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How do sovereign credit ratings help to financially develop low-developed countries?

Prabesh Luitel and Rosanne Vanpée

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Prabesh Luitel and Rosanne Vanpée*

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Abstract

This paper investigates the importance of having a sovereign credit rating for a country's financial development. After controlling for endogeneity and selection bias, we compare different aspects of the financial sector and the capital markets of recently rated countries with otherwise similar, but unrated countries. We find that obtaining a sovereign credit rating changes the composition of the assets of domestic banks and leads to a growth in bank assets. With a sovereign rating, the government is less dependent on bank financing and it can tap international bond markets. Banks subsequently provide more credit to the private sector, which translates into riskier debt holdings, resulting in an increase in the banks' risk-weighted assets. We also show that an initial sovereign credit rating attracts foreign investors, both FDI and portfolio investments. Hence, we conclude that a sovereign credit provision plays a crucial role in enabling the financial development in a country.

* Prabesh Luitel is a researcher at the Research Centre for Finance, KU Leuven, Brussels Campus (Prabesh.luitel@kuleuven.be). Rosanne Vanpée is assistant professor at the Faculty of Economics and Business (FEB) and head of the Research Centre for Finance, KU Leuven, Brussels Campus (Rosanne.vanpee@kuleuven.be). We thank Igor Loncarski, Stefan Hirth, Mike Mariathasan, Piet Sercu, Bert d'Espallier and Lieven De Moor, as well as participants in seminars at the University of Ljubljana and the 2018 Annual Conference of ECMI for very helpful comments and discussions. The paper received the Best Paper Award at the 2018 Annual Conference of the European Capital Markets Institute (ECMI). We gratefully acknowledge financial support of the National Bank of Belgium (NBB) and ECMI. The opinions expressed are strictly those of the authors and do not necessarily reflect the views of the NBB. We accept full responsibility for any remaining errors.

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1 Introduction

When a country solicits for a sovereign credit rating at one of the globally recognized ratings agencies (Moody's, Standard & Poor's and Fitch), this typically reflects the intention to borrow internationally. A sovereign credit rating helps to obtain financing from abroad because the rating serves as a focal point in financial monitoring and acts as an information equalizer in investment decisions (Boot et al. (2005)). Credit ratings aim to assess the debt issuer's default risk and help investors to determine the risk premium they should demand to compensate for this default risk. When a country gets rated for the first time, uncertainty about the credit risk of opaque sovereigns reduces significantly, which in turn will help to channel more funds towards these typically less developed countries.

A sovereign credit rating is of great economic importance for a country that intends to issue debt securities. Having a credit rating is instrumental for attracting (foreign) investments because many investors prefer rated securities over unrated ones of apparently similar credit risk (Cantor & Packer, 1996). Boot et al. (2005) show that credit rating agencies play an economically meaningful role in reducing financial fragility in two ways. First, the agencies' credit watch procedures reduce monitoring costs. Second, credit ratings play a crucial role in the investment allocation decision of institutional investors like pension fund managers who are bound by regulatory constraints. The importance of sovereign credit ratings is further highlighted by Kim and Wu (2008) who show that foreign currency debt ratings encourage financial sector development and are a catalyser in attracting capital flows. They find that local currency ratings are also important for the development of domestic stock and bond markets, but local ratings do not help to attract foreign funds. A well functioning local bond market is important for financial stability because it allows countries to issue longer-term bonds in local currency. This mitigates the problem of original sin, the notorious currency mismatch and maturity mismatch in debt positions of emerging economies.

In this paper, we investigate the transmission channels through which a sovereign credit rating impacts a country's domestic and international financial development. Figure 1 illustrates the idea. We make a distinction between the domestic financial sector and a country's integration in the international financial markets. Establishing a causal link between credit rating provision and financial development is an exercise plagued by endogeneity issues and selection bias. We control for both problems simultaneously by preprocessing the data with an entropy balancing approach and a Heckman selection correction. This process ensures a valid

comparison of rated and unrated countries. Earlier studies mainly focus on rated countries only and the impact of down- and upgrades on their financial markets. Our focus is somewhat different. We investigate whether and to what extent having a sovereign rating has an impact on a country's financial development. This differentiation of rated and unrated countries in terms of financial development has, to our best knowledge, not yet been investigated so far. The validity of our results depends to a great extent on the precision by which we can match rated and unrated countries. Therefore, we run a series of robustness checks by applying alternative matching methods.

We find that when a country receives its initial rating, banks change their asset portfolio. Because new borrowing channels open up for the government, it becomes less dependent on bank financing. As a result, claims from banks to the government reduce and banks increase their borrowing to the private sector. Because private debt is typically more risky than sovereign debt, the banks' risk-weighted assets increase. We also find that a sovereign credit rating helps to attract foreign investors. After a country is rated, its ratio of inward foreign direct investments to GDP is three percent higher compared to unrated countries. Foreigners hold also more portfolio investments from recently rated countries. After receiving the initial rating, portfolio investments to GDP are one to two percent higher in rated countries, both in the short and the long term.

The paper is structured as follows. Section 2 reviews the relevant literature on the impact of sovereign credit risk on a country's financial market. In Section 3 we explain the entropy balancing methodology and Section 4 describes the data. We examine the impact of an initial sovereign credit rating on financial development in Section 5 and in Section 6 we provide the results of the robustness checks. Section 7 concludes.

2 Sovereign credit risk and financial development - previous literature

The objective of this paper is to analyze the impact of obtaining a sovereign credit rating on the financial development of a country. To get a better understanding of the potential spillover effects of a sovereign credit rating, we describe in the following sections the transmission channels of sovereign credit risk to the financial system. More specifically, we discuss the spillover effects from sovereign credit risk to respectively the banking sector, bond and stock markets and international capital flows. We subsequently develop the hypotheses that will be

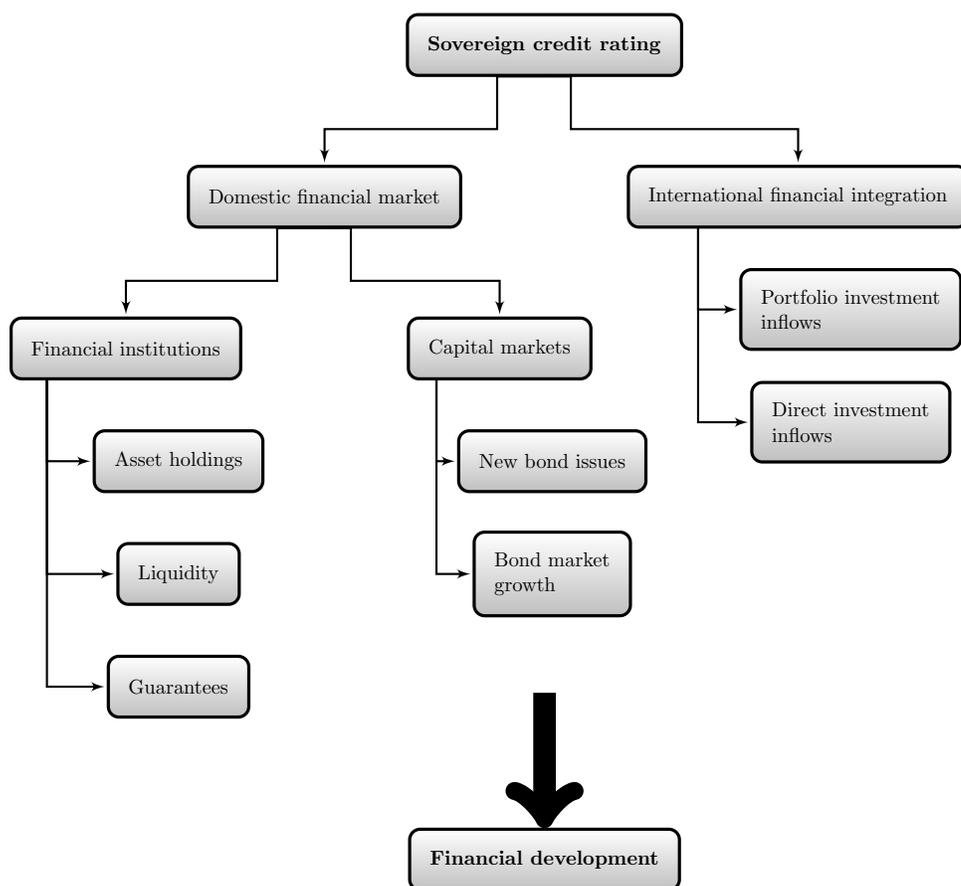


Figure 1: The impact of sovereign credit rating provision on financial development

tested in Section 5.¹

2.1 Sovereign credit risk and financial institutions

Based on a report of a study group at the Bank of International Settlements BIS (2011) and Drago and Gallo (2017), we distinguish four channels that transmit sovereign credit risks to financial institutions, notably an *asset holdings channel*, a *liquidity channel*, a *guarantee channel* and a *rating channel*. We discuss each of the transmission channels in the following paragraphs.

First, the asset holdings channel refers to the potential losses in a bank's balance sheet assets resulting from a deterioration in sovereign credit risk. Angeloni and Wolff (2012) show that during the Euro debt crisis in 2011, banks' holdings of sovereign bonds of vulnerable countries were severely affected which resulted in a negative stock market performance of banking shares. This negative effect on stock market performance was only temporary and the impact of sovereign distress on banks' performances was highly dependent on the banks' geographical location. The asset holdings channel is also found to be an important cause of contagion between bank and sovereign default risk by DeBruyckere et al. (2013) who show that banks that have high sovereign debt exposures suffer more contagion from sovereign credit risk. Drago and Gallo (2017) study the impact of sovereign rating revisions on banking activity and find that a sovereign rating downgrade significantly increases the risk-weighted assets of banks. Becker and Ivashina (2018) show that a form of financial repression arises in periods of sovereign financial distress. Governments put pressure on local banks to buy newly issued government debt at below market rates. As a result, the corporate lending of banks gets crowded out and the composition of the banks' assets changes dramatically with an increasing weight in sovereign debt holdings.

Second, the liquidity channel implies that sovereign financial distress reduces the value of the collateral to obtain short-term financing from the central bank and the interbank market. DeBruyckere et al. (2013) and Drago and Gallo (2017) find that the impact of deteriorating sovereign credit risk on banks' capital ratios and lending supply is amplified if they rely heavily on short-term funding during periods of sovereign distress. Negative liquidity shocks are

¹Throughout the text, we use the terms sovereign credit risk and sovereign credit ratings interchangeably because a sovereign credit rating is supposed to be a good proxy for sovereign credit risk.

quickly transmitted across banks and internationally. During the European sovereign debt crisis of 2011, U.S. branches of euro-area banks suffered dollar liquidity shortage in the form of reduced access to large time deposits from U.S. money market funds. This liquidity shock led to a decrease in corporate lending in the U.S., which negatively affected U.S. firms' investment (Correa et al., 2016). Popov and VanHoren (2014) come to the same conclusion about the spillover effects of sovereign distress on bank lending. They show that a deteriorating creditworthiness of foreign sovereigns reduces the lending activity of banks holding the distressed sovereign debt. Directly linking credit ratings banks' access to funding, Mensah et al. (2017) and Kim and Wu (2011) show that a positive sovereign rating announcement helps banks to access capital from the international interbank market at lower costs. Funding costs of banks in emerging markets are inversely related to the sovereign credit rating of the home country.

The third transmission channel of sovereign credit risk to financial institutions is the guarantee channel. The value of government guarantees depends crucially on the government's fiscal position. Banks traditionally benefited from an implicit (in some cases even an explicit) government guarantee which lowered the banks' funding cost. However, if the fiscal position of a sovereign deteriorates, so does the value of its government guarantees, which then increases the cost of funding (Acharya et al., 2014). Correa et al. (2014) emphasize that investors perceive sovereign and bank risks as interconnected through the government guarantee channel. They find that sovereign rating downgrades have a pronounced negative impact on banks' stock returns, especially if these banks are expected to receive strong support from their government. Alter and Schuler (2012) find that sovereign CDS spreads impact the spreads of banks' CDS after the government interventions on distressed banks during the European debt crisis. The government guarantee channel is especially relevant for large financial institutions that are considered to be too-big-to-fail. For large banks, the government is expected to intervene when a default is imminent. Seemingly contradicting this expectation, DeBruyckere et al. (2013) find that in general global banks are less sensitive to spillover effects from increased sovereign credit risk. However, the impact of bank size on the spillover effects of sovereign credit risk is reversed when tested on domestic banks. The excess correlation between bank default risk and the home country's sovereign credit risk is larger for large domestic banks because these banks' perceived riskiness depends crucially on the probability of government intervention.² Williams

²Excess correlation is equal to the correlation between bank and sovereign CDS spreads over and above what is explained by common factors.

et al. (2015) assess the impact of sovereign rating actions on banks in emerging countries and find that the guarantee channel does not play a role of importance to explain the impact of sovereign downgrades on bank valuation. Instead, Williams et al. find the rating channel as discussed below to be the main transmission channel of sovereign credit risk to bank valuation.

The fourth transmission channel of sovereign to financial institutions' default risk is identified as a rating channel, which implies that sovereign credit ratings have a strong spillover effect on the home country's bank ratings (Alsakka et al., 2014, Williams et al., 2013). The sovereign debt ceiling plays a crucial role here. Empirical evidence has shown that credit ratings of private-sector bonds are typically lower than the sovereign ratings of the home country of the bond issuers (Borensztein et al., 2013). Williams et al. (2013) study the impact of sovereign rating actions on bank ratings in emerging markets and find that bank ratings in emerging countries closely follow the ratings of their home country, irrespective of the ownership structure of the bank (state-owned, foreign-owned, or local privately-owned). In a follow-up study, Williams et al. (2015) show that sovereign credit rating actions have a significant effect on emerging market bank valuations, especially when the rating action considers new rating information. The sovereign rating actions of S&P are found to have the biggest effect on bank valuation.

The literature on the transmission of sovereign credit risk to the banking sector allows us to develop testable hypotheses regarding the impact of a sovereign credit rating provision. Based on the asset holdings transmission channel we expect that a sovereign credit rating provision has a positive effect on the banks' total assets. Not only do we expect a growth in bank assets, we also argue that the composition of the asset portfolio may change. When sovereigns are able to tap international bond markets, they are no longer solely dependent on bank borrowing. As a consequence, banks will have spare funds to grant more loans to the private sector. Because of the sovereign debt rating ceiling, the rebalancing of the banks' asset portfolios may result in higher risk-weighted assets. Thus, we define the first set of hypotheses as follows:

Hypotheses set 1: In recently rated countries a) banks' assets are larger, b) banks provide more (less) credit to the private sector (sovereign state), and c) banks have higher risk-weighted assets than in unrated countries.

We also want to assess the effect of a sovereign credit rating provision on the liquidity position of banks. The literature shows that a positive sovereign credit risk event improves the liquidity position of banks. Receiving an initial credit rating may be considered as a positive

rating event because the rating provision reduces information asymmetries and monitoring costs for banks. Hence, we expect that banks' access to short term capital improves. We formulate the second set of hypotheses as:

Hypotheses set 2: In recently rated countries a) banks experience a larger growth in liquid assets, b) banks experience a larger growth in short term liabilities, and c) financial liquidity is higher than in unrated countries.

2.2 Sovereign credit risk and bond and stock markets

The literature on the importance of sovereign credit ratings for stock and bond market focuses on market responses to rating changes with respect to (i) return and volatility, (ii) market liquidity and (iii) cross-country contagion. Although each of the studies discussed in the following paragraphs investigate the impact of sovereign credit risk on different aspects of bond or stock markets, there are two common threads. First, negative rating events like downgrades and negative outlooks have a significant effect on the capital markets, while upgrades hardly seem to matter. Second, the impact of rating events on stock and bond markets is larger for countries with lower levels of development.

Several studies have demonstrated that a change in the home country's sovereign credit rating or its outlook has a significant effect on bond yields, stock returns and stock and bond market volatility. The effects of rating changes on bond and stock returns are stronger for countries with high inflation and bigger fiscal deficits (Pukthuanthong-Le et al., 2007). For bond market returns, Pukthuanthong-Le et al. (2007) find that a change in the rating outlook has a greater impact than actual rating up- or downgrades, suggesting that investors anticipate the change in a rating. The effect of a change in the outlook is asymmetric: only negative rating announcements have a discernible impact on bond and equity returns and volatility (Afonso et al., 2014, Brooks et al., 2004, Pukthuanthong-Le et al., 2007, Treepongkaruna and Wu, 2012).³ The effects of a rating downgrade are magnified during crises, and especially in case of a loss of investment grade status. An imminent downgrade further destabilizes the stock market by increasing the volatility and depressing market returns (Brooks et al., 2015).

Sovereign credit rating announcements also affect market liquidity because investors re-

³An exception is Hooper et al. (2008), who finds that upgrades significantly improve the return and decrease the volatility of U.S. dollar denominated stocks.

balance their portfolios with rating announcements inducing international capital flows from downgraded to upgraded countries (Gande and Parsley, 2014, Kim and Wu, 2008). Sovereign rating downgrades induce significant capital outflows, especially for countries that score badly on the transparency index. Odders-White and Ready (2005) study the relationship between corporate credit ratings and stock market liquidity and find both to be inversely related. That is, companies with high effective and quoted bid-ask spreads have poor credit ratings. Studying the impact of sovereign debt rating changes on stock market liquidity, Lee et al. (2016) find a positive relationship between sovereign rating events and stock market liquidity. In line with what is found for returns, only downgrades seem to have an impact on the stock market. Especially losing the investment grade status has a strongly negative effect on stock market liquidity, while the positive impact of rating upgrades is negligible.

Sovereign credit ratings serve as an important channel of international financial contagion in emerging countries, and this contagion effect is magnified during crisis periods (Li et al., 2008, Glick and Rose, 1999, Ferreira and Gama, 2007, Kaminsky, 2002). Contagion of sovereign credit risk to neighboring countries is also found when credit risk is measured by bond or CDS spreads. The contagion effects of sovereign spreads and ratings are found to be asymmetric, downgrades and increases in credit spreads have a much larger effect than upgrades or narrowing spreads. One exception to this finding is Ismailescu and Kazemi (2010) who find that positive rating events have a greater impact on CDS markets and they are more likely to spill over to other emerging countries, while negative events are found to be anticipated by the market. Christopher et al. (2012) provide evidence for positive rating spillover effects in the stock markets and negative rating spillover effects in the bond markets. Rating upgrades benefit other countries' stock markets in the region, while rating downgrades result in investors shifting their funds from the downgraded stock market to neighboring countries' stocks. So sovereign ratings and outlooks are positively related to regional stock market co-movement. In bonds markets however, sovereign ratings and outlooks negatively impact cross-country market movements, suggesting contagion during rating downgrades.

In this study, we will assess the impact of a sovereign credit rating provision on the development of a country's bond markets.⁴ We assume that countries solicit for a sovereign credit

⁴We do not look at the impact of a rating provision on the stock market because of data scarcity. Our sample is limited to countries that received a credit rating after 2000. These are all low developed countries, most of which do not have a stock exchange.

rating when they have the intention to issue internationally traded debt securities in the future. Therefore, we expect that receiving a sovereign credit rating has an immediate effect on the country's bond markets and on the issuance activity of international bonds. Also the provision of a sovereign credit rating can be considered as a positive rating event because it reduces information asymmetries regarding the country's default risk. The availability of a credit rating provided by a globally recognized rating agency also lowers the monitoring costs for banks. Because in our setting a rating event refers to obtaining a long-term foreign currency rating, the hypotheses regarding the effect of a sovereign credit rating provision on the bond markets are stated as follows:

Hypotheses set 3: Recently rated countries a) issue a higher (lower) amount of foreign (local) currency denominated debt, b) issue longer maturity debt, and c) face lower borrowing costs than unrated countries.

In the following section we turn to the importance of sovereign credit risk in attracting international investors.

2.3 International capital flows

If countries are open to investments from abroad, capital can be attracted under the form of foreign direct investments (FDI) or portfolio investments. Conditional on sufficient absorptive capacities, foreign capital can contribute significantly to economic growth. In the case of FDI, there is an additional benefit for the host country because FDI typically comes with a transfer of know-how and technology from the home to the recipient country (Borensztein et al., Pra). Although foreign capital has the potential to boost economic growth in the country, foreign investors can also disrupt the economy and may be a cause of instability. The literature shows that both net and gross capital flows are volatile and pro-cyclical.⁵ There is a retrenchment in capital inflows during crisis periods (Broner et al., 2013, Palma, 2002, Mohamed, 2006). Albuquerque (2003) shows that FDI inflows are far less volatile than other forms of foreign capital flows because investments in FDI are much harder to unwind than portfolio holdings.

Over the last two decades, developing countries have attracted a steadily increasing amount of foreign capital under the form of FDI, portfolio debt and portfolio equity flows. This devel-

⁵Net capital flows are equal to the difference in gross capital flows, i.e. the net purchases of domestic assets by foreign investors minus the net purchases of foreign assets by domestic investors.

opment was caused by the surging capital account liberalization process of the host countries combined with periods of near-zero interest rates in the developed countries which led to a search for yield by investors residing in these countries. Konopczak and Konopczak (2017) show that foreign capital flows are related to sovereign credit risk in two opposing ways. On the one hand, the increasing demand for a country’s debt securities decreases bond yields. On the other hand, the over-reliance on external financing and the increased vulnerability to sudden stops of capital inflows increases the sovereign bond yields. There is empirical evidence that for emerging markets, the demand effect outweighs the vulnerability effect (for example Carvalho and Fidora (2015), Andritzky (2012)). Yet, Konopczak and Konopczak (2017) find that the effects depend on the length of the time horizon studied. They show that in the short run, the demand effect prevails reflecting the immediate effect of demand pressure. In the long run however, the emerging market sovereign yields increase with increasing foreign capital flows, reflecting a dominance of the vulnerability effect.

Investigating the drivers of capital flows into BRICS countries, Swamy and Narayana-murthy (2018) find that, amongst other factors, sovereign credit ratings have a significantly positive effect on inward foreign capital. Similarly, Kim and Wu (2008) show that FDI inflows, international banking and portfolio inflows increase significantly when long-term foreign currency ratings of emerging countries improve. Thus, based on the literature, we expect to find a positive effect of a sovereign credit rating provision on a country’s inflow of foreign capital because of a reduction of information gathering costs for foreign investors. This assumption leads to the following set of hypotheses:

Hypotheses set 4: Recently rated countries a) attract more FDI inflows, b) attract more foreign investors in debt and equity instruments, and c) have more internationally oriented banks than unrated countries.

3 Methodology: Entropy balancing with Heckman selection

The establishment of a causal relationship between sovereign credit rating provision and a country’s financial development is challenging because of potential endogeneity issues and a sample selection bias. Endogeneity problems occur when the dependent variable is measured with error, the predictor(s) and the dependent variable are determined simultaneously, or if the model suffers from omitted variables. We solve the endogeneity issue in several ways. First, we apply an entropy balancing approach to preprocess the data to obtain a well-balanced sample.

A detailed description of this approach is provided in the following paragraphs. Second, we control for simultaneity by using lagged values of the predictors in our panel regressions. Third, we control for country and time fixed effects to address a potential omitted variable bias. In addition, our selection of variables is based on a broad literature review and continuous and time-varying variables are added to the model based on a two-directional selection process. Apart from endogeneity, a self selection bias may occur in our sample of rated countries. This is because sovereign credit ratings are typically solicited for by the government. A country that solicits for a credit rating has prepared for a credit risk evaluation process and therefore a sovereign credit rating cannot be considered as a random event. We address the sample selection bias by following a three-stage approach, combining the entropy balancing approach with the Heckman two-stage model (Heckman, 1976, 1979). Entropy balancing addresses the selection bias due to observed characteristics by eliminating the difference between two groups such that an exact matching of moments is obtained in the final sample. The Heckman two-stage model addresses the selection bias due to unobserved characteristics. To summarize, the model structure is as follows:

1. Compute the rebalancing weights for the control group
2. Determine the Inverse Mills Ratio (IMR) from the selection equation
3. Estimate a weighted least squares model controlling for the IMR

Each stage of the methodology is explained in detail below.

3.1 Reweighting the control group

In the first stage of our methodology, we apply the entropy balancing data preprocessing technique developed by Hainmueller (2012) to achieve a covariate balance between the treated group and the control group.⁶ In our setting, treatment refers to obtaining a sovereign credit rating. In entropy balancing, a covariate balance is obtained by imposing a set of balance constraints that require an equal pretreatment of the covariate means, variances and skewness across the treated and the non-treated groups. By doing so, it is ensured that the sample of unrated countries contains units that are as similar as possible to the rated countries.

⁶Since its introduction by Heinmueller, the entropy balancing technique is commonly used in observational studies with binary treatments. In an economic context, entropy balancing has been applied by Neuenkirch and Neumeier (2016) and Balima (2017).

In our research setup, obtaining a sovereign credit rating represents the treatment while the level of financial development (for example the size of the banking sector) represents the outcome variable. The units of observation are country-year observations. We consider a sample of n_1 countries that are rated during our sample period as the treatment group and a sample of n_0 countries for which a rating is absent for all years as the control group. Each unit i is exposed to a binary treatment $R_i \in \{1, 0\}$; $R_i = 1$ if unit i has a rating and $R_i = 0$ if i has no rating. Next, we consider X , a matrix of J exogenous pretreatment variables, where $X_{i,j}$ refers to the value of the j th characteristic for unit i such that $X_i = [X_{i,1}, X_{i,2}, \dots, X_{i,J}]$ is the row vector of characteristics for unit i . The densities of the treatment group (control group) are denoted as $f_{X|R=1}$ ($f_{X|R=0}$). $Y_i(R_i)$ denotes the pair of potential outcomes that country i attains if it is rated or not. Observed outcomes, i.e. levels of financial development ($FinDev$), for each country are realized as $FinDev_i = FinDev_i(1)R_i + (1 - R_i)FinDev_i(0)$ such that we simultaneously observe the triple $(R_i, FinDev_i, X_i)$.

The measure of interest is the average treatment effect on the treated country (ATT), which is defined as:

$$ATT = E[FinDev_1|R = 1] - E[FinDev_0|R = 1] \quad (1)$$

The first expectation in equation (1) is the level of financial development when a country is rated. This can be easily estimated from the treatment group data. The second expectation in equation (1) is unobserved. It is the counterfactual outcome for a country that is rated, i.e. the level of financial development that a country would have if it was not rated. To estimate the unobservable expectation, an appropriate proxy should be used. If being rated is a random event, we could compute the ATT by simply comparing the level of financial development of rated and unrated countries (Balima, 2017). However, we expect that being rated is endogenous to macroeconomic variables. One way to solve this is to use a matching approach to mimic randomization with respect to the assignment of the credit rating. In entropy balancing, the rated and unrated units are matched as close as possible with respect of pretreatment characteristics that are (1) correlated with being rated or not and (2) associated with the level of financial development. Thus, equation (1) can be rewritten as follows:

$$ATT = E[FinDev_1|R = 1, X = x] - \int E[FinDev_0|R = 0, X = x]f_{X|R=1}(x)dx, \quad (2)$$

where x is a vector of pretreatment characteristics that affect both the likeliness of being rated and the level of financial development. The last term in equation (2) is equal to the covariate adjusted mean, or the estimated mean of Y in the source population if its covariates were

distributed as in the target population (Hainmueller, 2012).

In entropy balancing, the control units are reweighted to match the first three moments of the treatment group. The weights w_i for each control unit are obtained by minimizing the Kullback and Leibler (1951) divergence metric $h(\cdot)$ using a set of base weights $q_i = 1/n_0$, where n_0 is the number of unrated countries. More specifically, the optimization problem is equal to:

$$\text{minimise}_{w_i} H(w) = \sum_{[i|R=0]} h(w_i) = w_i \ln(w_i/q_i) \quad (3)$$

subject to

$$\sum_{[i|R=0]} w_i c_{si}(X_i) = m_s \text{ with } s \in 1, \dots, S \text{ and} \quad (4)$$

$$\sum_{[i|R=0]} w_i = 1 \text{ and} \quad (5)$$

$$w_i \geq 0 \text{ for all } i \text{ such that } R = 0, \quad (6)$$

where $c_{si}(X_i) = m_s$ describes a set of S balance constraints imposed on the covariate moments of the reweighted control group. More specifically, we impose three balancing constraints to match the first three moments of the variables in X from the target population (rated countries) with the control group (unrated countries). Constraints (5) and (6) represent two normalization constraints. The first condition requires the weights to sum to unity and the second condition implies a nonnegativity constraint. The mean, variance and skewness of the covariates used in the entropy balancing approach are shown in Table 1. The first three moments of the distribution of the covariates for the treatment group and the control are shown before balancing (Panel A) and after rebalancing (Panel B).

3.2 Selection equation

To control for a sample selection bias caused by unobserved characteristics of the sample countries, we estimate the Heckman (1976, 1979) selection equation that provides the Inverse Mills Ratio (IMR) for the treatment effect as follows:

$$E(1_{i,t}^{sel}) = \text{Probit}(\zeta_{i,t} X_{i,t}), \quad (7)$$

where $E(1_{i,t}^{sel})$ is a dummy that is equal to unity if country i is in the treatment group and zero otherwise and X_i is the matrix of J exogeneous pretreatment variables and ζ_i is a vector of unknown parameters. Thus the probit regression in equation (7) estimates the probability to be rated. The IMR is then generated from the probit model and is defined as the ratio of the

Table 1: Summary statistics of the covariates used in the entropy balancing

<i>Panel A: Before balancing</i>						
	mean		variance		skewness	
	treat	control	treat	control	treat	control
GDP per capita	7.0705	6.8783	1.1813	1.5372	0.2244	0.8998
FCY reserves	6.4640	5.2818	5.2375	7.5927	-1.1946	-0.3527
Unemployment	0.1014	0.0655	0.0069	0.0037	1.2070	1.6981
Trade/GDP	0.7872	0.7228	0.1281	0.1277	1.4043	1.0516
Current account/GDP	-0.0682	-0.0593	0.0066	0.0191	0.2179	0.7394
Inflation	0.0711	0.0682	0.0076	0.0043	1.6040	0.4922
GDP growth	0.0507	0.0400	0.0011	0.0015	0.1457	0.8714
External debt/GDP	0.5202	0.5380	0.1481	0.2812	1.9755	2.8512
Previous default	0.2087	0.1776	0.1053	0.0924	1.5021	1.7719
Rule of law	-0.4663	-0.6613	0.2853	0.4751	0.5584	0.5085
Government effectiveness	-0.4756	-0.7653	0.2059	0.4307	0.6297	0.7579
Political stability	-0.3641	-0.4318	0.6354	0.9556	-0.0711	0.0286
Banking crisis	0.0102	0.0096	0.0102	0.0091	9.7345	10.2221

<i>Panel B: After balancing</i>						
	mean		variance		skewness	
	treat	control	treat	control	treat	control
GDP per capita	7.0705	7.0705	1.1813	1.1813	0.2244	0.2244
FCY reserves	6.4640	6.4640	5.2375	5.2375	-1.1946	-1.1946
Unemployment	0.1014	0.1014	0.0069	0.0069	1.2070	1.2070
Trade/GDP	0.7872	0.7872	0.1281	0.1281	1.4043	1.4043
Current account/GDP	-0.0682	-0.0682	0.0066	0.0066	0.2179	0.2179
Inflation	0.0711	0.0711	0.0076	0.0035	1.6040	0.4107
GDP growth	0.0507	0.0507	0.0011	0.0011	0.1457	0.1457
External debt/GDP	0.5202	0.5202	0.1481	0.1481	1.9755	1.9755
Previous default	0.2087	0.2087	0.1053	0.1053	1.5021	1.5021
Rule of law	-0.4663	-0.4663	0.2853	0.2853	0.5584	0.5584
Government effectiveness	-0.4756	-0.4756	0.2059	0.2059	0.6297	0.6297
Political stability	-0.3641	-0.3641	0.6354	0.6354	-0.0711	-0.0711
Banking crisis	0.0102	0.0102	0.0102	0.0102	9.7345	9.7345

Note: The rated countries are the treatment group (*treat*) and the unrated countries represent the control group.

standard normal density ϕ divided by the standard normal cumulative distribution function Φ :

$$IMR(\hat{\zeta}) = \frac{\phi(\hat{\zeta}X)}{\Phi(\hat{\zeta}X)} \quad (8)$$

3.3 Output equation: weighted least squares

In the third stage, the weights estimated from the first stage are used in a weighted least squares (WLS) regression where a measure of financial development $FinDev$ for country i in year t is explained by a dummy variable R that controls for a country being rated or not in the previous year. The WLS regression specification is as follows:

$$FinDev_{i,t} = \alpha + \beta R_{i,t-1} + \sum_{j=1,J} \gamma_j X_{i,j,t-1} + \delta IMR_{i,t} + \varepsilon_{i,t}, \quad (9)$$

The control variables $X_{i,j}$ are added to the regression model in a step-wise manner. The data has an unbalanced panel structure, and we control for country and time fixed effects.

Compared to other data preprocessing methods like propensity score matching, entropy balancing provides specific advantages. First, in contrast to nearest neighbor matching, where many data points are discarded, entropy balancing reweights all units to achieve balance, hereby preventing a loss of information. Second, by applying entropy balancing we do not have to specify an empirical model for the rating event, which avoids potential problems of model misspecification or multicollinearity (Neuenkirch and Neumeier, 2016). Third, after running a horse race between different propensity scoring methods and entropy balancing, Harvey et al. (2017) conclude that entropy balancing achieves higher estimation accuracy. In addition, they show that entropy balancing does not require post-processing of the data and effectively mitigates the selection bias in observational studies. Nevertheless, we provide the estimation results using propensity score matching, propensity score weighting and a matched difference-in-difference analysis in the section with robustness checks.

4 Data

We collect data for countries that received an initial credit rating in the year 2000 or later, the treatment group, and for unrated countries, the control group. Table 2 shows the list of rated countries, the date of the initial rating, the credit rating received and the name of the agency that assigned the initial rating. The last column in Table 2 shows the period full period

for which data is available. Credit ratings and the initial rating dates are obtained from the websites of the rating agencies and from Thomson Reuters. All the 24 rated countries are developing countries and the variety in the initial ratings is minimal. Initial ratings range from B+ for twelve countries to CCC+ for Malawi. The low variety in initial sovereign credit ratings justifies the interpretation of the rating event as a binary treatment. One could argue that the impact of sovereign credit rating provision is conditional upon the level of the rating. This cannot be tested in this setting since all ratings are fairly similar. The control group consists of 24 developing countries that are unrated on December 31st, 2016.⁷

Table 2: Treatment group: Recently rated countries

Country	Initial rating date	Initial rating	Agency	Sample period
Albania	2007-06-29	B+	Moody's	1999–2016
Angola	2010-05-19	B+	Moody's	1999–2016
Armenia	2006-05-24	BB-	Fitch	1999–2016
Bangladesh	2010-04-05	BB-	S&P	1999–2016
Belarus	2007-08-21	B+	S&P	1999–2016
Benin	2003-12-29	B+	S&P	1999–2016
Bosnia And Herzegovina	2004-03-29	B-	Moody's	1999–2016
Cambodia	2007-04-19	B+	S&P	1999–2016
Cameroon	2003-09-04	B	Fitch	1999–2016
Cape Verde	2003-08-15	B+	Fitch	1999–2016
Ethiopia	2014-05-09	B+	Moody's	1999–2016
Georgia	2005-12-06	B+	S&P	1999–2016
Ghana	2003-09-04	B+	S&P	1999–2016
Kenya	2006-09-08	B+	S&P	1999–2016
Macedonia	2004-07-30	BB	S&P	1999–2016
Madagascar	2004-05-25	B	S&P	1999–2016
Malawi	2003-05-20	CCC+	Fitch	1999–2015
Mali	2004-04-30	B-	Fitch	1999–2014
Nigeria	2006-01-30	BB-	Fitch	1999–2016
Rep Of Congo	2013-10-11	BB-	Moody's	1999–2015
Seychelles	2006-09-14	B	S&P	1999–2016
St. Vincent And The Grendines	2007-12-10	B+	Moody's	1999–2016
Uganda	2005-03-17	B	Fitch	1999–2015
Zambia	2011-03-02	B+	Fitch	1999–2016

Our proxies for financial development focus on the banking sector, the bond market and international financial integration. A description of the variables and the data source is provided in Table 3. A first aspect of financial development is the growth of the local banking sector. We measure composition and the size of the assets of the domestic banking sector by (1) the ratio of bank claims on the government to GDP, (2) the ratio of domestic credit provided by

⁷The unrated countries are Afghanistan, Algeria, Bhutan, Brunei, Burundi, Comoros, Djibouti, Guinea, Guinea Bissau, Guyana, Haiti, Maldives, Myanmar, Nepal, Niger, Samoa, Sao Tome and Principe, Sierra Leone, Swaziland, Tanzania, Togo, Tonga, Vanuatu, Zimbabwe.

the banking sector to GDP, (3) the ratio of total bank assets to GDP, and (4) the change in the banks' risk-weighted assets. The liquidity position of the banking sector is measured by the change in the banks' liquid assets. We also measure a country's financial liquidity more broadly by the variable broad money scaled by GDP. This liquidity measure is used by many researchers as a proxy of financial development. It reflects the depth of the financial market and the overall financial liquidity in a country. So it is a more general measure of domestic financial development than the banking measures.

Our second indicator of financial development is the development of a country's bond market. Because our sample consists of developing countries only, data availability is low, which implies that we are limited to study the effect of a rating provision on bond issuing activity and on the average bond yield. We measure bond market development by the ratio of foreign currency (local currency) bond issue size divided by total bond issue size and distinguish between long-term, medium term and short-term bond issues. We also consider the average bond yield as a proxy for a country's borrowing costs.

The third aspect of financial development is the ability to attract foreign capital under the form of foreign direct investments, portfolio investments and international bank flows. Capital inflows can come under the form of foreign direct investment or as portfolio investments, depending on the size of the foreign ownership stake. A foreign involvement of 10 percent or more of ordinary shares or voting power is considered to be a direct investment, while any involvement below 10 percent is considered as a portfolio investment. We use the following capital inflow variables: (1) direct debt investments, (2) direct equity investments, (3) debt portfolio and (4) equity portfolio investments. All capital inflow variables are scaled by the home country's GDP. To measure the internationalisation of the banking sector, we consider the ratio of foreign loans and deposits of local banks vis-a-vis the banking sector as a percentage of total domestic bank deposits.

The control variables in the panel regressions are macroeconomic, political and institutional indicators. The description of the control variables and their source is provided in Table 4.

5 The influence of a sovereign credit rating on financial development

We investigate recently rated countries to determine to what extent the sovereign credit rating had an impact on the country's subsequent financial development. As illustrated in Figure 1

Table 3: Definition and source of the variables measuring financial development

Datasets	Definition	Source
Banking sector		
Bank claims on government/GDP	Financial corporations ¹ (except central banks) claims on central government divided by GDP.	TR – IFS
Domestic credit by banks/GDP	Financial resources provided to private sectors by financial institutions (except central banks) through loans, trade credits, non-equity securities and other accounts receivables	TR – WDI
Bank assets/GDP	Gross financial and non-financial assets of banks divided by GDP	TR – IFS
Risk weighted assets	Bank assets weighted according to risk as established in the Basel framework	TR – FSI
Liquid assets	Liquid assets include currency, deposits and other financial assets available either on demand or within 3 months or less; securities that are traded in liquid markets and readily converted to cash	TR – FSI
Short-term liabilities	Short-term liabilities include short-term elements of debt liabilities and net short term market value of financial derivatives positions	TR – FSI
Broad money/GDP	Broad money divided by GDP.	TR – WDI
Bonds market development		
FCY issues/total issues	Notional amount issued in foreign currency divided by total amount of bonds issued. Considered as foreign currency are (in alphabet) AUD, GBP, EUR, JPY or USD.	TR
FCY long-term issues/total issues	Notional amount issued in foreign currency and bond maturity > 10 years divided by total amount of bonds issued.	TR
FCY medium-term issues/total issues	Notional amount issued in foreign currency and bond maturity > 5 years and < 10 years divided by total amount of bonds issued.	TR
FCY short-term issues/total issues	Notional amount issued in foreign currency and bond maturity < 5 years divided by total amount of bonds issued.	TR
LCY issues/total issues	Notional amount issued in local currency divided by total bond notional issued.	TR
LCY long-term issues/total issues	Notional amount issued in local currency with maturity > 10 years divided by total amount issued.	TR
LCY medium-term issues/total issues	Notional amount issued in local currency with maturity > 5 years and < 10 years divided by total amount issued.	TR
LCY short-term issues/total issues	Notional amount issued in local currency with maturity < 5 years divided by total amount issued.	TR
Bond yield	Average yield-to-maturity of fixed-coupon 10-year treasury bond.	IFS
International financial integration		
Direct debt investment/GDP	Direct investment involving debt securities on reporting economy divided by GDP.	TR – IIP
Direct equity investment/GDP	Direct investment involving equity and investment fund shares on reporting economy divided by GDP.	TR – IIP
Portfolio debt investment/GDP	Portfolio investment that serve as debt securities invested on reported economy divided by GDP.	CPIS
Portfolio equity investment/GDP	Portfolio investment on equity and investment fund shares on reported economy divided by GDP.	CPIS
Foreign loans and deposits	Foreign loans and deposits of reporting banks vis-a-vis the banking sector (% of domestic bank deposits)	GFD

Note: TR: Thomson Reuters Eikon; IMF: International Monetary Fund, IFS: International Financial Statistics, FSI: Financial Soundness Indicators, WDI: World Bank World Development Indicators, GFD: Global Financial Database, IDS: International Debt Statistics, OE: Oxford Economics, WEO: World Economic Outlook, WGI: World Bank World Governance Indicators, DOTS: Direction of Trade Statistics

Table 4: Definition and sources of the control variables

Datasets	Definition	Source
Current account/GDP	Current account balance of the reporting economy (% of GDP)	WDI
External debt/GDP	External debt stock position (USD) owed to non-residence divided by GDP	WDI, IDS, OE
FCY reserves	Natural logarithm of foreign currency reserves.	IFS
GDP growth	Annual percentage real GDP growth	WDI, WEO
GDP per capita	Natural logarithm of GDP per capita	WDI, WEO, OE
Inflation	Annual inflation rate	WDI
Political stability	Political stability and absence of violence index	WGI
Previous default	Exponential decay variable. 1 for defaulted/debt-restructured year t_0 and exponentially decay at the rate of 40% till year $t + 5$.	Standard and Poor's, Moody's Default Database, Paris Club Archive
Rule of law	Rule of law index: confidence in the rules of society	WGI
Government effectiveness	Quality of public and civil services and independence of political pressure	WGI
Trade/GDP	Total trade of the reporting economy (% of GDP)	WDI, DOTS, OE
Unemployment	Annual unemployment rate	WDI, WEO
Banking crisis	Dummy variable equal to 1 if the country suffered a banking crisis in the respective year	Laeven and Valencia (2013, 2018)

Note: TR: Thomson Reuters Eikon; IMF: International Monetary Fund, IFS: International Financial Statistics, FSI: Financial Soundness Indicators, WDI: World Bank World Development Indicators, GFD: Global Financial Database, IDS: International Debt Statistics, OE: Oxford Economics, WEO: World Bank World Economic Outlook, WGI: World Bank World Governance Indicators, DOTS: Direction of Trade Statistics

in the introduction, we distinguish between domestic financial development and international financial integration. The domestic financial development of a country is measured through the banking sector and the domestic bond market. As an element of international financial integration, we study the impact of the credit ratings on foreign direct investment, equity and debt holdings of foreigners, the participation in international bond markets and international bank flows.

5.1 Impact of the sovereign credit rating on the domestic banking sector

We study the impact of sovereign credit rating provision on the banking sector by focusing on the banks' assets, notably the amount of claims on the government and credit provided to the private sector. We also consider whether the banks' size, measured by their total assets changes after the sovereign receives its initial rating. Countries that do not have a credit rating rely for their financing mainly on banks, while rated sovereigns can tap a wider set of financing sources. Therefore, we expect that banks will hold a lower proportion of sovereign debt and a higher amount of private sector debt once a country is rated. This as a simple consequence of the fact that governments borrow from different lenders, once rated by a globally recognized rating agency. We also scrutinize the change in banks' risk-weighted assets. Risk-weighted assets of domestic banks may change when a country receives an initial credit rating because of two reasons. First, the risk weight of the existing government debt may change if the initial rating is above BB+ or below B-. According to Basel capital regulations, the risk weight for unrated sovereign debt is equal to 100%, which is comparable to sovereign bonds with a BB+ to B- rating. Sovereign debt that is rated below B- has a risk weight of 150%. In our sample of recently rated countries, Malawi is the only country whose initial rating is below B-. So the impact of receiving a rating on the risk weights of existing assets should be zero or negative. A second cause of a change in the risk-weighted assets is a shift in the bank's asset portfolio. If, after a country is rated, more sovereign debt is placed elsewhere, the proportion of corporate and private debt in the bank's total assets will increase. Since corporate and private debt are typically riskier than sovereign debt, the rebalancing will lead to an increase in the risk-weighted assets.

The estimation results for the regressions estimating the impact of sovereign credit rating provision on the domestic banking sector are reported in Table 5. The variable of interest, *Rated*, is highlighted in light grey. We find that when a country obtains a sovereign credit rating, domestic banks decrease their holdings of sovereign debt and simultaneously increase

Table 5: Domestic financial development: Banking sector

	Bank claims on govt./GDP	Domestic credit by banks/GDP	Banks assets/GDP	Δ Risk weighted assets	Δ Liquid assets	Δ Short term liabilities	Broadmoney/GDP
Banking crisis	0.03*** (0.01)	-0.02 (0.05)	-0.04 (0.05)	-0.16*** (0.06)	0.22*** (0.03)	0.28* (0.15)	-0.08* (0.04)
Current account/GDP	0.02 (0.02)	0.17*** (0.03)	0.14*** (0.04)				0.05** (0.02)
GDP growth	-0.57*** (0.19)		-1.80*** (0.56)			4.03** (1.94)	-0.18** (0.09)
GDP per capita	0.05*** (0.01)	-0.00 (0.02)	0.05 (0.04)		0.24* (0.13)	0.25* (0.15)	0.01 (0.02)
Government effectiveness	-0.09*** (0.02)		-0.12** (0.06)		0.18 (0.12)	0.25 (0.21)	
Inflation	-0.05* (0.03)	-0.06 (0.05)	-0.10* (0.06)	-0.09 (0.15)	0.21 (0.15)	0.25* (0.14)	-0.04*** (0.01)
Political stability	-0.01 (0.01)	0.04*** (0.01)	-0.03 (0.02)		-0.02 (0.04)	0.05 (0.06)	-0.02*** (0.01)
Rule of law	0.12*** (0.02)	0.08*** (0.01)	0.26*** (0.03)	0.81*** (0.29)		0.09 (0.10)	0.04*** (0.01)
Trade/GDP	0.01 (0.04)			-0.15 (0.21)	0.39 (0.39)		
Unemployment	0.00 (0.16)		-0.53 (0.46)		2.05 (1.32)	2.27 (2.19)	0.39** (0.19)
External debt/GDP		0.05*** (0.01)	0.05* (0.02)	0.33*** (0.11)	0.02 (0.17)	-0.17 (0.12)	-0.02 (0.02)
Previous default		0.05*** (0.01)	0.00 (0.04)	-0.34*** (0.06)		-0.06 (0.11)	
FCY reserves			-0.00 (0.01)	0.21*** (0.06)	0.12** (0.05)	0.24*** (0.03)	0.00 (0.00)
Rated	-0.03*** (0.00)	0.03*** (0.01)	0.02** (0.01)	0.11** (0.05)	0.08 (0.06)	0.02 (0.05)	-0.01 (0.01)
Inverse Mills Ratio	-0.23** (0.11)	0.26*** (0.06)	-0.79* (0.45)	-1.42*** (0.35)	-0.24 (0.31)	2.05 (1.27)	-0.04 (0.06)
Observations	620	661	586	178	182	162	618
R ²	0.15	0.08	0.11	0.13	0.03	0.15	0.03
Country FE	Y	Y	Y	N	N	N	Y
Year FE	Y	Y	Y	N	N	N	Y

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lags and take into account cross-sectional dependence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

credit provided to the private sector, which is in line with the portfolio rebalancing hypothesis. Recently rated countries also have larger balance sheets in terms of total assets. The combined effect of an increase in total assets and a larger weight of private credit in the asset portfolio leads to larger growth in risk-weighted assets for rated countries compared to their unrated counterparts.

We also assess the impact of sovereign rating provision on the liquidity buffer of the domestic banking sector. As discussed in the literature review, a change in sovereign credit risk is transmitted through a liquidity channel to the banking sector. We measure the liquidity buffer of domestic banks by the change in their liquid assets and short-term liabilities. We find that receiving a sovereign rating leads to an increase in both liquid assets and short-term liabilities, but we find the impact is not statistically significant.

In the last column of Table 5, we test the effect of a sovereign credit rating on the domestic money supply in the country. The variable of interest is the amount of broad money scaled to GDP. The treatment effect for the rating dummy is negative and insignificantly different from zero. Thus, we find no meaningful effect of sovereign rating provision on the total money supply.

5.2 Sovereign credit rating provision and bond market development

Receiving a sovereign credit rating has an immediate impact on the international tradability of a country's sovereign debt and therefore we expect a strong impact on the development of the country's bond market. The distinction between domestic and international bonds is crucial here since we focus on foreign currency bond ratings. Table 6 shows the impact of a sovereign credit rating on the proportion of foreign and local currency bond issues relative to the total bond issues in panels A and B respectively. We make a distinction between long term (maturity more than ten years), medium term (maturity between five and ten years) and short term bond (maturity below five years) bond issues. Panel C of Table 6 contains the average 10-year government bond yield.

The estimation results in panel A of Table 6 show that when a country obtains a sovereign credit rating, the proportion of foreign currency bond issues increases significantly, especially for long-term foreign currency bonds. This result is not surprising. The credit rating may be obtained after a government solicited for a rating at one of the rating agencies with the clear intention to tap the international capital markets by issuing international bonds. The impact

Table 6: Bonds market development: foreign and local currency bonds issues

	Panel A: Foreign Currency Bonds				Panel B: Local Currency Bonds				Panel C: Yield	
	FCY issues/total	FCY long-term/total	FCY med-term/total	FCY short-term/total	LCY issues/total	LCY long-term/total	LCY med-term/total	LCY short-term/total	Bond yield	
Banking crisis	-0.01 (0.01)	-0.00 (0.00)	-0.01 (0.01)	0.00 (0.00)	0.41** (0.19)	0.06 (0.04)	0.07** (0.03)	0.16 (0.22)	-0.42 (1.06)	
GDP growth	-0.12 (0.22)	-0.24*** (0.05)	-0.01 (0.01)	0.02 (0.02)					-15.76* (8.58)	
GDP per capita	0.05*** (0.02)	0.03*** (0.01)	-0.01 (0.01)	0.00 (0.00)	-0.49*** (0.07)			-0.18** (0.08)	-2.39*** (0.86)	
Inflation	0.08 (0.11)	0.02 (0.05)	0.02 (0.02)	-0.01* (0.00)	-0.50*** (0.11)	-0.02 (0.05)	-0.07 (0.04)	-0.45*** (0.08)	-1.12 (2.25)	
Political stability	0.01 (0.01)	0.01* (0.01)	0.01* (0.01)	0.00 (0.00)	-0.05** (0.02)	-0.05** (0.02)			-3.00*** (1.10)	
Previous default	-0.02 (0.02)	-0.01 (0.01)			-0.21*** (0.03)			-0.16*** (0.04)	0.73* (0.43)	
Rule of law	0.01 (0.02)		0.02*** (0.00)				0.24*** (0.06)	0.09 (0.10)	-0.70 (0.57)	
Unemployment	-0.03 (0.28)	-0.14 (0.09)		0.01 (0.03)		0.59 (0.49)		1.00 (1.13)		
Current account/GDP		0.03 (0.04)			0.08 (0.30)	0.47*** (0.09)	0.52*** (0.09)	-0.98** (0.43)	-17.88*** (2.53)	
FCY reserves		0.00 (0.00)			0.04 (0.03)	0.02* (0.01)	0.02 (0.01)	-0.01 (0.01)	-0.84** (0.33)	
Government effectiveness				-0.00 (0.00)		0.09*** (0.03)		-0.18 (0.13)		
Trade/GDP				0.00 (0.00)	-0.43** (0.18)	-0.01 (0.02)	0.00 (0.04)	-0.24* (0.14)		
Rated	0.03** (0.01)	0.01*** (0.00)	0.00 (0.00)	0.00*** (0.00)	-0.04 (0.07)	0.03* (0.01)	0.01 (0.03)	-0.13** (0.05)	-0.68 (0.61)	
Inverse Mills Ratio	-0.22 (0.13)	-0.12*** (0.03)	-0.00 (0.01)	0.00 (0.00)	-0.26 (0.20)	-0.07 (0.06)	0.29*** (0.10)	-0.58** (0.23)	-1.63 (7.52)	
Observations	676	676	676	676	676	676	676	676	154	
R ²	0.48	0.49	0.45	0.30	0.44	0.37	0.37	0.41	0.30	
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	

The standard errors are estimated according to Diagnostics and Kraay (1998) robust covariance matrix with four lags and take into account cross-sectional dependence.

** $p < 0.01$, * $p < 0.05$, $p < 0.1$

of a credit rating on the size of medium term foreign currency bond issues is not significant. Obviously, the increase in the proportion of foreign currency bond issues comes at the cost of local currency bond issues, which is shown in panel B of Table 6. Interestingly, we find that the substitution effect is not symmetric in terms of maturity. After obtaining a sovereign credit rating, there is a significantly lower proportion in short term local currency bond issues which is compensated by a higher proportion of long term foreign currency bond issues. Thus, we find that obtaining a sovereign credit rating does not help to reduce the problem of original sin in the strict sense, since countries will issue more debt in a foreign currency, but it does alleviate the problem of a maturity mismatch. Obtaining a sovereign credit rating allows the country to issue debt with a longer maturity. Panel C in Table 6 shows that the impact of a sovereign credit rating provision on the average borrowing costs for the government is estimated to be negative, but we do not find the coefficient estimate to be statistically significant.

The proportions of foreign versus local currency bond issues show the composition of a country's debt issues, but they don't tell us anything about the growth of the bond market as a whole. Therefore, in Table 7 we show the impact of sovereign credit rating provision on the growth of bond issuance, measured by the logratio of the total notional bond issued in the year after the rating provision relative to the notional amount issued the previous year. Surprisingly, the results in Table 7 do not provide evidence for growth in a country's bond market for recently rated countries. On the contrary, six out of eight coefficient estimates for the rating dummy are negative, indicating a decrease in issue size, both for foreign currency and for local currency bonds. For foreign currency bonds, the reduction in issue size is significant only for medium-term bonds, while the shrinkage in bond issues is more pronounced for local currency bonds. In short, our analysis reveal that rated countries issue smaller bond issues than unrated countries, especially when the bonds are issued in local currency.

5.3 Sovereign credit ratings and international financial integration

As a third aspect of financial development, Table 8 shows the impact of receiving a sovereign credit rating on the international financial integration of a country. We measure international integration by a country's ability to attract foreign capital and by the international activities of its domestic banking sector. The first two columns show the effect of a rating on inward foreign direct investment (FDI) in a country. The third and fourth column of Table (8) show the impact of the initial sovereign credit rating on inward portfolio investments, split up in debt and equity investments respectively. The dependent variable in the last column is equal

Table 7: Bonds market development: growth of bond issues (notional amount)

	Δ FCY issues	Δ FCY Long-term	Δ FCY Med-term	Δ FCY Short-term	Δ LCY issues	Δ LCY Long-term	Δ LCY Med-term	Δ LCY Short-term
GDP growth	12.90 (9.94)	-4.69 (3.33)		-0.83 (0.97)				
GDP per capita	0.99 (1.05)	1.34 (0.94)	0.31 (0.27)	0.35 (0.24)	3.92*** (0.86)			5.35*** (1.38)
Inflation	7.21 (4.45)	6.40** (3.20)	-0.12 (0.27)	-0.37* (0.24)	-5.39*** (1.25)	-2.34 (4.19)	0.07 (4.91)	-2.41 (1.92)
Political stability	0.83* (0.47)		0.61** (0.28)					
Previous default	0.09 (0.51)	-0.11 (0.22)			-0.08 (0.45)			0.05 (0.26)
Rule of law	-0.84 (1.41)		0.22 (0.25)				-0.54 (1.27)	2.65** (1.21)
Unemployment	2.04 (12.93)	-11.09 (7.36)		-1.72 (1.85)		0.81 (20.65)		30.16** (13.95)
Current account/GDP		-2.11 (1.96)			0.93 (2.19)	-6.01 (7.07)	-6.01 (3.83)	-0.64 (2.67)
FCY reserves		-0.03 (0.04)			1.13*** (0.40)	0.96*** (0.26)	1.23*** (0.39)	0.04 (0.13)
Government effectiveness				-0.46 (0.29)	2.04** (0.84)	-5.21** (2.04)		2.45** (1.01)
Trade/GDP				0.20 (0.27)		-1.08 (1.61)	0.97 (3.07)	0.18 (1.48)
Banking crisis								1.77*** (0.43)
Rated	-1.01 (1.68)	-0.43 (0.38)	-0.19*** (0.07)	0.06 (0.06)	-1.37*** (0.45)	-0.96*** (0.36)	0.52 (1.50)	-1.37** (0.53)
Inverse Mills Ratio	2.04 (7.76)	-1.88 (1.78)	-0.81* (0.42)	-0.66 (0.57)	4.77** (2.20)	1.11 (2.69)	-3.16 (2.92)	7.45*** (1.87)
Observations	632	632	632	632	632	632	632	632
R ²	0.03	0.05	0.01	0.00	0.07	0.14	0.03	0.06
Country FE	N	N	N	N	N	N	N	N
Year FE	N	N	N	N	N	N	N	N

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lags and take into account cross-sectional dependence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

to the amount of external loans and deposits of the banking sector as a percentage of domestic bank deposits and proxies for the internationalization of the domestic banking sector.

With respect to attracting foreign capital, we find that sovereign credit rating provision has a significantly positive effect on both direct inward FDI and portfolio investment. When a country receives a sovereign credit rating its ratio of FDI equity inflows to GDP is three percent higher than for unrated countries. The positive effect on FDI inflows is found for equity investments only. For portfolio investments, the rating effect is positive both for debt and equity investments. More specifically, portfolio investments in debt and equity to GDP are one percent higher on average for rated countries.

We also find supporting evidence for the hypothesis that sovereign credit ratings improve the international orientation of banks. The ratio of foreign loans and deposits vis-a-vis the banking sector to domestic deposits is six percent higher for recently rated countries, on average, than for unrated countries.

5.4 Short-term impact of sovereign rating provision

The estimation results in Tables 5 to 8 show the long-term effect of a sovereign credit rating provision on the financial sector following the publication of the initial rating. Developing a country's financial sector is a lengthy and challenging process, especially for the countries under consideration given their initially low levels of development. However, part of the observed changes in the financial sector during the post-rating period may be attributable to other events, for which we do not control. Also, the panel regressions are very imbalanced due to the large variation in initial rating dates. This implies that the rating effect is estimated over different periods across countries.

In this section we analyse the short-term impact of a credit rating provision. That is, we only include the first three years post rating for the rated countries. The immediate impact effect of a sovereign credit rating provision on the banking sector, the bond market and the international orientation of a country is shown in Tables 9 to 12 respectively. Overall, the short term impact effect of a sovereign credit rating is in line its long run effect. We find a negative effect on banks' holdings of sovereign debt, a positive effect on their holdings of private debt and a positive impact on banks' total assets to GDP. Hence, once rated banks experience an increase in risk-weighted assets. In contrast with the long-run effects, we find that receiving a sovereign credit rating induces a short-term growth in the banks' liquid assets. With respect

Table 8: International financial integration: Capital inflows

	Direct debt investments/GDP	Direct equity investments/GDP	Portfolio debt investments/GDP	Portfolio equity investments/GDP	Foreign loans and deposits
Current account/GDP	0.03 (0.04)	0.14** (0.07)	0.00 (0.02)	-0.04** (0.02)	-0.05 (0.19)
External debt/GDP	-0.03** (0.01)	0.11*** (0.02)	0.03** (0.01)	0.01*** (0.00)	0.03 (0.03)
FCY reserves	-0.01*** (0.00)	0.01 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.04* (0.02)
GDP per capita	-0.02* (0.01)	0.08*** (0.02)	0.02** (0.01)	-0.03*** (0.01)	-0.40*** (0.08)
Government effectiveness	0.06*** (0.01)	-0.05 (0.04)	-0.03 (0.02)	0.05*** (0.02)	0.24*** (0.09)
Inflation	-0.07*** (0.01)	-0.01 (0.03)	-0.03* (0.02)	0.02** (0.01)	0.19 (0.12)
Political stability	0.00 (0.01)	-0.02 (0.02)	-0.02** (0.01)	-0.00 (0.00)	-0.06 (0.04)
Previous default	-0.01 (0.01)	0.01 (0.02)	-0.01 (0.01)	0.01 (0.01)	
Rule of law	0.01 (0.01)	0.13*** (0.04)	0.01 (0.02)	-0.03*** (0.01)	-0.20*** (0.07)
Trade/GDP	0.02 (0.02)	0.19*** (0.05)	0.02 (0.02)	-0.01 (0.01)	-0.18 (0.11)
Unemployment	0.01 (0.11)	-0.84*** (0.32)	-0.24** (0.11)	-0.06 (0.04)	-3.39** (1.54)
GDP growth		-0.80** (0.37)	-0.35* (0.20)		2.48*** (0.80)
Banking crisis				0.02* (0.01)	-0.00 (0.07)
Rated	-0.00 (0.01)	0.03** (0.01)	0.01** (0.00)	0.01*** (0.00)	0.06** (0.02)
Inverse Mills Ratio	0.05 (0.04)	-0.33 (0.27)	-0.30** (0.14)	-0.01 (0.02)	0.49 (0.50)
Observations	422	420	642	642	645
R ²	0.27	0.72	0.48	0.46	0.44
Country FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lags and take into account cross-sectional dependence.
 ***p < 0.01, **p < 0.05, *p < 0.1

to the bond market development, the striking difference between the short term and long term impact of a sovereign credit rating provision is on the average bond yield. Within a period of three years, obtaining a sovereign credit rating leads to an increase in bond yield of 0.89 percent on average. The long term impact was estimated to be negative. This indicates that when a country receives a sovereign credit rating, bond yields initially increase, but over the long run bond yields decrease. Lastly, we find that recently rated countries attract more equity-based FDI and foreign investors hold more equity and debt securities as portfolio investments, which is in line with the estimated effects in the long run.

6 Robustness checks

The validity of our estimation results presented in the preceding sections depends crucially on the execution of the entropy balancing approach which ensures the comparability between countries prior to the credit rating event. Yet the matching of the covariates in the control and treatment groups is not perfect because we are unable to match the variance and skewness of inflation. Because this mismatch may affect the estimation results, we run a series of robustness checks for which we report the coefficient estimates of the dummy variable *Rated* in Table 13 to Table 15. For comparison, the first row of the tables with robustness checks shows the estimation results for our baseline analysis, notably the entropy balancing approach with a Heckman selection correction.

As a first robustness check, we apply the entropy balancing approach without the correction for the selection bias (check 1). Similarly, we also perform the analysis by applying the two-stage Heckman selection correction only (check 2). In a third check, we focus on the rated countries only and perform a difference-in-difference (diff-in-diff) analysis. By only considering the rated countries, we overcome the problem of imperfect matching between rated and unrated countries. The diff-in-diff framework requires a treatment group dummy, a post-treatment dummy and the interaction between both. Using only the treatment group in our setting, the post-treatment and interaction dummy are the same, so the analysis collapses to a simple difference test on pre and post-rating financial development for rated countries. To solve this problem and to implement a genuine diff-in-diff framework, we need a post-treatment period for the control group as well. This is what is done in the fourth robustness check by implementing a matched diff-in-diff analysis. In a standard diff-in-diff analysis, the intervention time starts in the same year for both the treatment the control group. However, in our setting, countries

Table 9: Short term development of banking sector

	Bank claims on govt./GDP	Domestic credit by banks/GDP	Banks assets/GDP	Δ Risk weighted assets	Δ Liquid assets	Δ Short term liabilities	Broadmoney/GDP
Banking crisis	0.07*** (0.01)	0.06*** (0.01)	0.01 (0.05)				0.01*** (0.00)
Current account/GDP	0.01 (0.02)	0.12*** (0.03)	-0.03 (0.02)				0.04 (0.03)
GDP growth	-0.58*** (0.08)	-0.01 (0.03)	0.68 (0.88)			7.96*** (2.51)	-0.13 (0.08)
GDP per capita	0.02 (0.02)	-0.06*** (0.03)	-0.08 (0.07)		0.11 (0.31)	0.34* (0.20)	-0.01 (0.02)
Government effectiveness	-0.06*** (0.01)	-0.13*** (0.05)	0.05 (0.08)		0.38** (0.15)	0.60** (0.24)	
Inflation	-0.09** (0.04)	-0.09** (0.01)	-0.04 (0.07)		-0.02 (0.25)	0.64*** (0.21)	-0.04*** (0.01)
Political stability	-0.01 (0.01)	0.03*** (0.01)	0.02 (0.03)		-0.03 (0.05)	0.13 (0.09)	-0.03*** (0.01)
Rule of law	0.10*** (0.01)	0.04*** (0.01)	0.09* (0.05)			-0.26** (0.12)	0.04*** (0.01)
Trade/GDP	0.01 (0.04)				0.70 (0.44)		
Unemployment	0.04 (0.15)				0.03 (0.30)		
External debt/GDP					4.45*** (1.30)	5.32* (2.78)	0.62*** (0.14)
Previous default					-0.34 (0.22)	-0.57*** (0.14)	-0.03*** (0.01)
FCY reserves					0.26 (0.19)	0.06 (0.14)	
					-0.36*** (0.07)	0.26*** (0.14)	
					0.01* (0.06)	0.01 (0.04)	
Rated	-0.02*** (0.01)	0.04*** (0.01)	0.03*** (0.01)		0.08* (0.05)	-0.01 (0.05)	-0.00 (0.01)
Inverse Mills Ratio	-0.28*** (0.06)	0.20*** (0.04)	0.60 (0.63)		-0.36 (0.65)	4.98*** (1.06)	-0.03 (0.06)
Observations	487	528	461	100	104	90	485
R ²	0.11	0.01	0.05	0.14	0.05	0.22	0.01
Country FE	Y	Y	Y	N	N	N	Y
Year FE	Y	Y	Y	N	N	N	Y

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lag period and takes into account cross-sectional dependence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Short term bond market development: bonds issues

	FCY issues/total	FCY long-term/total	FCY med-term/total	FCY short-term/total	LCY issues/total	LCY long-term/total	LCY med-term/total	LCY short-term/total	Bond yield
Banking crisis	-0.02** (0.01)	-0.00 (0.01)	0.00** (0.00)	-0.00** (0.00)	1.06*** (0.17)	0.01 (0.01)	0.01 (0.01)	0.94*** (0.13)	-46.57*** (8.73)
GDP growth	-0.10 (0.24)	-0.41*** (0.10)	0.03** (0.02)	0.03** (0.02)	-0.42*** (0.05)	0.05 (0.04)	0.03 (0.04)	-0.05 (0.10)	-3.08*** (1.42)
GDP per capita	0.03 (0.02)	0.03*** (0.01)	0.01*** (0.00)	-0.00 (0.01)	-0.62*** (0.11)	0.05 (0.04)	0.03 (0.04)	-0.06*** (0.18)	-5.51* (3.15)
Inflation	0.01 (0.09)	0.01 (0.05)	-0.00 (0.01)	-0.01 (0.01)	-0.11*** (0.03)	-0.04* (0.02)	0.03 (0.04)	-4.66*** (0.74)	-4.66*** (0.74)
Political stability	-0.00 (0.01)	-0.00 (0.01)	0.00** (0.00)	0.00** (0.00)	-0.11*** (0.03)	-0.04* (0.02)	0.03 (0.04)	-0.11*** (0.04)	-0.46 (0.57)
Previous default	0.01 (0.02)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	-0.11*** (0.03)	-0.04* (0.02)	0.03 (0.04)	-0.11*** (0.04)	-1.08** (0.69)
Rule of law	-0.04 (0.24)	-0.20*** (0.06)	0.00 (0.00)	0.01 (0.01)	-0.22 (0.44)	1.22** (0.47)	0.33*** (0.08)	0.04 (0.08)	0.04 (0.69)
Unemployment	0.02 (0.03)	0.02 (0.03)	0.00 (0.00)	0.01 (0.01)	-0.22 (0.44)	1.22** (0.47)	0.33*** (0.08)	2.21 (1.52)	2.21 (1.52)
Current account/GDP	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.03* (0.02)	0.09 (0.09)	0.03** (0.02)	-1.17** (0.48)	-11.59*** (2.44)
FCY reserves	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.03* (0.02)	0.09 (0.09)	0.03** (0.02)	-0.02 (0.01)	0.06 (0.21)
Government effectiveness	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.03* (0.02)	0.09 (0.09)	0.03** (0.02)	-0.25*** (0.06)	-0.25*** (0.06)
Trade/GDP	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.03* (0.02)	0.09 (0.09)	0.03** (0.02)	-0.19* (0.11)	-0.19* (0.11)
Rated	0.05*** (0.01)	0.02** (0.01)	0.00 (0.00)	0.00* (0.00)	-0.05 (0.04)	0.01 (0.01)	0.01 (0.02)	-0.12*** (0.03)	0.89*** (0.22)
Inverse Mills Ratio	-0.27* (0.15)	-0.22*** (0.05)	-0.01 (0.02)	0.00 (0.00)	-0.37** (0.19)	-0.12 (0.08)	-0.22*** (0.06)	-0.04 (0.15)	-24.77*** (6.21)
Observations	543	543	543	543	543	543	543	543	106
R ²	0.35	0.47	0.49	0.09	0.44	0.46	0.30	0.22	0.40
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

The standard errors are estimated according to Diagnostics and Kraay (1998) robust covariance matrix with four lag period and taken into account cross-sectional dependence.

***p < 0.01, **p < 0.05, *p < 0.1

Table 11: Bonds market development: growth of bond issues (notional amount)

	Δ FCY issues	Δ FCY Long-term	Δ FCY Med-term	Δ FCY Short-term	Δ LCY issues	Δ LCY Long-term	Δ LCY Med-term	Δ LCY Short-term
GDP growth	-22.49*** (6.58)	-7.37*** (3.37)		-0.13 (0.30)				
GDP per capita	1.07 (0.80)	1.54** (0.68)	0.10 (0.10)	0.02 (0.02)	5.58*** (1.22)			6.07*** (1.63)
Inflation GDP Deflator	-2.33*** (0.86)	0.54 (0.86)	-0.45*** (0.16)	-0.10 (0.08)	-5.08*** (1.28)	3.38** (1.71)	5.43** (2.74)	-0.72 (1.45)
Political Stability	0.02 (0.32)	0.25* (0.15)				8.00*** (1.54)		
Previous Default	-1.10*** (0.39)	-0.01 (0.21)			-0.11 (0.36)			-0.04 (0.21)
Rule of Law	0.57 (1.02)		-0.15 (0.24)				0.55 (0.76)	2.49* (1.35)
Unemployment	-8.76 (19.57)	-9.62 (10.68)		-1.66 (1.14)		13.31 (21.51)		22.06* (11.23)
Current A.C./GDP	-0.36 (1.06)	-0.36 (1.06)			-1.65 (2.34)	-11.36** (5.53)	-6.58 (4.31)	-3.91* (2.21)
FCY reserves	-0.07*** (0.02)	-0.07*** (0.02)			0.37 (0.23)	1.31*** (0.35)	0.47*** (0.12)	-0.34*** (0.10)
Government Effectiveness				-0.13** (0.07)	2.45*** (0.83)	-6.79*** (1.67)		3.01** (1.35)
Trade/GDP				0.00 (0.03)	1.64* (0.95)	-0.99 (1.38)	0.83 (0.90)	1.62 (1.46)
Banking Crises								0.89** (0.35)
Rated	-0.24 (1.20)	-0.35 (0.29)	-0.13* (0.07)	0.11* (0.06)	-1.67*** (0.43)	-1.06** (0.46)	1.48 (1.21)	-1.71*** (0.51)
Inverse Mills Ratio	-17.61*** (5.48)	-0.68 (2.36)	-0.41 (0.46)	-0.11 (0.20)	3.25* (1.96)	-3.34* (1.94)	-5.46* (2.98)	4.49*** (0.63)
Observations	499	499	499	499	499	499	499	499
R ²	0.02	0.03	0.00	0.04	0.07	0.27	0.03	0.10
Country FE	N	N	N	N	N	N	N	N
Year FE	N	N	N	N	N	N	N	N

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lag period and lags into account cross-sectional dependence.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12: Short term impact of international integration

	Direct debt investments/GDP	Direct equity investments/GDP	Portfolio debt investments/GDP	Portfolio equity investments/GDP	Foreign loans and deposits
Current account/GDP	0.04 (0.03)	0.05 (0.05)	-0.01 (0.01)	-0.02 (0.02)	0.30 (0.21)
External debt/GDP	-0.01** (0.00)	0.05*** (0.02)	0.02** (0.01)	0.01*** (0.00)	0.07* (0.04)
FCY reserves	-0.01*** (0.00)	0.01* (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.03* (0.01)
GDP per capita	-0.01* (0.01)	0.06** (0.03)	0.01 (0.01)	-0.04*** (0.01)	-0.43*** (0.06)
Government effectiveness	0.06*** (0.01)	-0.06** (0.02)	-0.03 (0.02)	0.06*** (0.02)	0.24*** (0.08)
Inflation	-0.07*** (0.01)	0.02 (0.03)	-0.01 (0.02)	0.02 (0.01)	0.10 (0.14)
Political stability	-0.00 (0.00)	0.00 (0.02)	-0.02** (0.01)	0.00 (0.00)	-0.09*** (0.02)
Previous default	-0.01** (0.00)	-0.00 (0.00)	-0.01 (0.01)	0.00 (0.00)	
Rule of law	-0.01 (0.01)	0.09*** (0.02)	0.00 (0.01)	-0.04*** (0.01)	-0.12 (0.08)
Trade/GDP	-0.02 (0.01)	0.21*** (0.03)	0.01 (0.01)	-0.01 (0.01)	-0.31*** (0.11)
Unemployment	-0.13 (0.14)	-0.52** (0.22)	-0.12 (0.14)	-0.14*** (0.05)	-4.49*** (1.52)
GDP growth		-0.51 (0.36)	-0.27 (0.18)		2.66*** (0.81)
Banking crisis				0.02 (0.02)	1.48*** (0.25)
Rated	-0.01 (0.01)	0.03** (0.01)	0.01*** (0.00)	0.02*** (0.01)	0.03 (0.03)
Inverse Mills Ratio	0.06 (0.05)	-0.28 (0.23)	-0.24 (0.14)	-0.02 (0.02)	0.69 (0.46)
Observations	313	311	509	509	529
R ²	0.30	0.72	0.45	0.48	0.45
Country FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y

The standard errors are estimated according to Driscoll and Kraay (1998) robust covariance matrix with four lags and take into account cross-sectional dependence.
 ***p < 0.01, **p < 0.05, *p < 0.1

do not receive a credit rating at the same time and the countries in the control group have no rating at all. We solve this by running a K-nearest neighbour (K-NN) matching algorithm to obtain the counterfactual initial rating year for the countries in the control group.⁸ Countries that cannot be matched with treated countries are omitted from the subsequent regression analysis. After matching, we generate a post-rated dummy and the interaction between the treatment group dummy and the post-rated dummy. The interpretation of the coefficient estimate of this interaction variable corresponds to that of the variable *Rated* in the baseline analysis.

To test whether the estimation results are sensitive to the choice of the balancing methodology, we apply two alternative methods notably propensity score matching (check 5) and propensity score weighting (check 6). Propensity score matching is a two-step approach. First, a propensity score for being rated is estimated for each country-year observation with a logistic regression. We use the same control variables as in the entropy balancing approach to predict the propensity scores. In the second step, each country of the treatment group is matched to a country of the control group based on the propensity scores and then the average treatment effect of being rated is estimated. We use the K-nearest neighbor method to do the matching.⁹ A negative side-effect of matching is that large amounts of data are thrown away large amounts of the data, because the treatment and control groups are shrunk down to the same size. In propensity score weighting, all observations are kept in play but they are reweighed according to the propensity score.

⁸The number of nodes K used for matching is 10. Matched countries should have minimum distance between treated countries and a particular control country. We run the matching for each country in the control group.

⁹We also applied other matching methods and results are similar. We opt for K-NN because of the shorter computation time.

Table 13: Alternative methods: Sovereign credit rating provision and the banking sector

Method	Bank claims on govt./GDP	Domestic credit by banks/GDP	Banks assets/GDP	Δ Risk weighted assets	Δ Liquid assets	Δ Short term liabilities	Broadmoney/GDP
Entropy balancing with selection corr	-0.03*** (0.00)	0.03*** (0.01)	0.02** (0.01)	0.11** (0.05)	0.08 (0.06)	0.02 (0.05)	-0.01 (0.01)
Check 1: Entropy balancing	-0.03*** (0.01)	0.04*** (0.01)	0.02* (0.01)	-0.06 (0.06)	-0.05 (0.06)	-0.00 (0.03)	0.00 (0.01)
Check 2: Heckman selection corr	-0.04*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.05 (0.03)	-0.04 (0.07)	-0.01 (0.04)	0.02*** (0.01)
Check 3: Diff-in-diff (rated only)	-0.03*** (0.01)	0.01*** (0.00)	0.01 (0.01)	-0.03 (0.05)	-0.08 (0.06)	-0.02 (0.03)	-0.01 (0.01)
Check 4: Matched diff-in-diff	-0.04*** (0.01)	0.07*** (0.01)	0.06*** (0.01)	0.27*** (0.08)	-0.02 (0.11)	0.07 (0.08)	0.03*** (0.01)
Check 5: Propensity score matching	-0.03*** (0.01)	0.03*** (0.01)	0.03 (0.02)	-0.02 (0.07)	-0.17 (0.10)	-0.17*** (0.05)	0.02 (0.01)
Check 6: Propensity score weighting	-0.03*** (0.01)	0.06*** (0.02)	0.04*** (0.01)	-0.00 (0.04)	-0.03 (0.06)	-0.01 (0.03)	0.05*** (0.02)

Note: This table presents estimated impact of a sovereign credit rating provision on the banking sector by using alternative methodologies. The dependent variables are in the column headings. The reported coefficients estimates are for the *Rating* dummy. The control variables include the lagged values of GDP per capita, FCY reserves, unemployment rate, trade/GDP, current account/GDP, inflation, real GDP growth, external debt/GDP, previous default dummy, rule of law, government effectiveness and a banking crisis dummy. The control variables are introduced in a step-wise manner based on statistical significance. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: Alternative methods: Sovereign credit rating provision and foreign and local currency bonds issues

Method	FCY/total	FCY long-term/total	FCY med-term/total	FCY short-term/total	LCY/total	LCY long-term/total	LCY med-term/total	LCY short-term/total	Bond yield
Entropy balancing with selection corr	0.03** (0.01)	0.01*** (0.00)	0.00 (0.00)	0.00*** (0.00)	-0.04 (0.07)	0.03* (0.01)	0.01 (0.03)	-0.13** (0.05)	-0.68 (0.61)
Check 1: Entropy balancing	0.04*** (0.01)	0.01*** (0.00)	0.01** (0.00)	0.01** (0.01)	0.02 (0.05)	0.04*** (0.01)	0.03 (0.03)	-0.10*** (0.03)	-0.76 (0.69)
Check 2: Heckman selection corr	0.05*** (0.02)	0.01*** (0.00)	0.01*** (0.00)	0.01** (0.01)	-0.04 (0.06)	0.02 (0.01)	-0.02 (0.03)	-0.03 (0.04)	-0.40 (0.69)
Check 3: Diff-in-diff	0.01 (0.02)	0.01* (0.00)	0.01 (0.01)	0.01 (0.01)	-0.04 (0.05)	0.01 (0.02)	-0.02 (0.03)	-0.02 (0.04)	-0.42 (1.06)
Check 4: Matched Diff-in-diff	0.05* (0.03)	0.01* (0.00)	0.02*** (0.00)	0.02** (0.01)	0.01 (0.05)	0.03** (0.02)	0.00 (0.04)	-0.02 (0.02)	-1.47 (0.91)
Check 5: Propensity score matching	0.06*** (0.02)	0.02*** (0.00)	0.01** (0.01)	0.01 (0.01)	-0.06* (0.04)	0.01 (0.01)	-0.02 (0.02)	-0.08*** (0.03)	-0.50 (0.87)
Check 6: Propensity score weighting	0.05*** (0.02)	0.01*** (0.00)	0.01** (0.00)	0.01* (0.01)	-0.00 (0.05)	0.03** (0.01)	0.03 (0.03)	-0.09*** (0.03)	-0.62 (0.72)

Note: This table presents estimated impact of a sovereign credit rating provision on the proportion of foreign (local) currency bond issues to total bond issues. The dependent variables are in the column headings. The reported coefficients estimates are for the *Rating* dummy. The control variables include the lagged values of GDP per capita, FCY reserves, unemployment rate, trade/GDP, current account/GDP, inflation, real GDP growth, external debt/GDP, previous default dummy, rule of law, government effectiveness and a banking crisis dummy. The control variables are introduced in a step-wise manner based on statistical significance. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 15: Alternative methods: Sovereign credit rating provision and capital inflows and international banking

Method	Direct debt/GDP	Direct equity/GDP	Portfolio debt/GDP	Portfolio equity/GDP	Foreign loans and deposits
Entropy balancing with selection corr	-0.00 (0.01)	0.03** (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.06** (0.02)
Check 1: Entropy Balancing	-0.00 (0.01)	0.03** (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.06*** (0.02)
Check 2: Heckman selection corr	-0.01 (0.01)	0.05*** (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.11 (0.07)
Check 3: Diff-in-diff	-0.00 (0.01)	-0.02** (0.01)	0.00*** (0.00)	0.01* (0.00)	0.12*** (0.03)
Check 4: Matched diff-in-diff	-0.02* (0.01)	0.09*** (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.13 (0.11)
Check 5: Propensity score matching	-0.02* (0.01)	0.01 (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.05 (0.05)
Check 6: Propensity score weighting	-0.01 (0.01)	0.02** (0.01)	0.01*** (0.00)	0.01*** (0.00)	0.03 (0.04)

Note: This table presents estimated impact of a sovereign credit rating provision on inward foreign direct investments, portfolio investments and foreign loans and deposits provided to the banking sector. The dependent variables are in the column headings. The reported coefficients estimates are for the *Rating* dummy. The control variables include the lagged values of GDP per capita, FCY reserves, unemployment rate, trade/GDP, current account/GDP, inflation, real GDP growth, external debt/GDP, previous default dummy, rule of law, government effectiveness and a banking crisis dummy. The control variables are introduced in a step-wise manner based on statistical significance. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

7 Conclusion

Moody's, Standard and Poor's and Fitch, three privately owned and U.S.-based credit rating agencies, have immense power over debt issuers all around the world. By assigning credit ratings, credit rating agencies provide opinions about the default risk of a borrower. Although the credit rating is just an opinion, rating agencies dictate the actions of sovereign borrowers. This is because being rated is a necessary condition for tapping the international capital markets. The quality of the credit rating determines the interest rates governments have to pay to service their debt. In addition, credit ratings play an important role in the legal system. Most institutional investors like pension funds are only allowed to invest in securities rated above a specific level and the capital ratios of banks depend on the credit ratings of the assets they hold on their balance sheets. In short, having a credit rating is of utmost importance if a country aims to issue publicly traded debt.

Income per capita is generally low in emerging economies, which translates into low savings, on average. In addition, domestic financial institutions are not efficient enough to mobilize these savings for capital formation. Access to international capital markets is important for emerging countries to guarantee investment and economic growth. International investors bring not only the capital but also managerial expertise and technical know-how to the host countries (Schnitzer, 2002). However, investment in low-income countries is generally perceived to be risky. Not only because of the high volatility and significant political risk that is typically associated with these countries, but also because of important information asymmetries disfavoring international investors. The provision of a sovereign credit rating can improve the information provision regarding the sovereign credit risk of the low-income countries. Increased transparency about the sovereign default risk may create positive spillover effects to the domestic banking sector and can be a catalyser to develop the country's financial markets.

In this article we investigate the impact of a sovereign credit rating provision on the financial markets of low income countries. We find this effect to be important in several ways. First and foremost we find that sovereign credit ratings foster foreign inward investment, both in terms of FDI and portfolio investments. We also show that banks rebalance their asset portfolio and provide more credit to the private sector and lend less to the government. This increase in private lending activity by domestic banks may foster private investment in the country. Our results also show that a sovereign credit rating provision increases the risk-weighted assets of domestic banks, which is a logical consequence of the rebalancing of the asset portfolio.

Contrary to our expectations, we only find a small impact on the sovereign's debt issuing behavior. We do find that the proportion of foreign (local) currency bond issues relative to total bond issues in rated countries is higher (lower) than in unrated countries, but we do not find an increase in bond issue size. Rated countries seem to issue smaller bond principals, especially when the bond is issued in local currency.

Overall, we conclude that receiving an initial sovereign credit rating has positive effects on the financial market of the rated country. However, we do want to express a small concern with respect to our findings. In general we find that a newly rated country relies more on external financing than before it was rated. Several studies have shown that foreign capital flows can be highly volatile and there is even a risk of so-called sudden stops in capital flows. Also, issuing foreign currency denominated debt aggravates the problem of original sin, which implies that a country has a currency mismatch between its assets and its liabilities, exposing the country to foreign currency risk. This is a serious concern for low-income countries, that typically have weaker currencies. Although our results indicate that the foreign currency credit rating increase the currency mismatch of sovereign borrowing, we do provide some evidence that the rating provision helps to solve the maturity mismatch of sovereign borrowing. Low-income countries generally rely on shorter term financing than developed countries. We find that when a country gets rated, it issues less short term debt and more long term debt.

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