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Does competition improve sovereign credit rating quality?

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Abstract

The market for sovereign ratings has been dominated by two agencies but credible new entrants have emerged. Decreasing market concentration has potentially significant implications for the quality of sovereign ratings. Using a global dataset from S&P, Moody's, Fitch and DBRS for 2000-2016, we find that S&P and Moody's ratings are higher (lower) in periods following increases in Fitch (DBRS) market share. Evidence suggests that DBRS employs a relatively lenient rating policy to proceed in this market but increased regulatory pressure on rating agencies weakens any tendency to inflate ratings to gain market share. We also find that sovereign rating strategies vary across the economic cycle. Our findings offer wide-ranging implications for market participants, policy makers and the rating industry.

JEL classification: G15; G24; G28.

Keywords: Sovereign rating quality; Competition; Catering; Reputation.

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1. Introduction

This paper investigates the impact of competition among Credit Rating Agencies (CRAs) on sovereign rating quality. We focus on whether competition alleviates or intensifies any tendency to inflate rating levels and our findings complement prior literature on ratings quality in the corporate and structured finance segments (Becker and Milbourn, 2011; Bae et al., 2019; Cohen and Manuszak, 2013; Flynn and Ghent, 2018). International policy makers' stance on this issue has tended to favour reinforcing competition in the rating industry. A number of initiatives have been introduced by the European Union such as encouraging issuers to appoint smaller CRAs where multiple ratings are solicited.¹ Despite being endorsed by the regulation, there are inconclusive findings from previous literature on whether competition can stimulate good behaviour among the CRAs. There is a dearth of empirical evidence regarding the implications of changing rating market structure for the quality of sovereign ratings.

The motivation to investigate the effects of competition on quality of sovereign ratings is threefold. First, sovereign rating changes are constantly monitored by market practitioners due to their profound impact on financial and economic activities. For instance, sovereign ratings influence governments' funding costs (Altdörfer et al., 2019) and affect stock and bond market volatility (Bales and Malikane, 2020). Countries with a high sovereign rating can attract more foreign direct capital from the OECD countries (Cai et al., 2018). Also, rating levels of non-sovereign issuers such as banks are heavily influenced by the sovereign ceiling (e.g., Adelino and Ferreira, 2016; Almeida et al., 2017).

Second, sovereign ratings play an important role for the CRAs' business outcomes. The sovereign rating business significantly contributes to CRAs' revenues, with rating fees that are

¹ Article 11a of Regulation (EC) No 1060/2009 enhances smaller CRAs' visibility to investors through the establishment of a public rating platform. Article 8b grants access for smaller CRAs to the information in relation to assets underlying structured financial instruments so they can issue unsolicited ratings. Article 8d encourages issuers to appoint smaller CRAs with no more than 10% of total market shares. Where issuers do not appoint at least one smaller CRA, such a decision must be documented.

on a par with those for non-sovereign issuers.² The amount of the rating fees is similar across the largest CRAs, but may differ across issuers/issues for various reasons.³ The sovereign rating business also plays an essential role for a CRA to expand its market share in the bank, corporate and structured finance rating segments. This is because a CRA would not normally rate a corporate entity within a country until after its government has been rated. For instance, there were 24 first sovereign rating assignments by S&P during the period 2000-2018, which led to S&P assigning first ratings for 141 bank and corporate issuers.⁴ Therefore, it is crucial for CRAs to establish sovereign rating coverage as a pre-cursor to being able to build market share in other rating segments in any given country.

Finally, regulatory measures in recent years have intended to manage the conflicts of interest problem in the rating industry and to reinforce competition among CRAs. Hence, it is necessary to examine whether such objectives are simultaneously achievable given concerns that competition might aggravate the conflicts of interest (see Section 2).

There are two key problems that affect the quality of sovereign ratings. First, CRAs that use the issuer-pays model have a motivation to understate risks in order to cater to issuers' desire for high ratings, leading to the rating inflation phenomenon.⁵ CRAs have regularly come under

² For example, in 2019, the (unaudited) revenues from public finance ratings' segment was approximately 18% of Fitch EU registered offices' total revenues from all asset classes (Fitch Ratings, 2020), and 15% of Moody's total revenues from all asset classes (Moody's Investors Service, 2020).

³ For example, as of January 2021, S&P rating fees for both sovereign and corporate (including industrial and financial service companies) are up to 7.2 basis points for most transactions with a minimum fee of \$110,000. The CRAs' policies seek to ensure that CRAs keep the receipt of rating fees separate from the activities influencing the rating analysis process. For more details, see for example, 2021 S&P Global Ratings U.S. Ratings Fees Disclosure, available at: <https://www.spglobal.com/ratings/en/>.

⁴ For example, S&P's rating coverage for bank and corporate issuers grew from nil to 14 in Saudi Arabia, 23 in Ukraine and 18 in Nigeria by 2018, following S&P's assigning the first sovereign ratings for these countries. Similarly, the assignment of first sovereign rating to Azerbaijan by Moody's in September 2006 led to Moody's assigning the first ratings to three banks within three months of the sovereign rating assignment.

⁵ Alp (2013) shows that rating standards in the corporate rating segment were tightened for investment-grade issuers but loosened for speculative-grade issuers during the period 1985-2002. This phenomenon was partially explained by the fact that the growth in the corporate debt market during this period was driven by speculative-grade first-time issuers.

the spotlight due to incidents related to mis-rating practices (e.g. Bedendo et al., 2018). CRAs' reputations were also scrutinised in the aftermath of the European sovereign debt crisis.⁶ The second problem is the oligopolistic market structure. Because CRAs' businesses are built on a long-term reputation for the quality of credit assessments, there is an absolute advantage for early market entrants. Due to the consequent entry barriers, the rating industry is highly concentrated. Until recent years, the market in all asset classes (excluding insurance) has been dominated by the most well-established CRAs: S&P, Moody's and Fitch. Their combined market share accounts for 98.8% of all outstanding government securities' ratings, with sovereign ratings being one of the most concentrated areas (Securities and Exchange Commission (SEC), 2020). The only smaller Nationally Recognized Statistical Rating Organization (NRSRO) seriously competing with the larger CRAs in sovereign ratings has been Dominion Bond Rating Service (DBRS).⁷

In the US, the criteria for certifying CRAs as NRSROs were relaxed after 2006, thus the number of NRSROs increased from three firms to nine at January 2020 (SEC, 2020). The market for sovereign ratings has developed in the direction expected by regulators. This is characterised by a growing presence of Fitch as the third global CRA since the early 2000s and DBRS as an emerging small CRA since 2005. According to the SEC's (2020) report, there are seven NRSROs providing government securities' credit ratings, including the larger CRAs (S&P, Moody's, Fitch) and four smaller CRAs.⁸ DBRS is the only smaller CRA with consistent increases in sovereign rating coverage. In Europe, the rating market is represented by a wider

⁶ CRAs were criticised for exacerbating the debt crisis due to downgrading sovereign ratings of high-rated countries in the region (Altdörfer et al., 2019, Bales and Malikane, 2020). These downgrades were considered by some observers to be far more severe than justified by fundamentals.

⁷ DBRS was acquired by Morningstar in July 2019 in a deal worth \$669 million. The DBRS rating business was integrated into Morningstar and renamed DBRS Morningstar. After the acquisition, DBRS Morningstar became the fourth largest CRA in the market. Morningstar did not assign ratings for sovereign securities before they acquired DBRS. Our sample period ends in December 2016, and hence it is not affected by this event.

⁸ These include: DBRS, HR Ratings de México, S.A. de C.V (HR), Japan Credit Rating Agency (JCR) and Kroll Bond Rating Agency (KBRA).

set of certified or registered CRAs. In 2019, the European Securities and Market Authority (ESMA)⁹ recorded 15 EU registered CRAs providing sovereign credit assessments. Examples of new entrants are discussed in Section 4.

Whether boosting competition improves or reduces sovereign rating quality is a matter for debate and evidence. Regulators believe that it improves rating quality hence their objectives to lower the entry barriers for smaller CRAs. Because debt issuers tend to hire the most reputable CRAs, it can be expected that more CRAs' resources will be dedicated to improving rating quality to maintain reputation (Frenkel, 2015). When facing competition, CRAs will expend more efforts in fulfilling their information production function for the capital market, thereby providing the market with timelier updates on issuers' creditworthiness (Morkoetter et al., 2017). We designate this as the *reputation channel of competition*. However, there is little hope of success for smaller CRAs to compete effectively through this channel because the established CRAs enjoy a clear reputational advantage. Flynn and Ghent (2018) show that smaller CRAs tend to inflate structured finance products' ratings to gain market share.¹⁰ The larger CRAs can respond by employing the same strategy. We refer to this as the *catering channel of competition* and it can be applicable for any asset class, including sovereign debt. Under the reputation channel, competition potentially improves rating quality, whereas rating quality deteriorates under the catering channel. Our paper is unique in its aim to identify which channel applies when competition increases in the sovereign rating market.¹¹

⁹ ESMA was established in 2011 by the Regulation No 1095/2010 of the European Parliament and of the European Council. ESMA is entrusted with supervision powers over CRAs. It is responsible for monitoring registered and certified CRAs in Europe.

¹⁰ In the European sovereign rating context, DBRS upheld some countries' only investment-grade sovereign rating. For example, Portugal's BBB-L rating prevented negative consequences for the country's banks, enabled Portuguese bonds to be used as collateral for European Central Bank (ECB) money-market operations, and secured the eligibility of the country's bonds for the ECB's quantitative easing bond-buying program.

¹¹ The relationship between competition and corporate/insurance ratings has been examined in the literature but the findings are mixed. Doherty et al. (2012) show that competition for insurance credit ratings plays a crucial role for S&P to invest in rating quality to increase its market share. On the other hand, CRAs might find it more appealing to gain market share by inflating ratings, so competition causes the incumbents to employ a lenient

Specifically, we consider a market structure represented by two incumbents (S&P and Moody's), one emerging global CRA (Fitch) and one smaller emerging CRA (DBRS). We focus on the reaction of each CRA to changes in competitors' annual market shares. The sample covers 132 countries whose sovereign ratings are assigned by one (or more) of the four CRAs between January 2000 and December 2016.

We reveal statistically and economically significant evidence that S&P and Moody's are responsive to the growing prominence of Fitch by implementing a more generous rating policy. A one standard deviation increase in Fitch's annual regional market share is associated with higher Moody's (S&P's) average ratings by 1.6 (1) notches. Our evidence of catering is more pronounced among solicited sovereign ratings, whereby S&P (Moody's) have a rating contract with, and receive rating fees from, the sovereign issuers. It can be interpreted that the largest two CRAs view Fitch as a credible competitor in the sovereign rating segment. We also find that a later market entrant prioritizes the catering strategy over reputation. Specifically, DBRS extends its geographic coverage of sovereign ratings by targeting high-rated countries already covered by the three larger CRAs and its average ratings are higher than other CRAs by 0.3 notches. Nevertheless, DBRS' expanding coverage of sovereign ratings drives the three larger CRAs toward tighter rating standards. DBRS' increased market share of sovereign ratings causes S&P to tighten their standards for both solicited ratings and unsolicited ratings. This is in line with our *reputation* hypothesis, whereby standards would be raised for all ratings if a CRA seeks to maintain reputation and trust from investors. The effects of DBRS' market share on the larger CRAs imply that the latter are induced to undermine the credibility of the new entrant rather than compete on rating levels. This is an interesting application of their market power and a challenge to regulators whose agenda is to attract new entrants to the market.

rating policy (Coffee Jr, 2011). This implies that competition induces a race to the bottom, i.e. rating quality deteriorates. Becker and Milbourn (2011) find that a one standard deviation increase in Fitch's market share for corporate ratings increases S&P's mean ratings by 0.19 notches.

CRAAs have been operating under more stringent regulations since 2010. We hypothesize that rating inflation is mitigated during the most recent period because CRAAs switch their attention from catering to *regulatory compliance*. Also, the incentives to inflate ratings vary across economic cycles. Dilly and Mählmann (2016) show that there is a boom bias effect in corporate ratings, i.e. CRAAs have a stronger incentive to assign inflated ratings to risky issuers during boom periods than during busts. Therefore, rating quality is counter-cyclical (Bar-Isaac and Shapiro, 2013). Creditworthiness demands closer attention during economic recessions hence there is increased scope for reputational damage from inflated ratings. CRAAs become more protective of reputation, thus less willing to inflate ratings to maintain market share.

Our empirical results support these expectations. We show that the competition-rating relationship becomes weaker after the recent regulatory reforms of CRAAs in Europe and the USA. This is particularly evident in the case of Moody's and S&P. Further, supporting Bar-Isaac and Shapiro's (2013) theory, our results reveal an increase in Moody's and Fitch rating conservatism during recessions, and S&P rating inflation diminishes due to its increasing awareness of reputation protection.

This paper makes significant contributions to the literature. First, this is a unique empirical study on the quality of sovereign ratings under competition. Although rating inflation still prevails for S&P and Moody's, the impact of smaller CRAAs mitigates this problem. In this respect, our findings identify a new positive aspect of competition in the rating industry. Second, we reveal original insights into the moderating effects of CRA regulation on the sovereign rating-competition relationship. We provide empirical support for a regulatory regime which raises CRAAs' awareness of assuring the independence of their credit assessments as well as lowering entry requirements for smaller CRAAs.¹² Finally, our paper offers the first

¹² Behr et al. (2018) documented rating inflation due to a government regulation change which discourages competition and increases barriers to entry. The paper indirectly points to the benefits of a regulatory regime that supports competition.

empirical support in the context of sovereign risk for the theory of counter-cyclical rating quality presented by Bar-Isaac and Shapiro (2013). The analysis shows that the rating-competition relationship also varies across the economic cycle.

The remainder of this paper is structured as follows. Section 2 reviews the main findings in the previous literature about the competition-rating relationship, Section 3 outlines our hypotheses and empirical models, Section 4 discusses data, Section 5 presents the empirical results, and Section 6 concludes.

2. Literature review

The effects of competition on rating quality in different asset classes is an important theme in the credit rating literature. Some of the theoretical literature does not advocate promoting competition in a credit rating market. For example, Skreta and Veldkamp (2009) argue that competition does not necessarily lead to ratings accuracy because it fosters the rating shopping phenomenon, under which issuers take advantage of the CRAs' disagreement by soliciting multiple ratings but selecting only the highest rating to be disclosed. This becomes more problematic for complex securities whose credit risk is difficult to evaluate, hence CRAs disagree more often on their credit ratings. Similarly, in Bolton et al.'s (2012) model, a duopoly rating industry is less efficient than a monopoly because shopping occurs under duopoly. Rabanal and Rud (2018) design and implement an experiment which incorporates these factors, but their findings do not support Bolton's et al. (2012) model. The incentive to inflate ratings becomes smaller under competition because competition lowers the average rating fee a CRA can charge their clients and there are also less naïve buyers in a competitive market than in a monopolistic one.

Camanho et al. (2021) show that the incentive to understate risks is a function of a given CRA's reputation and its competitors' reputations. When one CRA is less reputable than the

others, the less reputable one finds it profitable to compromise on reputational capital and to cater to issuers' preferences for high ratings. Bar-Isaac and Shapiro (2013) establish that ratings quality is lower during a boom period than a recession and that competition does not eliminate this counter-cyclical phenomenon. Frenkel (2015) finds that competition mitigates rating inflation in certain cases. In the absence of rating shopping, competition plays a disciplining role because issuers only use ratings from the CRAs with the best public reputation. Hence, competition leads to unbiased ratings. Finally, Manso (2013) considers a factor overlooked by most of the literature, i.e. the feedback effects of ratings on corporate survival rates. A concern is expressed that competition motivates CRAs to employ a tough-rating policy, which results in more downgrades and higher probabilities of defaults. Empirical studies also reveal mixed results in relation to this issue. Flynn and Ghent (2018) suggest that the causal relationship between competition and rating inflation is an empirical question because both reputation and revenue considerations will inevitably exist, and they pull in opposite directions.

For the corporate and structured finance rating segments, there remains a lack of consensus in the literature regarding which mechanism dominates. Becker and Milbourn (2011) show that the entry of Fitch leads S&P and Moody's to inflate their corporate ratings in the US. Using a similar dataset, Bae et al. (2015) show that the competition effects in Becker and Milbourn (2011) disappear after controlling for the unobserved industry effects and after removing regulated firms from the investigations. However, Bae et al. (2019) find similar results to Becker and Milbourn (2011) in a sample of Canadian corporate ratings, highlighting that competition jeopardizes rating accuracy. Specifically, DBRS, the smaller CRA, responds to the marked increase in S&P's market share in the Canadian corporate bond rating market by issuing more favourable and less informative ratings. Morkoetter et al. (2017) use a dataset of structured finance ratings assigned by the three largest CRAs and find that a competitive market

incentivises CRAs to engage more actively in information production. However, their study also provides evidence which raises concerns about rating inflation.

Griffin et al. (2013) argue that rating inflation is an unintended consequence of competition, but it doesn't necessarily reflect CRAs' untruthful behaviour. However, their findings from the structured finance market reject the latter conjecture because both Moody's and S&P make intentional rating adjustments when they encounter competition. Using a large structured finance ratings dataset, Cohen and Manuszak (2013) find that Moody's and S&P inflate ratings to combat the competitive threat from Fitch. This effect of competition was more pronounced when Fitch had just been established with a small market share but diminished over time in this particular market. Flynn and Ghent (2018) also analyse whether competition between the three larger CRAs and a smaller entrant (DBRS) distorts the quality of structured finance ratings. Their findings emphasize the negative aspect of competition, i.e. the larger CRAs and the new entrant loosen their rating standards to attract business.

The power of reputation (and more generally the conflict of interest problem) in issuer-pays CRAs is the subject of another branch of the rating literature. In theory, reputation concerns should matter to a conflict-free CRA regardless of whether an issuer is a corporation, sovereign, or a financial institution. Hence, securities with the same rating category should have the same level of credit risk regardless of the issuer type. However, Cornaggia et al. (2017) show that reputation concerns might not discipline a CRA to the same extent in different asset classes. They find that Moody's rating levels across asset classes are not consistent, whereby rating accuracy tends to be affected by the revenue stream from that asset class. Specifically, they report that Moody's rating inflation is most severe for structured finance products. This is in line with Moody's revenue distribution being increasingly skewed toward structured finance during the period studied. Cornaggia et al.'s (2017) findings are in line with Mathis et al.'s (2009) argument that protecting reputation becomes a secondary concern to a CRA compared

with the revenue boosting opportunity arising when a large fraction of their revenues is derived from a certain asset class.

The value of reputation to a CRA does not only vary across issuer types but also changes over time, i.e. it decreases in economic boom periods and increases in economic busts (Bar-Isaac and Shapiro, 2013; Dilly and Mählmann, 2016). Rapid economic growth in boom periods stimulates demand for ratings, inducing the CRAs to relax their rating standards to attract more business. Hence, a larger proportion of high ratings are assigned to risky issuers in boom periods than in crisis periods (Bolton et al., 2012). Using a sample of S&P corporate issuer ratings, Alp (2013) shows that risky corporate issuers benefited from a generous S&P rating policy in the boom period of 1985-2002, with S&P assigning higher ratings to first-time issuers with speculative grade ratings by 0.6 notches.

Since 2009, there has been a growing consensus among regulators about the need to lower the entry barriers for smaller CRAs, thereby reducing credit rating market concentration. For example, both European and US regulators identify the desirability of lowering certain regulatory barriers which present difficulties for smaller CRAs.¹³ A common inference from previous empirical studies is that reputation is less of a concern in a competitive rating market when a CRA's market share is low. This is true for both smaller market entrants as well as established CRAs entering a particular rating segment (Flynn and Ghent, 2018).

Prior studies on competition and its impact on CRAs' rating practices have important implications for the desirability of regulatory intervention to reform market structure. Yet, the literature concentrates on structured finance ratings in particular, along with a small number of studies on the corporate rating segment. There is no empirical evidence for the CRAs' reactions

¹³ SEC (2016) emphasizes the overly strict minimum requirements for the use of credit ratings in investment contracts (SEC, 2016). The European Commission, in its report to the Parliament and the Council in 2016, also highlights concerns about the exclusion of the majority of smaller CRAs from the ECAI status due to the minimum coverage requirements which favour dominant CRAs.

to competition in sovereign ratings. This is a glaring void given the extensive influence of sovereign ratings on a range of securities markets and financial market participants. Our paper addresses this issue.

3. Hypotheses and methodology

The CRAs under consideration operate under the issuer pays business model, therefore they are all subject to the conflict of interest problem, i.e. they are potentially motivated to understate risks by loosening rating standards. Therefore, we examine their rating quality, proxied by sovereign rating levels, under changing market structures. A structural shift across the rating spectrum reveals whether CRAs' rating standards have been relaxed or tightened as a consequence of changing competition (CRAs' market share). This approach is consistent with prior studies examining the quality of ratings assigned by CRAs prone to conflict of interest, e.g. Becker and Milbourn (2011), Baghai and Becker (2018, 2020) and Toscano (2020).

Under a competitive market, CRAs' rating revenues are driven by their clients whose prime interest is a favourable rating rather than the ratings' ability to predict defaults.¹⁴ This leads to two strategies for a CRA to gain market share: (i) relax rating standards to attract risky issuers as suggested by Alp (2013), (ii) tighten their credit rating standards to attract clients of high credit quality (Doherty et al., 2012) or to improve reputation because some issuers and market participants will only use ratings from the most reputable CRAs (Frenkel, 2015). The first strategy leads to rating inflation, whereas the latter leads to rating accuracy or deflation. In the absence of these strategies, competition does not lead to any significant change in the rating levels. Predicated on the above reasoning underlying the rating-competition relationship, we test the following hypothesis:

¹⁴ This is particularly true at the sovereign level because the rating will strongly influence ratings of non-sovereigns in the given country, and thereby widely affect borrowing costs across the entire economy.

H1: Increased market competition affects sovereign rating levels.

The influence of competition on CRAs' sovereign ratings occurs through either the catering channel or the reputation channel. Through the catering channel, CRAs react to competition by relaxing rating standards, i.e. they adopt the first strategy to maintain market share, leading to rating inflation. Through the reputation channel, competition motivates CRAs to tighten rating standards to boost reputation, to increase the customer base or to attract high-quality issuers (in the case of a new entrant). We test these channels with the following hypotheses:

H1_a: Increased market competition leads to sovereign rating deflation under the reputation channel.

H1_b: Increased market competition leads to sovereign rating inflation under the catering channel.

To test these hypotheses, and whether rating levels increase or decrease after a change in the market share of a competitor CRA, the following fixed effects model is estimated:¹⁵

$$CCR_{i,j,t} = \alpha_i + \beta_j MKS_{j',t-1} + \gamma \sum_{k=1}^9 X_{i,k,t-1} + \lambda Co_i + \partial Y_t + \varepsilon_{i,t} \quad (1)$$

i indexes the sovereign, j is the subscript for the CRA whose ratings are under consideration, j' represents the competitor CRA whose market share is the regressor, t is the year of observed ratings. The dependent variable is $CCR_{i,j,t}$ which indicates the 52-point CCR rating (see Appendix I) for sovereign i rated by CRA j in year t . Our key variable is $MKS_{j',t-1}$ which measures the fraction of all sovereign ratings in a geographic region assigned by the CRA j' in year $t-1$.¹⁶ The region market share variable varies both cross-sectionally and across time, which is consistent with the manner in which rating market share has been constructed in previous studies. For example, Becker and Milbourn (2011), Bae et al. (2015) and Bae et al.

¹⁵ The approach is consistent with Becker and Milbourn (2011).

¹⁶ Section 4 discusses the 52-point rating scale and the construction of MKS .

(2019) measure CRAs' market share for corporate ratings within an industry in a given year, while Flynn and Ghent (2018) measure CRAs' competition for CMBS ratings based on CMBS deal types in a given year. In the case of sovereign ratings, measuring competition based on geographic region coverage reflects the distribution of CRAs' revenues in sovereign ratings and the potential downstream business revenues from sovereign ratings (in particular, future corporate rating revenues). In addition, sovereigns are usually assigned to analysts from offices located in different geographic regions rather than centralised on a global scale.

X incorporates a set of nine sovereign-specific variables which determine sovereign credit ratings. The nine economic variables are inflation, equity capital to total assets of the banking system, current account balance/GDP, GDP growth, the average of six Worldwide Governance Indicators, GDP per capita, government gross debt/GDP, a sovereign default dummy which takes the value of one if a sovereign is recorded by S&P, Moody's, or Fitch as having defaulted in the past, and government budget balance/GDP. These economic controls are chosen following the literature on the determinants of sovereign credit ratings (Afonso et al., 2011; Reusens and Croux, 2017). Descriptions and sources of data for the control variables are reported in Appendix II. Co and Y are full sets of country and year dummy variables. The country dummy variables capture the unobserved sovereign-specific characteristics which determine credit ratings and the year dummy variables control for the time variation of credit ratings in our sample period.¹⁷ Eq. (1) is estimated with robust standard errors clustered by regions and years because these are the levels at which market shares vary.¹⁸

In Eq. (1), the parameter of interest is β_j . If β_j is insignificantly different from zero, we conclude that competition does not affect sovereign credit ratings, i.e. we reject H1. If β_j is

¹⁷ Eq. (1) controls for both country level time-variant macroeconomic indicators and country-year fixed effects, which might be correlated with each other. Eq. (1) is also estimated without the macroeconomic indicators, and similar results (available on request) are obtained.

¹⁸ For robustness, Eq. (1) is also estimated using Huber-White robust standard errors, and similar results (available on request) are obtained.

significant and negative, competition leads to rating deflation (supporting H1_a). If β_j is significant and positive, competition leads to rating inflation (supporting H1_b).

Our choice of a linear fixed effects model is consistent with the rating literature, such as Baghai and Becker (2018) and Altdörfer et al. (2019). However, Reusens and Croux (2017) argue for the use of an ordered response regression model because credit ratings are an ordinal measure of creditworthiness.¹⁹ For robustness, Eq. (1) is also estimated with an ordered probit approach using 18-notch ratings (excluding outlook and watch), and the inferences remain consistent (see Section 5.1).

Next, we estimate Eq. (1) using two sub-samples: solicited and unsolicited ratings. The latter are ratings initiated by a CRA with or without the participation of the rated entities, while solicited ratings are assigned and maintained at the request of the rated entities. Solicited ratings are distinguished from unsolicited ratings by a service contract between the two parties in the case of solicited ratings, whereby CRAs are compensated for their rating service by the issuers.²⁰ CRAs in this study assign both types of ratings, so their competition strategies would not be identical for solicited versus unsolicited ratings. Therefore, if H1_b holds, we would find evidence of rating inflation among the solicited ratings because they increase the revenues for the CRAs. Under H1_b, CRAs facing competition are more willing to compromise reputational capital to cater to issuers' preferences. In this case, the coefficient on $MKS_{j',t-1}$ is expected to be positive and significant for the solicited ratings' sub-sample. If H1_a holds, we expect no evidence of rating inflation in both solicited and unsolicited ratings because investors expect

¹⁹ However, an ordered-response model encounters two problems in our context. First, our dependent variables have 52 discrete outcomes. A response variable with a large number of outcomes poses an estimation challenge with limited sample size. Second, our model controls for country and year fixed effects on a panel dataset of credit ratings. Fitting a model with many fixed-effects tends to cause convergence problems when using the ordered-response model (Baghai and Becker, 2018).

²⁰ The literature provides evidence that unsolicited bank ratings are strategically lower than solicited bank ratings due to CRAs' conservatism (Poon et al., 2009; Van Roy, 2013; Bannier et al., 2010) and that unsolicited ratings can be used as a blackmail tool by CRAs to extract higher fees from customers (Fulghieri et al., 2014).

consistent rating standards in both types of ratings. If CRAs facing competition expend more resources in producing reliable credit information, the coefficient on $MKS_{j',t-1}$ is expected to be negative and significant for both solicited and unsolicited ratings' sub-samples.

3.1. Selection bias and endogeneity concerns

An important issue in the empirical studies on the quality of ratings under competition is that rating inflation might result from rating shopping not catering. This is because rating inflation caused by catering reflects the CRAs' deliberate bias but rating inflation due to shopping does not necessarily indicate that CRAs are upwardly biased. Rating shopping refers to the issuers soliciting multiple ratings and selectively disclosing ratings from the CRA that produces the most favourable credit assessments.²¹ There have been several papers that investigate whether rating shopping occurs, but they mainly focus on corporate debt and structured finance ratings, while there is no evidence from the rating literature that sovereign issuers engage in rating shopping.²²

Nevertheless, we investigate whether single-rated sovereigns dominate our data sample. All sovereigns which are rated by DBRS are also rated by the three global CRAs, so rating shopping does not exist by construction. In addition, 95% of sovereigns rated by Fitch also have sovereign ratings from Moody's or S&P or both. According to Kronlund (2020), selection bias is weak among issuers with ratings from two CRAs compared with issuers that are only rated by one CRA. Therefore, the probability that our model estimations are biased by the selection problem is low. Selection bias may also occur when new entrants selectively

²¹ The issuers' selective non-disclosure of less favourable ratings causes inefficiencies. Mählmann (2008) shows theoretically that investors always under-value debt from un-rated issuers whilst over-valuing debt from non-disclosing issuers because they cannot distinguish the former from the latter.

²² Evidence from the literature on rating shopping is quite mixed. For example, He et al. (2016) show a higher likelihood of shopping for single-rated MBS tranches' ratings. Kronlund (2020) finds similar evidence that rating shopping occurs in the corporate debt sector particularly among single-rated bonds. However, Griffin et al. (2013) reject rating shopping and support catering among CDO tranches in explaining rating inflation.

choose sovereigns with strong capabilities to repay in order to increase their rating coverage (Flynn and Ghent, 2018). Such a selection issue does not exist in our data sample, given that it is more common for developing than for developed countries to solicit their sovereign ratings from DBRS and Fitch. For example, 63% of Fitch's sovereign ratings of high-income countries are solicited in our sample.

Further, we empirically investigate the case whether a new entrant extends its rating coverage in the region where there is greatest potential of downstream business revenues from sovereign ratings (e.g. from future corporate rating revenues). A new entrant can achieve its goal by assigning sovereign ratings to countries where the financial markets are more mature and demand for ratings from the corporate sector is highest. To examine whether DBRS and Fitch strategically broaden market shares in this case, we estimate linear regressions of annual region market shares of each of these two emerging CRAs on a proxy for the region's financial development. Following Rajan and Zingales (1998), we measure the regional financial development using (i) the domestic credit to GDP, (ii) the equity market capitalisation as percentage of GDP, and (iii) the equity market capitalisation in US dollars. The data are obtained from the World Bank. Our results (available on request) show no evidence that Fitch and DBRS issue more sovereign ratings in the regions with more developed financial systems which can generate high demand for corporate ratings. This significantly reduces any potential concerns about selection bias.

In our regression model, it is important to consider any potential endogeneity issue relating to the market share variable. Firstly, the entry of a CRA in a geographic region might respond to the existing rating levels from other CRAs. In order to address this reverse causality problem, we lag the market share by one year relative to the year of the rating variable. Secondly, there could be some unobserved country-specific (and region-specific) factors which drive both the changes of market shares and ratings. Bae et al. (2015) argue that a market share

measure for corporate ratings might be correlated with industry characteristics which also affect rating levels, therefore it is imperative to control for industry fixed effects and firm-level characteristics in a model that regresses corporate ratings on market shares. In the case of sovereign ratings, these unobserved factors are country-specific and region-specific. To address the potential endogeneity bias in our market share variable, we estimate all models with country and year fixed effects and also use region fixed effects in robustness tests. In addition, our parameters are estimated with robust standard errors clustered by regions and years in all model specifications because this is the level at which market share varies. In addition, we re-estimate Eq. (1) using Two-Stage Least Squares Instrumental Variable (2SLS-IV) regressions to address any more general endogeneity issue (see Section 5.1 for details).

To further alleviate any endogeneity concern associated with potential omitted variable bias, we examine two specific sources of bias which might affect our results: (i) more stringent regulations of CRAs and (ii) economic cycles. Such omitted factors potentially drive sovereign rating levels and the competition landscape for sovereign ratings. They are also of great interest to rating users, hence are examined alongside our baseline regressions.

There are three significant regulatory events in our sample period, including the CRA Regulation No 1060/2009 of the European Parliament and of the Council in September 2009, which entered into force in December 2010; the Dodd-Frank Wall Street Reform and Consumer Protection Act in July 2010; and the establishment of ESMA for supervision of EU-registered CRAs in June 2011. We examine the 2010 Dodd-Frank Act (DFA) as we believe that it can capture the joint-effect of three events mentioned above.²³ Taking effect on 21st July 2010, the DFA delivers substantial reform of the regulation of CRAs in the US. It intensifies the

²³ For robustness, we estimate Eq. (1) and Eq. (2) using the two European regulatory events as cut-off points (16th September 2009 for the EU CRA Regulation and 30th June 2011 for the establishment of ESMA) and obtain similar inferences (results available on request).

regulatory pressure on CRAs and is not limited to any specific asset classes.²⁴ Some recent evidence suggests that the DFA makes CRAs more protective of reputation, to expend more effort in managing conflicts of interest and averting rating inflation (Dimitrov et al., 2015; Toscano, 2020). We argue that, under tightening regulatory pressure, the concerns about competition threats weaken because CRAs place a stronger emphasis on other matters related to regulatory compliance.²⁵ To test this prediction for sovereign ratings, we create a dummy variable named $Post_Reg_{i,t}$ which takes the value of one for ratings assigned after the DFA (ratings assigned on or after 21st July 2010), and zero otherwise. We test whether the competition-rating relationship weakens after the regulatory reforms of CRAs with an interaction term $Post_Reg_{i,t} * MKS_{j',t-1}$. We anticipate that the coefficient on the interaction term will be opposite to that of the market share variable.

Using controls for economic cycles is justified by Bar-Isaac and Shapiro (2013) and Dilly and Mählmann (2016) who show that rating quality is counter-cyclical. Data from the National Bureau of Economic Research are used to identify US economic recessions, specifically: March 2001-November 2001 and December 2007-June 2009.²⁶ The first period is associated with the bursting of the Dotcom bubble and the second follows the sub-prime crisis. A dummy variable, Rec_{it} , is created, which takes the value of one for ratings assigned during the identified recession periods, and zero otherwise. Due to a higher default likelihood during recessions, CRAs face a higher risk of reputation loss for inflating ratings more than warranted. We test Bar-Isaac and Shapiro's (2013) theory with sovereign rating data.²⁷ We interact the

²⁴ It raises a series of concerns such as rating quality, risk of facing lawsuits from investors, scrutiny by regulators in relation to recordkeeping, information disclosure, rating errors and the management of conflicts of interests.

²⁵ Toscano (2020) shows that the DFA reduces the conflict of interest problem related to corporate ratings assigned by CRAs that use the issuer pays business model. They provide evidence suggesting that S&P's corporate rating accuracy improves, and their rating standards become less lenient than before the passage of the DFA.

²⁶ The US economy is taken as a proxy for the global economic environment.

²⁷ Dilly and Mählmann (2016) conduct a test for corporate rating data and their results support the theory.

recession dummy with the market share variable to test whether concerns for reputation loss are sufficiently strong to eliminate rating inflation.

Taking regulation and economic cycles together, we estimate Eq. (2), as follows:

$$CCR_{i,j,t} = \alpha_i + \beta_j MKS_{j',t-1} + \delta_1 Post_Reg_{i,t} + \delta_2 Post_Reg_{i,t} * MKS_{j',t-1} + \varphi_1 Rec_{i,t} + \varphi_2 Rec_{i,t} * MKS_{j',t-1} + \gamma \sum_{k=1}^9 X_{i,k,t-1} + \lambda Co_i + \partial Y_t + \varepsilon_{i,t} \quad (2)$$

The coefficients of interest are δ_2 and φ_2 , which represent the moderating effects of CRA regulation and economic cycles, respectively, on the relationship between ratings and competition. The expectation is that δ_2 and φ_2 have the opposite signs to β_j (the coefficient on the competition variable $MKS_{j',t-1}$).

4. Data and sample description

The data sample comprises long-term foreign-currency sovereign issuer ratings for the period from 1st January 2000 to 31st December 2016. SEC (2020) recorded that there are seven NRSROs assigning sovereign credit ratings (see Section 1). In Europe, there are 15 EU-registered CRAs providing sovereign ratings (ESMA, 2019). There are new entrants among the 15 CRAs, including ARC Ratings, BCRA and Rating-Agentur Expert RA. The latter CRA did not rate any country until 2015, while ARC and BCRA rated fewer than five countries in 2016. We require a minimum of three years of data and a broad rating coverage, and hence the CRAs meeting our criteria are S&P, Moody's, Fitch and DBRS. Ratings data are collected from the CRAs' press releases, including ratings, outlook and watch statuses. For each year, we collect a sovereign's rating status on the first day of the year plus all rating actions announced by the CRAs during that year. To assess the global market coverage, we identify the number of sovereigns whose ratings are assigned by each CRAs in each year. We consider the annual global rating coverage of the four eligible CRAs.

Table 1 presents the full annual sovereign rating coverages of CRAs during 2000-2016. Moody's leads the market in the pre-2003 and post-2014 sub-periods. During 2003-2014, it was surpassed by S&P. Nevertheless, S&P and Moody's jointly lead the market during the entire period. DBRS did not rate any country except Canada until 2005. There is a subsequent rapid increase such that in December 2016, DBRS rated 36 countries. Overall, DBRS' annual global market share has increased steadily from 0.4% to 8.9%. However, DBRS' market share remains considerably smaller than that of Moody's or S&P, hence we refer to DBRS as an 'emerging small CRA'. DBRS became the fourth CRA granted the NRSRO designator by the SEC in 2003. Kisgen and Strahan (2010) show that DBRS' reputation improved after its regulatory certification, whereby bond yields changed in the direction suggested by its rating actions. On 1st January 2008, DBRS was the only entrant, joining Moody's, S&P and Fitch, to become an External Credit Assessment Institution under the Eurosystem's Credit Assessment Framework, implying that DBRS ratings are considered suitable by the Eurosystem for the acceptance of eligible assets as collateral. Nevertheless, research on DBRS' economic role and the quality of its sovereign ratings is scant, which is partly due to its smaller size compared to Fitch, Moody's and S&P. Prior studies mainly examine DBRS rating quality in the face of competition from more established CRAs in corporate debt (Bae et al., 2019) and structured finance instruments (Flynn and Ghent, 2018). Yet, due to its rapid emergence in the sovereign rating market and its recent regulatory recognition, DBRS becomes a suitable emerging CRA for a study on competition in sovereign ratings.

Table 1 also shows that Fitch ranks third in terms of the overall sovereign rating coverage during the sample period. However, Fitch demonstrates consistent gains in its aggregate market share. Therefore, we refer to Fitch as an 'emerging global CRA' in this paper. In aggregate, Moody's and S&P are the leading CRAs, whereas Fitch has been a distant third CRA in terms of total rating coverage in most asset classes and number of employees engaged

in ratings (White, 2016). Established in 1913, Fitch was a small CRA in the rating industry until the 1990s. The growing prominence of Fitch as an emerging global CRA is the consequence of a rapid consolidation process in the late 1990s. Consequently, Fitch has become a major competitor to Moody's and S&P in various asset classes such as corporate debt (Becker and Milbourn, 2011) and commercial mortgage-backed securities (Cohen and Manuszak, 2013). Fitch's emerging global status has been investigated in the literature. Previous studies have examined the informativeness of Fitch's sovereign credit ratings for financial markets in comparison to Moody's and S&P (e.g., Afonso et al., 2012; Alsakka and ap Gwilym, 2012; Caselli et al., 2016; Livingston and Zhou, 2016), while other studies have explored the economic role of Fitch's ratings in the corporate bond market (e.g., Bongaerts et al., 2012). In the sovereign rating industry, Fitch has also become a major rival to Moody's and S&P. In 1994, Fitch assigned sovereign ratings for only 20 countries, which is less than half the number of countries that were rated by Moody's or S&P. Since then, the market share gap between Fitch and the two-leading global CRAs has been shrinking, whereby the gap was reduced from 11% in 2000 to 1.5% by 2016 (see Table 1).

Fig. 1 presents the annual region market shares of the CRAs during 2000-2016. Region market share of a CRA is the proportion of its sovereign rating coverage in a geographic region to the total rating coverage of the four CRAs for that region. Countries are placed in six regions based on the World Bank's classifications, as follows: Middle East & North Africa, South Asia, Sub-Saharan Africa, East Asia & Pacific, Europe & Central Asia, and Americas, where Americas is a merged entity including North America, Caribbean and Latin America. We find that DBRS' emergence in the sovereign rating market can be split into two stages. From 2005 to 2010, DBRS focuses on extending its market presence in South Asia and the Americas. From 2010 onwards, it encompasses East Asia & Pacific, Europe & Central Asia. DBRS apparently grasped an opportunity to expand its sovereign rating coverage during the European debt crisis.

Most recently, we see initial signals of its penetration into the Middle East & North Africa. Fitch's global coverage continues to rise over the entire period. It maintains a market share of over 30% in four regions including Americas, East Asia & Pacific, Europe & Central Asia, Middle East & North Africa. The region market shares of S&P and Moody's follow a decreasing trend across the years due to the increased competition from the two growing rivals. Moody's market share slides in Sub-Saharan Africa and in Europe & Central Asia, whereas S&P's market share decreases in all six regions.

A summary of the average region market share is displayed in Table 2. DBRS is still absent in Sub-Saharan Africa. Its two most active regions during the entire period are the Americas and South Asia. Fitch has its largest market shares in Sub-Saharan Africa and Europe & Central Asia. Its overall average market share is 29.06%. S&P is ranked first for its overall market share of 35.57% and Moody's is second with 32.36%.

It is clear from Fig. 1 and Table 2 that Fitch is an emerging global CRA with sovereign rating coverage across all six different regions. This partially reflects Fitch's strategy to become a global CRA which rates the full spectrum of segments (corporates, sovereigns, financial institutions, insurance and structured finance instruments). It should be noted that establishing sovereign rating coverage is a necessary pre-cursor to expanding market share in corporate and financial institution ratings (Adelino and Ferreira, 2016; Almeida et al., 2017). DBRS appears to follow a similar strategy. Our data lends support to the observation of the European Commission (2016) that the market for sovereign credit ratings is becoming less concentrated.

Credit ratings are mapped into a 52-point comprehensive credit ratings (CCR) scale, in ascending order of credit quality (see Appendix I). Ratings are adjusted upward by one (two) point(s) for positive outlook (watch) and downward by one (two) point(s) for negative outlook (watch) (similarly to Altdörfer et al., 2019) and many other authors subsequently). We also convert ratings to an 18-notch scale for robustness tests. The 18-notch scale does not account

for the outlook and watch, thus does not reflect the CRA's complete opinion. By definition there is a much larger sample of actions based on the 52-point scale than on the 18-notch scale.

Panel A of Table 3 reports the distributions of sovereign ratings for our sample period. The samples contain all sovereign rating data points for which sovereign-specific time-variant economic fundamentals (see Section 3) are available. DBRS has evidently targeted countries of medium to high credit quality. Table 3 shows that DBRS' average rating is approximately 33.4 CCR points (A-), and 75% of its sovereign ratings are investment-grade (BBB-L or above). S&P's rating coverage includes a larger number of medium to low credit quality countries. Most of its newly added coverage since 2010 includes countries with weak repayment capability such as Ethiopia, Iraq, Nicaragua and the Republic of Congo. Its average ratings (BBB) are two notches lower than DBRS.²⁸ 50% of S&P's sovereign ratings are below investment-grade. Fitch and Moody's rating distributions are broadly comparable to S&P, i.e. they cover a large number of low-rated countries. Moody's mean rating is higher than S&P's by approximately two-thirds of a notch (a watch status), whereas Fitch's mean rating is higher than S&P's by approximately one-third of a notch (an outlook status).

We also conduct a comparison of mean credit ratings with a paired t-test for the four CRAs in our sample. For a meaningful comparison, we compare ratings at specific points in time, selecting the CCR assigned by a given CRA on 1st January each year. The test results appear in Panel B of Table 3. We find that S&P is more stringent than any other CRA. S&P is the most conservative CRA when it comes to sovereign risk assessments, which is in contrast with the corporate debt market wherein Moody has been the most conservative CRA (Livingston et al., 2010; Bowe and Larik, 2014). Table 3 identifies that DBRS rates higher than

²⁸ This observation is reinforced by a recent case. DBRS Morningstar downgraded the UK's sovereign rating from the top level of AAA to AAH on 13th November 2020. S&P rated the UK at AA from December 2019. Moody's had downgraded the UK to Aa3 on 16th October and Fitch had done so (to AA-) in March 2020.

each of the other CRAs by up to one third of a notch (-0.9 difference).²⁹ It is important to note that these differences are much more economically significant than the others in Table 3.

5. Empirical results

5.1. Baseline model - Eq. (1)

The results of OLS estimations of Eq. (1) are reported in Table 4. The first CRA group includes the two market leaders (Moody's and S&P) with stable and dominant market shares during the whole sample period. The second group is Fitch and DBRS.

Panels A and B of Table 4 show that both S&P and Moody's inflate their ratings when Fitch's market share increases. Moody's rating inflation is more severe than that of S&P. For instance, the coefficient on the market share of Fitch in the S&P model is 45.88 and significant at the 1% level. The coefficient is 77.43 in the Moody's model and significant at the 1% level. This suggests that Moody's inflates its sovereign ratings by 4.8 CCR points (1.6 notches) following a one standard deviation increase in Fitch's market share (0.0631) in the previous year. S&P inflates its sovereign ratings by approximately 2.9 CCR points (approximately 1 notch) for the same change in Fitch's market share.³⁰

Fitch emerged to become one of the largest CRAs before the start of our sample period.³¹ A rapid increase in DBRS sovereign rating coverage is observed in the post-2010 period, so a weaker result for DBRS market share is expected. Consistent with our expectation, the DBRS market share coefficient is significant in both S&P and Moody's models, but the coefficients are smaller compared to those on Fitch's market share. Interestingly, we find

²⁹ We conduct the same-paired t-test using ratings based on the 18-notch rating scale, and the inferences remain unchanged.

³⁰ A marginal increase in Moody's average ratings for one standard deviation increase of Fitch's annual region market share (0.0631) is equal to $77.43 \times 0.0631 = 4.8$ CCR points ($4.8/3 = 1.6$ notches). Similarly, the estimated S&P average ratings increase by $45.88 \times 0.0631 = 2.9$ CCR points ($2.9/3 = 0.97$ notches).

³¹ This was achieved by merger and acquisition with Duff & Phelps, IBCA and Thomson BankWatch in 2000.

evidence of sovereign rating deflation from S&P and Moody's when faced with competition from DBRS. Moody's deflates its ratings more than S&P. The coefficient on DBRS market share in the Moody's (S&P) model is -35.81 (-17.52) and statistically significant at the 1% level. This implies a rating decrease of 0.5 (0.3) notch when DBRS market share increases by one standard deviation (0.0448) in the previous year. The magnitude of DBRS' influence on the incumbents' rating strategy is small, but not negligible. Market entry by the smaller CRA apparently does not induce the incumbents to relax their sovereign rating standards.

We investigate the effects of competition on the rating quality of Fitch and DBRS. Panels C and D of Table 4 report the results, which suggest a different strategy from Moody's and S&P. Specifically, Fitch does not appear to inflate its sovereign ratings to gain market share. We find weaker evidence of Fitch's ratings becoming more stringent due to competition from DBRS. The coefficient of DBRS market share in the Fitch model is -13.95. It implies that Fitch's ratings decrease by 0.63 CCR points (0.2 notch) if DBRS market share increases by one standard deviation (0.0448). The results in Panel D confirm that DBRS apparently employs a 'lenient -ratings' policy, i.e. it assigns more generous ratings to support its expanded coverage in the sovereign rating sector. We find that the quality of DBRS ratings is largely affected by Moody's market shares, which emphasises the latter CRA as an important competitor. DBRS sovereign ratings increase by 3.18 CCR (1.06 notch) if Moody's market share in the previous year increases by one standard deviation (0.0718).

Table 5 presents the results of estimating Eq. (1) using only sovereigns rated by *both* the CRA of interest and its competitor. The results in the 'Full sample' column confirm the findings in Table 4. We report from Table 4 that Fitch and DBRS have the opposite effects on Moody's and S&P ratings. To verify the net effects of these two CRAs, we partition our sample into two: (i) a sub-sample for sovereigns which DBRS also rates ('Rated by DBRS' Column), and (ii) a sub-sample for sovereigns which DBRS does not rate ('Not rated by DBRS'

Column).³² We find that Moody's rating inflation in response to Fitch's market share is significant, regardless of whether the sovereigns are rated by DBRS or not.

To consider the ordinal nature of sovereign credit ratings, Eq. (1) is estimated using an ordered probit modelling approach with country and year fixed-effects and using ratings based on the 18-notch rating scale. The results are reported in Table 6 and are consistent with Table 4. The marginal effects reveal additional evidence for our inferences drawn from the OLS regressions. Specifically, increases in Fitch's market share increase the probabilities that S&P and Moody's rate a sovereign at the investment grade and lower the probabilities that they assign speculative-grade ratings.³³ The reverse is true in the case of DBRS market shares. Increased competitive pressure from DBRS incentivises the two market leaders to refrain from inflating sovereign ratings, whereby a sovereign is less likely to be assigned an Aaa/AAA rating by Moody's (S&P) by 40.3% (24%) for example. The ordered probit model confirms our OLS results that Fitch ratings are only responsive to the market entrant DBRS. Fitch becomes more conservative about assigning investment-grade ratings to sovereign issuers. The likelihood for a sovereign to be assigned the highest rating by Fitch decreases by 19.6% which only occurs in the presence of an increase in DBRS market share. We also find evidence that DBRS caters to rating issuers. They become more lenient and this is more pronounced in the case of an increase in Moody's market share. We find that assigning an 'AAA' rating becomes more likely by 18.1% for a unit increase in Moody's market share.

To sum up, our empirical results offer evidence of sovereign rating inflation by Moody's and S&P caused by market competition from Fitch. This is in line with the findings from the literature on the adverse effects of competition on the quality of corporate ratings

³² Because all sovereigns rated by DBRS in Table 4 are rated by all three larger CRAs, Table 5 doesn't present the result for DBRS ratings.

³³ Moving across the speculative-investment threshold is associated with lower liquidity and higher risk premia in the bond market (e.g. Cornaggia et al., 2017).

(Becker and Milbourn, 2011; Bae et al., 2019) and structured finance products (Griffin et al., 2013; Flynn and Ghent, 2018). In contrast, Xia (2014) examines the corporate market penetration of Egan-Jones Rating (EJR) and finds that EJR's market entry results in an improvement in the quality of corporate ratings assigned by S&P. Our analysis finds similar positive effects in the case of DBRS sovereign ratings. We do not find evidence of rating catering on the part of the three larger CRAs when DBRS enters the sovereign credit rating market. Consistent with Flynn and Ghent (2018), who show that the smaller CRAs cater to CMBS issuers' preferences, we find similar signals in the sovereign rating market in the case of DBRS. Our results reveal that DBRS adopts a lenient rating policy as its main strategy to compete with the larger three CRAs. However, we do not find any such evidence for Fitch. Overall, it can be argued that S&P and Moody's regard Fitch as a credible competitor whereas they adopt a reputation-oriented approach in response to the leniency applied by DBRS.³⁴

To investigate the robustness of our baseline model's results (reported in Table 4), we re-estimate Eq. (1) using Two-Stage Least Squares Instrumental Variable (2SLS-IV) regressions. Following Becker and Milbourn (2011), we employ the predicted market share as an instrument for the actual market share. The predicted market share $P_MKS_{k,t}$ for a region k in year t is given as below:

$$P_MKS_{k,t} = MKS_{k,0} + \ln(t) * \frac{MKS_T - MKS_{k,0}}{MKS_{k,0}} \quad (3)$$

Where t denotes the year, k denotes the region, $MKS_{k,0}$ is the market share in the first year of the sample and T is the last year of the sample. MKS_T is the 2016 median market share. Eq. (3) implies that the market share is expected to increase faster in the region where a CRA has a low presence at the beginning of the period. The market share also increases or decreases at

³⁴ As a robustness check, we replace the country fixed effects with the region fixed effects in Eq. (1). The results (available upon request) are strongly consistent with the baseline results using country fixed effects reported in Tables 4 and 5.

a decreasing rate through time. Since the first year's market share might be endogenous, we remove the first year's market share from our regressions. Our results of 2SLS-IV regressions yield coefficients with larger magnitudes than the OLS regressions (in Table 4), and the inferences are predominantly consistent.³⁵ Specifically, our findings concerning Moody's and S&P rating standards being loosened in regions where Fitch's market share is high are supported by the results of 2SLS-IV regressions. These results also provide evidence consistent with our conclusion that the catering channel of competition is applicable for Moody's and S&P but not Fitch. They additionally confirm that DBRS rates sovereigns more leniently to attract business where competition from leading global CRAs is high.

5.2. *Solicited versus unsolicited ratings*

This section investigates the response of each CRA to competition when assigning solicited ratings versus unsolicited ratings. We estimate Eq. (1) using two sub-samples of ratings based on their solicitation status. Fitch sovereign ratings' solicitation status is obtained from the FitchConnect Database. We collect information on Moody's unsolicited ratings from their website (information has been regularly updated by Moody's since September 2010).³⁶ For S&P, we use three reports released on 24th February 2011 in which S&P announced unsolicited ratings for 14 countries (S&P, 2011a, 2011b, 2011c).³⁷ There were additional conversions since 2011, including Turkey in 2013, Sweden and Portugal in 2014, and Saudi Arabia in 2015. Rating solicitation statuses are not reliably identified for DBRS for the entire sample period, which prevents us from any further analysis beyond the scope of the baseline model.

³⁵ The full tabulated results are available on request. The predicted market share is generally found to be a good instrument for the actual market share, based on both the partial R-squared and Z-statistic on the estimate of the predicted market share in the first-stage regressions. This applies in eight out of twelve cases.

³⁶ The list of unsolicited sovereign ratings only concerns the sovereigns rated by Moody's EU offices for the period 2010-2016. Therefore, the coverage of Moody's data in our sub-sample analyses is limited.

³⁷ These include Belgium, France, Germany, Italy, Netherlands, Switzerland, United Kingdom, Australia, Cambodia, India, Japan, Singapore, Taiwan and the United States.

Due to the limitations in solicitation data, sample sizes are reduced to 1417 observations for Fitch's ratings, 369 for Moody's and 789 for S&P. Similar to corporate and structured finance ratings, the majority of sovereign issuers pay CRAs for their sovereign rating service. Approximately 85% of S&P ratings in our sample are solicited by sovereign issuers, whilst it is 82% (76%) in the case of Moody's (Fitch).³⁸

Eq. (1) is estimated using solicited ratings and unsolicited ratings separately, and the results are presented in columns 'Solicited' and 'Unsolicited' of Table 7. Consistent with the baseline model (Table 4), Panel A of Table 7 shows supporting evidence for the effects of the catering channel when S&P faces competition from Fitch. We find that S&P solicited sovereign ratings are not influenced by Moody's market shares, but they are significantly higher when Fitch's market shares increase. The main competition threat to S&P comes from emerging CRAs, Fitch and DBRS, consistent with the results reported in Table 4. Also, S&P's average solicited ratings increase by approximately 1.9 CCR points for a one standard deviation increase in Fitch's market shares (6.31%) in the previous year, which supports our rating inflation hypothesis (H1_b). Finally, consistent with the baseline model, S&P's ratings become more conservative when DBRS joins the market, with the effects being significant for both S&P's unsolicited ratings and solicited ratings. This is in line with the reputation channel, i.e. incumbent CRAs raise their rating standards for both solicited and unsolicited ratings.

Panel B of Table 7 reports the results of Eq. (1) for Moody's solicited and unsolicited ratings. The results should be interpreted with a caveat because the data only concerns

³⁸ It is documented in the literature that unsolicited bank ratings are strategically lower than solicited bank ratings due to CRAs' conservatism (Poon et al., 2009, Van Roy, 2013, Bannier et al., 2010). Unsolicited ratings can be used as a blackmail tool by CRAs to extract higher fees from customers (Fulghieri et al., 2014). However, this might not be the case for sovereign ratings. Our data shows that the average unsolicited rating is higher than the average solicited ratings by 2.5 notches to 4.7 notches. The majority of countries which are assigned unsolicited sovereign ratings are advanced economies that attract the greatest market attention, such as Australia, France, Belgium, Germany, Italy, Japan, Singapore, United Kingdom, and United States. Therefore, it is more likely that CRAs assign unsolicited sovereign ratings to underpin their activities in non-sovereign ratings in a particular jurisdiction.

sovereigns rated by Moody's EU offices during 2010-2016. In contrast with the baseline model, we do not find a significant impact of a DBRS market share on Moody's solicited and unsolicited ratings. Yet, we find evidence of Moody's rating inflation due to competition effects from Fitch and S&P when Moody's is solicited to rate sovereigns. This is consistent with our expectation that the catering channel is more pronounced among solicited ratings.

Panel C reports the results of Eq. (1) using Fitch's solicited and unsolicited rating subsamples. We do not find any evidence supporting the inflation hypothesis for both solicited and unsolicited Fitch ratings in response to changes in Moody's and S&P's market shares. This finding implies that Fitch does not relax their standards nor inflate their sovereign solicited ratings to win market shares from S&P or Moody's. Consistent with the baseline model, Fitch assigns more conservative solicited ratings due to DBRS' rising prominence in the market, though the coefficient of -8.919 is small.³⁹

In summary, the results of Eq. (1) estimated using solicited and unsolicited ratings' subsamples are consistent with our key conclusions in Section 5.1. The results highlight that Fitch's increasing market share prompts S&P and Moody's to relax their rating standards for sovereigns with whom they have a rating contract. Our results shed light on Fitch as the most important rising competitor, whose market presence motivates S&P and Moody's to understate risk. Consistent with the results of the model for the full sample, DBRS has had some mitigating effects on the upward bias of S&P's solicited and unsolicited ratings, though such effects are rather small in economic terms.

³⁹ Resembling the approach of Section 5.1, our results (available on request) of Eq. (1) for solicited joint ratings and unsolicited joint ratings remain largely unchanged.

5.3. The rating-competition relationship across economic cycles and CRA regulations

We analyse whether the effects of competition on sovereign ratings attenuate under a stringent regulatory regime and/or vary across economic cycles. The results of Eq. (2) are presented in Table 8 for S&P and Moody's and in Table 9 for Fitch and DBRS. The moderating effects of CRA Regulation (and economic cycles) on rating-competition relationship are captured by $Post_Reg_{i,t} * MKS_{j',t-1}$. ($Rec_{i,t} * MKS_{j',t-1}$). First, we find that the results in Section 5.1 regarding the rating-competition relation (captured by MKS) are robust to the inclusion of $Post_Reg$ and Rec variables. Specifically, S&P and Moody's are sensitive to the growing presence of Fitch. We do not find evidence of rating inflation by Fitch, while inflated ratings by DBRS are revealed in response to increased market share of larger CRAs.

In line with our expectations, the results show evidence of a shift in the competition-rating relationship after the CRA regulatory reforms. The coefficient of $Post_Reg * MKS$ has an opposite sign to that of the market share, implying that all four CRAs have shifted emphasis towards compliance. The responses of S&P and Moody's are more pronounced than the smaller CRAs. For example, for a one standard deviation increase in Fitch's market share (0.0631), $Post_Reg * MKS$ in Table 8 shows that S&P's rating in the post-regulatory period declines by 1.9 CCR points (0.6 notch). The coefficient of Fitch's market share in the S&P's model is 54.2, implying a rating increase by 3.42 CCR points (1.1 notches) in response to a one standard deviation increase of Fitch's market share. The two results combined imply that S&P ratings' sensitivity to Fitch's market share in the post regulatory period has declined by 56% (1.9 CCR/3.42 CCR or 30.17/54.2). Similar results are obtained for Moody's ratings. $Post_Reg * MKS$ implies that Moody's ratings' sensitivity to Fitch's market share in the post-regulatory period drops by 55% (47.21/85.33).

Table 9 confirms our baseline model's results for DBRS. In the post-regulatory period, DBRS concentrates on broadening its rating coverage to countries with upper-medium to

strong repayment capacity. Most of the newly rated countries in this period are in Europe and East Asia-Pacific. This partly explains the significant and positive coefficient on the *Post_Reg*MKS* variable (models with Moody's and S&P as competitors). Regulatory pressure has a similar influence on DBRS as on S&P and Moody's. DBRS ratings' sensitivity to Fitch market share in the post-regulatory period drops by 86% (39.69/46.31).

Since the recessions fall within the pre-regulation period, the coefficients obtained disentangle the counter-cyclical effects from the regulation effects. Consistent with the corporate rating literature, we find evidence supporting Bar-Isaac and Shapiro's (2013) theory about the counter-cyclical effects for Moody's and Fitch, but not for DBRS.⁴⁰ *Rec* coefficients suggest an average decline in Fitch's rating level by 5.6 CCR points (1.9 notches) and a decline of 4.3 CCR points (1.4 notches) in Moody's rating levels during recessions. Further, the *Rec*MKS* coefficient is negative and significant in the case of S&P's model (with Fitch as a competitor), suggesting that S&P becomes more protective of its reputation in economic recessions, weakening its motivation to inflate ratings when facing competition from Fitch.

In summary, our results concerning the impact of competition on sovereign rating levels are robust to the inclusion of regulation and economic cycle effects. Regulatory reforms have resulted in a weaker influence of competition pressure on CRAs' rating strategy. All four CRAs react similarly to CRA regulatory reforms, but we find a stronger response from S&P and Moody's. There is an increase in rating conservatism by Moody's and Fitch during economic downturns, in line with Bar-Isaac and Shapiro's (2013) theory. Also, S&P rating inflation diminishes in recessions due to its increasing awareness of reputation protection.

⁴⁰ DBRS rated Canada only at the time of the 2000 recession and its rating assigned to Canada during this period was stable at the second highest category AA-H. For the 2007-09 recession, DBRS had extended its market coverage from 1 to 9 countries; with most of the new coverage being Latin American countries where ratings remained stable.

6. Conclusions

This paper investigates how increased competitive threats impact on the level of sovereign credit ratings. We examine whether CRAs relax or tighten their rating standards to maintain or increase market share. Our empirical investigation benefits from a large dataset of long-term foreign currency sovereign credit ratings assigned by the largest two CRAs, Moody's and S&P, Fitch (as an emerging global CRA) and DBRS (as an emerging small CRA). Two hypotheses to explain the impact of competition on CRAs' rating standards are offered. Our first hypothesis is concerned with reputation. Under the reputation channel, CRAs respond to competition by mobilizing resources in enhancing their reputation for rating quality. The alternative hypothesis is concerned with catering. Under the catering channel, CRAs attract business by employing less stringent rating standards. We anticipate that the reputation channel results in a better quality of both solicited and unsolicited ratings, whereas the catering channel results in rating standards being loosened particularly for solicited ratings. We expect that rating inflation occurs under the catering channel but not under the reputation channel.

Our results reveal that Moody's and S&P tend to inflate their sovereign ratings in response to Fitch's growing prominence in the sovereign rating segment and the effect is stronger for solicited ratings. Our results imply that competition does not alleviate the conflict of interest problem among the two largest CRAs which apply the issuer-pays business model. The emergence of DBRS does have some mitigating effects, but it's not strong enough to eliminate the structural shift to the higher end of the rating scale, especially for Moody's. In contrast to Moody's and S&P, we find no evidence of rating inflation applied by Fitch. There is a rapid increase in DBRS rating coverage, particularly in the post-2010 period for medium to high credit quality sovereigns. DBRS employs a relatively lenient rating policy than its larger competitors. The growing prominence of DBRS has mixed effects: (i) they cause the larger CRAs to tighten their rating standards for both solicited and unsolicited ratings, and (ii) DBRS

inflate their own sovereign ratings to build market share, apparently exploiting the European debt crisis to some extent.

We examine whether the rating-competition relationship varies across economic cycles and after the recent regulatory reforms of rating industry in the US (2010 Dodd-Frank Act) and Europe (CRA Regulation No 1060/2009 and the establishment of ESMA in 2010). We find that more stringent regulatory measures attenuate the catering phenomenon caused by competition, particularly in the cases of S&P and Moody's. We also show that the rating-competition relationship varies across the economic cycle, in line with Bar-Isaac and Shapiro's (2013) theory. There is an increase in Moody's and Fitch rating conservatism during economic downturns, while S&P is more protective of its reputation in recessions than in booms.

The results in this paper are of interest to various parties including regulators and the investors whose decisions rely on CRAs' sovereign credit opinions. The paper has practical implications for the future proposed competition-enhancing measures by regulators. One of the matters that concerns CRA regulators is to reduce the entry barriers for smaller CRAs. In its report on the state of the credit rating market, the SEC (2016) points out a number of difficulties confronting smaller CRAs. They include the minimum rating requirements that smaller CRAs must meet for their ratings to be used in certain investment contracts, and the fact that major fixed income indices require ratings from specified NRSROs. The European Commission (2016) also highlights the regulatory barriers to market entry. Due to extremely strict requirements concerning rating coverage, none of the smaller CRAs, other than DBRS, is eligible for the External Credit Assessment Institutions (ECAI) certification under the Eurosystem's Credit Assessment Framework. This implies a need for future measures to reduce the entry barriers emanating from regulations which inhibit competition. In this context, it is essential that smaller CRAs take every opportunity to convey rating quality and credibility.

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Table 1: Sovereign issuer ratings assigned by S&P, Moody's, Fitch, DBRS during the period 2000-2016

Number of sovereign issuer ratings during a year					Annual global market shares %			
Year	S&P	Moody's	Fitch	DBRS	S&P	Moody's	Fitch	DBRS
2000	86	96	69	1	34.1	38.1	27.4	0.4
2001	89	96	71	1	34.6	37.4	27.6	0.4
2002	92	96	78	1	34.5	36.0	29.2	0.4
2003	98	96	84	1	35.1	34.4	30.1	0.4
2004	105	99	89	1	35.7	33.7	30.3	0.3
2005	107	100	95	1	35.3	33.0	31.4	0.3
2006	111	102	99	5	35.0	32.2	31.2	1.6
2007	114	105	103	8	34.6	31.8	31.2	2.4
2008	120	106	102	9	35.6	31.5	30.3	2.7
2009	120	107	103	9	35.4	31.6	30.4	2.7
2010	121	111	105	13	34.6	31.7	30.0	3.7
2011	123	112	106	21	34.0	30.9	29.3	5.8
2012	122	117	106	25	33.0	31.6	28.6	6.8
2013	124	122	110	29	32.2	31.7	28.6	7.5
2014	123	125	113	31	31.4	31.9	28.8	7.9
2015	123	126	118	33	30.8	31.5	29.5	8.3
2016	124	128	118	36	30.5	31.5	29.1	8.9

Table 1 reports the annual evolution of global coverage of sovereign credit ratings assigned by S&P, Moody's, Fitch and DBRS. Panel A presents the number of countries rated by a CRA each year from 2000 to 2016. Panel B presents the annual global market shares. To obtain the annual global market shares, we obtain the row-total of Panel A and divide the number in a cell for a CRA by the corresponding row-total. Each sovereign with ratings in a year is considered as one rating observation regardless of how many times the ratings are revised during the year.

Table 2: Summary statistics of region market shares during the period 2000-2016

Regions	DBRS	Fitch	Moody's	S&P
Americas				
Mean	6.61	24.39	35.71	33.29
Standard Deviation	4.05	1.39	2.85	2.04
East Asia & Pacific				
Mean	1.19	29.51	34.96	34.34
Standard Deviation	2.41	1.15	1.36	1.42
Europe & Central Asia				
Mean	4.25	31.64	31.78	32.33
Standard Deviation	5.70	2.24	1.96	1.77
Middle East & North Africa				
Mean	0.29	28.44	36.64	34.63
Standard Deviation	0.81	2.69	3.14	1.66
South Asia				
Mean	5.74	23.02	33.67	37.56
Standard Deviation	5.17	4.59	5.72	3.55
Sub-Saharan Africa				
Mean	0.00	37.36	21.37	41.27
Standard Deviation	0.00	8.47	10.01	5.82
Total				
Mean	3.01	29.06	32.36	35.57
Standard Deviation	4.48	6.31	7.18	4.30

This table summarises the annual region market share for each CRA. We identify six geographic regions in accordance with the World Bank's region classifications. We merge North America and Caribbean with Latin America and denote the merged one as Americas. Panel Total presents the average market share across the six regions and 17 years and its standard deviation. The remaining panels present the average market shares across 17 years for each CRA in each region.

Table 3: Summary statistics of sovereign issuer credit ratings

Panel A: Sovereign credit rating distributions					
	S&P	Moody's	Fitch	DBRS	
Mean	27.8	29.7	28.6	33.6	
Std. dev.	14.5	14.7	14.1	14.6	
Minimum	1	1	1	1	
Median	25	28	26	33	
Maximum	52	52	52	52	
No of obs	1556	1384	1417	276	

Panel B: Comparison of mean credit ratings assigned to the same sovereigns					
CRA2	N	CRA1 mean ratings	CRA2 mean ratings	Difference	t-stat
CRA1= S&P					
Moody's	1659	29.25	29.58	-0.33***	-4.73
Fitch	1517	29.70	29.91	-0.20***	-3.69
DBRS	225	36.06	36.96	-0.89***	-5.15
CRA1= Moody's					
Fitch	1,452	30.82	30.57	0.25***	3.49
DBRS	225	36.05	36.96	-0.91***	-4.55
CRA1=Fitch					
DBRS	225	36.06	36.96	-0.89***	-6.53

Panel A of this table reports the sample distributions of sovereign credit ratings assigned by S&P, Moody's, Fitch and DBRS from 2000 to 2016. The samples contain all rating data points for which data on sovereign economic fundamentals is available (details are reported in Appendix II). Panel B presents the mean rating comparison paired t-test for all sovereigns assigned by S&P, Moody's, Fitch and DBRS during the period 2000-2016. For a meaningful comparison, the ratings on 31st December each year are selected. '52-point CCR' refers to ratings that are converted using the 52-point numerical scale that considers outlook and watch statuses. *** denotes that the difference is statistically significant at the 1% level.

Table 4: The effects of competition on sovereign credit ratings

Panel A: S&P ratings				Panel C: Fitch ratings			
MKS (Moody's)	1.156 (0.34)			MKS (S&P)	-13.71 (-1.57)		
MKS (Fitch)		45.88*** (4.94)		MKS (Moody's)		5.109 (1.38)	
MKS (DBRS)			-17.52*** (-4.58)	MKS (DBRS)			-13.95*** (-3.81)
Macro-economic controls	Yes	Yes	Yes	Macro-economic controls	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Country & year fixed effects	Yes	Yes	Yes
N	1556	1556	1556	N	1417	1417	1417
adj. R-sq	0.936	0.938	0.937	adj. R-sq	0.939	0.939	0.940
Panel B: Moody's ratings				Panel D: DBRS ratings			
MKS (S&P)	20.14 (1.24)			MKS (S&P)	29.03 (0.96)		
MKS (Fitch)		77.43*** (6.82)		MKS (Moody's)		44.33*** (4.72)	
MKS (DBRS)			-35.81*** (-7.04)	MKS (Fitch)			12.73 (1.08)
Macro-economic controls	Yes	Yes	Yes	Macro-economic controls	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Country & year fixed effects	Yes	Yes	Yes
N	1384	1384	1384	N	276	276	276
adj. R-sq	0.913	0.918	0.916	adj. R-sq	0.982	0.983	0.982

This table reports the results of Eq. (1) using OLS for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 52-point numerical rating scale) by S&P in Panel A, Moody's in Panel B, Fitch in Panel C and DBRS in Panel D. Market share of a CRA *MKS* is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA. There are six regions including: Americas (including North America, Caribbean, and Latin America), East Asia and Pacific, Europe and Central Asia, Middle East and North Africa, South Asia, and Sub-Saharan Africa. Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details are in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 5: The effects of competition on sovereign credit ratings – jointly rated sovereigns

	Full sample	Rated by DBRS	Not rated by DBRS	Full sample	Rated by DBRS	Not rated by DBRS	Full sample
Panel A: S&P ratings							
MKS (Moody's)	1.473 (0.21)	41.93*** (3.10)	-6.696 (-0.97)				
MKS (Fitch)				47.79*** (4.66)	30.39 (1.56)	21.30** (2.30)	
MKS (DBRS)							-55.02*** (-5.53)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1459	293	1166	1474	293	1181	293
adj. R-sq	0.933	0.970	0.944	0.936	0.969	0.946	0.971
Panel B: Moody's ratings							
MKS (S&P)	18.65 (1.10)	261.3*** (2.93)	33.42*** (2.96)				
MKS (Fitch)				79.37*** (6.51)	83.04** (2.37)	40.58*** (3.52)	
MKS (DBRS)							-107.9*** (-4.73)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1353	268	1085	1326	268	1058	268
adj. R-sq	0.913	0.958	0.935	0.917	0.956	0.936	0.961
Panel C: Fitch ratings							
MKS (S&P)	-11.33 (-1.24)	142.1** (2.65)	-1.734 (-0.25)				
MKS (Moody's)				-3.320 (-0.58)	39.82*** (2.77)	-4.935 (-0.92)	
MKS (DBRS)							-64.97*** (-4.61)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1369	261	1108	1313	261	1052	261
adj. R-sq	0.938	0.964	0.955	0.935	0.963	0.953	0.965

This table reports the results of Eq. (1) using OLS for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 52-point numerical rating scale) by S&P in Panel A, Moody's in Panel B and Fitch in Panel C. Market share of a CRA MKS is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA (see Table 4). Column 'Full sample' indicates that sovereigns are jointly rated by the CRA of interest and its competitor, whose market share appears on the RHS of the regression equation, in the last 12 months. 'Rated by DBRS' ('Not rated by DBRS') indicates that, in addition to the competitor CRA, ratings are also rated (not rated) by DBRS (details in Table 4). Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 6: The effects of competition on sovereign credit ratings: Ordered probit model

	<u>Coef</u>	t-stat	<u>Marginal effects</u>							
			<=CC	CCC	B	BB	BBB	A	AA	AAA
Panel A: S&P ratings										
MKS (Fitch)	14.99***	(4.84)	-0.341	-0.276	-0.153	-0.144	0.091	0.106	0.099	0.502
MKS (DBRS)	-7.20***	(-5.09)	0.163	0.134	0.079	0.078	-0.048	-0.053	-0.048	-0.240
Panel B: Moody ratings										
MKS (Fitch)	20.96***	(7.03)	-0.237	-0.543	-0.191	-0.261	0.099	0.109	0.338	0.770
MKS (DBRS)	-10.63***	(-7.68)	0.120	0.266	0.109	0.134	-0.06	-0.054	-0.168	-0.403
Panel C: Fitch ratings										
MKS (DBRS)	-6.19***	(-4.66)	0.100	0.07	0.110	0.063	-0.054	-0.021	-0.074	-0.196
Panel D: DBRS ratings										
MKS (Moody's)	38.20***	(3.87)	-1.175	-0.787	1.784	-0.629	0.908	-0.438	0.624	0.181

This table reports the results of Eq. (1) using ordered probit for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 18-notch numerical rating scale) by S&P in Panel A, Moody's in Panel B, Fitch in Panel C and DBRS in Panel D. Market share of a CRA *MKS* is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA (see Table 4). Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 7: The effects of competition on solicited ratings versus unsolicited ratings

	Solicited	Unsolicited	Solicited	Unsolicited	Solicited	Unsolicited
Panel A: S&P Ratings 2011 – 2016						
MKS (Moody's)	-1.793 (-0.42)	75.73*** (2.86)				
MKS (Fitch)			30.78*** (2.91)	30.17** (2.16)		
MKS (DBRS)					-28.35*** (-4.33)	-39.04*** (-3.75)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	669	120	669	120	669	120
adj. R-sq	0.956	0.978	0.957	0.977	0.957	0.979
Panel B: Moody's Ratings 2010 - 2016 (sovereigns rated by Moody's EU offices)						
MKS (S&P)	73.33** (2.39)	50.21 (0.48)				
MKS (Fitch)			110.4*** (3.29)	136.3 (1.03)		
MKS (DBRS)					-17.96 (-0.89)	158.7 (1.27)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	303	66	303	66	303	66
adj. R-sq	0.898	0.971	0.900	0.971	0.897	0.972
Panel C: Fitch Ratings 2000 -2016						
MKS (S&P)	-13.61 (-1.52)	-6.517 (-0.40)				
MKS (Moody's)			1.422 (0.35)	5.124 (0.67)		
MKS (DBRS)					-8.919** (-2.07)	-6.475 (-1.24)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1077	340	1077	340	1077	340
adj. R-sq	0.917	0.956	0.917	0.956	0.917	0.956

This table reports the results of Eq. (1) for solicited ratings and unsolicited ratings separately, using OLS for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 52-point numerical rating scale) by S&P in Panel A, Moody's in Panel B, Fitch in Panel C and DBRS in Panel D. Market share of a CRA *MKS* is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA. There are six regions including: Americas (including North America, Caribbean, and Latin America), East Asia and Pacific, Europe and Central Asia, Middle East and North Africa, South Asia, and Sub-Saharan Africa. Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details are in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 8: The effects of competition on sovereign credit ratings: Economic recessions and CRA regulation – S&P and Moody's

	Panel A: S&P			Panel B: Moody's		
	MKS (Moody's)	MKS (Fitch)	MKS (DBRS)	MKS (S&P)	MKS (Fitch)	MKS (DBRS)
Rec	-0.521 (-0.21)	6.955*** (3.20)	1.797*** (3.54)	-30.25*** (-2.71)	-4.342* (-1.88)	-1.886* (-1.82)
Post_Reg	-6.738** (-2.06)	9.995*** (5.08)	0.367 (1.15)	-34.74*** (-3.84)	14.97*** (5.42)	0.399 (0.84)
MKS	-9.681 (-1.28)	54.20*** (6.54)	-30.72*** (-4.09)	-42.08* (-1.83)	85.33*** (8.76)	-52.19*** (-5.87)
Rec*MKS	7.459 (1.01)	-16.08** (-2.49)	14.86** (2.15)	85.57** (2.58)	9.777 (1.28)	11.37 (1.45)
Post_Reg*MKS	22.99** (2.44)	-30.17*** (-4.45)	14.29** (2.05)	104.7*** (4.14)	-47.21*** (-5.19)	20.79** (2.27)
Constant	21.96*** (6.51)	-1.252 (-0.39)	17.55*** (11.59)	33.93*** (3.78)	-7.276* (-1.67)	21.41*** (9.59)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1556	1556	1556	1384	1384	1384
adj. R-sq	0.937	0.939	0.937	0.915	0.919	0.916

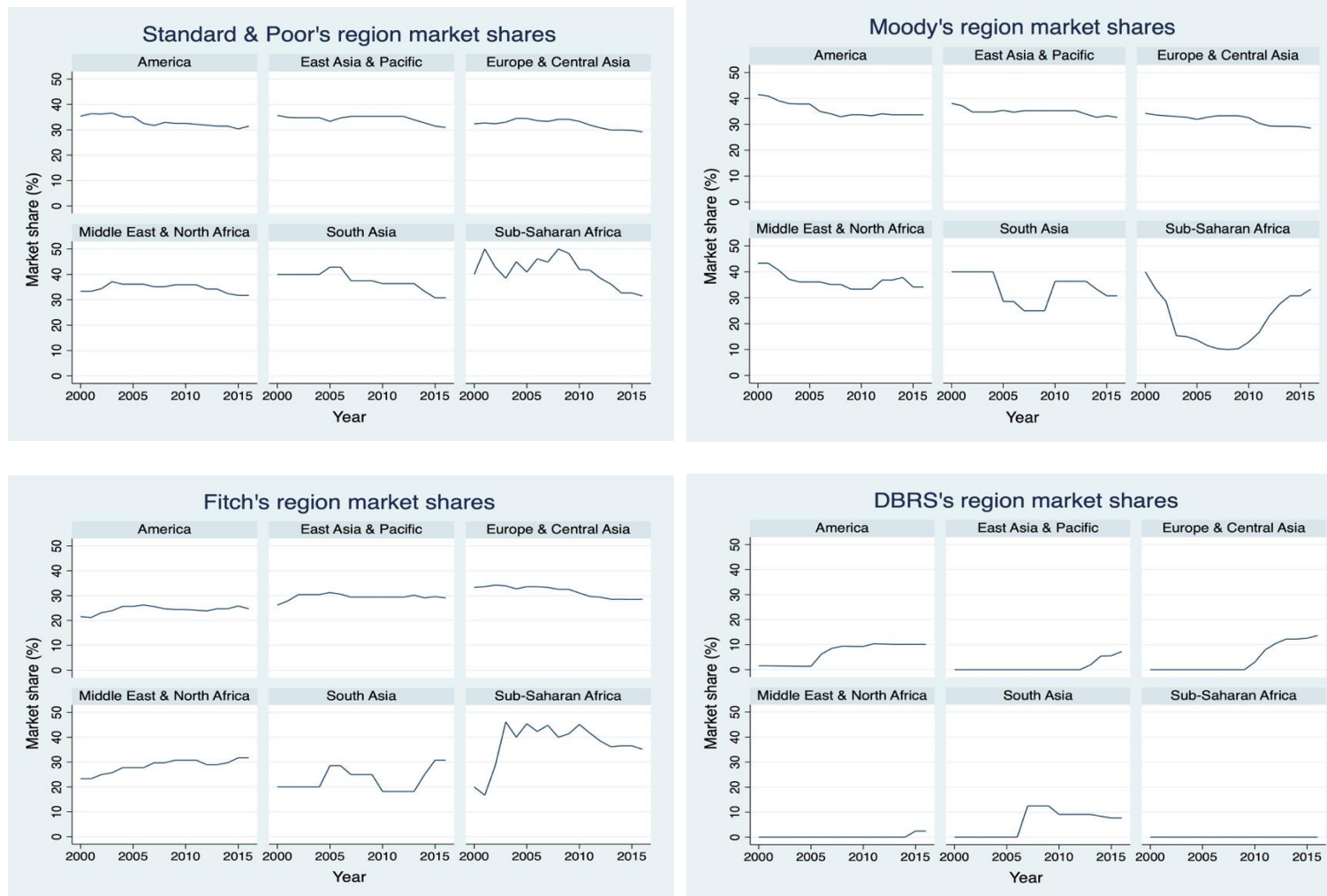
This table reports the results of Eq. (2) using OLS for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 52-point numerical rating scale) by S&P in Panel A and Moody's in Panel B. Market share of a CRA *MKS* is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA (see Table 4). *Rec* is the dummy for ratings assigned during either of the economic recessions identified by the NBER: March 2001-November 2001 and December 2007-June 2009. *Post-Reg* is a dummy taking the value of one for ratings assigned after the regulatory reforms of CRAs (ratings assigned on or after 21st July 2010), and zero otherwise. Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Table 9: The effects of competition on sovereign credit ratings: Economic recessions and CRA regulation - Fitch and DBRS

	Panel A: Fitch			Panel B: DBRS		
	MKS (S&P)	MKS (Moody's)	MKS (DBRS)	MKS (S&P)	MKS (Moody's)	MKS (Fitch)
Rec	-5.621*	-3.115	0.0832	7.691	-2.064	-44.26
	(-1.70)	(-1.45)	(0.13)	(1.42)	(-0.73)	(-0.90)
Post_Reg	-6.329	-6.436**	-0.866*	-21.04***	-21.92**	12.47***
	(-1.51)	(-2.22)	(-1.70)	(-2.87)	(-2.12)	(3.63)
MKS	-23.07*	-4.758	-31.75***	0.115	9.734	46.31***
	(-1.92)	(-0.68)	(-3.19)	(0.00)	(0.58)	(2.72)
Rec*MKS	17.09*	10.75	13.44	-17.96	11.92	187.1
	(1.82)	(1.57)	(1.52)	(-1.19)	(1.20)	(0.94)
Post_Reg*MKS	16.93	18.84**	21.52**	67.42***	68.36**	-39.69***
	(1.48)	(2.40)	(2.32)	(3.17)	(2.22)	(-3.27)
Constant	25.49***	20.50***	17.72***	18.19	13.32	4.710
	(5.32)	(6.41)	(10.79)	(1.68)	(1.04)	(0.47)
Macro-economic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country & year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	1417	1417	1417	276	276	276
adj. R-sq	0.939	0.940	0.940	0.983	0.983	0.982

This table reports the results of Eq. (2) using OLS for a sample period of January 2000 to December 2016. The dependent variable is the sovereign CCR (based on a 52-point numerical rating scale) by Fitch in Panel A and DBRS in Panel B. Market share of a CRA *MKS* is the annual fraction of long term foreign currency sovereign credit ratings in a geographic region assigned by that CRA (see Table 4). *Rec* is the dummy for ratings assigned during either of the economic recessions identified by the NBER: March 2001-November 2001 and December 2007-June 2009. *Post-Reg* is a dummy taking the value of one for ratings assigned after the regulatory reforms of CRAs (ratings assigned on or after 21st July 2010), and zero otherwise. Country fixed-effects, year fixed-effects, and a set of nine macro-economic variables (details are in Appendix II) are included in all estimations. Standard errors are clustered by regions and years. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

Fig. 1: The evolution of region market shares of S&P, Moody's, Fitch and DBRS during the period 2000-2016



Appendix I

Rating scales and numerical conversion

S&P	Moody's	Fitch	DBRS	18-notch	52 CCR
AAA	Aaa	AAA	AAA	18	52
AA+	Aa1	AA+	AA-L	17	49
AA	Aa2	AA	AA	16	46
AA-	Aa3	AA-	AA-L	15	43
A+	A1	A+	A-H	14	40
A	A2	A	A	13	37
A-	A3	A-	A-L	12	34
BBB+	Baa1	BBB+	BBB-H	11	31
BBB	Baa2	BBB	BBB	10	28
BBB-	Baa3	BBB-	BBB-L	9	25
BB+	Ba1	BB+	BB-H	8	22
BB	Ba2	BB	BB	7	19
BB-	Ba3	BB-	BB-L	6	16
B+	B1	B+	B-H	5	13
B	B2	B	B	4	10
B-	B3	B-	B-L	3	7
CCC+	Caa1		CCC-H	2	4
CCC	Caa2	CCC	CCC	2	4
CCC-	Caa3		CCC-L	2	4
CC	Ca	CC	CC-H/CC/CC-L	1	1
R/SD/D	C	C/RD/D	C-H/C/C-L/ D	1	1

The 52-CCR (comprehensive credit rating) involves adjustment of 1 (2) point(s) if a sovereign is rated with positive outlook (under review for possible upgrade) and by -1 (-2) point(s) if a sovereign is rated with negative outlook (under review for a possible downgrade).

Appendix II

Macroeconomic variables

Variables	Specifications	Data Sources
L_inflation_3yav	Inflation, consumer prices - Lagged 3-year average	World Bank WDI
L_bank_capasst	Bank capital and reserves to asset ratio – Lagged one year	World Bank WDI
L_cabal_3yav	Current account balance (% of GDP) – Lagged 3-year average	World Bank WDI
L_gdp_growth_3yav	GDP growth (annual %) – Lagged 3-year average	World Bank WDI
L_gdp_pc	GDP per capita – Lagged one year	World Bank WDI
L_grossdebt_gdp	General government gross debt (% of GDP) – Lagged one year	World Economic Outlook
L_wgi_av	Average of six Worldwide Governance Indicators – Lagged one year	World Bank WGI
L_govbal_3yav	General Government budget balance (% of GDP) – lagged 3-year average	Various sources (IMF, Eurostat, national governments and national statistics agencies)
df_dummy	Default dummy (1 for past defaults and 0 otherwise)	<ul style="list-style-type: none"> - Fitch Global Sovereign 2016 Transition and Default Study - Moody's Sovereign Default and Recovery Rates, 1983-2016 - S&P 2016 Annual Sovereign Default Study and Rating Transitions