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Intensified competition and the impact on credit ratings in the RMBS market

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Abstract

In this paper, we empirically investigate the impact of intensified competition on rating quality in the credit rating market for residential mortgage-backed securities (RMBS) in the period 2017-2020. We provide evidence that competition between large credit rating agencies (CRAs) (Moody's and Standard & Poor's) and newer smaller ones (Dominion Bond Rating Service Morningstar and Kroll Bond Rating Agency) creates credit rating inconsistencies in the RMBS market. While a credit rating should solely represent the underlying credit risk of a RMBS, irrespective of the competition in the market, our results show that this is not the case. When competitive pressure increases, both large and small CRAs tend to adjust their rating standards (smaller CRAs react to large CRAs and vice versa).

Keywords: rating quality, credit rating agencies, competitive pressure.
JEL classifications: G15, G21, G24, G28.

Non-technical Summary

The impact of competition in the structured finance market on rating quality has received considerable attention by regulators since the Global Financial Crisis (GFC). Regulators have attempted to stimulate new entrants into the credit rating agencies (CRA) industry. The question remains whether encouraging competition in the market for ratings of structured products has had a positive effect on the quality of ratings. In this paper, we assess the extent to which intensified competition between the new (Dominion Bond Rating Service Morningstar (DBRS) and Kroll Bond Rating Agency (KBRA)) and traditional CRAs (Moody's and Standard & Poor's (S&P)) has impacted the consistency of credit ratings of residential mortgage-backed securities (RMBS).

We analyze 4,190 RMBS tranches that were originated and sold in the European Union and United States market from the first quarter of 2017 and the third quarter of 2020 to study the impact of competition on the consistency of rating quality. We use several (ordered) logit models to analyze if market share movements of large (small) CRAs tend to impact the consistency of rating quality of small (large) CRAs. Inconsistency in rating quality arises when a CRA tends to report higher or lower credit ratings, on average, than its peer, for the same tranche.

We find that CRAs adjust their credit rating based on competition. Moody's and DBRS are particularly sensitive to market share movements of one another; ratings become inconsistent (stricter, on average, for the same tranche) when competition of Moody's or DBRS intensifies. Surprisingly, we find that KBRA shows the opposite effect when confronted with Moody's. KBRA provides more optimistic ratings on average when competition with Moody's intensifies. Furthermore, we provide evidence that when competitive pressure increases, both large and small CRAs tend to adjust their rating standards. Finally, we show that small CRAs tend to inflate their ratings, on average, when dealing with a more powerful issuer.

These findings suggest that CRAs not only consider underlying credit risk factors when assigning a credit rating to the tranches of an RMBS but also use ratings to expand market share and revenue. Thus, our findings suggest that a regulatory environment that stimulates the use of multiple credit ratings and that encourages new CRAs to enter the

market does not necessarily solve the problem of misleading credit ratings assigned by the prevailing market players. Based on our findings we suggest that regulators should not focus merely on the number of ratings or CRAs in the market, but rather to make sure that CRAs apply independent rating methodologies that are not adversely affected by competition in the CRA market or by RMBS issuers who put pressure on CRAs for more favorable ratings.

1. Introduction

The credit rating agencies (CRAs) and those identified as producers of credit ratings in the United States (US) are referred to as national recognized statistical organizations. The credit rating market continues to be dominated by three major players – Moody's, Standard & Poor's (S&P), and Fitch – who assigned 92% of the credit ratings in the European Union (EU) and 95% in the US market (ESMA, 2020; SEC, 2020). This triopoly in combination with the way revenue is generated (i.e., issuer-pays revenue model) in the credit rating industry is one of the problems that critics of CRAs argue caused inflated credit ratings (see e.g., Bolton et al., 2012; Goldstein and Huang, 2020).[1,2]

However, the new rules and regulations[3] in the last decade created to stimulate competition in the residential mortgage-backed securities (RMBS) market, have actually led to stronger competition and more level playing field amongst CRAs. Smaller CRAs (e.g., Dominion Bond Rating Service Morningstar (DBRS) and Kroll Bond Rating Agency (KBRA)) have gained prominent market share at the expense of S&P, Fitch, and Moody's in the RMBS market. As a result, we are interested to learn to what extent intensified competition between new and traditional CRAs has impacted the consistency of the RMBS ratings. Thus, in this paper we focus on the RMBS market for two reasons. First, the entry of smaller CRAs (DBRS and KBRA) to the credit rating market for RMBS offers a unique setting to empirically assess how increased competition affects the rating consistency of small and large CRAs. Second, the RMBS market is, because of its role in the subprime

[1] The income of CRAs is generated from issuers, rather than investors, while at the same time it is in the issuer's own interest to engage the rating service of the highest credit rating to optimize the issue price, or equivalently, to obtain the lowest funding cost. Issuers can request multiple credit ratings from several CRAs and select (and pay) only those to their liking, while the discarded CRAs only receive a minor contract-breaking fee.

[2] That issuers are able to request and select a rating from several CRAs, is argued as a conflict of interest as it motivates CRAs to grant more optimistic (or inflated) ratings compared to their competitors, to increase the probability that their preliminary rating will be selected by the issuer.

[3] These regulations as they pertain to CRAs include the European Union, Regulation (EU) No 462/2013 of the European Parliament and of the Council of 21 May 2013 amending Regulation (EC) No 1060/2009 on credit rating agencies, and the Regulation (EU) No 2017/2402 of the European Parliament and of The Council of 12 December 2017 on securitization of 2017. The major U.S. regulation is the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.

mortgage crisis, one of the few markets targeted heavily by regulation where regulators sought to improve the market structure by stimulating competition and transparency in the rating process.[4]

To the best of our knowledge, our study is the first to analyze the increased competition in a market heavily targeted by regulation, where smaller CRAs have gained significant prominence after the 2007 subprime mortgage crisis. Surprisingly, given that the objectives of rating regulation was to improve competition in the rating market for RMBS and to improve the ratings process, no studies have investigated this issue. There have been studies on various issues related to the contribution of RMBS ratings to the subprime mortgage crisis and the subsequent Global Financial Crisis (GFC), as well as other developments in the rating markets. However, previous studies that have analyzed the entry of new CRAs to the market, focused mainly on bond rating developments both prior to and right after the GFC (e.g., Bae et al., 2019; Becker and Milbourn, 2011), but not on securitized products. Moreover, when competition was the focus of the rating study, the analysis primarily compared the competition of the largest two CRAs (Moody's and S&P), to that of the third largest CRA (Fitch), in the rating market for bonds (see e.g., Jewell and Livingston, 2000; Becker and Milbourn, 2011; Bae et al., 2015). Only a few studies (Flynn and Ghent, 2017; Bae et al., 2019) have scrutinized the entry of significant smaller CRAs to the credit rating market, but again not for RMBS specifically. Based on their empirical evidence, the results of competition were mixed. Becker and Milbourn (2011), for example, find economically modest but statistically significant evidence of rating

[4] DBRS has grown to be the fourth largest international CRA, but still has only a small portion (roughly 3%) of the EU and US credit rating market as of 2020. However, DBRS' market share in the MBS market is remarkably higher. In the EU MBS market, DBRS' market share is roughly 14% as of 2020. In the US MBS market, DBRS is also the fourth largest CRA with a 2020 market share of 32%. KBRA is slightly smaller than DBRS with a total market share of 0.3% in the EU and 0.7% in the US rating market as of 2020. KBRA is the seventh largest CRA in the EU MBS market with a market share of 0.3%, while KBRA is the second largest CRA in the US MBS market with a 2020 market share of 52% (ESMA, 2020; SEC, 2020). ESMA only reports market share information at the market level (structured finance); the SEC reports more detailed information at the product-type level, but only for MBS in general. The market share in the US MBS market reported by SEC exceed 100% because more ratings per product might be assigned. The calculations by the SEC in 2020 are based on the first six months only.

inflation by Moody's and S&P in response to the entry of Fitch to the credit rating market between 1997 and 2007, while Bae et al. (2015) find no relation at all between Fitch's market share and rating inflation in the period 1995-2006. In a later study covering the period 1996 to 2012, Bae et al. (2019) conclude that the ratings of DBRS for Canadian corporate bonds do become more optimistic compared to S&P's rating, when the competition (expressed by market share) of S&P increases. They argue that the potential risk, that is reputational damage associated with issuing more optimistic ratings, is not an effective deterrent for small CRAs. In line with Bae et al. (2019), Flynn and Ghent (2017) show that small CRAs are more likely to issue optimistic ratings than large CRAs, particularly for interest-only tranches in the commercial mortgage-backed securities (CMBS) market in the period 2009-2014.

We use a complete dataset from Bloomberg, of 7,719 RMBS tranches, originated and sold from the first quarter of 2017 to the third quarter of 2020. The total par value of these tranches is $3 trillion. We obtained information on the underlying tranche and deal characteristics. Furthermore, we calculate the market shares of CRAs in the RMBS market and use this as a measure of competition intensity. We obtained information on credit ratings of Moody's, S&P, Fitch, DBRS, and KBRA, and use DBRS and KBRA as representatives of small CRAs and Moody's, S&P, and Fitch as the large, global CRAs. We analyze if market share movements of large (small) CRAs tend to impact the consistency of rating quality of small (large) CRAs. Inconsistency in rating quality arises when a CRA tends to report higher or lower credit ratings, on average, than its peer, for the same tranche.

In our first set of tests, we have analyzed whether an increase in market share of large (small) CRAs has led the smaller (larger) CRAs to assign more optimistic ratings. We find mixed results. Only for tranches rated by both Moody's and KBRA, an increase of market share of Moody's has led KBRA to assign the better ratings. Looking at DBRS, our results show again the strongest significance in combination with Moody's. However, the results are opposite of what we would expect. In general, DBRS does not assign more optimistic ratings for the same tranche when competition of Moody's intensifies. On the contrary, our results show that in these cases Moody's report the better ratings, not DBRS.

When the situation is the other way around, so DBRS is increasing in market share, it is DBRS who ends up in the deal providing the highest rating and Moody's the lowest one for the same tranche.

In our second set of tests, we investigate whether market share movements of large (small) CRAs have led the smaller (larger) CRA to adjust their rating standards. We find that they do, and provide evidence that when competitive pressure increases, both large and small CRAs tend to adjust their rating standards. In our third, and final, set of tests we examine whether small CRAs tend to inflate their ratings, on average, when dealing with a more powerful issuer. We find that they do. Particularly KBRA tends to report more lenient (optimistic) ratings when dealing with larger, more powerful, issuers.

Our study contributes to a growing body of literature on competition (Bolton et al., 2012; Zhou et al., 2017; Baghai and Becker, 2019) and rating standards (see e.g., Alp, 2013; Cafarelli, 2020) in the credit rating market. The works closest in spirit to our paper are those of Flynn and Ghent (2018) and Bae et al. (2019). Our paper contributes to the literature by analyzing a unique market setting, namely one in which small CRAs have gained significant prominence in the RMBS market over the past years. We are therefore able to assess whether the rules and regulations that have stimulated competition in the credit rating market are also beneficial in practice for the quality of ratings. Additionally, our paper is the first to test if small CRAs are more sensitive to issuers' power than large CRAs, building upon the work by He et al. (2012) who show that investors differentiate between the power of issuers. Our results are relevant to policymakers seeking to improve the effectiveness and efficiency of their legislative frameworks for fostering competition in the market for credit ratings.

The paper proceeds as follows. Section 2 reviews the related literature. Section 3 sets forth our empirical strategy while Section 4 describes our dataset and variable construction. Section 5 contains our analysis and the main empirical results. Section 6 summarizes our findings.

2. Literature Review

The GFC that started in the second half of 2007 was caused by an overextension of mortgages to weak borrowers (so-called subprime mortgages) which were packaged and sold to investors. It is alleged in numerous lawsuits by investors that tranches of subprime RMBS had inflated credit ratings, resulting in overpricing of these securities since investors were led to believe that they had lower credit risk. What followed was a market meltdown when mortgage rates increased, which resulted in high default rates among homeowners (particularly in the case of subprime mortgages) who had adjustable-rate mortgages in 2007-2008 and faced a "mortgage payment shock". In turn, the value of homes declined, leading to a further increase in default rate due to what is best described as "strategic defaults".[5] It is alleged that this chain of events led to the subprime mortgage crisis and the subsequent Great Recession of 2008 was primarily attributable to inflated credit ratings assigned by CRAs and these inflated credit ratings were due to competition and the business model in the industry (He et al., 2016). The substantial losses in the RMBS marked have caused major reputational damages for securitized products; investor demand dropped significantly, and regulators implemented more and stricter rules and regulations after the GFC.

The primary reason cited for CRAs to inflate credit ratings for RMBS is the way that revenue is generated by CRAs: the issuer-pays revenue model. This model means that the revenue of CRAs is not generated from investors but rather from issuers, notwithstanding that at the same time the CRA's task is to objectively rate the securities issued by these issuers in order for investors to rely on these ratings.[6] It might therefore be in the issuers' own interest to select the most optimistic ratings and, consequently, CRAs might have an incentive to cater ratings to issuers' demand (see, e.g., Griffin et al., 2013; He et al., 2016; Zhou et al., 2017; Flynn and Ghent, 2018). Empirical studies investigating the CRA rating

[5] A strategic default occurs when a homeowner finds that the market value of the property is less than the remaining mortgage balance.

[6] Before the introduction of the photocopier, it was investors who paid for a book produced by a CRA that provided ratings. This was the investor-pay model. With the introduction of the photocopier, the credit ratings in the book could be distributed to other investors who need not pay for the cost of the book.

process emphasize that CRAs are even more likely to offer optimistic ratings if the issuer is able to bring, or possibly remove, future deals to the CRAs (see e.g., He et al., 2012). Furthermore, CRAs tend to offer more optimistic ratings when competition in the CRA market intensifies.

There is a well-established stand in the literature pertaining to competition in the CRA market. For example, studying the entry of new CRAs in the structured finance market, Flynn and Ghent (2018) find that small CRAs assign more optimistic ratings, often by several notches, than larger CRAs. They conclude that the inflated ratings by smaller CRAs is a strategy to win business from larger CRAs. Similarly, in their study of the Canadian bond market between 1996 and 2012, Bae et al. (2019) found that DBRS assigns more favorable, but less informative, credit ratings when S&P's competition is higher. The findings of Becker and Milbourn (2011) complement those of Bae et al. (2019), as they find that an increase in competition from Fitch results in lower rating quality assigned by the larger CRAs. Specifically, Becker and Milbourn find that an increase in Fitch's market share is predicted to increase the average credit rating of large CRAs. Morkoetter et al. (2017) however, find no evidence that CRAs assign biased ratings to tranches in order to gain market shares.

Although it might sound attractive to inflate credit ratings to gain current revenue, it does not go without the risk of losing reputation. Investigating the reputational damage to S&P in their rating of commercial mortgage-backed securities (CMBS), Baghai and Becker (2019) find that CRAs can still regain market share even if they suffered from reputational damage by issuing inflated ratings.[7] It seems investors in structured products tend to be forgiving in dealings with CRAs. Bae et al. (2019) state that small CRAs are more likely to forgo their reputation at the expense of future revenue than large CRAs as they have a higher immediate need to protect or gain market share, unlike large CRAs who have more to lose from a damaged reputation. After all, recovering from reputational damage is expensive, burdensome, and time-consuming.

[7] These credit ratings are not only used by investors but also by regulators in the United States and European national competent authorities such as bank and insurance regulators to determine capital requirements (see White, 2010).

Empirically investigating the trade-off between future income and current income of CRAs, Camanho et al. (2020) find that CRAs are more likely to inflate ratings in a monopoly than in a duopoly. They also suggest that lower entry barriers in the CRA market might increase the level of rating inflation. Similarly, Manso (2013) shows that an increase in competition results in a higher number of defaults, leading to rating downgrades. Notwithstanding the argument that competition might reduce rating quality, competition may also enhance the effectiveness of the market (Hörner, 2002). Specifically, it has been argued that competition among CRAs creates benefits such as less misreporting (Rabanal and Rud, 2017). One of the possible effects of the issuer-pays revenue model is the adjustments, and specifically loosening, of rating standards by CRAs. There are a good number of studies that have examined the quality of rating standards (see, for example, Becker and Milbourn, 2012; Alp, 2013), especially after the large number of mispriced securities that came to light during the GFC. These CRA scandals have resulted in several (forced) adjustments in rating standards by CRAs. For example, in 2009, S&P announced that it was making adjustments to its rating methodology for certain structured products (such as collateralized debt obligations and RMBS).

To summarize, the market for credit ratings has had high barriers to entry because it is largely dominated by only three players who have a well-established reputation and an international client base. As an entry strategy, a new, significantly smaller CRA might loosen its rating standards and provide more optimistic ratings than its competitor to gain market share. On the one hand, large CRAs are found to be less likely, compared to smaller CRAs, to compromise their rating standards because building reputational capital is costly and recovering from a damaged reputation is a lengthy and difficult process. On the other hand, it might well be that the larger CRAs react upon the entrance of the smaller CRA and adjust their ratings compromising their standards. The possible tweaking of ratings in order to gain or retain market share is found to be even more pronounced when CRAs are dealing with powerful issuers who are able to bring potential future revenue.

2.1 ***Hypotheses***

Our assessment of the literature on competition in the credit rating market leads us to formulate several hypotheses regarding the ratings for RMBS products. The starting point is that the competition in the CRA market may cause it to provide more optimistic, or inflated, ratings to cater to the demand by issuers. We start by comparing the credit ratings of large and small CRAs for the same tranche in a given RMBS transaction. Looking at the effects of the issuer-pays revenue model, one might expect that CRAs with lower market share, such as DBRS and KBRA (*small CRA* hereafter), need to compete more aggressively (for example, by inflating its ratings) than CRAs who have a high market share and strong global outreach, such as Moody's, S&P, and Fitch (*large CRA hereafter*) (see, for example, Flynn and Ghent, 2018; Bae et al., 2019). We hypothesize that small CRAs are more likely to inflate their credit ratings if the additional rating is assigned by a CRA that has dominant market power. We exploit these variations and test whether an increase in competition (market share) of a large CRA in a specific market incentivizes small CRAs to provide a more optimistic rating than the large CRA, on average, for the same tranche. Hence, market share movements of a larger competitor might cause rating quality inconsistency by small CRAs. We construct the following hypothesis:

> *H1A. With higher competitive pressure from large CRAs, small CRAs tend to report more optimistic ratings than large CRAs for the same tranche in an RMBS transaction.*

We then turn to the question of how an increase in competition (market share) of small CRAs affect the rating of larger CRAs. A question that is specifically of interest for the RMBS market, where the smaller CRAs recently gained significant market share. This gives us our next hypothesis:

H1B. With higher competitive pressure from small CRAs, large CRAs tend to report more optimistic ratings than small CRAs for the same tranche.

Extending this hypothesis, one might expect that small (large) CRAs tend to stretch their rating standards to a greater extent than large (small) CRAs and assign more optimistic ratings for the same issue than the large CRA to retain or gain market share. This leads to our next two hypotheses:

H2A: With higher competitive pressure from large CRAs, small CRAs are more likely to loosen their rating standards.

H2B: With higher competitive pressure from small CRAs, large CRAs are more likely to loosen their rating standards.

The issuer-pays revenue model of CRAs creates high bargaining power for issuers as they are able to solicit ratings from multiple CRAs and only disclose the ratings provided by the most favorable one(s). This bargaining power might even be higher when the issuer is able to bring many deals to the CRA market (e.g., see He et al., 2012). We expect that issuers who bring more deals to the market (large issuers hereafter) will receive and disclose more optimistic ratings than issuers who are smaller (small issuers hereafter). We expect that this effect is even more pronounced for small CRAs as they are willing to compromise their standards for the purpose of potentially generating greater revenue from prospective work offered by the large issuer. This leads to our last hypothesis:

H3A: Tranches issued by large issuers receive more optimistic ratings from small CRAs, compared to large CRAs for the same tranche.

3. **Methodology**

We conduct three different tests to answer three sets of hypotheses. First, we use an ordered logit model to estimate how the market share of large CRAs impact the consistency of rating quality between CRAs (Hypothesis 1). Our model specification to test our first hypothesis is:

$$\begin{aligned} &\textit{Rating Differences}_{jt} = \\ &\alpha_0 + \alpha_1\, \textit{Market Share CRA}_{jt} + \textit{Tranche, Issuer and Market Controls}_{ijt} + \epsilon_{ijt} \end{aligned} \tag{1}$$

The data vary by year (t), deal (i), and security (j). We control for security-specific characteristics, credit rating and time-fixed effects. In order to analyze the trends in rating standards (Hypothesis 2), we follow Blume et al. (1998) and Alp (2013) to apply the following ordered logit model:

$$R_{it} = \begin{cases} 21\ if Z_{it} \in [\mu_{21},\ \infty) \\ 20\ if Z_{it} \in [\mu_{20},\ \mu_{21}) \\ \vdots \\ 2\ if Z_{it} \in [\mu_1,\ \mu_2) \\ 1\ if Z_{it} \in [-\infty,\ \mu_1) \end{cases} \tag{2}$$

$$Z_{it} = \alpha_t + \beta' X_{it} + \epsilon_{it} \tag{3}$$

$$E[\epsilon_{it} | X_{it}] = 0, \tag{4}$$

where R_{it} denotes the credit rating of security i in issuance year t. α_t is the intercept for year t, β is the vector of slope coefficients, and Z_{it} is a latent variable that relates to R_{it} in the ranges between different partition points μ_i. R_{it} ranges from 1 to maximum 20. The

matrix X_{it} denotes columns with explanatory variables including *Tranche Count, Subordination Level, Number of Ratings, Log Tranche Value, Log Transaction Value, Top Ten Issuer,* and *Coupon*. The variable definitions are described in Section 4. The coefficient values in ordered logit models are reported in units of latent variables and consequently not economically relevant as the year indicator coefficient a_t is not in the same unit as Z_{it}. We follow Alp (2013) and Liu and Wang (2019) to convert a_t into the unit of rating notch, that is, the average distance between the partition points. The average rating notch length is calculated for each CRA separately.[8]

Lastly, we use a logit model to investigate the impact of issuer's size on the rating quality of small CRAs (Hypothesis 3):

$$Higher\ by\ Small_{jt} = \alpha_0 + \alpha_1\ Issuer\ Size_{ijt} + Tranche,\ Issuer\ and\ Market\ Controls_{ijt} + \epsilon_{ijt} \quad (5)$$

All variables in equations (1) and (5) are defined in Section 4.

4. **Data**

We manually collected the data for this study from *Bloomberg.* The complete universe consists of 7,119 tranches from 1,404 RMBS deals with a total value of USD 3.026 trillion that were issued and sold in the EU and US from the first quarter of 2017 to the third quarter of 2020. Using data of the most recent years allows us to study the impact of small CRAs, as they only gained significant market shares during that time period. For each deal, the dataset provides the available deal and tranche names, issuers characteristics, pricing date, reference rates, credit ratings, principal balance.

The credit ratings in our dataset are assigned by Moody's, S&P, Fitch, DBRS, and KBRA. We apply several filters to our dataset, removing tranches with incomplete information. By including only tranches with credit rating, year of issuance, and issuer information, our sample is reduced from 7,119 to 4,211. We further discarded all tranches

[8] For example, Moody's provide credit ratings in our sample that range from 1(AAA) to 19(Caa3). The average rating notch length for Moody's will be calculated as $(\mu_{19} - \mu_1)/18 = 0.63$.

with missing coupon values (14 tranches) and tranche size (73 tranches). The remaining 4,190 tranches constitute our full sample.

We use different subsamples to test our hypotheses. The first subsample is constructed to test hypothesis 1, where we compare multiple credit ratings assigned to one tranche. Here we are interested in tranches that received a rating of at least one large and one small CRA. For this reason, we discard all single (1,783) and triple (196) rated tranches from the regressions. Unfortunately, there are an insufficient number of RMBS tranches rated by Fitch and a smaller peer (DBRS or KBRA) to enable statistical analyses on tranches rated by Fitch and a small CRA (197 tranches). This reduced our sample further for testing hypothesis 1 to 2,035 observations, of which 721 tranches were rated by Moody's and DBRS, 582 by Moody's and KBRA, 502 by S&P and DBRS, and 230 by S&P and KBRA.

To test hypothesis 2, we use our full sample of 4,190 tranches. Hence, we include all tranches rated by Moody's, S&P, DBRS, and KBRA regardless of whether they received one or multiple credit ratings. For our final set of tests (hypothesis 3), we compare all tranches that received at least a rating of a large and a small CRA (2,155 tranches) and test whether issuer size is related to inflated ratings by small or large CRAs.

4.1 *Dependent Variables*

Our first dependent variable is the rating difference between small and large CRAs as given by equation (1). We measure the rating difference by subtracting the numerical credit rating score of a small CRA from the numerical credit rating score of a large CRAs. We create a numerical scale by converting the credit ratings to numerical scores corresponding to the rating notches. Using S&P's credit rating system as an example, the numerical scores were as follows: 1 for AAA, 2 for AA+, 3 for AA, 4 for AA-, and so on.

We measure rating difference between small and large CRAs by constructing the following four variables:

- Moody's rating minus DBRS' rating for the same tranche (*Rating Differences Moody's – DBRS*),
- S&P's rating minus DBRS' rating for the same tranche (*Rating Differences S&P – DBRS*),
- Moody's rating minus KBRA's rating for the same tranche (*Rating Differences Moody's – KBRA*), and
- S&P's rating minus KBRA's rating for the same tranche (*Rating Differences S&P – KBRA*).

Table 1 reports the variable distribution. For all four variables, more than half of the tranches do not have any rating difference between the small and large CRAs. Interestingly, the ratings differ mostly by one notch, and this difference is largely caused by a smaller CRA that provided a higher (more optimistic) rating on average than the larger CRA. For example, all tranches rated by both Moody's and DBRS, 57% obtained a similar rating of both CRAs and 24% obtained a higher (more optimistic) rating of DBRS. Similarly, for tranches rated by S&P and DBRS, 59% of the tranches are rated equal and in 17% of the cases, DBRS assigned a more lenient rating as shown in Table 1.

<INSERT TABLE 1 ABOUT HERE>

In equations (2), (3), and (4), we use the numerical credit rating scores of a CRA as the dependent variable. We use the numerical credit rating score of Moody's, S&P, DBRS, and KBRA as four separate dependent variables. Table 2 reports the summary statistics for the total sample. Panel B of Table 2 shows that the full sample of 4,190 tranches consists of 42.36% of the tranches with a single rating disclosed at the time of issuance, 51.20% of tranches with a dual rating, and 4.66% of tranches with three ratings. The majority of the tranches in our sample are rated by DBRS (2,010) and KBRA (1,661), followed by Moody's (1,583) and S&P (1,018). Fitch only rated 372 tranches in our sample.

Finally, in equation (5) the dependent variable, *Higher by Small*, is defined as a dummy variable that takes the value of one if the small CRA assigned a more lenient (optimistic) rating than the larger CRA, for the same tranche, and zero if the credit rating by the large CRA is equal or higher. Panel C of Table 2 reports the distribution for the variable. A minority of the tranches (28.86%) received a higher (more optimistic) rating by the smaller CRA. The remaining tranches (71.14%) received an equal rating by the small and large CRA or a more lenient rating by the larger CRA.

<INSERT TABLE 2 ABOUT HERE>

4.2 *Independent Variables*

Our first key independent variable is the market share of CRAs as given by equations (1) and (2). Following Becker and Milbourn (2011) and Bae et al. (2019), we use a CRA's market share of ratings as a measure of competition faced by other CRAs.[9] Consistent with these studies, we base our market share measures on our sample rather than publicly available data. We do so for two reasons. First, we are interested in the RMBS market specifically and public data only reports data on the structured finance market in general (EU) or the MBS (US) market, but not specifically for the RMBS market. Second, the market shares per product type in the US market show relatively diverse market shares between CRAs within the different type of structured finance product (i.e., for RMBS, CMBS, collateralized loan obligations, and asset-backed securities). Hence, using the market shares of the structured finance market in general might not provide an accurate measure of the RMBS market specifically.

We calculate the market share of CRAs before we apply any filters to our dataset as we are interested in the total market share for the RMBS market for each CRA. Bloomberg reports credit ratings of five CRAs for the RMBS tranches issued between 2017 and 2020. The credit ratings in our dataset are assigned by Moody's, S&P, Fitch, DBRS, and KBRA. We calculate the market share of CRAs per year in a specific market. We obtained

[9] The market presence of the large CRA may vary across industries and time periods and impacts the intensity of competition for small CRAs (Bae et al., 2019).

RMBS tranches for the US and EU markets. We compute the market shares in two ways: (1) based on the total tranche value that has been rated by a CRA in a specific market per year (*MS by Balance*) and (2) based on the number of tranches that has been rated by a CRA in a specific market per year (*MS by Frequency*).

Table 3 reports summary statistics for our market share calculations. The market shares for each CRA measured by the principal balance is reported in Panel A of Table 3, and market share per frequency in Panel B of Table 3. In addition, we construct a variable that combines the market share per market per year of the three largest CRAs[10] (*Large CRAs by Balance Size* and *Large CRAs by Tranche Count*) and a variable that combines the market share per market per year of the two significant smaller CRAs[11] (*Small CRA by Balance Size* and *Small CRAs by Tranche Count*).

<INSERT TABLE 3 ABOUT HERE>

Figure 1 plots the market share measures reported in Table 3. We observe a relative high portion of market share for KBRA in the US market but a very low to no market share in the EU market, both for market share measured by balance size (panel A of Figure 1) and tranche count (panel B of Figure 1). For DBRS we observe relatively high market shares in both markets. Especially in the US market, the small CRAs have a dominant high market share (roughly 60%) compared to the larger CRAs in our sample period. This is consistent with the publicly available data, discussed in Section 1, that shows a significant higher market share of DBRS and KBRA in the US MBS market. While in the EU market, large CRAs remain the most dominant market players with market shares ranging between 66% and 80% in our sample period (panel C of Figure 1).

[10] That is the market share of Moody's + S&P + Fitch. For example, in 2017 in the EU market the market share by balance size would be calculated as: 35.14% (Moody's) + 20.53% (Fitch) + 10.53% (S&P) = 66.19%.

[11] That is the market share of DBRS + KBRA. For example, in 2017 in the EU market this would be calculated as: 0.00% (KBRA) + 33.81% (DBRS) = 33.81%.

<INSERT FIGURE 1 ABOUT HERE>

Our second key independent variable is the size of issuers as used in equation (5). We measure issuer size in two ways: (1) whether they are large or small issuers measured by the value of their market share (*Issuer Size by Balance*), and (2) whether they are frequent issuers measured by the number of tranches they placed in the market (*Issuer Size by Frequency*). We measure relative size on a global basis, as opposed to measuring the top 10% of issuers within each market (i.e., the US and EU market) separately. Panel C of Table 2 shows that the majority of tranches in our sample are issued by relatively large issuers in terms of both principal balance size (60.70%) and frequency (53.41%).

4.3 ***Control Variables***

We include several control variables to capture characteristics of the underlying deal, such as tranche count, capital allocation, transaction value, credit rating, and year of issuance. We report the descriptive statistics and variable distributions in Panels A to C of Table 2. *Tranche Count* equals the total number of tranches in a corresponding RMBS deal. In our total sample, the mean tranche count is 15.86. *Log Tranche Value* equals the natural logarithm of the face value of a tranche at issuance. The mean *Log Tranche Value* over the whole sample is 17.40. *Capital Allocation* is the level of credit support for a tranche and the mean is about 44% over the whole sample. *Log Transaction Value* equals the natural logarithm of the transaction value (i.e., the face value, at issuance, of the total RMBS of which the tranche is a part) measured in millions of US dollars. The mean *Log Transaction Value* of the sample is 21.12. *Coupon* is the coupon rate assigned for each tranche at issuance, the mean coupon rate of our full sample is 2.60%. *Number of ratings* is the number of ratings assigned to a tranche at issuance; the number of ratings range from 1 to 3 and the mean number of ratings over the whole sample s is 1.59.

We also control for the market share of the issuer. We include a dummy variable, *Top Ten Issuer*, that equals one if the issuer is among the top 10% of issuers measured

using the global RMBS market share, and zero if the issuer is among the remaining 90%.[12] We also control for the geographic location of the underlying collateral for each tranche (*Geography of Collateral*). If the geographic location of the underlying collateral is widespread (i.e., 40% in California and 60% in Wyoming), then the location with the majority of collateral is used as a measure of location (i.e., Wyoming). In our models given by equations (1) and (5), we also control for credit rating. We use the numerical scale to convert all credit ratings to numerical scores, as explained in Section 4.1. In order to create one credit rating control variable, we had to combine the credit ratings of several CRAs.[13] Finally, we include *Year,* a control variable for the year in which the security is issued (ranging from 2017 to 2020).

5. **Results**

In this section, we examine the impact of competition in the market for credit ratings on rating differences and standards. We start by analyzing the impact of market share movements on the rating difference between small and large CRAs in Section 5.1. We seek to analyze the impact of competition in the CRA market on the consistency of CRAs' rating quality. In Section 5.2, we examine if competition in the credit rating market has an impact on the rating standards of CRAs. We expect that CRAs react to an increase in competition by adjusting their rating standards as a competitive strategy. Moreover, it is expected that power of issuers plays an important role in competition between CRAs. To examine this issue, we look at the size of issuers in Section 5.3, expecting that CRAs are more likely to inflate ratings for tranches issued by larger issuers.

Table 4 provides the regression results for equation (1), the rating difference between small and large CRAs is the dependent variable and the market shares of large CRAs the key independent variable (H1A). In Table 5 we repeat the analysis of Table 4 but replace the key independent variables with the market shares of small CRAs (H1B). Table

[12] We do not include this variable in model (5) since we use the issuer size measure as an independent variable in that model.

[13] The number of observations is significantly reduced if we do not combine the credit ratings of different CRAs to create one control factor.

6 presents the results of equations (2), (3), and (4), where we regress the credit rating of a small CRA on the market share of large CRAs (H2A). In Table 7 we replicate the regressions of Table 6 but use the credit rating of large CRAs as dependent variables (H2B). We report the results of equation (5) in Table 8, the rating differences between small and large CRAs is the dependent variable and the size of issuers is the primary independent variable (H3).

5.1 *Competition and rating differences*

The results of the ordered logit regressions with the rating differences between large and small CRAs as dependent variables are shown in Table 4. Panel A of Table 4 presents odds ratios of regressions for tranches rated by DBRS. We only use tranches that received a rating by both a large and a small CRA as we are interested in the rating differences between large and small CRAs. We use two subsamples for tranches rated by DBRS: one for tranches rated by DBRS and Moody's (columns 1 to 4) and one for tranches rated by DBRS and S&P (columns 5 to 8). We perform a similar analysis for KBRA in Panel B of Table 4, where we also split our sample into two subsamples: one for tranches rated by KBRA and Moody's (columns 1 to 4) and one for tranches rated by KBRA and S&P (columns 5 to 8). In both panels of Table 4 we use all our measures of market share for larger CRAs, as specified in section 4.2, as independent variables.[14]

First, we study the tranches rated by both DBRS and Moody's in columns (1) to (4) of Panel A. In column (1) of Panel A we find that the odds ratio of *MS Moody's by Balance* is negative significant (with odds of −8.22), indicating that a one standard deviation increase in market share by Moody's increases the odds of experiencing a stricter rating by DBRS, compared to Moody's, for the same tranche. With a stricter rating we mean a rating that is less optimistic, so further away from AAA, compared to the other rating assigned for the same tranche. We find similar results when we use our market share

[14] In an unreported test we perform the same regression as in Table 4, but we split the sample between tranches issued in the US and the EU market. We do so as the market shares of CRAs differ across markets (e.g., see Figure 1 and Table 3). We find similar results than those of Table 4, with slightly higher significant levels for tranches issued in the US market. For KBRA, the number of observations in the EU market is too low to perform statistical analysis.

measure by frequency, albeit at the 5% significance level (column 2) and consistent highly significant results when we use our combined market share measure for large CRAs (columns 3 and 4).

Next, we study the tranches rated by both DBRS and S&P in columns (5) to (8) of Panel A. In column (5) we find that the odds ratio of *MS S&P by Balance* is negative, but only significant at a 10% significance level. We do find negative significant results, at the 5% level, for our *MS S&P by Frequency* measure of market share in column (6) of Panel A. We find that a one standard deviation increase in *MS S&P by Frequency* increases the odds of experiencing a stricter rating by DBRS than by S&P for the same tranche. Consistent results are found for our combined market share measure for large CRAs, *MS Large CRAs by Balance*, with the odds of −3.89, statistically significant at a 5% level (z-statistic of −1.97), column (7).

In sum, the results of Panel A of Table 4 suggest that an increase in market share of a large CRAs results, on average, in a higher likelihood of a stricter (or less optimistic) rating by DBRS than the rating assigned by Moody's for the same tranche. So, DBRS is giving a worse rating, on average, than Moody's when Moody's is increasing its market share.

We find opposite results for tranches rated by KBRA and Moody's in columns (1) to (4) of Panel B of Table 4. In column (1) of Panel B, we find that the odds ratio of *MS Moody's by Balance* is positive, but only statistically significant at a 5% level (z-statistic of 2.22). This indicates that a one standard deviation increase in *MS Moody's by Balance* increases the odds of experiencing a higher (more optimistic) rating by KBRA than from Moody's, for the same tranche. We find consistent significant results (again at the 5% significance level) for the market share measures *MS Moody's by Tranche* in column (2), and for our combined market share measure for large CRAs in columns (3) and (4). However, if we move to the tranches rated by KBRA and S&P in column (4) to (8) in Panel B, we find no significant results at all for our market share measures.

Overall, the results of Table 4 show that DBRS and KBRA react differently to movements in market shares from its larger peers. Specifically, we find that an increase in market share from the large CRAs results in a lower likelihood of a more optimistic

(closer to AAA) rating from DBRS for the same tranche. So, DBRS is not providing the more optimistic credit rating, Moody's or S&P are. KBRA, however, does provide the better rating compared to that of Moody's with an increasing market share. This means that our first hypothesis (H1A), that with a higher market presence of a large CRA, small CRAs tend to report more optimistic ratings than large CRA, can only be supported for KBRA, not for DBRS.

<INSERT TABLE 4 ABOUT HERE>

In Table 5, we repeat our analysis of Table 4, but replace our dependent variables (the market shares of the larger CRAs) by the market shares of the smaller CRAs. We do so as we are also interested in the impact that the smaller CRAs have on the large CRAs, especially since the market share of small CRAs is increasing remarkably in the RMBS market over the last years. Panel A of Table 5 presents the odds ratios of regressions for tranches rated by Moody's. We again use only tranches that received a rating of both a large and a small CRA, so we construct the following subsamples: one for tranches rated by Moody's and DBRS (columns 1 to 4) and one for tranches rated by Moody's and KBRA (columns 5 to 8). We perform a similar analysis for S&P in Panel B of Table 5, where we also split our sample in two subsamples: one for tranches rated by S&P and DBRS (columns 1 to 4) and one for tranches rated by S&P and KBRA (columns 5 to 8). In both panels of Table 5, we use all our measures of market share for smaller CRAs, as specified in section 4.2, as independent variables.

Firstly, we analyze the tranches rated by both Moody's and DBRS in columns (1) to (4) of Panel A. We find no significant effect for our first market share measure of DBRS, *MS DBRS by Balance*, in column (1) of Panel A. However, for our other market share measure of DBRS in column (2), we find highly significant results; the odds ratio of *MS DBRS by Tranche* is positive significant (z-stat = 3.41), indicating that a one standard deviation increase in market share by DBRS increases the odds of experiencing a more lenient (optimistic) rating by DBRS, compared to Moody's, for the same tranche. We find consistent results when we use our combined market share measure for large CRAs

(columns 3 and 4). This indicates that Moody's does *not* have the tendency, on average, to provide a more lenient rating (one closer to AAA) than DBRS when competition in the CRA market intensifies by DBRS. When we move to our sample of tranches rated by Moody's and KBRA, in columns (5) to (8) of Panel A, we observe that the sign of the coefficients changes from positive to negative. We find that the odds ratios of our market share measures for KBRA, *MS KBRA by Balance* (column 5) and *MS KBRA by Tranche* (column 6), are negative but only significant at a 5% significance level. For example, a one standard deviation increase in *MS KBRA by Tranche* decreases the odds, with −306.1 (z-stat = −2.22), of experiencing a more lenient rating by KBRA than by Moody's for the same tranche. We find consistent results for our combined market share measure *MS Small CRAs by Balance* and *MS Small CRAs by Tranche* in columns (7) and (8).

Secondly, we study the tranches rated by S&P in Panel B of Table 5. For tranches rated by S&P and DBRS in columns (1) to (4) in Panel B, we find only slightly positive significant results (at the 5% level) for one of our combined market share measure of small CRAs, *MS Small CRAs by Balance* (column 3). We find no significant results for our market share measures of DBRS in columns (1) and (2). Besides, we find no significant results at all for tranches rated by S&P and KBRA in columns (5) to (8) of Panel B.

The results of Table 5 suggest that, with an increase in market share of DBRS, Moody's is more likely to assign a stricter (further away from AAA) rating compared to DBRS for the same tranche. This suggests that Moody's does not assign more optimistic ratings to retain or gain market shares when competition of DBRS intensifies. We find no significant results that S&P assigns either stricter or more lenient ratings compared to its smaller peers, when competition of small CRAs increases. Hence, we cannot support our second hypothesis (H1B) in which we posit that with a higher market presence of a small CRA, large CRA tend to report more optimistic ratings than small CRAs. We actually find that the opposite effect is more likely for tranches rated by Moody's and DBRS; on average stricter ratings of Moody's when market share of DBRS increases.

<INSERT TABLE 5 ABOUT HERE>

5.2 *Competition and rating standards*

There are at least two caveats regarding the interpretation of the outcomes in Tables 4 and 5. First, the impact of competition could be overstated because the sample of tranches for which we use rating differences may not be representative of all rated tranches in the RMBS market. Second, the positive (negative) relation between market share of CRAs and rating differences could arise when the CRA applies more stringent (loosening) rating standards as it has higher (lower) market powers in the first place. Meaning, the relation could be due to deflated (inflated) ratings from the large CRAs rather than inflated (deflated) ratings from the small CRAs (Bae et al., 2019). To address the issue, we run ordered logit regressions to measure how CRA's rating standards vary with changes in market shares of its competitors. The results are presented in Tables 6 and 7. The ordered logit model has been extensively used in the literature to identify changes in rating standards (see e.g., Blume et al., 1998; Alp, 2013; Baghai et al., 2014; Bae et al., 2019).

In Table 6, we use DBRS' and KBRA's rating as the dependent variable and the market share of large CRA (Moody's and S&P) as the key independent variables. In our regression model in Panel A, we follow Bae et al. (2019) and use the sample of all tranches rated by DBRS (columns 1 to 4), irrespective of whether they are rated by another CRA. We also do this for KBRA (columns 5 to 8). To control for the determinants of credit ratings, we include the following variables: *Number of Ratings, Tranche Count, Subordination Level, Log Tranche Value, Log Transaction Value, Top Ten Issuer,* and *Coupon*. We also include year dummy variables and control for the country in which the collateral is located. All variables are explained in detail in section 4. In Table 6, a significant negative coefficient for our market share measures, *MS Moody's by Frequency* and *MS S&P by Frequency*, indicates that the small CRA weakens its rating standards with higher market share of the larger CRA. An insignificant coefficient suggests that the market share of a large CRA is unrelated to the small CRA's rating standards, and a

significant positive coefficient indicates that the small CRA strengthens its rating standards with a higher market share of the large CRA.[15]

We start by looking at the rating standards of DBRS in columns (1) to (4) of Panel A. Column (1) shows a negative significant coefficient for *MS Moody's by Frequency*, and this effect is also economically significant, as shown in column (2) which present the economic magnitude of the coefficient estimates[16]. This indicates that a one-standard deviation increase in Moody's market share corresponds to an upgrade of 0.94 notch in DBRS' ratings. Interestingly, we find no significant result for S&P's market share in column (3). This suggests that DBRS weakens its rating standards more when it faces stronger competition from Moody's, but not from S&P. We are also interested in the control variable *Number of Ratings* as it indicates whether DBRS adjust its rating standards to a greater extent when dealing with dual or triple rated tranches, compared to a single DBRS rating. In columns (1) and (2) we observe a negative coefficient for *Number of Ratings*, indicating that a one-standard deviation increase in the number of ratings corresponds to an upgrade of a 0.76 notch in DBRS' rating. We find similar results in columns (3) and (4). Hence, DBRS is more likely to provide optimistic ratings when a tranche also received a rating from another CRA. Next, we move to the sample of all KBRA-rated tranches to analyze KBRA's rating standards, reported in columns (5) to (8) in Panel A. Interestingly, we find no significant results in columns (5) to (8), suggesting that the market share of large CRAs and *Number of Ratings* is unrelated to KBRA's rating standards.

In Panel B of Table 6 we perform a similar analysis as in Panel A of Table 6, but we reduce our sample to tranches that received a rating by a large and a small CRA. We do so as we are interested in whether small CRAs adjust their rating standards to a greater

[15] In other tests we have repeated the regression models in Table 6 and 7 with our other market share measures: *MS DBRS by Balance, MS KBRA by Balance, MS Small CRAs by Balance, and MS Small CRA by Tranche*, and find similar results.

[16] The coefficient estimates in an ordered logit model show the units of the latent variable, making it rather difficult to understand the economic significance. Therefore, in line with Alp (2013) and Bae et al. (2019), we estimate the average change in ratings that would results from a change in the relevant explanatory variable. The economic magnitude is calculated as follows: the coefficient of the explanatory variable, for example *Tranche Count*, is multiplied by its standard deviation and divided by the average rating notch length (measured in terms of latent variables). For a dummy variable, such as *Top Ten Issuer*, this means that the coefficient is only divided by the rating notch length.

extent when the exact same tranche also received a rating from a specific larger competitor (Moody's or S&P). We split our sample in tranches rated by: Moody's and DBRS (columns 1 and 2), S&P and DBRS (columns 3 and 4), Moody's and KBRA (columns 5 and 6), and S&P and KBRA (columns 7 and 8).

We start by comparing the results for DBRS in Panel B (columns 1 to 4) with the results for DBRS in Panel A (columns 1 to 4). In Panel B, we observe results consistent with Panel A for DBRS; a negative and highly significant coefficient for *MS Moody's by Frequency* (column 1) and no significant results for the market share measure of S&P (*MS S&P by Frequency*). If we move to the subsamples of KBRA in columns (5) to (8) of Panel B, we observe negative odds ratios of −13.7 (z-stat = −4.35) for Moody's market share measure (*MS Moody's by Frequency*), statistically significant at the 1% level. The economic magnitude of the coefficient estimates indicates that a one standard deviation increase in market share by Moody's (*MS Moody's by Frequency*) corresponds to an upgrade of 1.06 in KBRA's rating (column 6), for tranches rated by both Moody's and KBRA. We also find a negative coefficient for S&P's market share measure (*MS S&P by Frequency*) in column 7, but only at the 5% significance level. Remarkably, KBRA tends to adjust (loosen) its rating standards when the tranche also received a rating of a larger CRA (Panel B) but does not adjust its standards when we consider all tranches rated by KBRA, including single and triple rated tranches (Panel A).

Overall, the results of Table 6 shows that DBRS and KBRA tend to loosen their rating standards as a competitive strategy against Moody's, but not necessarily S&P. For DBRS, we find that they tend to loosen its rating standards when Moody's market share increases, both when the tranche is and is not rated by Moody's as well. While DBRS does not adjust its rating standards when the competition of S&P increases (i.e., higher market shares of S&P). Apparently, DBRS is more sensitive to competition with Moody's and while it loosens its rating standards with heightened competition from Moody's (Table 6), it still does not provide a more optimistic (inflated) rating on average for the same tranche (Table 4). While for KBRA, we find that it tends to loosen its rating standards when competition from Moody's tightens, but only when the same tranche also received a Moody's rating. This finding is consistent with the results of Table 5, where we find that

KBRA assigns more optimistic (inflated) ratings on average when the tranche is also rated by Moody's. The findings of Table 6 suggest that H2A, in which we posit that with higher competitive pressure, small CRAs are more likely to loosen their rating standards, is supported, but only for higher competitive pressures of Moody's and not from S&P.

<INSERT TABLE 6 ABOUT HERE>

In Table 7 we repeat the regression models of Table 6, but we replace our dependent variables (the market share of large CRAs) with the market share of smaller CRAs, and we use Moody's and S&P's rating as the dependent variables. By doing so we can analyze the opposite effect to address whether large CRAs react upon the relative new competition of the smaller CRAs by adjusting their rating standards. In Panel A of Table 7 we use all tranches in our sample that received at least one rating from Moody's (columns 1 to 4) and similarly for S&P (columns 5 to 8). We find no significant results for the market share measures of DBRS (*MS DBRS by Frequency*) and KBRA (*MS KBRA by Frequency*) in the Moody's sample in columns (1) to (4). However, we do observe significant negative coefficients for the *Number of Ratings*. The magnitude in column (2) indicates that a one-standard deviation increase in the number of ratings corresponds to an upgrade of 1.58 in Moody's rating. So, Moody's is more likely to adjust its rating standards when the tranche also received a rating from another CRA than for tranches that only received a rating from Moody's. We find similar results if we add KBRA's market share to the model in column (4).

If we move to the rating standards of S&P, in columns (5) to (8), we find significant negative coefficients for our market share measures of DBRS (*MS DBRS by Frequency*) and KBRA (*MS KBRA by Frequency*), indicating that S&P tends to loosen its rating standards when the market share of the small CRAs increases. Specifically, we find that a one-standard deviation increase in market share of DBRS (KBRA) corresponds to an upgrade of 1.88 (2.08) notch in S&P's rating. Furthermore, similar to Moody's, we also find that S&P tends to upgrade its credit rating when the tranche is rated by two or three CRAs.

This result is indicated by the negative significant coefficient for *Number of Ratings* in both columns (5) and (8).

In Panel B of Table 7, we again limit our sample to tranches that received a rating from both a small and a large CRA. We split our sample in tranches rated by Moody's and DBRS (columns 1 and 2), Moody's and KBRA (columns 3 and 4), S&P and DBRS (columns 5 and 6), and S&P and KBRA (columns 7 and 8). We do so to analyze if large CRAs adjust their rating standards differently when the tranche also obtained a credit rating of a smaller CRAs. We find that Moody's does when a tranche also received a rating of KBRA. This result is provided in column (3) of Panel B, where we observe a positive significant coefficient for *MS KBRA by Frequency*, with odds of 56.34 (z-stat = 2.77). The economic magnitude of the coefficient estimate is presented in column (4). The magnitude indicates that a one-standard deviation increase in market share of KBRA corresponds to a downgrade of 8.57 notch in Moody's rating. We find no significant results for DBRS' market share measure, *MS DBRS by Frequency*. This means that Moody's is not likely to adjust its rating standards when competition from DBRS increases. If we look at the rating standards of S&P in columns (5) to (8) in Panel B, we observe no highly significant results for our market share measures of small CRAs.

Overall, not only small CRAs, but also the large incumbents modify their rating standards when competition of their smaller peers is higher. Concretely, we find that Moody's is likely to tighten its rating standards when competition from KBRA intensifies, but only when the tranche is rated by both Moody's and KBRA. While S&P tends to loosen its rating standards when the competitive pressures of DBRS and KBRA is higher, this occurs only when the tranche is not rated by a small CRA. Rather, S&P loosened its standard when the tranche received a rating from: S&P only; S&P and Moody's or; S&P and Fitch. This suggests that S&P is less sensitive to market share movements of its smaller competitors.

<INSERT TABLE 7 ABOUT HERE>

5.3 ***Competition and issuers' power***

The issuer-pays revenue model allows issuers to request credit ratings from several CRAs and only select the most optimistic ones. To increase the change of being selected by issuers, CRAs might provide more attractive ratings relative to their peers. This incentive may become greater when the credit rating is requested by a powerful, large issuer, who is potentially able to provide more future revenue for the CRA. So, competition among CRAs is found to be influenced by the power of issuers (e.g., see He et al., 2012). In this section, we test whether on average small CRAs provide more optimistic ratings in general and for the same tranche, than their larger competitors. Issuer size is our independent variable, used in two ways: whether they are large or small issuers measured by value of their market share (*Issuer Size by Balance*), and whether or not they are frequent issuers measured by the number of tranches they placed in the market (*Issuer Size by Frequency*). Our dependent variable is a dummy variable that equals one if the credit rating assigned by a small CRAs is more optimistic than the large CRA, and zero if the credit rating is equal or higher by large CRAs.

The results are presented in Table 8. In Panel A we use all tranches that received a rating of DBRS or KBRA and a larger peer, and in Panel B we split our sample between DBRS and KBRA to test whether this effect is the same for both CRAs. In columns (1) and (3) of Panel A, we show that the odds ratio of issuer size is positive and significant for both *Issuer Size by Frequency* with an odd ratio of 1.35 (z-stat = 11.56) and *Issuer size by Balance* with odds of 0.85 (z-stat = 8.18). This suggests that large issuers increase the odds of experiencing a more optimistic rating by the smaller CRA. We observe similar results if we include our explanatory variables in the regression model in column (2) and (4). This finding suggests that large (or more powerful) issuers tend to influence credit ratings of small CRAs; the smaller CRA is more likely to inflate their rating, probably to increase their selection opportunity.

We now shift our attention to each of the small CRAs (DBRS and KBRA) separately in Panel B of Table 8 to assess whether this effect is the same for both DBRS and KBRA. We study the tranches that are rated by DBRS and a larger peer (columns 1-2) and tranches rated by KBRA and a larger peer (column 3-4). Remarkably, both our issuer size

measures are not highly significant for DBRS (column 1-2). While for KBRA we observe highly significant results for *Issuer Size by Balance*; we find that large issuers (in terms of balance size) increase the odds of experiencing a more optimistic rating by KBRA by 63%, which is significant at a 1% level (z-stat = 2.69), column (4). The other issuer size measure, *Issuer Size by Frequency*, is also positive, with odds of 0.77, and highly significant at the 1% level, column (3).

To summarize, we find that small CRAs are more likely to provide a more lenient rating than large CRAs, on average, when the tranche is issued by a more powerful issuer. Especially for KBRA, we see that issuers' power increases the likelihood of providing more optimistic credit ratings. It may well be that KBRA inflates its credit ratings when dealing with more powerful issuers, to increase the change of future revenue and, eventually, a higher market share. This means that we can support Hypothesis 3 in which we posit that large issuers tend to receive more optimistic ratings from small CRAs, compared to their larger peers.

<INSERT TABLE 8 ABOUT HERE>

6. **Conclusion**

The impact of competition in the structured finance market on rating quality has received substantial attention by academics and regulators in the last decade. Regulators have attempted to stimulate new entrants into the CRA industry. The question remains whether these rules and regulations have a positive effect on the quality of ratings. We analyze 4,190 RMBS tranches that were originated and sold from the first quarter of 2017 and the third quarter of 2020 to study the impact of competition on the consistency of rating quality.

We provide evidence that competition between large (Moody's and S&P) and small (DBRS and KBRA) CRAs creates rating quality inconsistencies in the RMBS market. We find that especially Moody's and DBRS are sensitive to market share movements of one another; ratings become inconsistent (stricter, on average, for the same tranche) when competition of Moody's or DBRS intensifies. Surprisingly, we find that KBRA shows the

opposite effect when confronted with Moody's. KBRA provides more optimistic ratings on average when competition with Moody's intensifies. Furthermore, our results show that small CRAs tend to loosen their rating standards when the competitive pressure of their larger peers increases, especially in the case of Moody's. While S&P seems to be less sensitive to market share movements of small CRAs, it does apply stricter rating standards for tranches that did not receive an additional rating of a small CRA.

Our results also show that small CRAs are sensitive to the power of issuers; they tend to inflate ratings when dealing with more powerful issuers, a finding that corresponds to the downside effects of the issuer-pays revenue model. This finding also suggests, in line with Bae et al. (2019), that the risk of reputational damages is not necessarily an effective deterring mechanism for small CRAs who must deal with competitors who have high global presence in the rating industry. In addition, we find that dual or triple rated tranches receive more optimistic ratings on average from CRAs, compared to single rated tranches. While at the same time, credit ratings of tranches that received a rating of both a large and a small CRA (dual rated tranches) are found to be influenced by competitive pressures of CRAs and power of issuers.

The CRA industry is an issuer-pay revenue model. Despite this revenue model (which depends on market share), investors using credit ratings to make investment decisions expect that the assigned ratings should not depend on the compensation received by a CRA. Hence, the credit rating should solely represent the underlying credit risk of an RMBS, regardless of the competition in the rating market. However, we find that CRAs adjust their credit rating based on competition. So apparently, CRAs consider not only underlying credit risk factors when assigning a credit rating to the tranches of an RMBS but also use ratings as a means to expand market share and revenue. Thus, our findings suggest that a regulatory environment that stimulates the use of multiple credit ratings and that encourages new CRAs to enter the market does not necessarily solve the problem of misleading credit ratings assigned by the prevailing market players. Perhaps new regulations have aggravated these issues in the RMBS market. Based on our findings we suggest that regulators should not focus merely on the number of ratings or CRAs in the market, but rather to make sure that CRAs apply independent rating methodologies

that are not adversely affected by competition in the CRA market or by RMBS issuers who pressure CRAs for more favorable ratings.

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TABLE 1: RATING DIFFERENCES BETWEEN SMALL AND LARGE CRAS

This table reports summary statistics of RMBS tranches issued in the first quarter of 2017 up to the third quarter of 2020. '*Rating Differences Moody's – DBRS*' stands for the numerical value of Moody's rating minus the numerical value of DBRS' rating. We have converted the credit ratings at issuance for each tranche into a numerical value, using Moody's as an example the values are: 1 for AAA, 2 for AA+, 3 for Aa, and so on. '*Rating Differences S&P – DBRS*' stands for the numerical value of S&P's rating minus the numerical value of DBRS' rating. '*Rating Differences Moody's – KBRA'* stands for the numerical value of Moody's rating minus the numerical value of KBRA's rating. '*Rating differences S&P – KBRA*' stands for the numerical value of S&P's rating minus the numerical value of KBRA's rating.

	Rating Differences Moody's – DBRS		*Rating Differences S&P – DBRS*		*Rating Differences Moody's – KBRA*		*Rating Differences S&P – KBRA*	
Rating discrepancy in notches	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent
-4	0	0%	1	0%	0	0%	0	0%
-3	0	0%	4	1%	0	0%	0	0%
-2	15	2%	18	4%	6	1%	2	1%
-1	41	6%	41	8%	11	2%	9	4%
0	414	57%	297	59%	318	55%	139	60%
1	176	24%	84	17%	176	30%	63	27%
2	48	7%	30	6%	59	10%	17	7%
3	7	1%	12	2%	9	2%	0	0%
4	12	2%	10	2%	3	1%	0	0%
5	2	0%	5	1%	0	0%	0	0%
6	2	0%	0	0%	0	0%	0	0%
7	1	0%	0	0%	0	0%	0	0%
8	2	0%	0	0%	0	0%	0	0%
9	1	0%	0	0%	0	0%	0	0%
Total	721	100%	502	100%	582	100%	230	100%

TABLE 2: SUMMARY STATISTICS OF RMBS CHARACTERISTICS

This table reports summary statistics of RMBS tranches issued in the first quarter of 2017 up to the third quarter of 2020. *'MS Moody's by Frequency', 'MS S&P by Frequency' , 'MS DBRS by Frequency'*, and *'MS KBRA by Frequency'* represent the percentage of the number of tranches rated by Moody's, S&P, DBRS and KBRA in a given year and market. *'MS Moody's by Balance', 'MS S&P by Balance' , 'MS DBRS by Balance'*, and *'MS KBRA by Balance'* represent the percentage of total tranche value rated by Moody's, S&P, DBRS and KBRA in a given year and market. *'Tranche Count'* stands for the total number of tranches in the RMBS of which the security is part of. *'Subordination Level'* represent the level of internal credit enhancement supporting such a security within a RMBS, measured as the ratio of all tranches subordinated to the tranche in question divided by the total face value of the RMBS. '*Number of Ratings*' is the number of ratings assigned to a specific tranche at issuance. *'Log Tranche Value'* is the natural logarithm of the face value of the security at issuance. *'Log Transaction Value'* is the natural logarithm of the transaction value of the deal at issuance. *'Top Ten Issuer by Balance Size'* is a dummy that equal 1 is the issuer is among the top 10% of issuers in the RMBS market, measured by the value in balance size, and zero otherwise. *'Top Ten Issuer by Tranche Count'* is a dummy that equal 1 is the issuer is among the top 10% of issuers in the RMBS market, measured by the number of tranches placed in the market, and zero otherwise. *'Coupon rate'* is the coupon rate assigned for each tranche at issuance. *'Year'* represents the year of issuance, which equals a dummy of 1 that corresponds to the year the RMBS was issued, and zero otherwise. *'Higher by Small'* that equals 1 if, at issuance, a tranche received a more lenient (optimistic) rating by the small CRA, and zero otherwise.

Panel A: Overall Summary Statistics

Variable	N	Mean	Median	Std	P25	P75
MS Moody's by Frequency	4,190	0.23	0.21	0.07	0.19	0.21
MS S&P by Frequency	4,190	0.16	0.15	0.10	0.11	0.16
MS DBRS by Frequency	4,190	0.30	0.32	0.06	0.30	0.35
MS KBRA by Frequency	4,190	0.26	0.30	0.10	0.27	0.31
MS Moody's by Balance	4,190	0.20	0.15	0.08	0.15	0.19
MS SP by Balance	4,190	0.17	0.18	0.08	0.11	0.20
MS DBRS by Balance	4,190	0.31	0.33	0.07	0.30	0.37
MS KBRA by Balance	4,190	0.26	0.28	0.10	0.26	0.30
Tranche Count	4,190	15.86	16.00	7.25	10.00	21.00
Subordination Level	4,190	0.44	0.46	0.34	0.08	0.73
Number of Ratings	4,190	1.59	2.00	0.61	1.00	2.00
Log Tranche Value	4,190	17.40	17.27	1.60	16.30	18.65
Log Transaction Value	4,190	21.12	21.01	0.96	20.63	21.36
Top Ten Issuer by Balance Size (in %)	4,190	0.58	1.00	0.49	0.00	1.00
Top Ten Issuer by Tranche Count (in %)	4,190	0.71	1.00	0.45	0.00	1.00
Coupon	4,190	2.60	3.00	1.67	0.64	3.89
Year	4,190	2019	2019	0.94	2018	2019
Higher by Small	4,190	0.16	0.00	0.37	0.00	0.00

Panel B: Number of credit ratings

Number of ratings per tranche

	Freq.	Percent
1	1,783	42.36%
2	2,155	51.20%
3	196	4.66%
Total	4,190	100%

Total credit ratings per CRA (irrespectively whether the tranche is rated by other CRAs)

CRA	Freq.
DBRS sample	2,010
KBRA sample	1,661
Moody's sample	1,583
S&P sample	1,018
Fitch sample	372
Total	6,644

Panel C: Variable specifications Higher by Small & Issuer Size

Higher by Small

	Freq.	Percent
1 (Higher by small)	622	28.86%
0 (Higher by large or equal)	1,533	71.14%
Total	2,155	100%

Issuer Size by Balance

	Freq.	Percent
1 (Top 10%)	1,308	60.70%
0 (Non-Top 10%)	847	39.30%
Total	2,155	100%

Issuer Size by Frequency

	Freq.	Percent
1 (Top 10%)	1,151	53.41%
0 (Non-Top 10%)	1,004	46.59%
Total	2,155	100%

TABLE 3: MARKET SHARE OF CRAS

This table reports summary statistics of RMBS tranches issued in the first quarter of 2017 up to the third quarter of 2020. *'Large CRAs by Balance'* stands for the combined market share, measured in terms of balance size, of Moody's, S&P, and Fitch in a given year and market. *'Small CRAs by Balance'* stands for the combined market share, measured in terms of balance size, of DBRS and KBRA in a given year and market. *'Large CRAs by Frequency'* stands for the combined market share, measured in terms of balance size, of Moody's, S&P, and Fitch in a given year and market. *'Small CRAs by Frequency'* stands for the combined market share, measured in terms of the number of tranches rated, of DBRS and KBRA in a given year and market. All other variables are defined in Table 2. Panel A presents the market share calculations measured by tranche's balance size and Panel B by the number of tranches rated by a CRA in a given year and market.

Panel A: Market share of CRAs measured by Balance Size

	EU				US			
	2017	2018	2019	2020	2017	2018	2019	2020
MS Moody's by Balance	35.14%	35.21%	41.03%	41.06%	31.14%	14.59%	14.53%	19.43%
MS Fitch by Balance	20.53%	28.16%	13.14%	10.51%	0.00%	0.00%	9.08%	6.04%
MS DBRS by Balance	33.81%	18.68%	26.29%	19.95%	30.26%	37.02%	32.54%	26.76%
MS KBRA by Balance	0.00%	0.00%	0.00%	0.70%	29.86%	28.29%	25.97%	36.48%
MS S&P by Balance	10.53%	17.94%	19.54%	27.78%	8.74%	20.10%	17.87%	11.30%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Large CRAs by Balance	66.19%	81.32%	73.71%	79.35%	39.88%	34.69%	41.48%	36.76%
Small CRAs by Balance	33.81%	18.68%	26.29%	20.65%	60.12%	65.31%	58.52%	63.24%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Panel B Market share of CRAs measured by Tranche Count

	EU				US			
	2017	2018	2019	2020	2017	2018	2019	2020
MS Moody's by Frequency	38.86%	37.32%	24.78%	34.65%	33.44%	19.03%	20.74%	20.97%
MS Fitch by Frequency	25.71%	21.83%	16.96%	8.91%	0.00%	0.00%	6.40%	6.84%
MS DBRS by Frequency	18.29%	23.59%	30.87%	24.75%	28.54%	34.75%	31.72%	29.90%
MS KBRA by Frequency	0.00%	0.00%	0.00%	1.98%	29.96%	30.73%	26.51%	31.52%
MS S&P by Frequency	17.00%	17.25%	27.39%	29.70%	8.06%	15.49%	14.63%	10.78%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Large CRAs by Frequency	81.71%	76.41%	69.13%	73.26%	41.50%	34.52%	41.77%	38.59%
Small CRAs by Frequency	18.29%	23.59%	30.87%	26.73%	58.50%	65.48%	58.23%	61.41%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

TABLE 4: ORDERED LOGIT REGRESSIONS OF MARKET SHARE OF LARGE CRAS ON RATING DIFFERENCES

This table reports ordered logit regressions of the market share of large CRAs on rating differences, controlled for deal-level characteristics and market conditions. We use the sample of RMBS securities issued in the first quarter of 2017 up to the third quarter of 2020. The sample is based on securities that received a rating from at least one large CRA (Moody's and/or S&P) and at least one small CRA (DBRS and/or KBRA) as reported on Bloomberg. The dependent variables '*Rating Differences Moody's – DBRS*' stands for the numerical value of Moody's rating minus the numerical value of DBRS' rating. '*Rating Differences S&P – DBRS'* stands for the numerical value of S&P's rating minus the numerical value of DBRS' rating. '*Rating Differences Moody's – KBRA'* stands for the numerical value of Moody's rating minus the numerical value of KBRA's rating. '*Rating differences S&P – KBRA*' stands for the numerical value of S&P's rating minus the numerical value of KBRA's rating. The independent variables '*MS Moody's by Frequency' and 'MS S&P by Frequency'* represent the percentage of the number of tranches rated by Moody's and S&P in a given year and market. *'MS Moody's by Balance' and 'MS S&P by Balance'* represent the percentage of total tranche value rated by Moody's and S&P in a given year and market. *'Large CRAs by Balance'* stands for the combined market share, measured in terms of balance size, of Moody's, S&P, and Fitch in a given year and market. *'Large CRAs by Frequency'* stands for the combined market share, measured in terms of balance size, of Moody's, S&P, and Fitch in a given year and market. *'Year'* represent the year of issuance, which equals a dummy of 1 that corresponds to the year the RMBS was issued, zero otherwise. '*Credit Rating'* are a set of dummy variables to indicate the credit rating of a security at issuance, after we convert the ratings into a numerical value by setting 1 for Aaa (AAA), 2 for Aa1 (AA+), 3 for Aa2 (Aa), and so on. '*Geography of Collateral*' represent the geographic location of the (majority of the) underlying collateral for each tranche. Z-statistics are reported in parentheses and (*), (**), (***) denote significance levels of 10%, 5% and 1%, respectively. Panel A presents results for tranches rated by DBRS and Moody's or S&P. Panel B presents results for tranches rated by KBRA and Moody's or S&P.

Panel A: DBRS sample

	Rating Differences Moody's – DBRS				*Rating Differences S&P – DBRS*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS Moody's by Balance	-8.22***							
	(-3.53)							
MS Moody's by Tranche		-10.04**						
		(-2.28)						
MS Large CRAs by Balance			-6.50***				-3.89**	
			(-4.69)				(-1.97)	
MS Large CRA by Tranche				-8.85***				-3.93*
				(-5.75)				(-1.68)
MS S&P by Balance					-9.38*			
					(-1.90)			
MS S&P by Tranche						-9.29**		
						(-2.14)		
Year	Y	Y	Y	Y	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y	Y	Y	Y	Y
Geography of Collateral	Y	Y	Y	Y	Y	Y	Y	Y
Sample	Moody's/ DBRS	Moody's/ DBRS	Moody's/ DBRS	Moody's/ DBRS	SP/ DBRS	SP/ DBRS	SP/ DBRS	SP/ DBRS
Observations	721	721	721	721	502	502	502	502
Pseudo R2	0.179	0.175	0.183	0.189	0.348	0.349	0.349	0.348

Panel B: KBRA sample

	Rating Differences Moody's − KBRA				*Rating Differences S&P − KBRA*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS Moody's by Balance	40.78**							
	(2.22)							
MS Moody's by Tranche		38.30**						
		(2.22)						
MS Large CRAs by Balance			153.6**				-50.92	
			(2.22)				(-0.78)	
MS Large CRA by Tranche				164.1**				-54.42
				(2.22)				(-0.78)
MS S&P by Balance					61.87			
					(0.78)			
MS S&P by Tranche						58.23		
						(0.78)		
Year	Y	Y	Y	Y	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y	Y	Y	Y	Y
Geography of Collateral	Y	Y	Y	Y	Y	Y	Y	Y
Sample	Moody's/ KBRA	Moody's/ KBRA	Moody's/ KBRA	Moody's/ KBRA	SP/ KBRA	SP/ KBRA	SP/ KBRA	SP/ KBRA
Observations	582	582	582	582	230	230	230	230
Pseudo R2	0.297	0.297	0.297	0.297	0.481	0.481	0.481	0.481

TABLE 5: ORDERED LOGIT REGRESSIONS OF MARKET SHARE OF SMALL CRAS ON RATING DIFFERENCES

This table reports ordered logit regressions of the market share of small CRAs on rating differences, controlled for deal-level characteristics and market conditions. We use the sample of RMBS securities issued in the first quarter of 2017 up to the third quarter of 2020. The sample is based on securities that received a rating from at least one large CRA (Moody's and/or S&P) and at least one small CRA (DBRS and/or KBRA) as reported on Bloomberg. The dependent variables '*Rating Differences Moody's – DBRS*' stands for the numerical value of Moody's rating minus the numerical value of DBRS' rating. '*Rating Differences S&P – DBRS'* stands for the numerical value of S&P's rating minus the numerical value of DBRS' rating. '*Rating Differences Moody's – KBRA'* stands for the numerical value of Moody's rating minus the numerical value of KBRA's rating. '*Rating differences S& – KBRA*' stands for the numerical value of S&P's rating minus the numerical value of KBRA's rating. The independent variables *MS DBRS by Frequency' and 'MS KBRA by Frequency'* represent the percentage of the number of tranches rated by DBRS and KBRA in a given year and market. *'MS DBRS by Balance' and 'MS KBRA by Balance'* represent the percentage of total tranche value rated by DBRS and KBRA in a given year and market. *'Small CRAs by Balance'* stands for the combined market share, measured in terms of balance size, of DBRS and KBRA in a given year and market. *'Small CRAs by Frequency'* stands for the combined market share, measured in terms of balance size, of DBRS and KBRA in a given year and market. *'Year'* represent the year of issuance, which equals a dummy of 1 that corresponds to the year the RMBS was issued, zero otherwise. '*Credit Rating'* are a set of dummy variables to indicate the credit rating of a security at issuance, after we convert the ratings into a numerical value by setting 1 for Aaa (AAA), 2 for Aa1 (AA+), 3 for Aa2 (Aa), and so on. '*Geography of Collateral*' represent the geographic location of the (majority of the) underlying collateral for each tranche. Z-statistics are reported in parentheses and (*), (**), (***) denote significance levels of 10%, 5% and 1%, respectively. Panel A presents results for tranches rated by Moody's and DBRS or KBRA. Panel B presents results for tranches rated by S&P and DBRS or KBRA.

Panel A: Moody's sample

	Rating Differences Moody's – DBRS				*Rating Differences Moody's – KBRA*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS DBRS by Balance	-5.01							
	(-1.11)							
MS DBRS by Tranche		23.65***						
		(3.41)						
MS Small CRAs by Balance			6.50***				-153.1**	
			(4.69)				(-2.22)	
MS Small CRA by Tranche				8.85***				-163.5**
				(5.76)				(-2.22)
MS KBRA by Balance					-72.14**			
					(-2.22)			
MS KBRA by Tranche						-306.1**		
						(-2.22)		
Year	Y	Y	Y	Y	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y	Y	Y	Y	Y
Geography of Collateral	Y	Y	Y	Y	Y	Y	Y	Y
Sample	Moody's/ DBRS	Moody's/ DBRS	Moody's/ DBRS	Moody's/ DBRS	Moody's/ KBRA	Moody's/ KBRA	Moody's/ KBRA	Moody's/ KBRA
Observations	721	721	719	719	582	582	582	582
Pseudo R2	0.173	0.178	0.183	0.189	0.297	0.297	0.297	0.297

Panel B: S&P sample

	Rating Differences S&P − DBRS				*Rating Differences S&P − KBRA*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS DBRS by Balance	11.71							
	(1.50)							
MS DBRS by Tranche		3.27						
		(0.34)						
MS Small CRAs by Balance			3.89**				50.76	
			(1.97)				(0.78)	
MS Small CRA by Tranche				3.92*				54.24
				(1.67)				(0.78)
MS KBRA by Balance					23.92			
					(0.78)			
MS KBRA by Tranche						101.5		
						(0.78)		
Year	Y	Y	Y	Y	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y	Y	Y	Y	Y
Geography of Collateral	Y	Y	Y	Y	Y	Y	Y	Y
Sample	SP/DBRS	SP/DBRS	SP/DBRS	SP/DBRS	SP/KBRA	SP/KBRA	SP/KBRA	SP/KBRA
Observations	502	502	502	502	230	230	230	230
Pseudo R2	0.347	0.346	0.349	0.348	0.481	0.481	0.481	0.481

TABLE 6: ORDERED LOGIT REGRESSIONS OF MARKET SHARE OF LARGE CRAS ON THE CREDIT RATING OF SMALL CRAS

This table reports ordered logit regressions of the market share of large CRAs on the credit rating of small CRAs, controlled for deal-level characteristics, issuer characteristics and market conditions. We use the full sample of RMBS securities issued in the first quarter of 2017 up to the third quarter of 2020. The sample is based on securities that received at least one rating from DBRS or KBRA as reported on Bloomberg. The dependent variable are the numerical values of a credit rating of the tranches at issuance, we use the numerical values of the credit rating of DBRS and KBRA as dependent variables. We have converted the ratings into a numerical value by setting 1 for AAA (AA+), 2 for AA (AA), 3 for AA (AA-), and so on. The key independent variables *'MS Moody's by Frequency'* and *'MS S&P by Frequency'* represent the percentage of the number of tranches rated by Moody's and S&P in a given year and market. All other independent variables are defined in Table 2. Z-statistics are reported in parentheses and (*), (**), (***) denote significance levels of 10%, 5% and 1%, respectively. Panel A presents results for all (single, dual, and triple) tranches that received a rating by DBRS and KBRA; Panel B for dual rated tranches by large and small CRA only.

Panel A: Rating Standards of small CRAs – full samples

	DBRS sample only *(Dependent=DBRS rating)*				***KBRA sample only*** *(Dependent=DBRS rating)*			
	Coefficient (P-value)	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS Moody's by Frequency	-12.14***	-0.94			10.61	0.82		
	(-3.74)				(1.36)			
MS S&P by Frequency			1.11	0.12			-48.65	-5.39
			-0.31				(-1.36)	
Number of Ratings	-1.13***	-0.76	-1.17***	-0.78	-0.62*	-0.42	-0.62*	-0.42
	(-5.94)		(-6.14)		(-1.91)		(-1.91)	
Tranche Count	-0.29***	-2.31	-0.29***	-2.27	-0.37***	-2.99	-0.37***	-2.99
	(-10.59)		(-10.43)		(-7.10)		(-7.10)	
Subordination Level	-0.21	-0.08	-0.22	-0.08	-0.16	-0.06	-0.16	-0.06
	(-1.17)		(-1.27)		(-0.70)		(-0.69)	
Log Tranche Value	-2.38***	-4.20	-2.36***	-4.16	-3.63***	-6.44	-3.63***	-6.44
	(-28.61)		(-28.53)		(-24.6)		(-24.6)	
Log Transaction Value	2.82***	2.98	2.80***	2.95	2.11***	2.25	2.11***	2.25
	(18.79)		(18.52)		(8.63)		(8.63)	
Top Ten Issuer	0.01	0.01	-0.04	-0.05	0.52	0.57	0.52	0.57
	(0.02)		(-0.16)		(1.26)		(1.26)	
Coupon	0.79***	1.45	0.79***	1.44	0.81***	1.50	0.81***	1.50
	(14.67)		(14.67)		(9.46)		(9.46)	
Year	Y		Y		Y		Y	
Geography of Collateral	Y		Y		Y		Y	
Sample	DBRS only		DBRS only		KBRA only		KBRA only	
Observations	2,010		2,010		1,661		1,661	
Pseudo R2	0.345		0.345		0.483		0.483	

Panel B: Rating Standards of small CRAs - split samples

	DBRS subsamples *(Dependent=DBRS rating)*				***KBRA subsamples*** *(Dependent=KBRA rating)*			
	Coefficient (P-value)	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS Moody's by Frequency	-16.55***	-1.27			-13.7***	-1.06		
	(-3.75)				(-4.35)			
MS S&P by Frequency			-4.00	-0.44			-66.26**	-7.35
			(-0.77)				(-2.04)	
Tranche Count	-0.23***	-1.86	0.04	0.31	-0.35***	-2.85	-0.26***	-2.11
	(-8.86)		(1.16)		(-6.52)		(-5.93)	
Subordination Level	-0.32	-0.12	-0.15	-0.06	-0.07	-0.03	0.23	0.09
	(-1.31)		(-0.48)		(-0.23)		(0.52)	
Log Tranche Value	-1.99***	-3.50	-1.79***	-3.16	-3.43***	-6.08	-3.04***	-5.39
	(-18.62)		(-13.21)		(-16.02)		(-9.62)	
Log Transaction Value	1.82***	1.93	2.06***	2.17	2.86***	3.04	3.51***	3.73
	(12.25)		(13.77)		(7.11)		(11.44)	
Top Ten Issuer	0.87***	0.96	-0.08	-0.09	0.93**	1.03	-0.76*	-0.84
	(4.15)		(-0.38)		(2.52)		(-1.87)	
Coupon	0.65***	1.19	1.23***	2.25	0.63***	1.17	0.80***	1.48
	(6.35)		(12.05)		(3.97)		(4.39)	
Year	Y		Y		Y		Y	
Geography of Collateral	Y		Y		Y		Y	
Sample	Moody's/DBRS		S&P/DBRS		Moody's/KBRA		S&P/KBRA	
Observations	719		502		582		230	
Pseudo R2	0.287		0.29		0.435		0.397	

TABLE 7: ORDERED LOGIT REGRESSIONS OF MARKET SHARE OF SMALL CRAS ON THE CREDIT RATING OF LARGE CRAS

This table reports ordered logit regressions of the market share of small CRAs on the credit rating of large CRAs, controlled for deal-level characteristics, issuer characteristics and market conditions. We use the full sample of RMBS securities issued in the first quarter of 2017 up to the third quarter of 2020. The sample is based on securities that received at least one rating from Moody's or S&P as reported on Bloomberg. The dependent variable are the numerical values of a credit rating of the tranches at issuance, we use the numerical values of the credit rating of Moody's and S&P as dependent variables. We have converted the ratings into a numerical value by setting 1 for Aaa (AAA), 2 for Aa1 (AA+), 3 for Aa2 (Aa), and so on. The key independent variables *'MS DBRS by Frequency'* and *'MS KBRA by Frequency'* represent the percentage of the number of tranches rated by DBRS and KBRA in a given year and market. All other independent variables are defined in Table 2. Z-statistics are reported in parentheses and (*), (**), (***) denote significance levels of 10%, 5% and 1%, respectively. Panel A presents results for all (single, dual, and triple) tranches that received a rating by DBRS and KBRA; Panel B for dual rated tranches by large and small CRA only.

Panel A: Rating Standards of Large CRAs

	Moody's sample only *(Dependent=Moody's rating)*				***S&P sample only*** *(Dependent=S&P rating)*			
	Coefficient (P-value)	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS DBRS by Frequency	-2.51	-246.71			-28.93***	-1.88		
	(-0.56)				(-4.07)			
MS KBRA by Frequency			-2.01	-0.31			-20.65***	-2.08
			(-0.29)				(-3.00)	
Number of Ratings	-1.62***	-1.58	-1.64***	-1.59	-2.66***	-1.72	-2.60***	-1.68
	(-6.79)		(-6.93)		(-10.18)		(-9.92)	
Tranche Count	-0.16***	-1.83	-0.16***	-1.79	0.20***	1.54	0.19***	1.46
	(-5.82)		(-5.83)		(3.28)		(3.08)	
Subordination Level	0.02	0.01	0.02	0.01	0.05	0.02	0.05	0.02
	(0.14)		(0.12)		(0.20)		(0.21)	
Log Tranche Value	-2.20***	-5.61	-2.19***	-5.60	-2.02***	-3.42	-2.01***	-3.41
	(-28.10)		(-28.11)		(-18.15)		(-18.15)	
Log Transaction Value	1.87***	2.87	1.88***	2.87	1.64***	1.67	1.93***	1.96
	(13.14)		(13.17)		(6.96)		(8.64)	
Top Ten Issuer	0.64*	1.03	0.63*	1.01	-1.97***	-2.08	-2.15***	-2.28
	(1.82)		(1.80)		(-3.11)		(-3.44)	
Coupon	0.43***	1.15	0.43***	1.16	1.15***	2.02	1.14***	2.01
	(7.01)		(7.10)		(14.54)		(14.53)	
Year	Y		Y		Y		Y	
Geography of Collateral	Y		Y		Y		Y	
Observations	1,583		1,583		1,018		1,018	
Pseudo R2	0.293		0.293		0.356		0.354	

Panel B: Rating Standards of Large CRAs - Split samples

	Moody's subsamples *(Dependent=Moody's rating)*				***S&P subsamples*** *(Dependent=S&P rating)*			
	Coefficient (P-value)	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*	*Coefficient (P-value)*	*Economic magnitude*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MS DBRS by Frequency	-5.37	-0.53			5.20	0.34		
	(-0.90)				(0.88)			
MS KBRA by Frequency			56.34***	8.57			-110.3**	-11.12
			(2.77)				(-2.12)	
Tranche Count	-0.20***	-2.36	-0.16***	-1.90	-0.07**	-0.54	-0.127***	-0.97
	(-8.82)		(-3.87)		(-2.13)		(-3.46)	
Subordination Level	-0.04	-0.02	-0.39	-0.21	-0.00	0.00	0.68*	0.24
	(-0.19)		(-1.50)		(-0.00)		(1.65)	
Log Tranche Value	-1.81***	-4.61	-2.61***	-6.66	-1.73***	-2.93	-2.21***	-3.75
	(-19.92)		(-18.00)		(-13.80)		(-10.19)	
Log Transaction Value	1.79***	2.75	1.85***	2.84	2.16***	2.20	2.70***	2.75
	(12.59)		(5.89)		(14.49)		(11.85)	
Top Ten Issuer	0.73***	1.17	0.55*	0.87	-0.29	-0.30	-0.46	-0.49
	(3.96)		(1.82)		(-1.34)		(-1.27)	
Coupon	0.53***	1.42	0.43***	1.16	0.97***	1.71	0.51***	0.91
	(5.88)		(4.01)		(10.56)		(3.57)	
Year	Y		Y		Y		Y	
Geography of Collateral	Y		Y		Y		Y	
Sample	Moody's/DBRS		Moody's/KBRA		S&P/DBRS		S&P/KBRA	
Observations	719		582		502		230	
Pseudo R2	0.242		0.34		0.266		0.313	

TABLE 8: LOGIT REGESSIONS OF THE OF ISSUER SIZE ON RATING DIFFERENCE SMALL VS. LARGE CRAS

This table reports logit regressions of the issuer size on the rating differences, controlled for deal-level characteristics, issuer characteristics and market conditions. We use the full sample of RMBS securities issued in the first quarter of 2017 up to the third quarter of 2020. The sample is based on securities that received a rating from at least one large CRA (Moody's and/or S&P) and at least one small CRA (DBRS and/or KBRA) as reported on Bloomberg. The dependent variable is the dichotomous variable *'Rating Differences'* that equals 1 if, at issuance, a security received a better rating by a small CRA and zero if the rating at issue is worse by a small CRA. *'Issuer Size by* Balance' is a dummy that equals 1 if the issuer is among the top 10% of issuers in the global RMBS market measured by size, and zero otherwise. *'Issuer Size by Frequency'* is a dummy that equals 1 if the issuer is among the top 10% of issuers in the global RMBS market measured by tranche number, and zero otherwise. All other independent variables are defined in Table 5. Z-statistics are reported in parentheses and (*), (**), (***) denote significance levels of 10%, 5% and 1%, respectively. Panel A presents the tranches rated by DBRS or KBRA and a larger peer (Moody's/ S&P); Panel B divides the sample between tranches rated by only DBRS and a larger peer and tranches rated by KBRA and a larger peer.

Panel A: Full Sample (Dependent = Higher by Small)

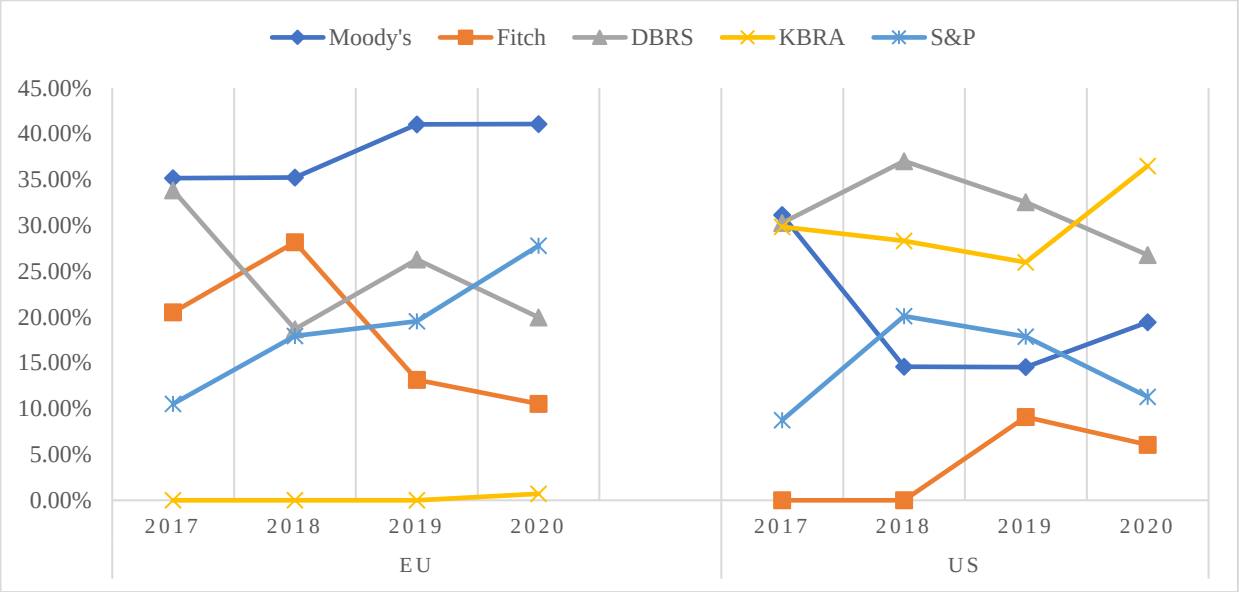
	Issuer size measured by frequency		*Issuer size measured by balance size*	
	(1)	(2)	(3)	(4)
Issuer Size by Frequency	1.35***	0.51***		
	(11.56)	(3.44)		
Issuer Size by Balance			0.85***	0.34***
			(8.18)	(2.66)
Tranche Count		0.08***		0.09***
		(5.71)		(6.89)
Subordination level		0.62***		0.62***
		(3.92)		(3.96)
Log Tranche Value		-0.26***		-0.27***
		(-4.07)		(-4.20)
Log Transaction Value		0.39***		0.40***
		(4.63)		(4.80)
Coupon		-0.03		-0.04
		(-0.74)		(-0.77)
Year	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y
Observations	2,155	2,155	2,155	2,155
Pseudo R2	0.171	0.234	0.142	0.232

Panel B: Sample split (Dependent = Higher by Small)

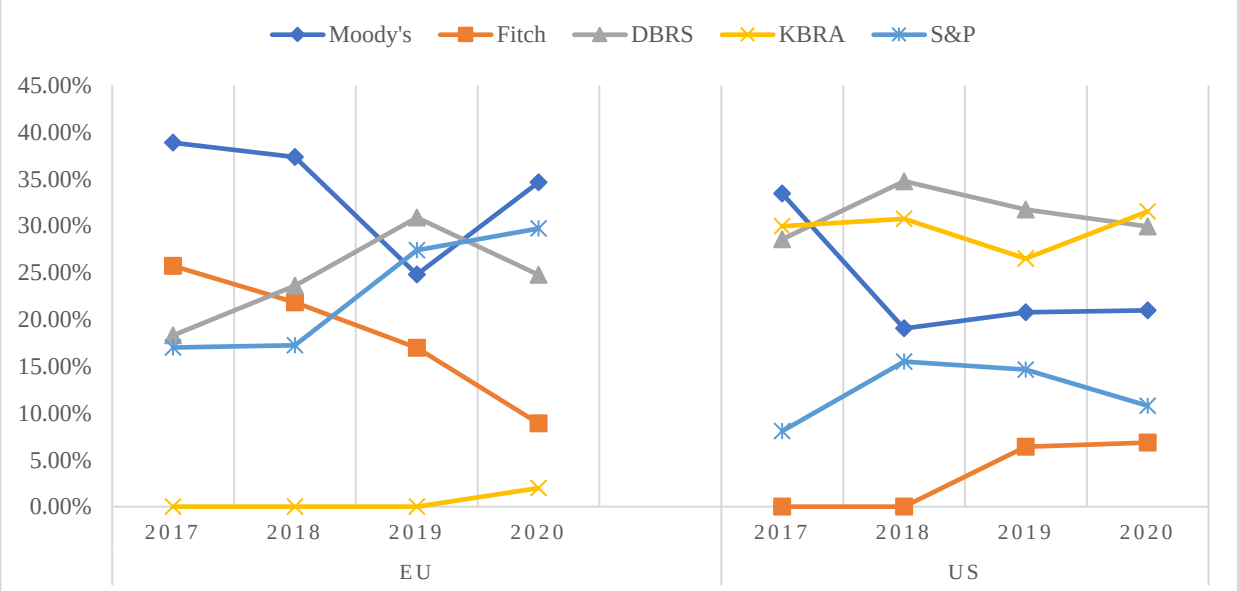
	Tranches rated by DBRS		*Tranches rated by KBRA*	
	(1)	(2)	(3)	(4)
Issuer Size by Frequency	0.45**		0.77***	
	(2.50)		(2.61)	
Issuer Size by Balance		0.13		0.63***
		(0.86)		(2.69)
Tranche Count	0.001	0.02	0.08***	0.10***
	(0.06)	(0.68)	(2.82)	(3.60)
Subordination level	0.66***	0.63***	-0.01	0.02
	(3.12)	(2.99)	(-0.02)	(0.05)
Log Tranche Value	-0.40***	-0.41***	-0.35***	-0.33***
	(-4.72)	(-4.91)	(-2.97)	(-2.88)
Log Transaction Value	0.46***	0.51***	0.64***	0.61***
	(4.29)	(4.83)	(3.56)	(3.39)
Coupon	-0.05	-0.03	-0.01	-0.04
	(-0.79)	(-0.44)	(-0.07)	(-0.37)
Year	Y	Y	Y	Y
Credit Rating	Y	Y	Y	Y
Observations	1,223	1,223	812	812
Pseudo R2	0.156	0.153	0.390	0.390

FIGURE 1: MARKET SHARE OF CRAS SORTED BY MARKET AND YEAR

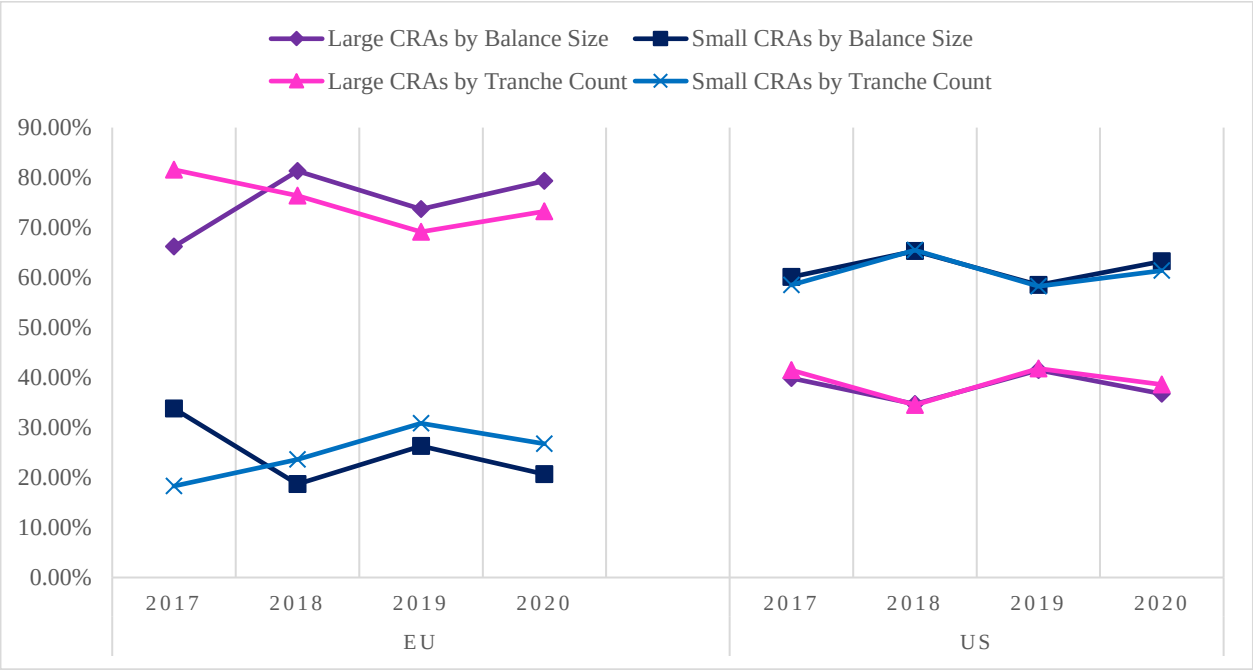
This figure illustrates the market share movements of Moody's, Fitch, DBRS, KBRA, and S&P over time and in a specific market (the EU and US). The sample includes all tranches for which the RMBS tranche received a credit rating from one of the five CRAs disclosed at issuance originated between the first quarter of 2017 up to the third quarter of 2020. The market share percentages are set out in more detail in Table 3. Figure 1(a) illustrates the market share movements of CRAs in the RMBS market over time in a specific market, measured by balance size of a tranche. Figure 1(b) illustrates the market share movements of CRAs in the RMBS market over time in a specific market, measured by the number of tranches rated. Figure 1(c) illustrates the combined market share movements of large (Moody's, S&P, and Fitch) and small (DBRS and KBRA) CRAs in the RMBS market over time in a specific market, measured by both balance size and number of tranches rated.



Panel A: Market share by balance size



Panel B: Market share by tranche count



Panel C: Market share: Large vs. small CRAs

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