given that the dependent variable, *Default Rate*, is a deal-level variable, we measure *Deal Size*, *Weighted Average Life*, and *Floating* at the deal level using par value-weighted averages across the tranches in a deal, and we measure *Number of Ratings* as the number of rating agencies that rate at least one tranche in the deal. We include fixed effects for issuing year-quarter and asset type (i.e., auto loans, credit card receivables), linearly in the baseline model and interactively in the expanded model. Following He, Qian, and Strahan [2012], we exclude issuer fixed effects in the baseline model and include these effects in the expanded model. We estimate equation (1) using OLS, and calculate standard errors clustering observations by issuer × asset type. Subsequent equations include the same control variables and fixed effects and are estimated using the same methods.

To corroborate the results based on the slope coefficient on *Yield* × *Treat* × *Post*, following Becker and Milbourn [2011, pp. 508–9] we also examine the incremental R^2 attributable to *Yield*. To do this, we first regress *Default Rate* on all variables and fixed effects in equation (1) except for *Yield* and its interactions with *Treat* and/or *Post*. In the second stage, we regress the residuals from the first stage, denoted $Default\ Rate_{Residual}$, on *Yield*, separately for the treatment sample versus the control sample in the pre-period versus the post-period. We expect a positive slope coefficient on *Yield* × *Treat* × *Post* in our primary tests to correspond to a larger increase in the second-stage R^2 for the treatment sample than for the control sample from the pre-period to the post-period.

3.2 IMPACT OF ASSET-LEVEL DISCLOSURES ON CREDIT RATING QUALITY

To test whether asset-level transparency improves credit rating quality, following prior literature we test whether these disclosures are associated with an increase in the ability of initial credit ratings to predict the future default rate of the underlying assets using the following model:

$$\begin{aligned} Default\ Rate_i = {} & \beta_0 + \beta_1 (Rating_i \times Treat_i \times Post_t) + \beta_2 Rating_i \\ & + \beta_3 (Rating_i \times Treat_i) + \beta_4 (Rating_i \times Post_t) \\ & + \beta_5 (Treat_i \times Post_t) + \sum \beta_k Deal\text{-}level\ Control\ Variable_i^n \\ & + Issuer\ Fixed\ Effects + Asset\text{-}type\ Fixed\ Effects \\ & \times Issuing\ Year\text{-}quarter\ Fixed\ Effects + \varepsilon_i. \end{aligned} \tag{2}$$

$Rating_i$ is the value-weighted average of the initial tranche-level credit ratings provided by S&P, Moody's, or Fitch across the tranches in deal *i*. Higher values of *Rating* indicate higher credit risk. The main explanatory variable of interest is the three-way interaction *Rating* × *Treat* × *Post*. A significantly positive coefficient β_1 on this variable would indicate that asset-level

disclosures increase credit rating quality, as reflected in the ability of credit ratings to predict the subsequent performance of the underlying assets. We again corroborate the results based on the slope coefficient on *Rating* × *Treat* × *Post* by examining the incremental R^2 attributable to *Rating*.

4. Sample Selection and Summary Statistics

Panel A of table 1 summarizes the sample selection. We obtain an initial sample of 1,922 U.S. nonagency ABS deals issued from June 1, 2013, to November 30, 2018, from Bloomberg. We remove 1,297 deals that are privately placed and thus not subject to Reg AB II's asset-level disclosure requirements. For the remaining deals, from Bloomberg we extract deal-level information including issuer name, issuance date, and underlying asset type, as well as tranche-level information including initial credit ratings issued by the three largest credit rating agencies (S&P, Moody's, and Fitch), coupon type and rate, principal amount, and weighted-average life. We obtain initial principal balance and periodic data on cumulative write-offs of the underlying assets from Moody's ABS database, filling in any missing data with information from the issuers' Form 10-D filings on EDGAR. We remove 39 deals for which there is no periodic information on cumulative write-offs of the underlying assets, all of which are floorplan ABS deals, which yields a final sample of 586 deals issued by 35 distinct consolidated firms.[17]

Panel B of table 1 reports the composition of the sample deals by collateral type and by pre-period (i.e., before the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements) versus post-period (i.e., after the effective date). Of the 586 sample deals, 317 (54%) are treatment deals and 269 are control deals. Of the 317 treatment deals, 209 (66%) are issued in the pre-period, and 108 are issued in the post-period. Of the 269 control deals, 175 (69%) are issued in the pre-period and 74 are issued in the post-period.

Panel C of table 1 reports descriptive statistics for the model variables in the overall sample. The average *Default Rate* is 0.27% and initial *Yield* spread is 0.53%. The average *Rating* is 1.26, which corresponds to an S&P rating between AAA and AA+, reflecting the relatively large sizes of the most senior tranches in deals. For the average deal, the initial principal of the underlying assets is $843.81 million, the *Weighted Average Life* of 2.72 years, and 26% of the assets have *Floating* coupon rates. The average *Number of Tranches* is 3.35 and *Number of Ratings* is 2.05.

Panel D of table 1 compares the sample means of the model variables for the treatment sample versus the control sample in the pre-period versus the post-period. We find that auto ABS are riskier (i.e., have higher

[17] Consolidated firms often own multiple issuers on Bloomberg. We treat such affiliated issuers as a single issuer.

TABLE 1
Sample

Panel A: Sample selection

	No. of deals
ABS deals issued over June 1, 2013 to November 30, 2018[a]	1,922
Less:	
Privately placed (144A) ABS deals	1,297
Deals with no periodic information on cumulative write-offs[b]	39
Final sample of SEC-registered ABS deals	586

Panel B: Sample composition

Asset Type	Pre-period (Jun 2013 to Nov 2016)	Post-period (Dec 2016 to Nov 2018)	Total
Auto Loan ABS (treatment group)	209	108	317
Nonauto ABS (control group)	175	94	269
Includes:			
Credit Card ABS	131	84	215
Equipment ABS	27	10	37
Student Loan ABS	17	0	17
Total	384	202	586

(*Continues*)

TABLE 1—*Continued*

Panel C: Overall descriptive statistics

Variable	*N*	Mean	Std. err.	p25	Median	p75
Default Rate	586	0.27	0.35	0.08	0.19	0.29
Yield	586	0.53	0.21	0.38	0.49	0.63
Rating	586	1.26	0.57	1.00	1.00	1.18
Deal Size	586	20.46	0.45	20.25	20.53	20.75
Initial Principal Amount ($ million)	586	843.81	343.68	625.00	824.55	1,028.53
Weighted Average Life	586	2.72	1.42	1.88	2.14	2.97
Floating	586	0.26	0.38	0.00	0.08	0.27
Number of Tranches	586	3.35	2.01	1.00	3.00	5.00
Number of Ratings	586	2.05	0.35	2.00	2.00	2.00

Panel D: Descriptive statistics for treatment sample versus the control sample in the pre-period versus the post-period

	Pre-period			Post-period			
Variable	Treatment	Control	Diff.	Treatment	Control	Diff.	Diff. in diff.
Default Rate	0.25	0.21	0.04*	0.43	0.26	0.17**	0.12*
Yield	0.62	0.49	0.13***	0.50	0.42	0.08***	−0.05*
Rating	1.40	1.03	0.37***	1.56	1.04	0.52***	0.15
Deal Size	20.50	20.34	0.16***	20.61	20.44	0.16***	0.01
Weighted Average Life	1.97	3.59	−1.62***	1.87	3.77	−1.90***	−0.28
Floating	0.13	0.45	−0.32***	0.08	0.39	−0.31***	0.01
Number of Tranches	4.85	1.68	3.17***	4.80	1.50	3.30***	0.13
Number of Ratings	1.93	2.22	−0.28***	1.94	2.14	−0.19***	0.09

(*Continues*)

TABLE 1—*Continued*

Panel E: Testing for parallel trends between the treatment and the control samples in the pre-period

	Default Rate	*Yield*	*Rating*	*Deal Size*	*Weighted Average Life*	*Floating*	*Number of Tranches*	*Number of Ratings*
Time Trend × *Treat*	−0.017	−0.015	−0.033	0.032	0.064	0.122***	0.102	0.047
	(−0.71)	(−0.87)	(−1.22)	(0.71)	(0.69)	(4.76)	(1.28)	(1.19)
Time Trend	0.029	0.074***	−0.004	−0.030	−0.088	−0.109***	0.020	−0.036
	(1.42)	(4.94)	(−0.62)	(−0.85)	(−0.96)	(−4.40)	(0.39)	(−0.95)
Constant	−23.988	−118.546***	76.560	15.573	50.913*	−26.914*	−241.470*	−20.224
	(−1.01)	(−7.61)	(1.43)	(0.27)	(1.95)	(−1.97)	(−1.94)	(−0.97)
Asset type FEs	Y	Y	Y	Y	Y	Y	Y	Y
Observations	384	384	384	384	384	384	384	384
Adj. R^2	0.09	0.19	0.14	0.04	0.54	0.33	0.71	0.19

[a]This initial sample excludes mortgage-backed securities (RMBS and CMBS).
[b]The deals with no periodic information on cumulative losses are all floorplan ABS deals.

Panel A reports the sample construction. Panel B presents the sample composition for the treatment group versus the control group in the pre–Reg AB II period versus the post-period. Panel C reports summary statistics for the model variables in the overall sample. Panel D compares the sample mean of the model variables for the treatment sample versus the control sample in the pre-period versus the post-period. Panel E reports tests of parallel trends in the model variables for the treatment and control samples in the pre-period; in these tests, each of the model variables is regressed on *Time Trend*, which equals the ABS issuance year minus 2012, and the interaction of *Time Trend* with *Treat* using the sample of ABS deals issued in the pre-period. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

default rates, higher yields, and poorer ratings), are issued in larger deals, have shorter weighted-average lives, have more tranches, are less likely to have floating coupon rates, and are rated by fewer rating agencies than nonauto ABS. Pairwise *t*-tests show that these differences are statistically significant. However, most of the differences are stable across the pre-period and the post-period. The rightmost column of panel D reports that the difference-in-differences are significant only for *Default Rate* and *Yield* (at the 10% level). Moreover, in the multivariate regression reported in column 3 of table 7, *Default Rate* does not significantly change for the treatment group relative to the control group around the effective date of the asset-level disclosure requirements.[18] In contrast, the regression reported in column 1 of table 7 indicates that *Yield* significantly decreases for the treatment group relative to the control group after this date, consistent with asset-level disclosures lowering investors' required returns.

Panel E of table 1 reports tests of parallel trends in the model variables for the treatment and control samples in the pre-period. Consistent with parallel trends, the coefficient on *Time Trend* × *Treat* is insignificant for seven of the variables, including the key variables *Default Rate*, *Yield*, and *Rating*. The sole exception is *Floating*, for which this coefficient is significantly positive.

5. Empirical Results

5.1 Impact of Asset-Level Disclosures on Yield Informativeness

To test the effect of ABS issuers' asset-level disclosures under Reg AB II on the informativeness of yields, panel A of table 2 reports ordinary least squares (OLS) estimations of equation (1). The dependent variable is *Default Rate*. Column 1 reports the results for the baseline model with asset-type and issuing year-quarter fixed effects, whereas column 2 reports the results for the expanded model that includes issuer and interactive asset-type and year-quarter fixed effects.

The coefficient on the main explanatory variable of interest, *Yield* × *Treat* × *Post*, is significantly positive in both columns, consistent with yield spreads becoming more predictive of the future default rate for the treatment sample relative to the control sample from before to after the effective date of Reg AB II's asset-level disclosure requirements. These results are economically significant. To illustrate, a one standard deviation in *Yield* (0.21%) is associated with an increase in *Default Rate* of 0.30% in column 1 and 0.23%

[18] In untabulated analysis, we investigated whether loosening of underwriting criteria for auto loans over time explains why *Default Rate* rose for the treatment group both by itself and relative to the control group after the effective date of the asset-level disclosure requirements. Inconsistent with this explanation, we observed no change from the pre– to post–Reg AB II periods in average FICO score and loan amount for auto loans, and we observed a decrease in the average loan-to-value ratio. See section 7.4 for discussion of features of our research design and additional tests we conducted to mitigate the possibility that the differential increase in *Default Rate* for the treatment group drives our results.

TABLE 2

Impact of Asset-Level Disclosures on Yield Informativeness

Panel A: Interaction model

Dependent Variable = *Default Rate*	(1)	(2)
Yield × *Treat* × *Post*	1.444***	1.083***
	(4.38)	(3.25)
Yield	0.982***	−0.018
	(3.17)	(−0.11)
Yield × *Treat*	0.035	0.443
	(0.14)	(1.02)
Yield × *Post*	0.010	0.050
	(0.06)	(0.66)
Treat × *Post*	−0.551***	−0.387**
	(−3.96)	(−2.33)
Deal Size	0.031	0.001
	(0.64)	(0.06)
Weighted Average Life	−0.056**	0.002
	(−2.31)	(0.13)
Floating	0.085*	0.001
	(1.83)	(0.05)
Number of Tranches	0.018	0.012
	(1.14)	(0.66)
Number of Ratings	0.053	−0.059
	(0.73)	(−1.08)
Asset-type FEs	Y	
Issuance Year-quarter FEs	Y	
Asset-type FEs × Issuance Year-quarter FEs		Y
Issuer FEs		Y
Observations	586	586
Adj. R^2	0.61	0.78

Panel B: R^2 Test

	Treatment		Control	
Dependent Variable = *Default Rate* $_{Residual}$	Pre-period	Post-period	Pre-period	Post-period
Yield	−0.106	0.673***	−0.016	0.047
	(−0.59)	(5.07)	(−0.56)	(0.82)
Observations	209	108	175	94
R^2	0.02	0.19	0.01	0.03

This table presents the analysis of the effect of asset-level disclosures on yield informativeness. Panel A reports whether the value-weighted average of the initial yield spreads of the deal tranches (*Yield*) more strongly predicts cumulative write-offs of the underlying assets (*Default Rate*) for the treatment ABS relative to the control ABS after the effective date of Reg AB II's asset-level disclosure requirements. Column 1 reports the estimation of the baseline model with asset-type and issuance year-quarter fixed effects. Column 2 reports the estimation of the expanded model with asset-type × issuance year-quarter and issuer fixed effects. Panel B presents the contribution of *Yield* to the R^2. To calculate this incremental R^2, we first estimate the regression model in column 2 of panel A with all variables and fixed effects except for *Yield* and its interactions with *Treat* and/or *Post*. In the second stage, we regress the residuals from the first stage, denoted *Default Rate*$_{Residual}$, on *Yield*, separately for the treatment sample versus the control sample in the pre-period versus the post-period. Panel B reports the coefficients and R^2s from the second stage. See appendix B for variable definitions. Standard errors are calculated clustering observations by issuer × asset type. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

in column 2 for the treatment sample relative to the control sample after the effective date.

Regarding the control variables, all coefficients are insignificant in column 2, reflecting the very rich fixed effects structure. In column 1, the coefficients on *Yield* and *Floating* are significantly positive, and the coefficients on *Treat* × *Post* and *Weighted Average Life* are significantly negative.

Panel B of table 2 presents the incremental R^2 for *Yield*. For the treatment sample, the incremental R^2 for *Yield* is 0.02 in the pre-period and 0.19 in the post-period, for a sizable increase in the incremental R^2 of 0.17. In contrast, for the control sample the incremental R^2 for *Yield* is 0.01 in the pre-period and 0.03 in the post-period, for an increase in the incremental R^2 of only 0.02. Consistent with the slope coefficient results described above, these differential changes in the incremental R^2s are consistent with initial yields becoming more predictive of future credit losses for the treatment sample relative to the control sample from the pre-period to the post-period.

As an alternative test of the informativeness of initial yields, we examine the absolute magnitudes of deviations of subsequent yield spreads based on secondary-market ABS trade prices from initial yield spreads.[19] Intuitively, if the initial yield spread is more informative in predicting the future performance of the underlying assets, then the subsequent yield spread, which incorporates information about future realized performance, should deviate less from the initial yield spread. We expect subsequent yield spreads to deviate *less* from initial yield spreads for auto ABS issued after the adoption of Reg AB II's asset-level disclosure requirements. For comparability with the default rate analysis, and given the low liquidity of the secondary ABS market,[20] we examine secondary-market trades in the [−30, +30] day window centered six months after ABS issuance. Consistent with asset-level disclosures improving the informativeness of the initial yield spreads, we find that the subsequent yield spreads deviate less from the initial yield spreads for the treatment deals than for the control deals in the post-period relative to the pre-period. The results of this test are presented in section A1 and table A1 of the online appendix.

5.2 IMPACT OF ASSET-LEVEL DISCLOSURES ON CREDIT RATING QUALITY

Panel A of table 3 reports OLS estimations of equation (2), which we use to test the effect of asset-level disclosure on credit rating quality. As in

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[19] For tranches with a fixed coupon rate, the subsequent yield spread is calculated as the coupon rate minus the U.S. Treasury rate with the closest maturity, divided by the current price. For tranches with floating rates, the subsequent yield spread is defined as the specified fixed markup over the reference rate (e.g., one-month LIBOR) divided by the current price.

[20] The ABS tranches in our sample trade a mean (median) of three (four) days per month, reflecting the limited liquidity in the secondary ABS markets. Because TRACE starts to cover ABS trades in June 2015, in this analysis we only include the 385 deals issued since December 2014, in order to observe subsequent trade prices six months after issuance. In all 1,005 (75%) of the 1,344 tranches in these 385 deals are traded in the [−30, +30] day window centered six months after issuance.

TABLE 3

Impact of Asset-Level Disclosures on Rating Quality

Panel A: Interaction model

Dependent Variable = *Default Rate*	(1)	(2)
Rating × *Treat* × *Post*	0.237**	0.217***
	(2.38)	(3.61)
Rating	0.609**	0.102
	(2.58)	(0.71)
Rating × *Treat*	−0.205	0.140
	(−0.86)	(0.87)
Rating × *Post*	−0.045	−0.034
	(−0.68)	(−0.79)
Treat × *Post*	−0.241*	−0.220
	(−1.87)	(−1.58)
Deal Size	−0.032	−0.005
	(−0.56)	(−0.23)
Weighted Average Life	−0.018	−0.002
	(−1.22)	(−0.22)
Floating	−0.028	−0.001
	(−0.69)	(−0.13)
Number of Tranches	0.007	0.006
	(0.48)	(0.27)
Number of Ratings	0.043	−0.035
	(0.62)	(−1.06)
Asset-type FEs	Y	
Issuance Year-quarter FEs	Y	
Asset-type FEs × Issuance Year-quarter FEs		Y
Issuer FEs		Y
Observations	586	586
Adj. R^2	0.70	0.79

Panel B: R^2 Test

Dependent Variable =	Treatment		Control	
Default Rate$_{Residual}$	Pre-period	Post-period	Pre-period	Post-period
Rating	−0.043	0.153***	0.068	−0.034
	(−0.47)	(3.81)	(1.11)	(−0.54)
Observations	209	108	175	94
R^2	0.03	0.19	0.01	0.01

This table presents the analysis of the effect of asset-level disclosures on credit rating quality. Panel A reports whether the value-weighted average of the initial credit ratings of the deal tranches (*Rating*) more strongly predicts cumulative write-offs of the underlying assets (*Default Rate*) for the treatment ABS relative to the control ABS after the effective date of Reg AB II's asset-level disclosure requirements. Column 1 reports the estimation of the baseline model with asset-type and issuance year-quarter fixed effects. Column 2 reports the estimation of the expanded model with asset-type × issuance year-quarter and issuer fixed effects. Panel B presents the contribution of *Rating* to the R^2. To calculate this incremental R^2, we first estimate the regression model in column 2 of panel A with all variables and fixed effects except for *Rating* and its interactions with *Treat* and/or *Post*. In the second stage, we regress the residuals from the first stage, denoted *Default Rate* $_{Residual}$, on *Rating*, separately for the treatment sample versus the control sample in the pre-period versus the post-period. We report the coefficients and R^2s from the second stage. See appendix B for variable definitions. Standard errors are calculated clustering observations by issuer × asset type. t-statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

table 2, the dependent variable is *Default Rate* and column 1 (2) reports the estimation of the baseline (expanded) model. The coefficient on the main explanatory variable of interest, *Rating* × *Treat* × *Post*, is significantly positive in both columns, consistent with ratings becoming more predictive of the future default rate (i.e., of higher quality) for the treatment sample relative to the control sample from the pre-period to the post-period. Because Reg AB II apparently did not change the agencies' access to asset-level information, this result suggests that the public release of the information disciplines the agencies' evaluations of ABS. These results are economically significant. To illustrate, an increase in initial ratings of one standard deviation (0.57 notches) is associated with an increase in *Default Rate* of 0.14% in column 1 and 0.12% in column 2 for the treatment sample relative to the control sample after the effective date.

Panel B of table 3 presents the incremental R^2 for *Rating*. For the treatment sample, the incremental R^2 for *Rating* is 0.03 in the pre-period and 0.19 in the post-period, for a sizable increase in the R^2 of 0.16. In contrast, for the control sample the incremental R^2 for *Yield* is 0.01 in the pre-period and 0.01 in the post-period, with no change the R^2. Consistent with the slope coefficient results described above, these differential incremental R^2s suggest that initial ratings become more predictive of the future default rate for the treatment sample relative to the control sample from the pre-period to the post-period.

5.3 THE SHARPNESS OF THE DOCUMENTED EFFECTS AROUND THE EFFECTIVE DATE OF REG AB II'S ASSET-LEVEL DISCLOSURE REQUIREMENTS

To provide further support that the results reported in tables 2 and 3 are attributable to ABS issuers' provision of asset-level disclosures under Reg AB II, rather than to time trends or omitted variables that differentially affect the treatment and control samples, we empirically estimate these effects around the November 23, 2016, effective date of the requirements. We partition the pre-period into three 14-month subperiods and partition the post-period into two 12-month subperiods. We treat deals issued in the first subperiod of December 2013 to November 2014 as the benchmark and create indicator variables for deals issued in the subsequent four subperiods. Consistent with our primary results being attributable to Reg AB II's asset-level disclosure requirements, in figure 1 the coefficients on *Yield* in the yield informativeness test (panel A) and *Rating* in the rating quality test (panel B) increase sharply after the effective date of Reg AB II's asset-level disclosure requirements for the treatment sample, but are nearly flat across the subperiods for the control sample. Similarly, in figure 1 the R^2s attributable to *Yield* (panel C) and *Rating* (panel D) increase sharply around the effective date for the treatment sample, but they are nearly flat across the subperiods for the control sample.

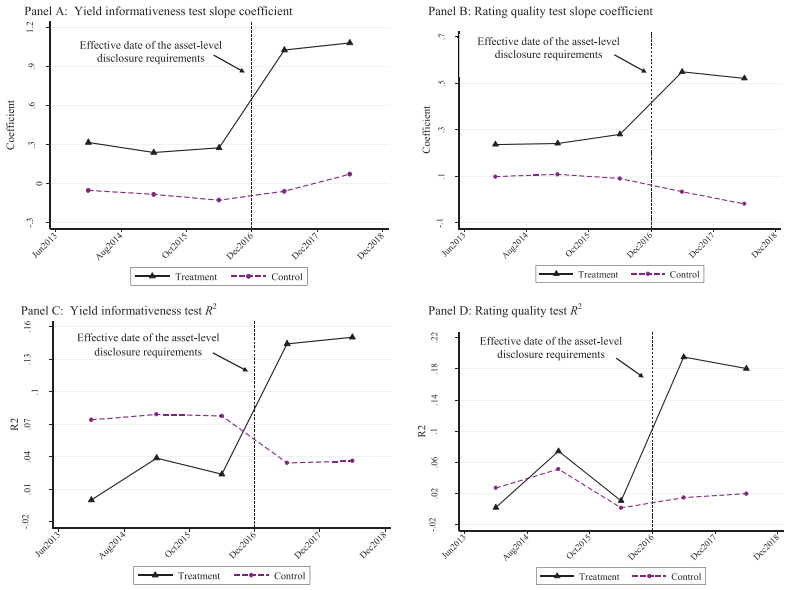

FIG 1.—This figure depicts the sharpness of the documented effects of asset-level disclosures on yield informativeness and rating quality around the effective date of the asset-level disclosure requirements. We partition the pre-period into three 14-month subperiods (June 2013 to July 2014, August 2014 to September 2015, and October 2015 to November 2016) and partition the post-period into two 12-month subperiods (December 2016 to November 2017 and December 2017 to November 2018). To plot the coefficients, we estimate the following regression models for the yield informativeness and rating quality tests, respectively:

$$\begin{aligned} \textit{Default Rate}_i = {} & \beta_0 + \beta_1 \textit{Yield}_i + \beta_2 (\textit{Yield}_i \times \textit{Treat}_i) \\ & + \sum_{i=2}^{5} \theta_i (\textit{Yield}_i \times \textit{Treat}_i \times \textit{Subperiod Indicator}_i) \\ & + \sum_{i=2}^{5} \mu_i (\textit{Yield}_i \times \textit{Subperiod Indicator}_i) \\ & + \sum_{i=2}^{5} \gamma_i \textit{Subperiod Indicator}_i + \delta_1 (\textit{Treat}_i \times \textit{Post}_t) \\ & + \sum \delta_k \textit{Deal-level Controls Variable}_i^n + \textit{Asset-type Fixed Effects} \\ & + \textit{Issuer Fixed Effects} + \varepsilon_i \end{aligned} \tag{3}$$

$$\begin{aligned} \textit{Default Rate}_i = {} & \beta_0 + \beta_1 \textit{Rating}_i + \beta_2 (\textit{Rating}_i \times \textit{Treat}_i) \\ & + \sum_{i=2}^{5} \theta_i (\textit{Rating}_i \times \textit{Treat}_i \times \textit{Subperiod Indicator}_i) \\ & + \sum_{i=2}^{5} \mu_i (\textit{Rating}_i \times \textit{Subperiod Indicator}_i) \\ & + \sum_{i=2}^{5} \gamma_i \textit{Subperiod Indicator}_i + \delta_1 (\textit{Treat}_i \times \textit{Post}_t) \\ & + \sum \delta_k \textit{Deal-level Controls Variable}_i^n + \textit{Asset-type Fixed Effects} \\ & + \textit{Issuer Fixed Effects} + \varepsilon_i \end{aligned} \tag{4}$$

Panel A and panel B plot the slope coefficients $\beta_1 + \beta_2 + \Theta_i$ for the treatment group (solid line) and $\beta_1 + \mu_i$ for the control group (dashed line) for the yield informativeness test and the rating quality test, respectively. i ranges from 2 to 5. The dotted vertical line in the figures denotes the effective date of Reg AB II's asset-level disclosure requirements. To plot R^2, we first estimate the following regression models:

$$\begin{aligned} \textit{Default Rate}_i = {} & \alpha_0 + \sum_{i=2}^{5} \alpha_i \textit{Subperiod Indicator}_i + \alpha_6 (\textit{Treat}_i \times \textit{Post}_t) \\ & + \sum \alpha_k \textit{Deal-level Control Variable}_i^n + \textit{Asset-type Fixed Effects} \\ & + \textit{Issuer Fixed Effects} + \varepsilon_i \end{aligned} \tag{5}$$

We then regress the residuals from the first stage regression on *Yield* (*Rating*) for each subperiod for the treatment group versus the control group. Panel C and panel D plot the R^2 of each second-stage regression for the treatment group (solid line) versus the control group (dashed line) for the yield informativeness test and the rating quality test, respectively. The dotted vertical line in the figures denotes the effective date of Reg AB II's asset-level disclosure requirements.

6. *Risk Layering and the Complexity of Credit Risk Tranching as Mechanisms*

In this section, we evaluate two mechanisms through which we expect ABS issuers' asset-level disclosures under Reg AB II to improve the (e)valuation of ABS by investors and credit rating agencies. First, we expect that these disclosures enable investors to accurately estimate the extent of risk layering in the underlying assets. Second, we expect that the disclosures are more useful for the (e)valuation of ABS deals with more complex tranching of credit risk.

6.1 RISK LAYERING

Risk layering refers to individual assets having multiple high-credit-risk attributes or to an asset pool having a high proportion of such assets (Office of the Comptroller of the Currency (OCC [2018, p. 21]). For example, an auto loan with a low FICO score borrower, high loan-to-value ratio, and low documentation is risk layered. The presence of multiple high-credit-risk attributes in a loan typically increases its default risk, because risk-layered loans tend to be close to or to exceed prudent risk management limits and thus tend to perform poorly (OCC [2018, p. 22]). Relatedly, pools with higher proportions of risk-layered loans tend to exhibit higher default rates, holding the univariate distribution of each credit-risk attribute constant. Opaque risk layering of the subprime mortgages underlying many types of ABS during the boom period leading up to the financial crisis is posited to have contributed to the system-wide buildup of default risk during this period (Bernanke [2007], Financial Crisis Inquiry Report [2011, p. 118], FDIC [2017, Ch. 1, p. 12]). Risk layering is one of four key aspects of credit risk that bank regulators assess and monitor in retail lending (OCC [2018, p. 18]). As discussed in section 2.2, in their comment letters on the SEC's proposals for Reg AB II, some auto ABS investors emphasize that asset-level information enables them to assess risk layering in the

underlying assets, and that this assessment is critical for understanding the credit risk of ABS.

As discussed in section 3, ABS issuers' disclosures of pool-level summary statistics for fairly wide buckets based on relatively few individual credit risk attributes prior to the effective date of Reg AB II's asset-level disclosure requirements provided essentially no information about the extent of risk layering of the underlying assets in the pool. In contrast, these issuers' asset-level disclosures under Reg AB II, which report the exact values of more numerous credit-risk attributes for each individual underlying asset, largely reveal the extent of risk layering.

To our knowledge, no prior study has developed a proxy for risk layering, perhaps because it was not feasible to do so prior to the fairly recent effective date of Reg AB II's asset-level disclosure requirements. Using the asset-level information reported in auto ABS issuers' initial Form ABS-EE filings for each deal during the post-period, we define an auto loan as risk layered if it exhibits three or more of the following five key indicators of high credit risk: lowest quartile borrower FICO credit score, highest quartile loan-to-value ratio, highest quartile payment-to-income ratio, the actual payment for the most recent prior payment period (usually a month) falling below the scheduled payment, and no documentation of borrower income or employment. We calculate *Risk Layering* for a deal as the sum of the principal amounts of all risk-layered loans in the pool divided by the sum of the principal amounts of the loans in the pool with available information on all five credit risk attributes.[21]

To demonstrate the construct validity of *Risk Layering*, for the auto ABS deals issued in the post-period, column 1 of table 4 reports the results of regressing *Default Rate* on the pool-level value-weighted average of the five credit-risk attributes and other deal-level control variables, whereas column 2 reports the regression results adding *Risk Layering* as an explanatory variable. As expected, in column 1 *Default Rate* is significantly negatively associated with the pool-level value-weighted average *FICO* score and *Actual-payment-to-scheduled-payment* ratio, and significantly positively associated with the pool-level value-weighted average *Loan-to-value* ratio, *Payment-to-income* ratio, and proportion of *Low Documentation* loans. Also as expected, and more importantly, in column 2 the coefficient on *Risk Layering* is significantly positive, consistent with estimates of risk layering based on auto ABS issuers' asset-level disclosures under Reg AB II having incremental predictive power for *Default Rate* beyond their disclosures of pool-level summary statistics for individual risk attributes.

The results reported in the remaining columns of table 4 provide evidence that investors (rating agencies) incorporate risk layering beyond the pool-level average individual credit-risk attributes in making ABS

[21] About 10% of auto loans have missing information on one or more of the five credit-risk attributes.

TABLE 4

Direct Effects of Risk Layering on the Levels of Yields and Credit Ratings

Dependent Variable =	*Default Rate*		*Yield*		*Rating*	
	(1)	(2)	(3)	(4)	(5)	(6)
Risk Layering		2.818***		0.602**		2.932**
		(4.95)		(2.65)		(2.44)
FICO	−0.006***	−0.004***	−0.001***	−0.001***	−0.007***	−0.005***
	(−9.03)	(−5.19)	(−5.59)	(−4.06)	(−6.33)	(−4.58)
Loan-to-value	1.850**	0.026	0.803***	0.414	2.694**	0.796
	(2.52)	(0.05)	(3.40)	(1.61)	(2.53)	(1.02)
Payment-to-income	0.024**	−0.001	0.007	0.002	0.033**	0.008
	(2.78)	(−0.07)	(1.43)	(0.39)	(2.39)	(0.47)
Actual-payment-to-scheduled-payment	−0.033*	−0.022**	−0.007	−0.004	−0.033	−0.022
	(−2.02)	(−2.63)	(−0.96)	(−0.92)	(−1.53)	(−1.07)
Low Documentation	1.649**	0.033	0.885***	0.540**	4.387**	2.706
	(2.93)	(0.06)	(5.65)	(2.45)	(2.42)	(1.21)
Deal-level controls	Y	Y	Y	Y	Y	Y
Observations	108	108	108	108	108	108
Adj. R^2	0.85	0.87	0.75	0.76	0.89	0.90

Columns 1 and 2 of this table demonstrate the construct validity of *Risk Layering*. Column 1 reports the estimation of the regression of cumulative write-offs of the underlying assets (*Default Rate*) on the five credit-risk attributes and other deal-level control variables for the auto ABS deals during the post-period. Column 2 reports the estimation of the regression adding *Risk Layering* as an explanatory variable. Columns 3 and 4 (5 and 6) report the estimations of regressions of the value-weighted average of the tranche-level initial yield spreads and credit ratings across the tranches of an ABS deal (*Yield* and *Rating*, respectively) on the same explanatory variables as in columns 1 and 2, respectively. Columns 3 and 5 (4 and 6) exclude (include) *Risk Layering* as an explanatory variable. Because *Risk Layering* can be calculated only when asset-level data are available, the sample in this table is limited to the 108 auto ABS deals issued between November 23, 2016, and November 31, 2018. The five credit-risk attributes in the regressions in this table are defined as follows. *FICO*: the value-weighted average FICO score of the underlying assets in a deal; *Loan-to-value*: the value-weighted average loan-to-value ratio of the underlying assets in a deal; *Payment-to-income*: the value-weighted average payment-to-income ratio of the underlying assets in a deal; *Actual-payment-to-scheduled-payment*: the value-weighted average ratio of actual payment to scheduled payment of the underlying assets in a deal; and *Low Documentation*: the proportion of the underlying assets with either no documented income or no documented employment in a deal. Deal-level controls include *Deal Size*, *Weighted Average Life*, *Floating*, *Number of Tranches*, *Number of Ratings*, and an indicator variable that equals one for auto loan ABS and zero for auto lease ABS. See appendix B for variable definitions and appendix C for the construction of *Risk Layering*. Standard errors are calculated clustering by issuer. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

investment (credit rating) decisions. Columns 3 and 4 (5 and 6) report the estimations of regressions of *Yield* (*Rating*) on the same explanatory variables as in columns 1 and 2, respectively. The estimations reported in columns 3 and 5 include only the five credit-risk attributes and other deal-level control variables as explanatory variables, whereas the estimations reported in columns 4 and 6 add *Risk Layering* as an explanatory variable. As expected, in column 4 *Yield* is significantly positively associated with *Risk Layering*, consistent with investors incorporating estimates of risk layering in their valuation of ABS.[22] Regarding the control variables, *Yield* is significantly negatively associated with the average *FICO* score and is significantly

[22] We also conduct analysis showing that, for auto ABS deals in the pre–Reg AB II period, risk layering has a significantly positive incremental association with the subsequent default

positively associated with *Loan-to-value* (column 3 only) and *Low Documentation*.

As expected, in column 6 *Rating* is significantly positively associated with *Risk Layering*, consistent with the rating agencies incorporating estimates of risk layering in their ratings of ABS. Regarding the control variables, *Rating* is significantly negatively associated with the average *FICO* score and in column 5 is significantly positively associated with *Loan-to-value*, *Payment-to-income*, and *Low Documentation*.

The results of table 4 described above are consistent with asset-level disclosures improving market participants' (e)valuation of treatment ABS deals by enabling them to determine the extent of risk layering in the underlying assets. Providing further support for this conclusion, table 5 reports replications of our primary tests reported in tables 2 and 3 partitioning the treatment sample on the extent of risk layering. For deals with no or few risk-layered loans, ABS issuers' asset-level disclosures under Reg AB II likely provide little incremental information. In contrast, for deals with a high proportion of risk-layered loans, these disclosures enable investors to determine the extent of risk layering.

An obstacle we face in conducting these replications is that, prior to the effective date of Reg AB II's asset-level disclosure requirements, the asset-level data necessary to calculate the extent of risk layering in the underlying assets are not available. This obstacle appears manageable, however, because in the post-period the magnitude of *Risk Layering* is relatively stable across treatment deals issued by trusts with the same issuer, as identified by a common initial portion of the issuer's name. For example, all seven auto deals issued by the series of trusts with names beginning with "AmeriCredit Automobile Receivables Trust" in the post-period exhibit relatively high *Risk Layering*, whereas all four auto deals issued by the series of trusts with names beginning with "GM Financial Consumer Automobile Receivables Trust" in the post-period exhibit relatively low *Risk Layering*. We assume that this intertemporal stability of *Risk Layering* extends to auto ABS deals issued in the pre-period. We classify auto ABS deals in the pre-period as exhibiting above-median (below-median) *Risk Layering* if the auto ABS deals in the post-period issued by the series of trusts with the same initial portion of their names exhibit above-median (below-median) *Risk Layering*.

Panels A and B of table 5 report the yield informativeness and rating quality tests, respectively. We conduct these tests on the union of each *Risk Layering* treatment subsample with the control sample.[23] In both panels,

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rate but is not associated with the initial yield spread, consistent with ABS investors being unaware of risk layering in the pre-period. This analysis is presented in section A3 and table A3 of the online appendix. We thank the reviewer for suggesting this analysis.

[23] We cannot split the control sample based on the magnitude of *Risk Layering*, because issuers generally do not provide the asset-level disclosures necessary to construct *Risk Layering* for the control deals.

TABLE 5

Risk Layering as the Mechanism

Panel A: Yield informativeness test

	Dependent Variable = *Default Rate*	
	Low *Risk Layering*	High *Risk Layering*
Yield × *Treat* × *Post*	0.002	1.126***
	(0.02)	(3.22)
Test of coefficient difference	$p < 0.001$	
Observations	416	410
Adj. R^2	0.95	0.85

	Dependent Variable = *Default Rate* $_{Residual}$			
	Low *Risk Layering*		High *Risk Layering*	
	Pre-period	Post-period	Pre-period	Post-period
Yield	0.001	0.007	−0.255*	0.610***
	(0.04)	(0.18)	(−2.42)	(5.24)
Observations	93	54	87	54
R^2	0.00	0.00	0.20	0.15

Panel B: Rating quality test

	Dependent Variable = *Default Rate*	
	Low *Risk Layering*	High *Risk Layering*
Rating × *Treat* × *Post*	−0.006	0.281***
	(−0.14)	(4.74)
Test of coefficient difference	$p < 0.001$	
Observations	416	410
Adj. R^2	0.95	0.84

	Dependent Variable = *Default Rate* $_{Residual}$			
	Low *Risk Layering*		High *Risk Layering*	
	Pre-period	Post-period	Pre-period	Post-period
Rating	0.013	−0.032	−0.101**	0.097***
	(0.51)	(−1.64)	(−2.75)	(8.53)
Observations	93	54	87	54
R^2	0.00	0.02	0.26	0.08

This table reports the yield informativeness and rating quality tests partitioning auto ABS deals into above-median (high) versus below-median (low) *Risk Layering* groups. Because *Risk Layering* is not observable in the pre–Reg AB II period, we classify an auto ABS deal issued in that period into the high (low) risk layering group if the auto ABS deals in the post-period issued by the series of trusts with the same initial portion of their names on average exhibit above-median (below-median) risk layering. The sample in the High (Low) *Risk Layering* column includes the treatment deals in the high (low) risk layering group and the control deals. We control for (but do not tabulate) *Deal Size*, *Weighted Average Life*, *Floating*, *Number of Tranches*, *Number of Ratings* as well as asset-type × issuance year-quarter and issuer fixed effects. In each panel, the top portion reports the coefficients on *Yield* (*Rating*) × *Treat* × *Post* and the bottom portion reports the results of the incremental R^2 tests. To calculate this incremental R^2, we first estimate the regression model in the top portion of the panel with all variables and fixed effects except for *Yield* (*Rating*) and its interactions with *Treat* and/or *Post*. In the second stage, we regress the residuals from the first stage on *Yield* (*Rating*), separately for the high versus low *Risk Layering* treatment sample in the pre-period versus the post-period. We report the coefficients and the R^2s from the second stage. See appendix B for variable definitions and appendix C for the construction of *Risk Layering*. Standard errors are calculated clustering by deal. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

the coefficients on the explanatory variables of interest, the triple interaction terms *Yield* × *Treat* × *Post* and *Rating* × *Treat* × *Post*, are insignificant for the treatment deals with below-median *Risk Layering*, but are significantly positive and significantly larger for the deals with above-median *Risk Layering*. These results are consistent with the improvements in yield informativeness and rating quality being attributable to asset-level disclosures enabling investors and credit rating agencies to estimate the extent of risk layering.

The bottom portions of panels A and B report the supplemental tests of the incremental R^2s for *Yield* and *Rating*. These incremental R^2s are close to zero in both the pre- and post-periods for the low risk-layering auto deals. Although the R^2s are relatively high at 0.20 in the yield informativeness test and 0.26 in the rating quality test in the pre-period for the high risk-layering auto deals, these R^2s reflect unexpectedly and significantly *negative* coefficients of −0.255 on *Yield* and −0.101 on *Rating* in the second-stage regressions. These negative coefficients may reflect investors and credit rating agencies' incorrect evaluation of high risk-layering auto deals prior to the effective date of Reg AB II's asset-level disclosure requirements, when investors lacked access to asset-level information. As discussed in section 3, although credit rating agencies could obtain asset-level information during this pre-period, they may have had insufficient incentives to expend the costly effort necessary to analyze this voluminous asset-level information and incorporate it into ratings, given investors' limited information and ability to identify inaccurate ratings.

Taken together, the results of tables 4 and 5 are consistent with auto ABS issuers' asset-level disclosures under Reg AB II improving market participants' (e)valuation of treatment ABS deals by enabling them to estimate and incorporate the extent of risk layering in the underlying assets into their (e)valuation.

6.2 Complexity of Credit Risk Tranching

Prior research shows that more complex tranching in an ABS deal increases market participants' difficulty in assessing the credit risk of each tranche in the deal. In particular, increasing the number of tranches with different seniority causes the payoffs to a representative tranche to become more nonlinear in the subsequent performance of the underlying assets and thus more sensitive to assumptions about that performance (Furfine [2014]). Hence, we expect asset-level disclosures to be more useful for assessing the credit risk of ABS in deals with more complex structures. Following prior research (He, Qian, and Strahan [2012], Efing and Hau [2015]), we use the number of tranches in a deal as the measure of deal complexity.

Employing the same approach and tabular structure as in table 5, panels A and B of table 6 report the tests of yield informativeness and rating quality, respectively, partitioning the auto ABS sample based on an indicator for below-median (low) and above-median (high) deal complexity

TABLE 6

Deal Complexity as the Mechanism

Panel A: Yield informativeness test

Dependent Variable = *Default Rate*	Low *Complexity*		High *Complexity*
Yield × *Treat* × *Post*	0.615**		1.589***
	(2.21)		(3.97)
Test of coefficient difference		$p < 0.001$	
Observations	464		391
Adj. R^2	0.83		0.80

	Dependent Variable = *Default Rate* $_{Residual}$			
	Low *Complexity*		High *Complexity*	
	Pre-period	Post-period	Pre-period	Post-period
Yield	−0.097	0.184**	−0.028	1.098***
	(−1.10)	(2.95)	(−0.13)	(5.59)
Observations	126	69	83	39
R^2	0.07	0.02	0.00	0.31

Panel B: Rating quality test

Dependent Variable = *Default Rate*	Low *Complexity*		High *Complexity*
Rating × *Treat* × *Post*	0.145***		0.212***
	(2.92)		(3.19)
Test of coefficient difference		$p = 0.275$	
Observations	464		391
Adj. R^2	0.82		0.86

	Dependent Variable = *Default Rate* $_{Residual}$			
	Low *Complexity*		High *Complexity*	
	Pre-period	Post-period	Pre-period	Post-period
Rating	−0.040	0.017	0.002	0.267***
	(−0.90)	(1.00)	(0.02)	(3.86)
Observations	126	69	83	39
R^2	0.06	0.00	0.00	0.40

This table report the results of the yield informativeness and rating quality tests partitioning auto ABS deals by the indicator for above-median (high) versus below-median (low) deal complexity (*Complexity*). We classify an auto ABS deal into the high (low) *Complexity* group if the number of tranches in the deal is above (below) the median. The sample in the High (Low) *Complexity* column includes the treatment deals in the high (low) *Complexity* group and the control deals. In each panel, the top portion reports the coefficients on *Yield* (*Rating*) × *Treat* × *Post* and the bottom portion reports the results of the incremental R^2 tests. We control for (but do not tabulate) *Deal Size*, *Weighted Average Life*, *Floating*, *Number of Tranches*, *Number of Ratings* as well as asset-type × issuance year-quarter and issuer fixed effects. To calculate this incremental R^2, we first estimate the regression model in the top portion of the panel with all variables and fixed effects except for *Yield* (*Rating*) and its interactions with *Treat* and/or *Post*. In the second stage, we regress the residuals from the first stage on *Yield* (*Rating*), separately for the high versus low *Complexity* treatment sample in the pre-period versus the post-period. We report the coefficients and the R^2s from the second stage. See appendix B for variable definitions. Standard errors are calculated clustering by deal. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

(*Complexity*). In both panels, the coefficients on the triple interaction terms *Yield* × *Treat* × *Post* and *Rating* × *Treat* × *Post* are significantly positive for both the below- and above-median *Complexity* auto deals in both the pre- and post-periods. In panel A, the coefficient on *Yield* × *Treat* × *Post* is significantly larger for the high *Complexity* auto deals than for the low *Complexity* deals. In panel B, however, the coefficient on *Rating* × *Treat* × *Post* is insignificantly larger for the high *Complexity* auto deals than for the low *Complexity* deals.

The bottom portions of panels A and B report the supplemental tests of the incremental R^2s for *Yield* and *Rating*. The incremental R^2s are fairly close to zero for the low *Complexity* auto deals in both the pre- and post-periods. In contrast, for the high *Complexity* deals, the incremental R^2 increases from 0.00 in the pre-period to 0.31 in the post-period in the yield informativeness test and from 0.00 in the pre-period to 0.40 in the post-period in the rating quality test.

With the exception of the insignificantly larger coefficient on *Rating* × *Treat* × *Post* for the high *Complexity* auto deals than for the low *Complexity* deals, the results in table 6 are consistent with auto ABS issuers' asset-level disclosures under Reg AB II improving market participants' (e)valuation of treatment ABS deals more for deals with more complex credit risk tranching.

7. *Additional Analyses, Robustness Tests, and Discussion*

7.1 Impact of asset-level disclosures on required yields

Disclosure theory generally predicts that greater transparency reduces uncertainty about future payoffs (credit losses) and thereby lowers required expected returns in equilibrium (Diamond and Verrecchia [1991], Easley and O'Hara [2004], Hughes, Liu, and Liu [2007], Lambert, Leuz, and Verrecchia [2007]). Consistent with this theory, the SEC expects that asset-level disclosures "should ultimately benefit issuers in the form of a lower cost of capital" (SEC [2014, p. 57194]). In this subsection, we test whether the enhanced yield informativeness attributable to asset-level disclosures under Reg AB II documented in sections 5 and 6 translates into lower initial tranche yields required by investors.

Column 1 of table 7 reports the estimated regression of initial tranche *Yield* on *Treat* × *Post* and control variables, including fixed effects for issuers, asset types, and issuing year-quarter. We expect the coefficient on *Treat* × *Post* to be negative. We find that this coefficient is weakly significantly negative, consistent with asset-level disclosures reducing the initial yields required by investors.

To investigate whether this finding reflects more favorable initial credit ratings and/or higher asset quality (i.e., lower subsequent credit losses), columns 2 and 3 of table 7 report the estimated regressions of initial tranche *Rating* and future *Default Rate*, respectively, on *Treat* × *Post*,

TABLE 7
Impact of Asset-Level Disclosures on the Levels of Yields, Ratings, and Default Rates

Dependent Variable =	*Yield* (1)	*Rating* (2)	*Default Rate* (3)
Treat × *Post*	−0.094*	0.073	0.075
	(−2.01)	(0.50)	(1.03)
Tranche Size	−0.074***	−0.908***	−0.015
	(−3.08)	(−4.32)	(−0.54)
Weighted Average Life	0.099***	0.343	−0.001
	(3.64)	(1.35)	(−0.06)
Floating	−0.255***	−0.520**	−0.001
	(−10.69)	(−2.66)	(−0.08)
Number of Tranches	0.035**	0.076	0.019
	(2.18)	(1.17)	(0.66)
Number of Ratings	0.028	−0.082	−0.054
	(1.26)	(−0.57)	(−0.85)
Asset-type FEs	Y	Y	Y
Issuance Year-quarter FEs	Y	Y	Y
Issuer FEs	Y	Y	Y
Observations	1,966	1,966	586
Adj. R^2	0.62	0.49	0.75

This table presents the analysis of the effect of asset-level disclosures on the initial tranche yield spreads (*Yield*), initial tranche credit ratings (*Rating*), and deal-level cumulative write-offs of the underlying assets (*Default Rate*). We use the tranche-level sample for the *Yield* and *Rating* tests and the deal-level sample for the *Default Rate* test, because yields and ratings are assigned at the tranche level whereas *Default Rate* is specified at the deal level. We include asset-type and issuance year-quarter fixed effects separately instead of asset-type × issuing year-quarter fixed effects because our main variable of interest is *Treat* × *Post*. See appendix B for variable definitions. Standard errors are calculated clustering observations by issuer × asset type. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

control variables, and fixed effects. In both columns, the coefficient on *Treat* × *Post* is statistically insignificant, consistent with no association between asset-level disclosures and the level of credit ratings or subsequent credit losses. These results suggest the finding reported in column 1 reflects ABS issuers' asset-level disclosures under Reg AB II reducing uncertainty for investors and thereby lowering the cost of capital for ABS issuers.

7.2 DOWNLOADS OF ASSET-LEVEL DATA BY AUTO ABS INVESTORS

To provide direct evidence that investors use asset-level data in valuing auto ABS at the time of ABS issuance, in this section we estimate the percentage of prospective auto ABS investors who download ABS issuers' Form ABS-EE filings from the SEC's EDGAR system. These ABS-EE filings contain the asset-level information required under Reg AB II. EDGAR provides filing download data only up to June 30, 2017, which limits our analysis to the 24 auto ABS deals issued between the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements and June 30, 2017. We estimate the percentage of prospective investors for each auto ABS deal who obtain (and presumably analyze) the asset-level disclosures under Reg AB II as the number of unique IP addresses that download Form ABS-EE, either by itself or in conjunction with the preliminary prospectus, divided by

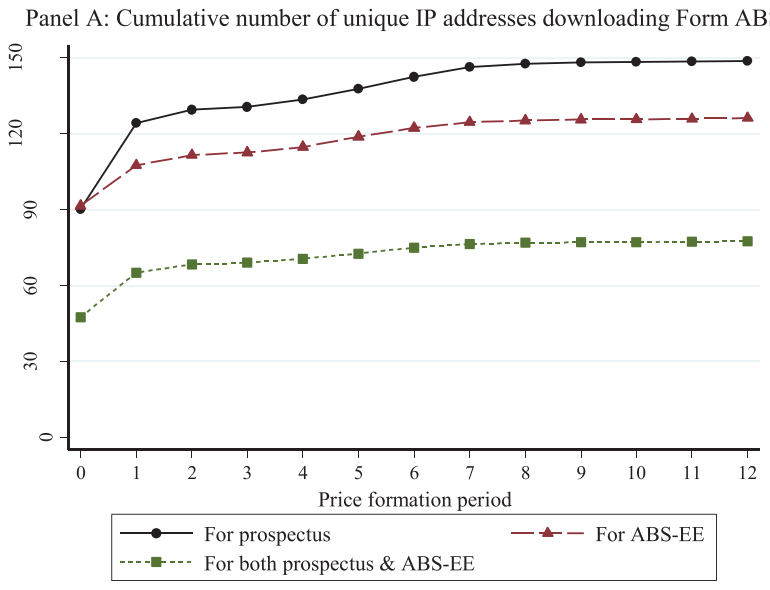
the number of these unique IP addresses that download the preliminary prospectus. We examine downloads in the fairly short window from the filing day of the preliminary prospectus to the day prior to the filing of the final prospectus, that is, during the price formation period.

We posit that this ratio captures the percentage of prospective auto ABS investors who use asset-level information to value the ABS at initial issuance for the following reasons. The average (maximum) time between the filing dates of the preliminary and final prospectuses is 8 (13) days for the 24 auto deals we examine. The key difference between the two prospectuses is that tranche coupon rates are left blank in the preliminary prospectus and specified in the final prospectus. Because almost all ABS are sold at or very close to par (Adelino [2009]), these coupon rates approximate the yields demanded by investors. Rating agencies typically release their tranche ratings for a deal on the day of the filing of the preliminary prospectus. After the effective date of Reg AB II's asset-level disclosure requirements, auto ABS issuers typically file Form ABS-EE on the day of filing the preliminary prospectus or one day before. Hence, prospective investors have both rating and asset-level information necessary to value the auto ABS in a deal when the preliminary prospectus is filed, and their valuations must be completed prior to the filing of the final prospectus to influence the tranche coupon rates. Appendix D depicts the timeline of the initial price formation process for auto ABS deals using Ally Auto Receivables Trust 2017-3 as an example.

Figure 2, panel A, plots the average cumulative number of unique IP addresses that download Form ABS-EE and/or preliminary prospectuses during the price formation period for the 24 auto deals. On average, 126 (149) unique IP addresses download Form ABS-EE (the preliminary prospectus) during this window, and 78 IP addresses download both filings. Based on these numbers, we estimate that between 52% (= 78/149) and 85% (= 126/149) of prospective auto ABS investors use the asset-level data when valuing the deal tranches. The 52% lower bound is applicable if individual investors downloading both Form ABS-EE and the preliminary prospectus always do so from the same IP address. The 85% upper bound is applicable if all 48 (= 126 – 78) of the individual investors who download only the Form ABS-EE filing from a given IP address download the preliminary prospectus from a different IP address.

Figure 2, panel B, plots the average incremental number of unique IP addresses that download Form ABS-EE and/or preliminary prospectuses for each day during the price formation period. Over 85% of the downloads of both filings occur during the first three days of the window, suggesting that prospective investors typically obtain both Form ABS-EE and the preliminary prospectus shortly after they become available.

As an additional test of investors' use of asset-level data in valuing auto ABS at the time of ABS issuance, in the online appendix we explore whether the number of prospective investors that access the preliminary prospectus increases for the treatment deals relative to the control deals



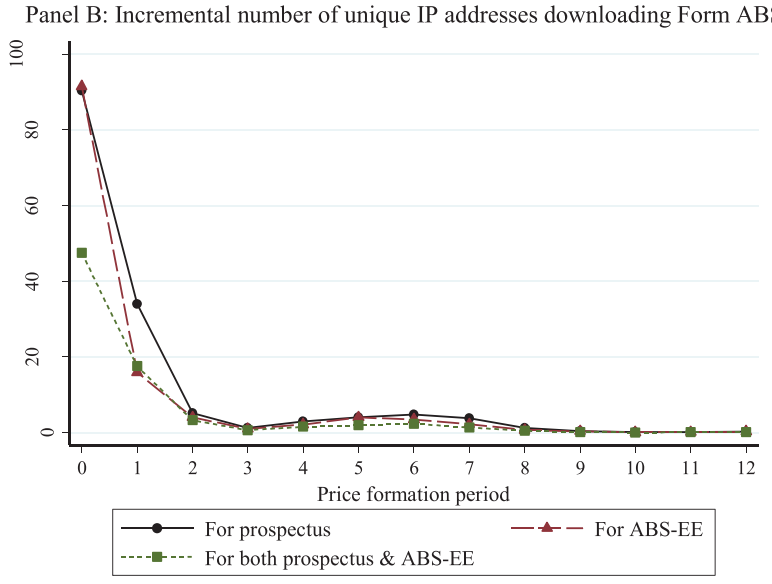


FIG 2.—Panel A (panel B) plots the average cumulative (incremental) number of unique IP addresses that download Form ABS-EE containing asset-level data and/or the preliminary prospectuses from the filing day for the preliminary prospectus ($t = 0$) to the day prior to the filing of the final prospectus for an auto ABS deal. In both panels, the solid (top) line depicts the average number of unique IP addresses that download a deal's preliminary prospectus, the long-dash line depicts the average number of unique IP addresses that download a deal's Form ABS-EE, and the short-dash line depicts the average number of unique IP addresses that download both filings. We obtain downloads from the EDGAR log file data set, which ends on June 30, 2017, limiting the analysis to the 24 auto ABS deals issued from the November 23, 2016, effective date of Reg AB II's asset-level disclosure requirements to June 30, 2017.

after the implementation of the asset-level disclosure requirements. We find that this is the case, consistent with asset-level disclosures yielding decreased information asymmetry for the treatment deals. This analysis is presented in section A4, Figure A1, and table A4 of the online appendix.

7.3 ROBUSTNESS TESTS

We conduct falsification tests to further rule out the possibility that omitted time-varying factors other than Reg AB II's asset-level disclosure requirements affect the treatment auto ABS deals differently than the control deals, yielding nonparallel trends for the two samples in the pre-period. We use November 24, 2014, the nominal effective date of Reg AB II, as the pseudo-effective date for Reg AB II's asset-level disclosure requirements. This date is two years prior to the actual effective date of the requirements. The pre-pseudo-event period is from June 1, 2013, to November 23, 2014, and the post-pseudo-event period is from November 24, 2014, to November 22, 2016. We exclude all deals issued after the actual effective date of the disclosure requirements.

Panels A and B of table 8 report the results of the falsification tests for the yield informativeness and rating quality tests, respectively. The coefficients on the main explanatory variables of interest (i.e., $Yield \times Treat \times Post_{pseudo}$ in the yield informativeness test and $Rating \times Treat \times Post_{pseudo}$ in the rating quality test) are statistically insignificant with one exception that does not undermine the inferences we draw from our primary tests. Specifically, the coefficient on $Yield \times Treat \times Post_{pseudo}$ is statistically significant in column 2 of panel A, but the negative sign of the coefficient (-0.270) is opposite to the positive sign of the corresponding coefficient (1.083) in the main test reported in column 2 of table 2. We also conduct a similar untabulated falsification test for the impact of asset-level disclosures on the level of yield, and find the coefficient on $Treat \times Post_{pseudo}$ is statistically insignificant. Overall, the results of the falsification tests are consistent with omitted time-related factors not explaining our primary findings.

Table 9 reports the results of several robustness tests for the main analyses reported in tables 2 and 3. In panel A of table 9, we measure *Default Rate* over a shorter (longer) horizon of four (eight) months after ABS issuance to incorporate loan defaults that are more (less) predictable at deal issuance. In panel B, we measure asset performance as the sum of *Default Rate* and the percentage of the principal balance that is delinquent for at least 60 or 90 days as of six months after ABS issuance. In panel C, we add CMBS deals (the only type of public deals not already included) to the control sample to mitigate the predominance of the inclusion of credit card ABS deals in that sample.[24] Our inferences are unaffected by each of these tests.

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[24] In an additional robustness test, in section A2 and table A2 of the online appendix we replace credit card ABS deals in the control sample with CMBS deals, and find that our inferences remain the same.

TABLE 8
Falsification Tests

Panel A: Yield informativeness tests

	Dependent Variable = *Default Rate*	
	(1)	(2)
Yield × *Treat* × *Post* $_{pseudo}$	−0.296	−0.270**
	(−1.42)	(−2.10)
Asset-type FEs	Y	
Issuance Year-quarter FEs	Y	
Asset-type FEs × Issuance Year-quarter FEs		Y
Issuer FEs		Y
Observations	384	384
Adj. R^2	0.57	0.79

	Dependent Variable = *Default Rate* $_{Residual}$			
	Treatment		Control	
	Pre-pseudo-period	Post-pseudo-period	Pre-pseudo-period	Post-pseudo-period
Yield	0.118***	0.054	−0.051**	0.007
	(3.89)	(0.67)	(−2.55)	(0.32)
Observations	89	120	97	78
R^2	0.03	0.01	0.08	0.00

Panel B: Rating quality tests

	Dependent Variable = *Default Rate*	
	(1)	(2)
Rating × *Treat* × *Post* $_{pseudo}$	0.136	0.004
	(0.96)	(0.04)
Asset-type FEs	Y	
Issuance Year-quarter FEs	Y	
Asset-type FEs × Issuance Year-quarter FEs		Y
Issuer FEs		Y
Observations	384	384
Adj. R^2	0.64	0.81

	Dependent Variable = *Default Rate* $_{Residual}$			
	Treatment		Control	
	Pre-pseudo-period	Post-pseudo-period	Pre-pseudo-period	Post-pseudo-period
Rating	0.045***	0.044	−0.051	−0.062
	(3.29)	(0.65)	(−0.99)	(−1.32)

(*Continues*)

TABLE 8—*(Continued)*

	Dependent Variable = *Default Rate* $_{Residual}$			
	Treatment		Control	
	Pre-pseudo-period	Post-pseudo-period	Pre-pseudo-period	Post-pseudo-period
Observations	89	120	97	78
R^2	0.05	0.03	0.02	0.01

This table presents falsification tests using the November 24, 2014, nominal effective date of Reg AB II as a *pseudo*-effective date for its asset-level disclosure requirements. We exclude deals issued on or after November 23, 2016, the actual effective date of the disclosure requirements. The top portion of each panel reports the coefficients on *Yield* (*Rating*) × *Treat* × *Post* and the bottom portions report the incremental R^2 tests. To calculate the incremental R^2, we first estimate the regression model in column 2 of the top portion of the panel with all variables and fixed effects except for *Yield* (*Rating*) and its interactions with *Treat* and/or *Post* $_{Pseudo}$. In the second stage, we regress the residuals from the first stage on *Yield* (*Rating*), separately for the treatment sample versus the control sample in the pre-pseudo-period versus the post-pseudo-period. We report the coefficients and R^2s from the second stage. We control for but do not tabulate *Deal Size*, *Weight Average Life*, *Floating*, *Number of Tranches*, and *Number of Ratings*. See appendix B for variable definitions. Standard errors are calculated clustering observations by issuer × asset type. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

7.4 DISCUSSION OF THE DIFFERENTIAL INCREASE IN THE DEFAULT RATE FOR THE TREATMENT VERSUS CONTROL ABS

As discussed in the introduction and section 4, and reported in table 1, panel D, in univariate analysis *Default Rate* increases weakly significantly more for the treatment auto ABS than for the control ABS from the pre–Reg AB II period to the post-period. As discussed in footnote 18, we investigated whether the differential increase in *Default Rate* is explained by loosening of underwriting standards for auto ABS deals, and found no evidence for this explanation. However, we do not have a specific explanation for this differential increase, which suggests that a shock other than Reg AB II may have disproportionately increased the default risk of auto ABS, possibly increasing the association between yields and default rates for those ABS. In the remainder of this section, we briefly summarize how this possibility is reduced by several features of our research design and additional tests we conduct.

First, as discussed in section 7.1 and reported in column 3 of table 7, we find that the differential increase in *Default Rate* becomes insignificant after controlling for observable deal, time, and issuer attributes.

Second, the inclusion of asset-type × year-quarter issuance fixed effects in our difference-in-differences models should fully absorb any systemic differences in *Default Rate* across asset types each year. This is because the mean of (unexplained) default rates after controlling for asset-type × year-quarter issuance fixed effects is, by construction, *zero* for both auto ABS deals and nonauto ABS deals in both the pre-period and the post-period.

Third, the incremental R^2 tests we report are not affected by changes in the level of *Default Rate* across asset types.

TABLE 9
Robustness Tests

Panel A: Alternative performance horizons for *Default Rate*

Dependent Variable = *Default Rate* measured at	Four-month window		Eight-month window	
Yield × *Treat* × *Post*	0.366***		1.706***	
	(3.28)		(2.83)	
Rating × *Treat* × *Post*		0.093**		0.321***
		(2.64)		(3.13)
Asset-Type FEs × Issuance Year-Quarter FEs	Y	Y	Y	Y
Issuer FEs	Y	Y	Y	Y
Observations	586	586	586	586
Adj. R^2	0.82	0.82	0.84	0.86

Panel B: Using the sum of default rate and delinquency rate to measure asset performance

Dependent Variable =	*Default rate* + *over 60-day delinquency rate*		*Default rate* + *over 90-day delinquency rate*	
Yield × *Treat* × *Post*	2.704**		1.532**	
	(2.50)		(2.45)	
Rating × *Treat* × *Post*		0.655***		0.495***
		(3.23)		(3.67)
Asset-Type FEs × Issuance Year-Quarter FEs	Y	Y	Y	Y
Issuer FEs	Y	Y	Y	Y
Observations	583	583	576	576
Adj. R^2	0.96	0.96	0.97	0.97

Panel C: Adding CMBS to the control sample

Dependent Variable = *Default Rate*	(1)	(2)
Yield × *Treat* × *Post*	1.132***	
	(3.55)	
Rating × *Treat* × *Post*		0.190***
		(4.07)
Asset-Type FEs × Issuance Year-Quarter FEs	Y	Y
Issuer FEs	Y	Y
Observations	863	863
Adj. R^2	0.82	0.83

This table presents three robustness tests of the effect of Reg AB II's asset-level disclosure requirements on both yield informativeness and rating quality. Panel A reports the results of using alternative time horizons of four months or eight months after ABS issuance to measure *Default Rate*. Panel B reports the results of using the sum of default rate and over 60- or 90-day delinquency rate as alternative dependent variables. Panel C reports the results of adding CMBS to the control sample. See appendix B for variable definitions. Standard errors are calculated clustering observations by issuer × asset type. *t*-Statistics are reported in parentheses below coefficient estimates. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Fourth, as mentioned in footnote 4 and section 5.1, in section A1 of the online appendix we conduct an alternative empirical analysis of the informativeness of the initial yield that does not rely upon *Default Rate*. Using TRACE data on prices in secondary-market ABS trades, we calculate the absolute deviation of the yield spread from the initial yield spread. Intuitively, if the initial yield spread is more informative in predicting the future performance of the underlying assets, then the subsequent yield spread, which incorporates information about future realized performance, will deviate *less* from the initial yield spread. This analysis yields the same inference as the default rate analysis.

8. Conclusion

Many financial market observers believe that the opacity of the assets underlying ABS issued prior to the 2007–09 financial crisis contributed to underappreciation of the risks of these ABS by investors and to excessively optimistic credit ratings of the ABS by credit rating agencies. As an important part of the postcrisis effort to reform and revive the ABS markets, Reg AB II's asset-level disclosure requirements substantially increase the transparency of the underlying assets in subject ABS deals. We test for the impact of these asset-level disclosures on the (e)valuation of ABS by investors and credit rating agencies by employing a difference-in-differences research design that compares auto ABS deals subject to these requirements to nonsubject ABS deals. We find that asset-level disclosures increase the ability of both initial yields and initial credit ratings for subject auto ABS to predict the subsequent performance of the underlying assets, indicating that the asset-level disclosures improve yield informativeness and credit rating quality. Because credit rating agencies could obtain asset-level information prior to the effective date of Reg AB II's asset-level disclosure requirements, our findings for credit ratings suggest that public asset-level disclosures discipline the agencies' evaluation of ABS.

We examine two mechanisms by which asset-level disclosures potentially improve the (e)valuation of ABS by investors and credit rating agencies. First, we expect asset-level disclosures to reveal the extent of risk layering in the underlying assets and thus to be more useful for ABS deals that involve greater risk layering. Second, we expect asset-level disclosures to enable investors to better assess the credit risk of deals with more complex tranching of credit risk. Consistent with these expectations, we find that our primary findings are concentrated in deals with above-median risk-layered loans and complexity.

We further find that asset-level disclosures are associated with a decrease in the level of yields, consistent with transparency lowering ABS issuers' cost of capital. Lastly, we provide direct evidence that most prospective ABS investors download asset-level information from EDGAR during the price formation period at the time of an ABS offering.

Our findings have two implications for policy. First, Reg AB II's required asset-level disclosures improve the (e)valuation of ABS by both investors

and credit rating agencies, consistent with transparency improving both price efficiency and rating quality in the ABS markets. Second, the improvement in credit ratings likely is attributable to these public disclosures increasing market discipline over rating agencies, an unintended consequence of Reg AB II.

The imposition of Reg AB II's asset-level disclosure requirements provides numerous possibilities for future research. For example, these requirements may influence the decisions of parties other than the two types we examine, such as ABS underwriters, financial regulators, and auditors. To illustrate, underwriters play important roles in the structuring and marketing of ABS deals. Like underwriters of other types of financial assets, ABS underwriters have reputations to develop, maintain, or lose.

APPENDIX A

Prospectus Disclosures for Auto ABS (The Treatment Sample) Before versus After REG AB II

PART I: EXAMPLE OF DISCLOSURES FOR AUTO ABS BEFORE REG AB II'S ASSET-LEVEL DISCLOSURE REQUIREMENTS

Capital Auto Receivables Asset Trust 2015-1. This auto ABS deal was issued in 2015, the year prior to the effective date of Reg AB II's asset-level disclosure requirements.[25] The final prospectus filed on January 26, 2015, includes the following pool-level summary information:

Composition of the Initial Receivables Pool—(Total: New and Used)

Aggregate amount financed	$1,327,000,613.17
Number of contracts in pool	72,383
Average amount financed	$18,333.04
Weighted average FICO score	632.13
Weighted average loan-to-value ratio	106.62
Weighted average annual percentage rate of all receivables in pool	8.26%
Weighted average annual percentage rate of nonsubvented receivables in pool	9.55%
Weighted average original maturity	68.11
Weighted average remaining maturity (range)	57.09 (3–82 months)
Percentage of new cars and light trucks in pool	60.50%
Percentage of used cars and light trucks in pool	39.50%
Percentage of cars in pool	41.55%
Percentage of light trucks in pool	58.45%
Percentage of subvented receivables in pool	24.54%
Percentage of nonsubvented receivables in pool	75.46%

[25] https://www.sec.gov/cgi-bin/browse-edgar?CIK=1630924%26owner=exclude%26action=getcompany

In addition, the prospectus includes distributions for the underlying asset pool of buckets of a few individual risk attributes such as interest rate, loan-to-value ratio, borrower FICO score, and geographic location.

Distribution of the Initial Receivables Pool by Loan-to-Value Ratio

Loan-to-Value Ratio	Number of Contracts	Average Original Amount Financed	Average Original Estimated Vehicle Value	Percentage of Contracts
Less than 80	8,587	$16,309.83	$25,146.65	11.86%
80–90	7,519	$21,325.90	$24,942.32	10.39%
91–100	11,547	$22,883.20	$23,861.34	15.95%
101–110	12,921	$25,363.12	$24,038.50	17.85%
111–120	13,703	$25,283.80	$21,906.59	18.93%
121–130	11,843	$23,496.56	$18,738.89	16.36%
131–140	6,263	$21,067.77	$15,629.48	8.65%
Greater than 140	—	$—	$—	0.00%
Total	72,383			100.00%

Distribution of the Initial Receivables Pool by FICO Score Range

FICO Band	Number of Contracts	Aggregate Amount Financed	Percentage of Aggregate Amount Financed
Business accounts and unavailable	4,043	$80,818,751.11	6.09%
Below 550	2,844	$52,190,430.24	3.93%
550—574	4,565	$83,653,271.42	6.30%
575—599	7,340	$140,721,656.79	10.60%
600—625	11,614	$231,592,639.00	17.45%
626–650	18,637	$375,230,603.10	28.28%
651–675	11,088	$210,974,920.57	15.90%
676–700	4,683	$70,527,908.15	5.31%
701–725	3,076	$41,472,513.92	3.13%
726–750	968	$8,719,563.42	0.66%
751–775	818	$7,383,949.99	0.56%
776–800	867	$7,796,860.86	0.59%
801–825	936	$8,449,424.29	0.64%
826–850	686	$5,626,183.09	0.42%
851–875	208	$1,733,383.62	0.13%
876–900	10	$108,553.60	0.01%
Total	72,383	$1,327,000,613.17	100.00%

PART II: EXAMPLE OF DISCLOSURES FOR AUTO ABS AFTER REG AB II'S ASSET-LEVEL DISCLOSURE REQUIREMENTS

Toyota Auto Receivables Owner Trust 2017-A. This auto ABS deal was issued in 2017, the year after the effective date of Reg AB II's asset-level disclo-

sure requirements.[26] Similar to auto loan deals issued before the regulation changes, the final prospectus filed on March 9, 2017, contains pool-level summary information and distributions for the underlying asset pool of buckets of a few individual risk attributes:

Composition of the Receivables as of the Cutoff Date

Total principal balance	$1,610,505,281.69
Number of receivables	93,151
Average principal balance	$17,289.19
Range of principal balances	$251.36 - $98,121.30
Average original amount financed	$25,815.87
Range of original amounts financed	$1,700.00 - $107,152.39
Weighted average APR(1)	2.20%
Range of APRs	0.00% - 22.70%
Weighted average original number of scheduled payments(1)	63.10 payments
Range of original number of scheduled payments	12–72 payments
Percentage of total principal balance consisting of receivables with original scheduled payments greater than 60 months	34.58%
Weighted average remaining number of scheduled payments(1)	48.33 payments
Range of remaining number of scheduled payments	4–68 payments
Weighted average FICO® score(1) (2)	757
Range of FICO® scores(2)	620 - 900

Distribution of the Receivables as of the Cutoff Date by FICO® Score Range(1)

FICO® Score Range(1)	Number of Receivables	Percentage of Total Number of Receivables	Cutoff Date Aggregate Principal Balance	Percentage of Cutoff Date Aggregate Principal Balance
620–650	4,044	4.34%	$76,953,329.83	4.78%
651–700	14,559	15.63	268,528,197.71	16.67
701–750	22,322	23.96	395,725,633.35	24.57
751–800	22,347	23.99	374,057,451.21	23.23
801–850	25,486	27.36	408,942,053.02	25.39
Greater than or equal to 851	4,393	4.72	86,298,616.57	5.36
Total(2)	93,151	100.00%	$1,610,505,281.69	100.00%

In addition, the issuer also filed Form ABS-EE to SEC on February 27, 2017. This filing contains 73 variables *for each loan* in the asset pool, many of which were not included in the prospectus. The following excerpt from the Form ABS-EE filing indicates some of these variables.

[26] https://www.sec.gov/cgi-bin/browse-edgar?CIK=1694919%26owner=exclude%26action=getcompany

Asset Number	Originator Name	Origination Date	Original Loan Amount	Vehicle Value Amount	Obligor Credit Score	Reporting Period Scheduled Payment Amount	Total Actual Amount Paid	Obligor Income Verification Level Code	Obligor Employment Verification Code
439116738	TMCC	Oct-14	13864.9	19301.84	819	231.09	231.09	2	2
449048111	TMCC	Oct-14	30370.36	30653.84	692	531.4	531.4	2	2
464867504	TMCC	Nov-14	25635.01	21719.84	725	448.56	448.56	2	2
484245794	TMCC	Nov-14	6730.2	12400	846	145.83	145.83	2	2
489425760	TMCC	Nov-14	24494.47	41518	787	529.54	529.54	2	2
544001733	TMCC	Dec-14	20685.92	21964.24	794	430.96	862	2	2
556653520	TMCC	Jan-15	40124.5	46620	704	720.07	1440	2	2
557827398	TMCC	Jan-15	13000	27909.6	784	227.47	300	2	2
576087709	TMCC	Jan-15	29558.41	26487.6	786	492.64	500	2	2
584975637	TMCC	Jan-15	19103.26	26937.6	827	318.38	318.38	2	2
606198591	TMCC	Feb-15	30364.04	28285.76	679	565.53	565.53	2	2
616185863	TMCC	Feb-15	20454.56	30118.6	827	340.91	340.91	2	2
640949082	TMCC	Mar-15	31113.36	36636.84	792	530.7	1062	2	2
649892909	TMCC	Mar-15	17957.33	26712.6	835	299.29	0	2	2
663644041	TMCC	Mar-15	34681.18	47447.6	815	620.04	1000	2	2
683898081	TMCC	Apr-15	14485.76	16275	712	241.74	241.74	2	2
687587409	TMCC	Apr-15	8744.8	22750.84	834	182.19	182.19	2	2

Note: the original file is in XML format; the above excerpt is in Excel format converted using http://www.finsight.com.

APPENDIX B

Variable Definitions

Variable	Definition	Source
Default Rate	The cumulative net write-offs because of defaults in the first six months after ABS issuance as a percent of the original balance of the underlying assets. For credit card ABS, it equals the average write-offs because of defaults as a percent of the monthly pool balance of the first six months after ABS issuance.	Moody's ABS & ABCP Database; Form 10-D filings from SEC EDGAR
Deal Size	The natural logarithm of the initial principal amount of the underlying assets in the deal.	Bloomberg
Floating	In tranche-level analyses, this variable equals one for tranches with floating coupon rates, and zero for other tranches. In deal-level analyses, it equals the sum of the principal amount of the tranches with floating coupon rates a percent of the sum of the principal amounts of the deal tranches.	Bloomberg
Number of Ratings	In tranche-level analyses, this variable equals the number of rating agencies (i.e., S&P, Moody's, and Fitch) that rate the tranche. In deal-level analyses, it equals the number of rating agencies that rate at least one tranche in the deal.	Bloomberg
Number of Tranches	The number of tranches in an ABS deal.	Bloomberg
Rating	In tranche-level analyses, this variable equals the average of the initial credit ratings of the tranche assigned by S&P, Moody's, and Fitch. Higher numerical values correspond to higher credit risk. In deal-level analyses, it equals the average of initial tranche ratings weighted by the principal amount of the tranches.	Bloomberg

(Continues)

Variable	Definition	Source
Risk Layering	The proportion of the underlying assets in an auto ABS deal that exhibits high risk on at least three of the five following key credit-risk attributes: bottom quartile borrower FICO score, highest quartile loan-to-value ratio, highest quartile payment-to-income ratio, actual payment in the most recent payment period (generally a month) falling behind the scheduled payment, and no documentation of borrower income or employment. See Appendix C for further details of the construction of this variable.	Form ABS-EE filings from SEC EDGAR
Post	An indicator variable equal to one for ABS deals issued on or after November 23, 2016 (the effective date of Reg AB II's asset-level disclosure requirements), and zero otherwise.	Bloomberg
$Post_{pseudo}$	An indicator variable equal to one for ABS deals issued between November 24, 2014 (the nominal effective date of Reg AB II) and November 22, 2016, and zero for deals issued before November 24, 2014. This variable is used in the falsification tests.	Bloomberg
Treat	An indicator variable equal to one for SEC-registered (i.e., publicly offered) auto ABS deals and zero for other SEC-registered ABS deals.	Bloomberg
Tranche Size	The natural logarithm of the initial principal amount of a tranche in an ABS deal.	Bloomberg

(Continues)

Variable	Definition	Source
Yield	In the tranche-level analyses, this variable equals the specified fixed markup (in percent) over the reference rate (e.g., one-month LIBOR) for tranches with floating coupon rates, and the initial coupon rate of the tranche less the yield on the U.S. Treasury security whose maturity is closest to the *Weighted Average Life* of the tranche for tranches with fixed coupon rates (He, Qian, and Strahan [2016]). In the deal-level analyses, it equals the average of the initial tranche yield spreads weighted by the principal amounts of the tranches.	Bloomberg; FRED Economic Data
Weighted Average Life	In the tranche-level analyses, this variable equals the disclosed expected number of years for a tranche's principal to be repaid. In the deal-level analyses, it equals the average of weighted average lives of the tranches weighted by their principal amounts.	Bloomberg

APPENDIX C

Construction of Risk Layering

Risk Layering is the proportion of the loans and leases (loans) underlying an auto ABS deal that exhibits at least three of the following five key indicators of high credit risk: low borrower FICO score, high loan-to-value ratio, high payment-to-income ratio, actual payment for the most recent payment period (generally a month) falling behind scheduled payment, and no documentation of borrower income or employment. The asset-level information used to measure these five risk attributes is collected from the initial Form ABS-EE filing of each auto ABS deal. Because these Form ABS-EE fillings are available only after Reg AB II's asset-level disclosure requirements become effective, we calculate *Risk Layering* only for the auto ABS deals issued after the effective date of these disclosure requirements. Our construction of the *Risk Layering* variable includes the following three steps.

Step 1: Identify loans that exhibit high credit risk on individual risk attributes

The indicator variable *D_FICO* equals one for a loan with borrower FICO score in the bottom quartile of the FICO score distribution (642 or below) for the 108 publicly offered auto ABS deals issued between November 23, 2016, and November 30, 2018, and zero otherwise. The indicator variable *D_LTV* equals one for a loan with loan-to-value ratio (LTV) in the top quartile of the LTV distribution (1.13 or above), and zero otherwise. The indicator variable *D_PTI* equals one for a loan with payment-to-income

ratio (PTI) in the top quartile of the PTI distribution (12.9% or above), and zero otherwise. The indicator variable *D_ATS* equals one for a loan with actual payment falling behind scheduled payment, and zero otherwise. The indicator variable *D_LowDoc* equals one for a loan if there is no documentation of borrower income or employment, and zero otherwise.

Step 2: Determine if a loan is risk-layered

We calculate the number of layers of risk by summing up the five indicator variables defined above: *D_FICO*, *D_LTV*, *D_PTI*, *D_ATS*, and *D_LowDoc*. The total number of layers of risk for each loan in a deal ranges from 0 (i.e., not risky on any of the five dimensions) to 5 (i.e., risky on all of the five dimensions). We classify a loan as multilayered if the number of risk layers for this loan is equal to or greater than 3.

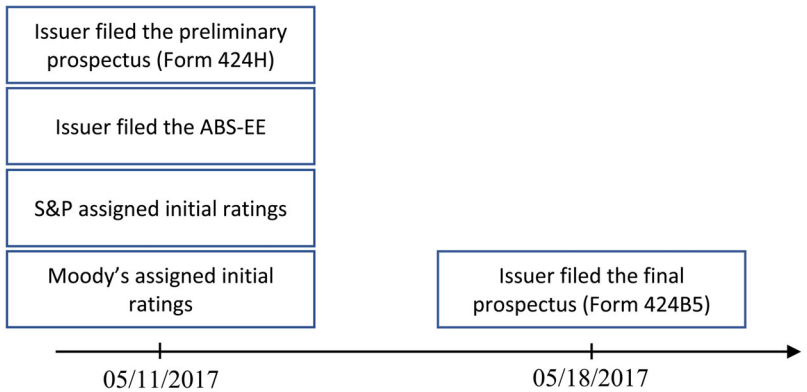
Step 3: Determine the proportion of risk-layered loans in a deal

We calculate *Risk Layering* for a deal as the sum of the principal amounts of all risk-layered loans in the asset pool divided by the sum of the principal amounts of the loans in the pool with available information on all five credit risk attributes.[27]

APPENDIX D

Timeline of the Initial Price Formation Process for Auto ABS Deals

We use an example auto ABS deal, Ally Auto Receivables Trust 2017-3, to illustrate the timeline of the initial price formation process of auto ABS deals:



On May 11, 2017, Ally Financial filed both the preliminary prospectus and the ABS-EE of this deal on EDGAR. On the same day, Moody's and

[27] About 10% of individual auto loans have missing information on one or more of the five credit-risk attributes.

S&P released their ratings assigned to this deal (this deal is only rated by Moody's and S&P). On the first page of the preliminary prospectus, the coupon rates of tranches have been left blank (see below).

	Class A-1 Notes(1)	Class A-2 Notes(1)	Class A-3 Notes(1)	Class A-4 Notes(1)	Class B Notes(1), (2)	Class C Notes(1), (2)	Class D Notes(1), (2)
Principal Balance	$270,000,000	$371,370,000	$271,370,000	$86,010,000	$22,220,000	$18,510,000	$13,750,000
Offered Amount	$256,500,000	$352,800,000	$257,800,000	$81,700,000	$21,100,000	$17,580,000	$13,060,000
Interest Rate	%	%	%	%	%	%	%
Initial Distribution Date	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017
Final Scheduled Distribution Date	June 15, 2018	March 16, 2020	September 15, 2021	March 15, 2022	July 15, 2022	October 17, 2022	January 16, 2024
Distribution Frequency	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Price to Public	%	%	%	%	%	%	%
Underwriting Discount	%	%	%	%	%	%	%
Proceeds to the Depositor	%	%	%	%	%	%	%

On May 18, 2017, Ally Financial filed the final prospectus of this deal to EDGAR. On the first page of the final prospectus, coupon rates of tranches have been set (see below).

	Class A-1 Notes(1)	Class A-2 Notes(1)	Class A-3 Notes(1)	Class A-4 Notes(1)	Class B Notes(1)	Class C Notes(1)	Class D Notes(1)
Principal Balance	$270,000,000	$371,370,000	$271,370,000	$86,010,000	$22,220,000	$18,510,000	$13,750,000
Offered Amount	$256,500,000	$352,800,000	$257,800,000	$81,700,000	$21,100,000	$17,580,000	$13,060,000
Interest Rate	1.10000%	1.53%	1.74%	2.01%	2.24%	2.37%	2.91%
Initial Distribution Date	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017	June 15, 2017
Final Scheduled Distribution Date	June 15, 2018	March 16, 2020	September 15, 2021	March 15, 2022	July 15, 2022	October 17, 2022	January 16, 2024
Distribution Frequency	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Price to Public	100.00000%	99.99442%	99.98957%	99.99511%	99.99189%	99.99596%	99.98317%
Underwriting Discount	0.050%	0.200%	0.250%	0.300%	0.400%	0.500%	0.600%
Proceeds to the Depositor	99.95000%	99.79442%	99.73957%	99.69511%	99.59189%	99.49596%	99.38317%

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