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ORIGINAL RESEARCH

# The social and environmental drivers of corporate credit ratings: international evidence

**Gregor Dorfleitner**[1] · **Johannes Grebler**[1]

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**Abstract** We provide evidence of the exogenous impact of environmental and social performance components on credit ratings in North America, Europe, and Asia. In particular, the product innovation dimension is clearly identified as being the dominating driver of credit ratings within the environmental performance in every subsample region. In the social performance dimension, the extent of diversity is a main driver for firms in North America and Europe, but due to cultural reasons, not in Asia. Our results show that the risk mitigation view holds for all significant corporate social or environmental performance variables, but the magnitude of impact differs regionally.

**Keywords** Credit risk · Credit ratings · Asset4 · CSP · CSR · Sustainability

## 1 Introduction

We identify the single dimensions of corporate social and environmental performance which have an impact on credit ratings. Our analysis differs from earlier studies through the joint use of more sophisticated and transparent corporate social performance (CSP)[1] measures of Asset4, the identification of the affecting CSP components, the regional differentiation in an international dataset (North America, Europe, and Asia), and the use of an instrumental variables approach in

[1] The term 'corporate social performance' (CSP), as usually used in literature, includes both, the social and the environmental dimension (cf. Ioannou and Serafeim 2012). For that reason, we refer to CSP in case of the overall CSP performance throughout the paper while referring to either the social or environmental dimension which is denoted as social or environmental performance.

✉ Gregor Dorfleitner
gregor.dorfleitner@ur.de

[1] Department of Finance, University of Regensburg, 93040 Regensburg, Germany

conjunction with commonly employed credit risk models. It is our approach in particular that allows us to provide clearer indications of a causal relationship in terms of how CSP components impact credit ratings, as opposed to the common approaches revealing only correlational relationships.

Dorfleitner et al. (2020) find that out-of-sample prediction quality improves by more than 0.8% in their North America sample if environmental and social performance measures are integrated into an established credit risk model. However, a detailed analysis of the underlying drivers within the social and environmental performance is only available for the USA and suffers from a potential exposure to endogeneity (e.g., Oikonomou et al. 2014) or rather simplistic credit risk modeling (e.g., Attig et al. 2013). Endogeneity, in terms of the reverse causality problem, is crucial to the analysis of the relationship between CSP and credit ratings. On the one hand, CSP is commonly expected to have a positive impact on credit ratings. On the other hand, though, the opposite direction of impact is also conceivable, in the way that firms with better credit ratings save financing costs and are therefore able to increase their spending on CSP. Most studies on this topic use lagged independent variables to deal with the endogeneity problem, which is the first step, but nonetheless appears not to be insufficient. Some (e.g., Bauer et al. 2009; Jiraporn et al. 2014) estimate a two-stage least squares (2SLS) model, which is generally appropriate for reducing endogeneity, but this approach does not meet the standards of current literature on credit risk because credit ratings need to be considered as categorical, and the employed OLS estimation is unable to model this. As a consequence, an international analysis with an adequate credit risk model and a sufficient approach to identify relevant CSP aspects which have a causal impact on credit ratings is still lacking in the literature.

We fill this gap by applying the analysis to both CSP in general and its components in an international dataset including Asset4 CSP measures based on the two-stage predictor substitution (2SPS) with an established credit risk model in the second stage. Asset4 CSP measures are internationally available on a granular level, allowing us to drive our analysis consistently for North America, Europe, and Asia. The environmental performance comprises measures for emission reduction, product innovation, and resource reduction, while the social performance dimension spans the categories product responsibility, community, human rights, diversity, respectively, equal opportunities, employment quality, health, and training. Asset4 scores are, compared to other providers such as MSCI-KLD, methodologically superior and more transparent (Chatterji and Levine 2006). Concerning established credit risk models, endogeneity can be mitigated through the two-stage predictor substitution (2SPS), which is an implementation of the instrumental variable approach for nonlinear models. In the first stage, we regress the CSP scores on instruments such as the average CSP level of firms located in the same area (Jiraporn et al. 2014) and measures for so-called 'national business systems' (NBS) (Whitley 1999) in terms of the political, the labor, education, and the cultural system according to Ioannou and Serafeim (2012) as well as on further control variables. All instruments have an impact on CSP as shown in the above studies, but obviously have no direct impact on credit ratings. Hence, they qualify as instruments. Finally, in the second stage, credit ratings are regressed on the CSP estimate of the first

stage. We choose the ordered choice model as introduced by Kaplan and Urwitz (1979) and as applied in many studies (e.g., Dimitrov et al. 2015; Baghai et al. 2014; Alp 2013; Jiang et al. 2012; Becker and Milbourn 2011; Blume et al. 1998).

We show that within the environmental performance, the innovation dimension has the most significant impact on credit ratings. This is true for North America, Europe, and Asia. However, the magnitude of the effect differs between these regions. The impact of social performance in North America and Europe is mainly driven by diversity, while no social aspects are relevant for Asia. Our findings are important for real-world decision makers, as they enable the identification of those CSP dimensions that have an impact on credit ratings. As the positive link between selected CSP components and credit ratings indicates a lower default risk of firms with high CSP levels, practitioners may profit from this knowledge through a more precise evaluation of credit risk and the resulting incentives to act. Also, as better credit ratings are associated with lower financing costs, our results help to target investments efficiently, leading to cost savings. Particular investments in environmental product innovation are far more impactful than those for emission and resource reduction. Likewise, among the social dimensions, diversity and employment quality are to be prioritized in investment decisions.

The remainder of the paper is organized as follows. We review the related literature and consider theory in Sect. 2. Section 3 describes our international data set and Sect. 4 introduces the employed instumental variable and ordered probit methodology. Sect. 5 presents the empirical results followed by Sect. 6 with robustness tests. Finally, Sect. 7 concludes the paper.

## 2 Theoretical considerations

A recent stream in literature analyzes the relationship between CSP and credit ratings. Dorfleitner et al. (2020), Stellner et al. (2015), Jiraporn et al. (2014), Oikonomou et al. (2014), Attig et al. (2013), Bauer and Hann (2010), Bauer et al. (2009) and Frooman et al. (2008) all contribute important insights to the prevailing positive link between CSP and credit ratings. However, the combination of a state of the art credit risk model and an econometrical framework to identify causal relationships rather than simple correlations has not yet been pursued.

In theory, there are two possible relationships between CSP and credit ratings. The overinvestment view regards CSP as being a waste of scarce resources, but there is little evidence of this perspective. In contrast, the risk mitigation view is based on the idea that sustainable companies face lower risks.

For US firms, Oikonomou et al. (2014), Attig et al. (2013), Bauer and Hann (2010), and Frooman et al. (2008) find a strong positive link between the KLD environment score and credit ratings. Dorfleitner et al. (2020) report an improved prediction quality in their North America sample if they consider environmental performance in their model. Environmental practices affect the solvency of borrowing firms by determining their exposure to potentially costly legal, reputational, and regulatory risks according to Bauer and Hann (2010). Following the correlation-based evidence of the above-mentioned previous studies, we also

conjecture a causal impact of (some of) the components of environmental performance on credit ratings. More concretely, we expect at least one of the environmental performance dimensions of emission reduction, resource reduction, and environmental innovation to have a positive impact on credit ratings.

Bauer et al. (2009) have already evidenced a positive relationship between the social pillar of CSP and credit ratings. Dorfleitner et al. (2020) report an improved prediction quality for North America, regarding a model that considers social performance. Through the breakdown into individual components, Attig et al. (2013) find that KLD social strengths and concerns correlate with credit ratings of US firms and that the individual components of CSP related to primary stakeholder management (i.e., community relations, diversity, and employee relations) matter most in explaining a firm's creditworthiness. Oikonomou et al. (2014) identify a similar relationship for community, employment, environment, and product safety. The positive link between CSP components and creditworthiness appears plausible especially for employee relations, as these are associated with greater productivity, higher profitability, higher firm value, and superior shareholder returns (e.g., Huselid 1995; Prennushi et al. 1997; Ichniowski and Shaw 1999; Edmans 2011). Bauer et al. (2009) argue that employee relations affect bondholders through their influence on firm risk. Thus, firms with sound and competitive employment practices can enhance their capacity to generate higher and more stable cash flows while simultaneously preempting or mitigating the harmful behavior of dissatisfied employees. In contrast, poor employee relations can limit firms' access to human capital, lead to the exit of valuable employees, increase both litigation and reputation risks, and raise transaction costs. Hence, we also expect a causal impact of (some of) the components of social performance on credit ratings. More narrowly, at least one of the social performance dimensions of product responsibility, community, human rights, diversity, employment quality, health, or training performance is expected to have a positive impact on credit ratings.

For the impact of CSP on some types of risk, it was already shown that this relationship varies regionally, e.g., Utz (2018) finds evidence for the risk mitigation view on the impact of CSP on idiosyncratic risk, while the overinvestment view seems to apply in Asia-Pacific. Some previous research on the relationship between CSP and credit ratings is provided for both North America and Europe. Jiraporn et al. (2014) find that the CSP policies of US firms are affected by CSP. Firms with high CSP have better credit ratings, i.e., by 4.5% for a one standard deviation change in the CSP level. In contrast, Stellner et al. (2015) find no relevance of Asset4's overall CSP rating for credit ratings regarding Europe. Dorfleitner et al. (2020) also confirm regional deviations between North America and Europe in the explanation and prediction quality of credit ratings through CSP. While social performance is a predictor for credit ratings in both North America and Europe, this is only the case for environmental performance in North America in their setting. Given there is an impact, we expect the effect of environmental and social performance categories on credit ratings to differ regionally.

## 3 Data

Our sample includes S&P credit ratings, Asset4 CSP measures, and some instrumental and control variables. After excluding financial firms based on the Thomson Reuters Business Classification (TRBC), the final data set encompasses 1212 firms with 7032 firm-year observations. Tables 1 and 2 present descriptive statistics of the credit rating variable, respectively, of the Asset4 scores, the instruments, and the control variables. The regional classification into North America, Europe, and Asia is described in Table 3.

The dependent variable of the second stage regression is the long-term borrower credit rating of S&P. These credit ratings reflect the creditworthiness of a borrower for a time horizon of at least 1 year. The referring rating grades comprise AAA, AA, A, BBB, BB, B, CCC, CC, and D. The default category D is assigned when obligors are overdue for their required payments. Vazza, and Kraemer (2017) provide further information on the rating methodology.

Asset4 publishes annual corporate social and environmental performance scores, which can be interpreted as being external measures for sustainable business models (Ioannou and Serafeim 2012; Chatterji et al. 2016; Humphrey et al. 2012). The scores include information from publicly available sources such as websites, SEC filings such as 10-K, DEF 14A, and 10-Q, sustainability reports, media sources, and NGO reports. The methodology is based on more than 700 questions about the fulfillment of a specific sustainable topic. Each question results in one data point. These pieces of information are aggregated to categories, which again are condensed to pillars. The approach of Asset4 allows us to overcome weaknesses

**Table 1** This table reports on the total number of firms and observations per rating class including the partial quantity of rating upgrades and downgrades compared with the previous period for the entire sample

| Rating | North America | | | Europe | | | Asia | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Upgr. | Downgr. | Total | Upg. | Down. | Total | Upgr. | Downgr. |
| AAA | 52 | 0 | 0 | 9 | 0 | 0 | 5 | 0 | 0 |
| AA | 131 | 4 | 6 | 70 | 1 | 2 | 158 | 2 | 1 |
| A | 841 | 30 | 9 | 375 | 17 | 11 | 277 | 11 | 9 |
| BBB | 1918 | 57 | 57 | 715 | 18 | 37 | 278 | 7 | 9 |
| BB | 1293 | 60 | 69 | 231 | 9 | 27 | 84 | 3 | 3 |
| B | 432 | 15 | 60 | 80 | 4 | 12 | 14 | 1 | 6 |
| CCC | 34 | 1 | 14 | 13 | 1 | 7 | 4 | 0 | 2 |
| CC | 2 | 0 | 2 | 3 | 0 | 3 | 0 | 0 | 0 |
| D | 6 | 0 | 6 | 4 | 0 | 4 | 3 | 0 | 3 |
| Total | 4709 | 167 | 223 | 1500 | 50 | 103 | 823 | 24 | 33 |

We use S&P long-term borrower credit ratings reflecting the obligor's creditworthiness over a long-term time horizon (greater than one year)

**Table 2** This table reports the descriptive statistics for the asset scores, the instrumental variables, and control variables in our sample covering the period from 2002 until 2018

| | North America | | | | | Europe | | | | | Asia | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% |
| *CSP variables* | | | | | | | | | | | | | | | |
| CSP score | 54.04 | 28.74 | 25.45 | 54.67 | 82.84 | 81.63 | 17.21 | 76.10 | 89.46 | 93.56 | 70.08 | 26.45 | 57.69 | 81.67 | 90.11 |
| Environm. score | 53.02 | 31.59 | 19.28 | 53.09 | 86.14 | 80.77 | 19.34 | 75.59 | 90.30 | 93.66 | 74.47 | 27.35 | 65.64 | 89.01 | 93.43 |
| Social score | 55.03 | 29.05 | 26.78 | 58.10 | 82.88 | 82.51 | 17.55 | 77.02 | 90.22 | 94.71 | 65.71 | 28.87 | 45.89 | 77.76 | 89.08 |
| Emission score | 52.28 | 31.84 | 18.81 | 52.03 | 86.00 | 81.35 | 19.52 | 78.54 | 90.33 | 93.84 | 74.04 | 27.72 | 60.40 | 88.89 | 93.80 |
| Env. inno. score | 50.52 | 30.84 | 21.92 | 40.24 | 83.43 | 71.89 | 29.32 | 48.36 | 87.32 | 95.71 | 70.71 | 28.99 | 45.75 | 83.52 | 95.78 |
| Resources score | 53.58 | 32.18 | 19.63 | 57.58 | 87.23 | 79.31 | 17.95 | 73.12 | 87.50 | 91.95 | 70.84 | 26.79 | 58.34 | 82.86 | 90.88 |
| Prod. resp. score | 53.33 | 28.14 | 28.44 | 49.71 | 82.45 | 72.10 | 25.43 | 52.39 | 84.13 | 94.07 | 59.61 | 30.35 | 35.04 | 62.24 | 89.56 |
| Comm. score | 56.33 | 29.26 | 28.91 | 60.02 | 84.28 | 70.32 | 23.69 | 55.16 | 78.95 | 90.41 | 64.83 | 28.25 | 46.70 | 74.24 | 88.68 |
| Hum. rights score | 53.68 | 32.54 | 22.13 | 37.43 | 90.79 | 76.48 | 26.98 | 57.73 | 92.07 | 94.71 | 61.88 | 30.16 | 30.26 | 66.33 | 93.16 |
| Diversity score | 54.19 | 28.69 | 24.79 | 52.96 | 84.24 | 75.74 | 24.13 | 61.20 | 88.08 | 94.61 | 63.22 | 34.01 | 23.89 | 83.30 | 92.23 |
| Employm. score | 53.12 | 29.51 | 23.67 | 54.41 | 82.11 | 74.07 | 23.20 | 58.78 | 84.05 | 93.06 | 52.44 | 28.58 | 26.41 | 52.26 | 80.06 |
| Health score | 53.22 | 29.83 | 26.18 | 49.24 | 84.67 | 75.68 | 23.61 | 56.89 | 87.42 | 96.32 | 58.89 | 29.27 | 31.60 | 61.46 | 88.92 |
| Training score | 48.99 | 30.46 | 18.45 | 49.57 | 79.86 | 80.09 | 16.41 | 75.07 | 86.40 | 91.80 | 63.34 | 27.77 | 41.55 | 75.06 | 85.72 |
| *Instruments* | | | | | | | | | | | | | | | |
| ∅ CSP score[a] | 54.01 | 4.96 | 52.15 | 55.82 | 56.99 | 81.12 | 8.40 | 76.41 | 82.46 | 86.91 | 70.03 | 15.50 | 62.60 | 70.17 | 83.37 |
| ∅ Environm. score[a] | 53.01 | 5.11 | 50.34 | 54.54 | 56.69 | 80.30 | 9.21 | 74.18 | 81.80 | 86.83 | 74.39 | 17.16 | 70.55 | 77.65 | 88.13 |
| ∅ Social score[a] | 55.01 | 4.99 | 53.99 | 57.13 | 57.32 | 81.94 | 8.67 | 77.30 | 83.27 | 87.59 | 65.66 | 14.91 | 59.04 | 65.03 | 78.94 |
| ∅ Emission score[a] | 52.28 | 5.61 | 49.33 | 53.18 | 55.08 | 80.95 | 9.09 | 76.86 | 81.73 | 86.52 | 73.96 | 17.77 | 67.90 | 79.07 | 88.57 |
| ∅ Env. inno. score[a] | 50.53 | 3.90 | 49.80 | 51.38 | 53.74 | 71.85 | 13.90 | 59.69 | 73.93 | 82.17 | 70.64 | 17.33 | 62.17 | 72.07 | 83.92 |
| ∅ Resources score[a] | 53.57 | 5.66 | 50.18 | 55.80 | 57.29 | 78.81 | 8.60 | 74.69 | 79.52 | 84.26 | 70.83 | 15.32 | 67.39 | 71.92 | 82.54 |
| ∅ Prod. resp. score[a] | 53.24 | 3.27 | 52.99 | 53.94 | 55.14 | 71.86 | 13.22 | 62.12 | 73.15 | 82.80 | 59.59 | 12.89 | 54.24 | 63.15 | 66.53 |

**Table 2** continued

| | North America | | | | | Europe | | | | | Asia | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% |
| ∅ Comm. score[a] | 56.26 | 4.71 | 54.81 | 56.52 | 57.89 | 70.04 | 10.68 | 65.20 | 72.28 | 75.99 | 64.74 | 13.03 | 57.93 | 64.44 | 75.88 |
| ∅ Hum. rights score[a] | 53.71 | 6.33 | 47.17 | 57.76 | 58.96 | 76.33 | 12.36 | 70.03 | 77.64 | 85.09 | 61.81 | 17.16 | 51.22 | 59.94 | 80.14 |
| ∅ Diversity score[a] | 54.15 | 4.17 | 54.13 | 54.71 | 56.73 | 75.44 | 12.23 | 69.82 | 76.57 | 84.17 | 63.24 | 20.52 | 46.29 | 62.77 | 85.62 |
| ∅ Employm. score[a] | 53.07 | 7.01 | 53.55 | 55.44 | 56.38 | 73.71 | 10.70 | 69.24 | 75.15 | 80.04 | 52.41 | 14.61 | 37.80 | 49.63 | 66.75 |
| ∅ Health score[a] | 53.19 | 4.43 | 52.72 | 54.00 | 54.14 | 75.36 | 9.70 | 71.35 | 74.84 | 80.89 | 58.84 | 11.92 | 50.07 | 57.65 | 65.71 |
| ∅ Training score[a] | 49.04 | 5.01 | 46.75 | 51.30 | 52.29 | 79.36 | 9.36 | 74.42 | 82.45 | 85.38 | 63.36 | 11.00 | 55.29 | 63.15 | 70.86 |
| Regulatory framew. | 17.33 | 1.10 | 17.00 | 17.00 | 17.00 | 16.52 | 10.12 | 12.00 | 14.00 | 20.00 | 29.97 | 13.36 | 24.00 | 37.00 | 37.00 |
| Anti-self-dealing | 0.65 | 0.00 | 0.65 | 0.65 | 0.65 | 0.50 | 0.27 | 0.28 | 0.38 | 0.95 | 0.62 | 0.20 | 0.50 | 0.50 | 0.58 |
| Corruption | 0.67 | 0.05 | 0.68 | 0.68 | 0.68 | 0.84 | 0.86 | 0.54 | 0.54 | 0.73 | 0.78 | 0.86 | 0.72 | 0.72 | 0.72 |
| Political orientation | 94.73 | 28.10 | 103.13 | 103.13 | 103.13 | 26.05 | 43.48 | 0.31 | 0.34 | 99.76 | 19.81 | 39.97 | 0.01 | 0.01 | 0.01 |
| Union density | 13.46 | 4.88 | 12.00 | 12.00 | 12.00 | 27.01 | 17.68 | 19.50 | 22.20 | 28.80 | 20.66 | 5.39 | 19.20 | 19.20 | 20.10 |
| Skilled labor | 6.12 | 0.10 | 6.09 | 6.09 | 6.09 | 6.26 | 0.48 | 5.78 | 6.30 | 6.46 | 5.13 | 0.95 | 4.50 | 4.50 | 6.06 |
| Power distance | 39.92 | 0.27 | 40.00 | 40.00 | 40.00 | 44.12 | 14.07 | 35.00 | 35.00 | 57.00 | 59.42 | 10.59 | 54.00 | 54.00 | 68.00 |
| Individualism | 90.10 | 3.02 | 91.00 | 91.00 | 91.00 | 73.85 | 11.82 | 68.00 | 71.00 | 89.00 | 39.42 | 10.44 | 25.00 | 46.00 | 46.00 |
| *Control variables* | | | | | | | | | | | | | | | |
| Interest coverage | 11.97 | 19.52 | 2.48 | 5.57 | 12.20 | 9.04 | 14.19 | 2.85 | 5.27 | 9.54 | 23.35 | 29.16 | 4.87 | 11.32 | 26.89 |
| Operating margin | 13.61 | 8.64 | 7.04 | 12.32 | 18.99 | 12.41 | 9.04 | 5.64 | 10.23 | 16.66 | 10.83 | 8.65 | 4.66 | 7.76 | 14.43 |
| Total debt | 45.52 | 20.72 | 30.55 | 42.99 | 58.18 | 46.64 | 16.85 | 33.48 | 45.91 | 58.34 | 37.58 | 19.20 | 23.02 | 37.01 | 51.94 |
| US$ billions | 20.34 | 46.62 | 2.83 | 6.57 | 17.49 | 25.90 | 35.81 | 4.94 | 11.46 | 31.72 | 20.50 | 29.67 | 6.13 | 11.69 | 24.38 |
| Beta | 0.56 | 0.49 | 0.15 | 0.45 | 0.89 | 0.55 | 0.48 | 0.16 | 0.44 | 0.91 | 0.59 | 0.48 | 0.16 | 0.49 | 1.00 |
| Idiosyncratic risk | 2.03 | 1.15 | 1.28 | 1.81 | 2.66 | 1.96 | 1.15 | 1.21 | 1.70 | 2.47 | 1.92 | 0.93 | 1.24 | 1.67 | 2.37 |
| Dividend payer | 0.71 | 0.45 | 0.00 | 1.00 | 1.00 | 0.88 | 0.33 | 1.00 | 1.00 | 1.00 | 0.96 | 0.19 | 1.00 | 1.00 | 1.00 |
| Market/Book | 3.00 | 2.22 | 1.48 | 2.32 | 3.74 | 2.61 | 2.04 | 1.25 | 2.02 | 3.18 | 1.68 | 0.78 | 1.08 | 1.48 | 2.02 |

**Table 2** continued

| | North America | | | | | Europe | | | | | Asia | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% | Mean | SD | 25% | Med. | 75% |
| Retained earnings | 0.25 | 0.30 | 0.06 | 0.24 | 0.44 | 0.19 | 0.19 | 0.06 | 0.18 | 0.33 | 0.29 | 0.16 | 0.17 | 0.27 | 0.39 |
| Capital expenditure | 4.86 | 3.03 | 2.26 | 4.20 | 7.21 | 4.45 | 2.69 | 2.26 | 3.84 | 6.07 | 5.40 | 2.83 | 3.10 | 5.14 | 7.50 |
| Cash holdings | 0.11 | 0.11 | 0.03 | 0.07 | 0.15 | 0.10 | 0.08 | 0.05 | 0.08 | 0.13 | 0.13 | 0.10 | 0.06 | 0.10 | 0.17 |
| Tangibility | 0.34 | 0.26 | 0.11 | 0.26 | 0.55 | 0.31 | 0.20 | 0.13 | 0.28 | 0.46 | 0.35 | 0.19 | 0.19 | 0.32 | 0.48 |
| R&D | 0.02 | 0.04 | 0.00 | 0.00 | 0.02 | 0.02 | 0.03 | 0.00 | 0.00 | 0.02 | 0.02 | 0.03 | 0.00 | 0.01 | 0.03 |
| GDP growth | 0.02 | 0.01 | 0.02 | 0.02 | 0.03 | 0.01 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 |
| **N** | 4709 | | | | | 1500 | | | | | 823 | | | | |

[a]Country average

**Table 3** This table reports the breakdown of our data panel on regions and countries which are the base for our panel selection when analyzing regional differences

| Continent | Countries | Observations | Firms |
|---|---|---|---|
| North America | Canada, USA | 4709 | 813 |
| Europe | Belgium, Switzerland, Germany, Denmark, Spain, Finland, France, Great Britain, Greece, Italy, Netherlands, Norway, Portugal, Sweden | 1500 | 224 |
| Asia | Hong Kong, India, Japan, Malaysia, Singapore, Taiwan | 823 | 175 |
| Total | | 7032 | 1212 |

of the KLD, FTSE4Good, and Dow Jones-rating approaches such as lack of transparency (Chatterji and Levine 2006) as far as possible. Following El Ghoul et al. (2017), we also derive the overall CSP performance from aggregating the environmental and social pillars. The final scores range from zero to 100% with high levels reflecting high CSP. The distribution of Asset4 scores may be skewed as the required information to assign a rating is easier to obtain from larger and high-CSP companies as badly performing firms are unlikely to provide the necessary information. As a consequence, we include size and a large set of further control variables in our models. The data is free from survivorship bias as post-bankruptcies, mergers, and other causes of de-listings are accounted for and the corresponding stocks are retained in the sample. A detailed description of the CSP scores is displayed in Table 4.

Our first instrument for CSP is selected based on the study by Jiraporn et al. (2014), who ascertain that the CSP policy of surrounding firms to have an impact on firm CSP performance. Thus we apply the average CSP score of all (available) surrounding firms within the same country. Second, a further set on instruments is included, namely the drivers for CSP in terms of "national business systems" (NBS) according to Whitley (1999), such as the political, labor, education, and the cultural systems. The theoretical NBS category political system is measured with the aid of a regulations index, an anti-self-dealing index, an absence-of-corruption index, and an index for left/center political orientation. The education and labor system is modeled by union density and a skilled labor index while the cultural system involves indices for power distance and individualism. A detailed description of the variables of each NBS category is presented in Table 5.

We add further control variables based on previous research. Following Standard&Poor's (2013) and Merton (1974), we include the three-year averages of the operating margin, the total debt, and the interest coverage ratios. The interest coverage ratio is transformed as suggested by Blume et al. (1998). We set negative values to zero because these could be due to low interest payments or high negative earnings, while both explanations have a contradictory impact on credit ratings. By assuming decreasing marginal effects for high levels of interest coverage, we cap the three-year average at 100. To model a non-linear shape, we transform the

**Table 4** This table presents the description of our selection on Asset4 CSP measures. Source: Asset4

| Variable | Definition |
|---|---|
| Emission | The emission reduction category measures a company's management commitment and effectiveness toward reducing environmental emission in the production and operational processes. It reflects a company's capacity to reduce air emissions (greenhouse gases, F-gases, ozone-depleting substances, NOx and SOx, etc.), waste, hazardous waste, water discharges, spills, or its impacts on biodiversity and to partner environmental organisations to reduce the environmental impact of the company in the local or broader community. Source: Thomson Reuters Datastream, Mnemonic ENER |
| Env. inno. | The product innovation category measures a company's management commitment and effectiveness toward supporting the research and development of eco-efficient products or services. It reflects a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed, dematerialized products with extended durability. Source: Thomson Reuters Datastream; Mnemonic ENPI |
| Resources | The resource reduction category measures a company's management commitment and effectiveness toward achieving an efficient use of natural resources in the production process. It reflects a company's capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management. Source: Thomson Reuters Datastream; Mnemonic ENRR |
| Prod. resp. | The customer/product responsibility category measures a company's management commitment and effectiveness toward creating value-added products and services upholding the customer's security. It reflects a company's capacity to maintain its license to operate by producing quality goods and services integrating the customer's health and safety, and preserving its integrity and privacy, also through accurate product information and labelling. Source: Thomson Reuters Datastream; Mnemonic SOPR |
| Comm. | The community category measures a company's management commitment and effectiveness toward maintaining the company's reputation within the general community (local, national, and global). It reflects a company's capacity to maintain its license to operate by being a good citizen (donations of cash, goods or staff time, etc.), protecting public health (avoidance of industrial accidents, etc.), and respecting business ethics (avoiding bribery and corruption, etc.). Source: Thomson Reuters Datastream; Mnemonic SOCO |
| Hum. rights | The human rights category measures a company's management commitment and effectiveness towards respecting the fundamental human rights conventions. It reflects a company's capacity to maintain its license to operate by guaranteeing the freedom of association and excluding child, forced or compulsory labor. Source: Thomson Reuters Datastream; Mnemonic SOHR |
| Diversity | The diversity and opportunity category measures a company's management commitment and effectiveness towards maintaining diversity and equal opportunities in its workforce. It reflects a company's capacity to increase its workforce loyalty and productivity by promoting an effective life-work balance, a family friendly environment and equal opportunities regardless of gender, age, ethnicity, religion or sexual orientation. Source: Thomson Reuters Datastream; Mnemonic SODO |
| Employm. | The employment quality category measures a company's management commitment and effectiveness towards providing high-quality employment benefits and job conditions. It reflects a company's capacity to increase its workforce loyalty and productivity by distributing rewarding and fair employment benefits, and by focusing on long-term employment growth and stability by promoting from within, avoiding lay-offs, and maintaining relations with trade unions. Source: Thomson Reuters Datastream; Mnemonic SOEQ |

**Table 4** continued

| Variable | Definition |
|---|---|
| Health | The health & safety category measures a company's management commitment and effectiveness towards providing a healthy and safe workplace. It reflects a company's capacity to increase its workforce loyalty and productivity by integrating into its day-to-day operations a concern for the physical and mental health, well-being, and stress level of all employees. Source: Thomson Reuters Datastream; Mnemonic SOHS |
| Training | The training and development category measures a company's management commitment and effectiveness towards providing training and development (education) for its workforce. It reflects a company's capacity to increase its intellectual capital, workforce loyalty, and productivity by developing the workforce's skills, competences, employability, and careers in an entrepreneurial environment. Source: Thomson Reuters Datastream; Mnemonic SOTD |

**Table 5** This table provides an overview of the NBS categories (Whitley 1999) and their variables, which we select as instruments for use during the first stage of our 2SPS regressions based on the work of Ioannou and Serafeim (2012)

| NBS category | Variable | Definition |
|---|---|---|
| Political system | Regulatory framework | Strengths of laws that encourage competition in the country (measured as of 2017). Source: IMD World Competitiveness Report 2017 |
| | Anti-self-dealing index | The extent to which laws restrict insider trading (measured as of 2001). Source: La Porta et al. (2006) |
| | Corruption | Inverse corruption score (measured as average of 1996-2017). Source: World Bank |
| | Political orientation | The extent to which both the Chief Executive and the largest party in Congress are politically left respectively central (measured as proportion of the time period 1928-1995). Source: Botero et al. (2004) |
| Education and labor system | Union density | The proportion of union members of all employees based on administrative and survey data (measured as average as of 2002–2017). Source: OECD and J.Visser, ICTWSS database (Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts) |
| | Skilled labor | The extent to which skilled labor is available in a country (measured as of 2017). Source: IMD World Competitiveness Report 2017 |
| Cultural system | Power distance | The degree of acceptance for inequality in the distribution of power inside organisations and institutions (measured as of 1973). Source: Hofstede et al. (2010) and Hofstede (2001) |
| | Individualism | The extent of including individuals into groups (measured as of 1973). Source:Hofstede et al. (2010) and Hofstede (2001) |

interest coverage $C_{it}$ of a company $i$ in year $t$ into four subvariables $c_{it}^{A}$, $c_{it}^{B}$, $c_{it}^{C}$, $c_{it}^{D}$ acording to:

| | $c_{it}^{A}$ | $c_{it}^{B}$ | $c_{it}^{C}$ | $c_{it}^{D}$ |
|---|---|---|---|---|
| if $C_{it} \in [0, 5)$ | $C_{it}$ | 0 | 0 | 0 |
| if $C_{it} \in [5, 10)$ | 5 | $C_{it} - 5$ | 0 | 0 |
| if $C_{it} \in [10, 20)$ | 5 | 5 | $C_{it} - 10$ | 0 |
| if $C_{it} \in [20, 100)$ | 5 | 5 | 10 | $C_{it} - 20$ . |

We control for firm size for two reasons. On the one hand, larger companies are less likely to default (Altman et al. 1977). On the other hand, the CSP scores are likely to be skewed with respect to firm size. Referring to Blume et al. (1998), we also control for systematic risk (market model beta) as well as idiosyncratic risk. The firms' willingness to pay dividends can also be an indicator of credit risk (Hoberg and Prabhala 2009). Furthermore, firms with a high market-to-book ratio may be less likely to default (Pástor and Pietro 2003). Retained earnings are used to proxy a company's life cycle phase (DeAngelo et al. 2006), whereas established companies tend to have better ratings (Fons 1994). Additionally, capital expenditure has been evidenced to influence credit risk (Tang 2009). We include cash among the controls because firms in distress tend to hold precautionary savings (Acharya et al. 2012). Furthermore, tangibility may have an impact on credit risk (Rampini and Viswanathan 2013). As S&P credit ratings appear to change at least to some extent pro-cyclically, the gross domestic product (GDP) growth rate is employed to model the business cycle. A detailed description of the above control variables is presented in Table 6. Time fixed effects are intended to catch all remaining systematic effects (Elton et al. 2001). Finally, we also control for industry-fixed effects. An overview of industries is delineated in Table 7.

In order to control for multicollinearity, we calculate variance inflation factors (VIF) for overall CSP scores, instruments, and control variables. If necessary, input variables are discarded in a selection process in order to maintain only VIFs below 10 indicating sufficient low exposure to multicollinearity. The variable 'individualism' is discarded in that process for the combined dataset of all three regions. An estimation based on the full set of instruments is presented in the robustness checks.

## 4 Methodology

As CSP and credit ratings are likely to be highly endogenous, our analysis is based on the instrumental variable approach to mitigate the bias due to the endogeneity of the input variables. Thus in the first stage, we regress the respective CSP factor on selected instruments and controls. All factors that can explain variation in CSP but do not affect credit ratings qualify as instruments.

**Table 6** This table describes used control variables that are firm specific except for GDP growth. All of them are delivered by Worldscope and Thomson Reuters Datastream

| Variable | Definition |
|---|---|
| Interest coverage | Earnings before interest and taxes divided by interest expense on debt (3-year averages; floored at 0; capped at 100). To model the nonlinear shape of the interest coverage ratio, the interval of (0–5) is assigned to sub-variable A, (5–10) to sub-variable B, (10–20) to sub-variable C, and (20–100) to sub-variable D. Source: Thomson Reuters Datastream; Mnemonic WC08291 |
| Operating margin | The ratio of operating income and net sales or revenues (3-year averages). Source: Thomson Reuters Datastream; Mnemonics WC08316 |
| Total debt | The ratio of long-term plus short-term debt and total capital plus short-term debt (3-year averages). Source: Thomson Reuters Datastream; Mnemonic WC08221 |
| Size | The percentile of the market capitalization among those of companies listed at the New York Stock Exchange (NYSE). Source: Thomson Reuters Datastream; Mnemonic WC07210 |
| Idiosyncratic risk | The root mean squared error of a market model estimation based on daily stock and local market index returns within the time horizon of one year if at least 50 observations are available. Source: Thomson Reuters Datastream; Mnemonics X(LI), X(RI) |
| Beta | The systematic risk beta of the market model as described for the calculation of idiosyncratic risk. Source: Thomson Reuters Datastream; Mnemonics X(LI), X(RI) |
| Dividend payer | Positive dividends per share indicated by a dummy variable. Source: Thomson Reuters Datastream; Mnemonic WC05101 |
| Market/Book | The ratio of common equity and its balance sheet value. Source: Thomson Reuters Datastream; Mnemonic MTBV |
| R&D | All costs related to the development of new processes, techniques, applications, and products that are intended for commercial exploitation. Missing values are replaced by zero. Source: Thomson Reuters Datastream; Mnemonics WC01201, WC02999 |
| Retained earnings | The ratio of accumulated earnings after tax that have not been paid as dividends or allocated to allowances and total assets. Source: Thomson Reuters Datastream; Mnemonics WC03495, WC02999 |
| Capital expenditures | The ratio of capital expenditures and total assets. Source: Thomson Reuters Datastream; Mnemonics WC08416, WC02999 |
| Cash holdings | The ratio of cash plus short-term investments and total assets. Source: Thomson Reuters Datastream; Mnemonics WC02001, WC02999 |
| Tangibility | The ratio of net property, plant, and equipment and total assets. Source: Thomson Reuters Datastream; Mnemonics WC02501, WC02999 |
| GDP growth | The growth rate of the gross domestic product (GDP) per year. Source: Thomson Reuters Datastream; Mnemonic GDP..D (in combination with the two letter country code) |

The first stage regression includes the CSP measure $x_{i,t-1}$ as a dependent variable, and instrument variables $\boldsymbol{z}_{i,t-1}$ and controls $\boldsymbol{c}_{i,t-1}$ as explanatory (vectorial) variables with referring coefficients vectors $\boldsymbol{\beta}_z$ and $\boldsymbol{\beta}_c$ as described by:

$$x_{i,t-1} = \boldsymbol{z}'_{i,t-1}\boldsymbol{\beta}_z + \boldsymbol{c}'_{i,t-1}\boldsymbol{\beta}_c + \epsilon_{1,i,t}. \quad (1)$$

This estimation is based on OLS. To account for the panel structure of our data, we

**Table 7** This table reports on industry classes according to the economic sector level of Thomson Reuters Business Classification (TRBC). Financial firms are excluded

| Industry Class | Observations | Industry Class | Observations |
|---|---|---|---|
| Basic materials | 624 | Oil and Gas | 569 |
| Consumer goods | 1050 | Technology | 527 |
| Consumer services | 1169 | Telecommunications | 213 |
| Healthcare | 539 | Utilities | 677 |
| Industry | 1664 | Total | 7032 |

include time-fixed effects among the controls and clustering of standard errors at the firm level.

The second stage regression is based on a model that was initially introduced by Kaplan and Urwitz (1979) and further developed by (e.g. Blume et al. (1998)). This model is applied in many studies (e.g., Dimitrov et al. 2015; Baghai et al. 2014; Alp 2013; Jiang et al. 2012; Becker and Milbourn 2011). Our threshold model is based on an unobserved linking variable $y_{it}^*$, which represents the creditworthiness of a firm $i$ and year $t$ and calculates

$$y_{it}^* = \hat{x}_{i,t-1}\beta_{\hat{x}} + \boldsymbol{c}_{i,t-1}'\boldsymbol{\beta}_c + \epsilon_{2,i,t}, \tag{2}$$

where $\hat{x}_{i,t-1}$ is the CSP estimate of the first stage and $\boldsymbol{c}_{i,t-1}$ represents the vector of observed explanatory variables of firm $i$ in the year $t-1$. Accordingly, $\beta_{\hat{x}}$ is the CSP coefficient while $\boldsymbol{\beta}_c$ is a vector of coefficients for control variables. The linking variable $y_{it}^*$ is continuous and its range comprises the set of real numbers. In our study, we consider nine different levels of credit ratings (i.e., AAA, AA, A, BBB, BB, B, CCC, C, and D). The variable $R_{it}$ defines the rating category of firm $i$ and year $t$. It takes the value 9 if firm $i$ has a rating of AAA, 8 if AA, 7 if A, 6 if BBB, 5 if BB, 4 if B, 3 if CCC, 2 if CC and 1 if D in year $t$. Thus the first stage of our estimation maps the credit ratings into a partition of the unobserved linking variable $y_{it}^*$ as follows:

$$R_{it} = \begin{cases} 9 & \text{if} \quad y_{it}^* \in [\mu_8, \mu_9) \quad (AAA) \\ 8 & \text{if} \quad y_{it}^* \in [\mu_7, \mu_8) \quad (AA) \\ 7 & \text{if} \quad y_{it}^* \in [\mu_6, \mu_7) \quad (A) \\ 6 & \text{if} \quad y_{it}^* \in [\mu_5, \mu_6) \quad (BBB) \\ 5 & \text{if} \quad y_{it}^* \in [\mu_4, \mu_5) \quad (BB) \\ 4 & \text{if} \quad y_{it}^* \in [\mu_3, \mu_4) \quad (B) \\ 3 & \text{if} \quad y_{it}^* \in [\mu_2, \mu_3) \quad (CCC) \\ 2 & \text{if} \quad y_{it}^* \in [\mu_1, \mu_2) \quad (CC) \\ 1 & \text{if} \quad y_{it}^* \in (\mu_0, \mu_1) \quad (D), \end{cases} \tag{3}$$

where $\mu_1, \ldots, \mu_8$ are partition points independent of time $t$ while $\mu_0 = -\infty$ and $\mu_9 = \infty$. Thresholds are not given ex-ante but instead determined in the statistical estimation procedure. The assumption that $\epsilon_{it}$ is normally and independently

distributed with a mean of 0 and a variance of 1 is ensured in the estimation. We obtain a certain rating (i.e., a realization of $R_{it}$) and a realization of the input variables for each company and each year during the observation period.[2] The explanatory variables are lagged by one period to model the status of information at the time of prediction. Table 8 provides an overview of the input factors, boundaries, and outputs of the estimated models.

Following the assumption that $\epsilon_{2,i,t,}$ is normally and independently distributed with a mean of 0 and a variance of 1 and given $\hat{x}_{i,t-1}$ and $\boldsymbol{c_{i,t-1}}$, the probability of assignment to a specific rating class can be calculated according to:

$$P(R_{it} = j|\hat{x}_{i,t-1}, \boldsymbol{c}_{i,t-1}) = \Phi(\mu_j - \hat{x}_{i,t-1}\beta_{\hat{x}} + \boldsymbol{c_{i,t-1}\beta_c}) - \Phi(\mu_{j-1} - \hat{x}_{i,t-1}\beta_{\hat{x}} + \boldsymbol{c_{i,t-1}\beta_c}) \tag{4}$$

with $j = 1, ..., 9$, $\mu_0 = -\infty$ and $\mu_9 = \infty$.

## 5 Empirical tests

To test our hypotheses, we estimate a total of 13 different model specifications. Starting with a model of overall CSP, two further models include the environmental or the social pillar respectively. Further models focus on each of the components contained in the pillars, respectively. Concerning environmental performance, we estimate models for *emission*, *environmental innovation*, and *resources*. Referring to social performance, additional models include *product responsibility*, *community*, *human rights*, *diversity*, *employment quality*, *health*, and *training*. All of these models are estimated on the pooled dataset of North America, Europe, and Asia in two stages based on the 2SPS approach. Each model considers one CSP score as a dependent variable in the first stage regressed on instrumental and control variables. The corresponding second step includes the credit rating as the dependent variable with both the CSP estimate and the same controls from the first stage as independent variables. The regression results for both stages of all models are presented in Table 9. Moreover, we test for weak instruments in the first stage and report adjusted $R^2$ values as goodness-of-fit measures for both stages of every model.

### 5.1 The impact of CSP and its components

The first stage regression results for the overall CSP, the environment, and the social model in our pooled sample of North America, Europe, and Asia show that some of our instruments are significant and hence add an important explanation to the CSP scores. The test on weak instruments delivers $p$ values close to zero, implying that

[2] The main purpose of lagging the variables is to enable a prediction of credit ratings through a function of explaining variables at the end of year $t - 1$. The specification of a lag of 1 year is frequently used in studies on CSP (e.g., Oikonomou et al. 2014; Attig et al. 2013), while we cannot find any references for benefits of lags of higher order in the literature (cf., Baghai et al. 2014). In the case of our data, which are characterized by short time series in a large cross section, lags of higher order would lower the estimation quality as we would lose a large number of observations. For these reasons, we choose the standard specification of only including a lag of one period.

**Table 8** This table gives an overview of both stages of our estimated models. The first stage includes instruments and control variables to estimate CSP scores as dependent variables. The second stage includes the estimate of the referring CSP score and the same control variables from the first stage with credit ratings as the dependent variable. The estimation results contain also boundaries needed to assign rating classes based on the linear predictor

| Dependent variable | | Stage 1 CSP score | Stage 2 Credit rating |
|---|---|---|---|
| CSP variables | CSP score estimate | | $\hat{x_0}$ |
| Instruments | Country average of CSP score | $x_1$ | |
| | Regulatory framework | $x_2$ | |
| | Anti-self-dealing | $x_3$ | |
| | Corruption | $x_4$ | |
| | Political orientation | $x_5$ | |
| | Union density | $x_6$ | |
| | Skilled labor | $x_7$ | |
| | Power distance | $x_8$ | |
| | Individualism | $x_9$ | |
| Control variables | Interest coverage A | $x_{10}$ | $x_1$ |
| | Interest coverage B | $x_{11}$ | $x_2$ |
| | Interest coverage C | $x_{12}$ | $x_3$ |
| | Interest coverage D | $x_{13}$ | $x_4$ |
| | Operating margin | $x_{14}$ | $x_5$ |
| | Total debt | $x_{15}$ | $x_6$ |
| | Size | $x_{16}$ | $x_7$ |
| | Beta | $x_{17}$ | $x_8$ |
| | Idiosyncratic risk | $x_{18}$ | $x_9$ |
| | Dividend payer dummy | $x_{19}$ | $x_{10}$ |
| | Market/Book | $x_{20}$ | $x_{11}$ |
| | Retained earnings | $x_{21}$ | $x_{12}$ |
| | Capital expenditure | $x_{22}$ | $x_{13}$ |
| | Cash holdings | $x_{23}$ | $x_{14}$ |
| | Tangibility | $x_{24}$ | $x_{15}$ |
| | R&D | $x_{25}$ | $x_{16}$ |
| | GDP growth | $x_{26}$ | $x_{17}$ |
| | Dummy for North America | $x_{27}$ | $x_{18}$ |
| | Dummy for Asia | $x_{28}$ | $x_{19}$ |
| | Dummy for year 1 (following years analogue) | $x_{29}$ | $x_{20}$ |
| Boundaries | Lower Boundary for rating AAA | | $\mu_8$ |
| | Lower boundary for rating AA | | $\mu_7$ |
| | Lower boundary for rating A | | $\mu_6$ |
| | Lower boundary for rating BBB | | $\mu_5$ |
| | Lower boundary for rating BB | | $\mu_4$ |
| | Lower boundary for rating B | | $\mu_3$ |
| | Lower boundary for rating CCC | | $\mu_2$ |
| | Lower boundary for rating CC | | $\mu_1$ |

**Table 8** continued

| Dependent variable | | Stage 1 CSP score | Stage 2 Credit rating |
|---|---|---|---|
| Output | CSP score estimate (becomes input for stage 2) | $\hat{x}_0$ | |
| | Linear predictor | | $y^*$ |
| | Rating class | | $R$ |

the null hypothesis of weak instruments can be rejected. In the second stage, we find coefficients of overall CSP in all three regions to be positive and significant on a 1% level. The sign indicates that strong CSP performance tends to be linked to better credit ratings. Thus increases of firm CSP also tend to go along with credit rating improvements. Hence, these results confirm the risk mitigation view. By implementing the argument of Galema et al. (2008) that aggregating multiple categories of CSP may hide confounding effects among the single components of corporate social and environmental performance, we focus on CSP components in the following.

When targeting the environmental category level of Asset4 CSP scores, we find that all environmental categories (*emission*, *environmental innovation*, and *resources*) are relevant. A consideration of the most distinct result regarding environmental innovation raises the question of why conventional control variables such as R&D expenses cannot catch the effect. First, we argue that CSP aims to measure future long-term development while the accounting ratios included in controls represent solely the status quo. Second, CSP also catches intangible assets which are likely not (fully) reflected in accounting ratios. Previous research reveals some reasons for the potential relationship between environmental innovation and firm performance. Environmental innovation may increase efficiency and hence decrease total material cost (Porter and Van der Linde 1995). Additionally, businesses can gain competitive advantages through green product and green process innovation (Chen et al. 2006). Moreover, Kammerer (2009) argues that product innovation also increases the customer benefits and thereby also the demand. Furthermore, a positive impact on the market performance is confirmed by Pujari (2006), including reputation among the potential drivers of this (Eiadat et al. 2008).

Next, we analyze which single categories of the social performance dimension drive the impact on credit ratings. Our findings show a significant positive impact of *health* and *diversity*, while the latter is more important in terms of significance. A considerable number of empirical studies identifies a positive relationship between gender diversity in the boardroom and firm performance for North America (Carter et al. 2003; Erhardt et al. 2003; Miller and del Carmen Triana 2009) and European countries (Campbell and Mínguez-Vera 2008; Reguera-Alvarado et al. 2017; Lückerath-Rovers 2013). A similarly positive relationship can be formulated between gender diversity in management and firm performance if moderated by a firm's strategic orientation and the organizational culture (Dwyer et al. 2003).

**Table 9** Pooled estimation

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| *Coefficients* | | | | | | |
| $\widehat{CSP}$ | | 0.040*** | | 0.044*** | | 0.032** |
| Intercept | − 31.250** | | − 17.871 | | − 37.630*** | |
| Dummy North Am. | − 11.405*** | 0.522 | − 11.419*** | 0.574* | − 12.635*** | 0.354 |
| Dummy Asia | − 20.021*** | 1.310*** | − 16.589*** | 1.187*** | − 24.717*** | 1.309*** |
| CSP cou. av. | 0.175*** | | 0.135* | | 0.162** | |
| Regulatory framework | 0.222** | | 0.184* | | 0.268*** | |
| Anti self− dealing | 19.017*** | | 16.106** | | 21.584*** | |
| Corruption | − 1.814** | | − 2.048** | | − 1.735** | |
| Political orientation | − 0.101*** | | − 0.115*** | | − 0.092*** | |
| Union density | 0.038 | | 0.033 | | 0.041 | |
| Skilled labor | 0.018 | | − 0.962 | | 0.542 | |
| Power distance | 0.078 | | 0.028 | | 0.127 | |
| Individualism | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Interest coverage A | − 0.707* | 0.379*** | − 0.898** | 0.389*** | − 0.501 | 0.367*** |
| Interest coverage B | 0.383 | 0.029 | 0.535 | 0.019 | 0.236 | 0.039 |
| Interest coverage C | − 0.126 | 0.055*** | − 0.040 | 0.051*** | − 0.214 | 0.058*** |
| Interest coverage D | 0.056* | 0.000 | 0.032 | 0.001 | 0.082** | 0.000 |
| Operating margin | − 0.456*** | 0.024** | − 0.491*** | 0.028*** | − 0.427*** | 0.018* |
| Total debt | 0.128*** | − 0.023*** | 0.159*** | − 0.025*** | 0.098*** | − 0.021*** |
| Size | 0.915*** | 0.059*** | 0.905*** | 0.056*** | 0.931*** | 0.066*** |
| Beta | 0.624 | − 0.004 | 0.995 | − 0.026 | 0.284 | 0.017 |
| Idiosyncratic risk | 0.371 | − 0.032 | 0.271 | − 0.028 | 0.471 | − 0.033 |
| Dividend payer | 7.836*** | 1.213*** | 9.302*** | 1.118*** | 6.311*** | 1.341*** |
| Market/Book | − 0.166 | 0.079*** | − 0.148 | 0.081*** | − 0.201 | 0.076*** |
| Retained earnings | 9.258*** | 1.529*** | 7.910** | 1.583*** | 10.841*** | 1.528*** |
| Capital expenditure | − 0.375 | − 0.044* | − 0.366 | − 0.043* | − 0.405* | − 0.046* |
| Cash holdings | 9.519* | − 1.415** | 14.188** | − 1.608** | 5.020 | − 1.227* |
| Tangibility | 15.816*** | 0.434 | 20.065*** | 0.168 | 11.827*** | 0.738 |

**Table 9** continued

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| R&D | 97.620*** | − 0.706 | 123.231*** | − 2.291 | 72.413*** | 1.079 |
| GDP growth | − 173.837*** | 0.774*** | − 193.196*** | 3.549*** | − 157.392*** | − 3.022*** |
| Time dummies | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | |
| AAA\|AA | | 17.025 | | 17.023 | | 17.015 |
| AA\|A | | 14.755 | | 14.750 | | 14.748 |
| A\|BBB | | 12.088 | | 12.081 | | 12.085 |
| BBB\|BB | | 8.489 | | 8.476 | | 8.490 |
| BB\|B | | 4.793 | | 4.779 | | 4.796 |
| B\|CCC | | 1.075 | | 1.055 | | 1.085 |
| CCC\|CC | | − 0.470 | | − 0.492 | | − 0.458 |
| CC\|D | | − 0.816 | | − 0.839 | | − 0.805 |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.505 | 0.364 | 0.478 | 0.365 | 0.457 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |
| Stage | Emission | | Env. inno. | | Resources | |
| Dependent variable | Stage 1<br>Emission | Stage 2<br>Cr. rat. | Stage 1<br>Env. inno. | Stage 2<br>Cr. rat. | Stage 1<br>Resources | Stage 2<br>Cr. rat. |
| *Coefficients* | | | | | | |
| $\widehat{CSP}$ | | 0.038*** | | 0.069*** | | 0.038*** |
| Intercept | − 8.656 | | 2.384 | | − 8.752 | |
| Dummy North Am. | − 11.450*** | 0.541* | − 9.530*** | 0.722*** | − 12.229*** | 0.415 |
| Dummy Asia | − 18.419*** | 1.135*** | − 9.784** | 1.289*** | − 18.822*** | 1.128*** |
| CSP cou. av. | 0.164** | | 0.094 | | 0.061 | |
| Regulatory framework | 0.102 | | 0.076 | | 0.264*** | |

**Table 9** continued

| Stage | Emission | | Env. inno. | | Resources | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Emission | Stage 2 Cr. rat. | Stage 1 Env. inno. | Stage 2 Cr. rat. | Stage 1 Resources | Stage 2 Cr. rat. |
| Anti self− dealing | 21.752*** | | − 1.174 | | 15.588** | |
| Corruption | − 2.215** | | − 1.262 | | − 1.536 | |
| Political orientation | − 0.156*** | | − 0.048 | | − 0.108*** | |
| Union density | 0.008 | | 0.028 | | 0.074 | |
| Skilled labor | − 3.287* | | − 0.267 | | − 1.383 | |
| Power distance | − 0.013 | | 0.029 | | 0.063 | |
| Individualism | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Interest coverage A | − 1.057** | 0.390*** | − 0.116 | 0.355*** | − 1.097** | 0.390*** |
| Interest coverage B | 0.293 | 0.030 | 0.876* | − 0.020 | 0.137 | 0.038 |
| Interest coverage C | − 0.063 | 0.051*** | 0.283 | 0.030 | − 0.072 | 0.052*** |
| Interest coverage D | 0.031 | 0.001 | 0.021 | 0.001 | 0.024 | 0.001 |
| Operating margin | − 0.352*** | 0.020** | − 0.651*** | 0.054*** | − 0.370*** | 0.020** |
| Total debt | 0.149*** | − 0.024*** | 0.184*** | − 0.031*** | 0.110*** | − 0.023*** |
| Size | 0.918*** | 0.061*** | 0.676*** | 0.048*** | 0.877*** | 0.063*** |
| Beta | 1.291 | − 0.029 | 1.010 | − 0.066 | 0.523 | 0.000 |
| Idiosyncratic risk | 0.171 | − 0.022 | 0.350 | − 0.041 | 0.188 | − 0.024 |
| Dividend payer | 8.083*** | 1.209*** | 7.535*** | 1.022*** | 8.870*** | 1.196*** |
| Market/Book | 0.018 | 0.074*** | − 0.582* | 0.120*** | − 0.026 | 0.074*** |
| Retained earnings | 8.572*** | 1.627*** | 6.259* | 1.451*** | 7.445** | 1.624*** |
| Capital expenditure | − 0.371 | − 0.044* | − 0.098 | − 0.053** | − 0.348 | − 0.045* |
| Cash holdings | 17.673*** | − 1.626** | 7.906 | − 1.530** | 11.881* | − 1.463** |
| Tangibility | 26.417*** | 0.014 | 4.645 | 0.787** | 18.477*** | 0.364 |
| R&D | 92.413*** | − 0.504 | 178.260*** | − 9.441*** | 90.222*** | − 0.260 |
| GDP growth | − 148.760*** | 1.134*** | − 189.804*** | 9.472*** | − 134.427*** | − 0.769*** |
| Time dummies | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | |
| AAA\|AA | | 16.876 | | 17.723 | | 17.217 |
| AA\|A | | 14.601 | | 15.447 | | 14.947 |

**Table 9** continued

| Stage | Emission | | Env. inno. | | Resources | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Emission | Stage 2 Cr. rat. | Stage 1 Env. inno. | Stage 2 Cr. rat. | Stage 1 Resources | Stage 2 Cr. rat. |
| A\|BBB | | 11.927 | | 12.776 | | 12.280 |
| BBB\|BB | | 8.320 | | 9.173 | | 8.680 |
| BB\|B | | 4.618 | | 5.474 | | 4.984 |
| B\|CCC | | 0.893 | | 1.748 | | 1.266 |
| CCC\|CC | | − 0.656 | | 0.199 | | − 0.281 |
| CC\|D | | − 1.003 | | − 0.147 | | − 0.627 |
| Weak Instruments | 0.000 | | 0.100 | | 0.000 | |
| $R^2$ | 0.476 | 0.365 | 0.386 | 0.365 | 0.401 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| *Coefficients* | | | | | | | | |
| $\widehat{CSP}$ | | 0.015 | | 0.020 | | 0.016 | | 0.046*** |
| Intercept | 28.154* | | − 30.982** | | − 10.844 | | 13.486 | |
| Dummy North Am. | − 14.028*** | − 0.067 | − 3.537* | − 0.143 | − 12.531*** | − 0.013 | − 10.763*** | 0.380 |
| Dummy Asia | − 28.248*** | 0.910*** | − 14.870*** | 0.852*** | − 23.288*** | 0.996** | − 24.244*** | 1.369*** |
| CSP cou. av. | − 0.083 | | 0.099 | | 0.151** | | 0.114* | |
| Regulatory framework | 0.524*** | | 0.262*** | | 0.502*** | | 0.194 | |
| Anti self− dealing | − 6.102 | | 38.338*** | | 3.995 | | 13.312** | |
| Corruption | − 2.591** | | − 1.053 | | − 2.573* | | − 0.647 | |
| Political orientation | 0.000 | | − 0.153*** | | − 0.003 | | − 0.093** | |
| Union density | 0.124 | | − 0.097 | | 0.207** | | − 0.064 | |
| Skilled labor | − 0.457 | | 0.604 | | 0.772 | | − 5.429** | |
| Power distance | 0.464*** | | − 0.097 | | 0.113 | | 0.016 | |

**Table 9** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Prod. resp. | Stage 2<br>Cr. rat. | Stage 1<br>Comm. | Stage 2<br>Cr. rat. | Stage 1<br>Hum. rights | Stage 2<br>Cr. rat. | Stage 1<br>Diversity | Stage 2<br>Cr. rat. |
| Individualism | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Interest coverage A | 0.241 | 0.347*** | − 0.323 | 0.359*** | − 0.504 | 0.358*** | − 0.826** | 0.386*** |
| Interest coverage B | 0.219 | 0.043 | 0.260 | 0.042 | 0.687 | 0.034 | 0.700* | 0.008 |
| Interest coverage C | − 0.061 | 0.052*** | − 0.321 | 0.057*** | − 0.271 | 0.054*** | − 0.372* | 0.064*** |
| Interest coverage D | 0.007 | 0.002 | 0.058* | 0.001 | 0.043 | 0.002 | 0.099*** | − 0.002 |
| Operating margin | − 0.407*** | 0.012 | − 0.340*** | 0.011 | − 0.497*** | 0.014 | − 0.276*** | 0.021** |
| Total debt | − 0.015 | − 0.018*** | 0.057 | − 0.019*** | 0.098** | − 0.020*** | 0.111*** | − 0.025*** |
| Size | 0.352*** | 0.090*** | 0.777*** | 0.080*** | 0.666*** | 0.084*** | 0.877*** | 0.055*** |
| Beta | 0.106 | 0.022 | 0.528 | 0.021 | − 1.036 | 0.043 | 0.744 | − 0.009 |
| Idiosyncratic risk | − 0.110 | − 0.019 | 0.170 | − 0.023 | 0.585 | − 0.029 | 0.317 | − 0.028 |
| Dividend payer | 2.765* | 1.522*** | 7.476*** | 1.387*** | 7.618*** | 1.438*** | 4.378*** | 1.335*** |
| Market/Book | 0.518* | 0.064** | 0.093 | 0.066** | − 0.507 | 0.078*** | − 0.126 | 0.085*** |
| Retained earnings | 7.716** | 1.699*** | 9.854*** | 1.656*** | 15.001*** | 1.570*** | 7.068** | 1.580*** |
| Capital expenditure | − 0.127 | − 0.059** | − 0.330 | − 0.051** | − 0.106 | − 0.057** | − 0.794*** | − 0.024 |
| Cash holdings | − 6.625 | − 0.981 | 6.190 | − 1.196* | 8.323 | − 1.171* | 6.941 | − 1.248** |
| Tangibility | − 1.240 | 1.210*** | 10.940** | 0.877** | − 4.934 | 1.231*** | 11.267** | 0.564 |
| R&D | 65.165** | 2.379 | 26.905 | 2.809 | 86.311*** | 1.780 | 72.942*** | − 0.422 |
| GDP growth | − 56.132 | − 7.453*** | − 149.072*** | − 6.073*** | − 35.191 | − 7.954*** | − 167.035*** | 7.052*** |
| Time dummies | Y | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | | | |
| AAA\|AA | | 17.776 | | 16.923 | | 17.496 | | 16.948 |
| AA\|A | | 15.511 | | 14.656 | | 15.231 | | 14.673 |
| A\|BBB | | 12.850 | | 11.991 | | 12.569 | | 11.998 |
| BBB\|BB | | 9.260 | | 8.401 | | 8.982 | | 8.393 |
| BB\|B | | 5.565 | | 4.708 | | 5.288 | | 4.683 |
| B\|CCC | | 1.859 | | 1.000 | | 1.582 | | 0.953 |
| CCC\|CC | | 0.314 | | − 0.542 | | 0.037 | | − 0.604 |
| CC\|D | | − 0.032 | | − 0.888 | | − 0.310 | | − 0.952 |

**Table 9** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Prod. resp. | Stage 2<br>Cr. rat. | Stage 1<br>Comm. | Stage 2<br>Cr. rat. | Stage 1<br>Hum. rights | Stage 2<br>Cr. rat. | Stage 1<br>Diversity | Stage 2<br>Cr. rat. |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.238 | 0.363 | 0.285 | 0.363 | 0.324 | 0.363 | 0.370 | 0.365 |
| $N$ | 7032 | | 7032 | | 7032 | | 7032 | |

| Stage | Employm. | | Health | | Training | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Employm. | Stage 2<br>Cr. rat. | Stage 1<br>Health | Stage 2<br>Cr. rat. | Stage 1<br>Training | Stage 2<br>Cr. rat. |
| *Coefficients* | | | | | | |
| $\widehat{CSP}$ | | − 0.017 | | 0.033* | | 0.011 |
| Intercept | − 76.749*** | | − 2.778 | | − 17.999 | |
| Dummy North Am. | − 9.913*** | − 0.581* | − 12.081*** | 0.316 | − 23.028*** | − 0.001 |
| Dummy Asia | − 18.272*** | 0.326 | − 23.882*** | 1.323*** | − 23.953*** | 0.903** |
| CSP cou. av. | 0.184*** | | 0.062 | | − 0.020 | |
| Regulatory framework | 0.164 | | − 0.124 | | 0.192** | |
| Anti self− dealing | 21.630*** | | 20.287*** | | 13.702* | |
| Corruption | − 0.995 | | − 0.140 | | − 1.126 | |
| Political orientation | − 0.065* | | − 0.102*** | | − 0.063* | |
| Union density | 0.024 | | 0.020 | | 0.029 | |
| Skilled labor | 6.132*** | | − 1.235 | | 2.033 | |
| Power distance | 0.085 | | 0.187 | | 0.196** | |
| Individualism | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Interest coverage A | − 0.293 | 0.347*** | − 0.271 | 0.363*** | − 1.085** | 0.365*** |
| Interest coverage B | − 0.528 | 0.034 | − 0.282 | 0.056 | 0.367 | 0.043 |
| Interest coverage C | − 0.127 | 0.047** | 0.038 | 0.051*** | 0.052 | 0.050*** |
| Interest coverage D | 0.089** | 0.004 | 0.082* | 0.000 | 0.046 | 0.002 |
| Operating margin | − 0.128* | 0.005 | − 0.251*** | 0.012 | − 0.386*** | 0.009 |

**Table 9** continued

| Stage | Employm. | | Health | | Training | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Employm. | Stage 2 Cr. rat. | Stage 1 Health | Stage 2 Cr. rat. | Stage 1 Training | Stage 2 Cr. rat. |
| Total debt | 0.040 | − 0.018*** | 0.117*** | − 0.022*** | 0.104*** | − 0.019*** |
| Size | 0.756*** | 0.107*** | 0.676*** | 0.073*** | 0.823*** | 0.086*** |
| Beta | 2.051* | 0.063 | 0.967 | − 0.005 | − 0.126 | 0.028 |
| Idiosyncratic risk | − 0.207 | − 0.025 | 0.598 | − 0.040 | 0.482 | − 0.027 |
| Dividend payer | 3.084** | 1.626*** | 6.305*** | 1.337*** | 1.996 | 1.538*** |
| Market/Book | − 0.170 | 0.068** | − 0.342 | 0.079*** | − 0.334 | 0.073*** |
| Retained earnings | 11.719*** | 1.974*** | 3.074 | 1.773*** | 10.796*** | 1.689*** |
| Capital expenditure | − 0.215 | − 0.063** | − 0.290 | − 0.049** | − 0.306 | − 0.056** |
| Cash holdings | − 0.365 | − 1.032 | 7.966 | − 1.385** | 5.798 | − 1.163* |
| Tangibility | 11.018*** | 1.383*** | 17.985*** | 0.545 | 11.297** | 1.044** |
| R&D | 26.741 | 3.517 | 80.501*** | 0.918 | 28.129 | 3.074 |
| GDP growth | − 187.798*** | − 11.729*** | − 98.888** | − 7.766*** | − 72.218* | − 9.344*** |
| Time dummies | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | |
| *Lower boundaries* | | | | | | |
| AAA\|AA | | 17.285 | | 17.352 | | 17.172 |
| AA\|A | | 15.018 | | 15.087 | | 14.907 |
| A\|BBB | | 12.353 | | 12.424 | | 12.245 |
| BBB\|BB | | 8.768 | | 8.830 | | 8.659 |
| BB\|B | | 5.067 | | 5.137 | | 4.966 |
| B\|CCC | | 1.363 | | 1.432 | | 1.264 |
| CCC\|CC | | − 0.184 | | − 0.107 | | − 0.278 |
| CC\|D | | − 0.532 | | − 0.454 | | − 0.624 |
| Weak Instruments | 0.000 | | 0.002 | | 0.001 | |
| $R^2$ | 0.309 | 0.363 | 0.329 | 0.363 | 0.359 | 0.363 |
| $N$ | 7032 | | 7032 | | 7032 | |

This table displays the estimation results of both stages of the instrumental variable approach for each CSP impact score. Coefficients of all variables are displayed including the significance level marked by asterisks. They are considered significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

Contrasting views (e.g., Adams and Ferreira 2009; Marinova et al. 2016) exist, but are less widespread. Possible explanations include the conjecture that diversity may help in decision processes by introducing other perspectives and information and additionally a different assessment of risk (Gul et al. 2011). Moreover, a diverse mindset within firms helps to catch up with business and society trends of the customer base and attract talented personnel (Li and Chen 2018).

### 5.2 The region matters

Tables 10, 11 and 12 show the second stage results for separate estimations on the panels of North America, Europe, and Asia.[3] When focusing on North America, we find all dimensions (*emission*, *environmental innovation*, *resources*, *product responsibility*, *community*, *human rights*, *diversity*, *employment quality*, *health*, and *training*) to be positively significant. Concerning Europe, we find the dimensions *environmental innovation* and *diversity* to be significantly positively related to credit ratings. The measures *community* and *training* are weakly significant on a 10% level and the first reveals a negative sign. Coefficients in the Asia subsample are significant in the dimensions of *emission*, *environmental innovation*, and *resources*. Among the social categories, no dimension is significant. Except for the *community* category in Europe, all significant CSP coefficients show positive signs indicating the positive link between the referring CSP scores and credit ratings. Our results once more generally support the risk mitigation view.

As the link function in our model limits the interpretability of the CSP impact, marginal effects (at means of the controls) according to Greene (2011) are calculated. In the Tables 18, 19 20, one can observe the practical implications of our results. Predominantly, we see increases of the probability to obtain a better rating class if the CSP score is significant and is increased by 1% point (ceteris paribus). At the same time, the probability to obtain a worse rating class decreases. For example, the probability of an actual BBB rated North American counterparty to upgrade to an A rating increases by 0.43% points if the overall CSP score increases by 1% point under otherwise identical circumstances, while the probability of a downgrade to BBB decreases by 0.48%.

In general, we support the argumentation of Attig et al. (2013) that CSP helps to generate intangible assets such as reputation and relationships with stakeholders, which again improve a firm's competitiveness (Orlitzky et al. 2003). This may explain the relevance of all CSP scores in North America. The same argumentation may apply also for Europe. However, besides *environmental innovation* and *diversity* no further CSP component is significant on the 1% level, which is likely caused by the comparably high mean levels and low variation of CSP of European firms. For example, *emission* exhibits a higher mean of 81.3% and a lower standard deviation of 19.5% when compared to the mean (52.3%) and standard deviation (31.8%) of North American companies. As a result, European firms can differentiate less from each other through *emission* reduction. In contrast, *environmental innovation* shows a higher standard deviation (29.3%) and turns out to be

[3] Referring first stage estimation results are presented in Tables 13, 14 and 15.

**Table 10** Panel North America

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| $\widehat{CSP}$ | 0.039** | 0.036** | 0.042** | 0.030** | 0.079*** | 0.037** | 0.076** |
| CSR country average | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Interest coverage A | 0.362*** | 0.364*** | 0.359*** | 0.357*** | 0.327*** | 0.378*** | 0.308*** |
| Interest coverage B | − 0.002 | − 0.007 | 0.004 | 0.003 | − 0.039 | 0.006 | − 0.040 |
| Interest coverage C | 0.070*** | 0.062*** | 0.078*** | 0.066*** | 0.024 | 0.065*** | 0.086*** |
| Interest coverage D | − 0.002 | − 0.001 | − 0.004 | − 0.002 | 0.000 | − 0.001 | − 0.001 |
| Operating margin | 0.030** | 0.029** | 0.030** | 0.023** | 0.057*** | 0.026** | 0.043** |
| Total debt | − 0.024*** | − 0.025*** | − 0.023*** | − 0.024*** | − 0.035*** | − 0.023*** | − 0.022*** |
| Size | 0.054*** | 0.057*** | 0.051** | 0.062*** | 0.043*** | 0.056*** | 0.061*** |
| Beta | 0.023 | 0.005 | 0.042 | 0.007 | − 0.047 | 0.014 | 0.111 |
| Idiosyncratic risk | 0.055 | 0.065 | 0.045 | 0.070 | 0.054 | 0.061 | 0.086 |
| Dividend payer | 1.259*** | 1.228*** | 1.300*** | 1.317*** | 0.929*** | 1.247*** | 1.349*** |
| Market/Book | 0.075** | 0.074** | 0.078** | 0.068** | 0.098*** | 0.073** | 0.074** |
| Retained earnings | 1.627*** | 1.726*** | 1.511*** | 1.788*** | 1.493*** | 1.710*** | 1.458*** |
| Capital expenditure | − 0.043 | − 0.044 | − 0.042 | − 0.044 | − 0.056* | − 0.044 | − 0.064** |
| Cash holdings | − 1.446* | − 1.586** | − 1.292* | − 1.744** | − 1.682** | − 1.485* | − 0.557 |
| Tangibility | − 0.012 | − 0.148 | 0.151 | − 0.238 | 0.315 | − 0.125 | 1.218** |
| R&D | − 2.842 | − 3.321 | − 2.263 | − 1.612 | − 10.330*** | − 2.658 | − 4.475 |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | | |
| AAA\|AA | 15.346 | 15.386 | 15.301 | 15.306 | 15.762 | 15.713 | 18.829 |
| AA\|A | 13.815 | 13.855 | 13.770 | 13.774 | 14.231 | 14.182 | 17.298 |
| A\|BBB | 11.060 | 11.100 | 11.015 | 11.020 | 11.476 | 11.428 | 14.544 |
| BBB\|BB | 7.499 | 7.539 | 7.454 | 7.458 | 7.915 | 7.866 | 10.982 |
| BB\|B | 3.682 | 3.721 | 3.637 | 3.641 | 4.097 | 4.049 | 7.165 |
| B\|CCC | − 0.465 | − 0.426 | − 0.510 | − 0.506 | − 0.050 | − 0.098 | 3.018 |
| CCC\|CC | − 2.333 | − 2.293 | − 2.378 | − 2.374 | − 1.918 | − 1.966 | 1.150 |
| CC\|D | − 2.636 | − 2.596 | − 2.681 | − 2.678 | − 2.221 | − 2.269 | 0.847 |
| Weak instruments | 0.000 | 0.000 | 0.000 | 0.000 | 0.060 | 0.000 | 0.003 |

**Table 10** continued

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| $R^2$ | 0.370 | 0.370 | 0.370 | 0.370 | 0.370 | 0.370 | 0.370 |
| $N$ | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 |
| | Comm. | Hum. rights | Diversity | Employm. | Health | Training | |
| *Coefficients* | | | | | | | |
| $\widehat{CSP}$ | 0.034** | 0.088*** | 0.067** | 0.044** | 0.050** | 0.063** | |
| CSR country average | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | |
| Interest coverage A | 0.337*** | 0.359*** | 0.404*** | 0.351*** | 0.342*** | 0.418*** | |
| Interest coverage B | 0.006 | − 0.031 | − 0.027 | 0.037 | 0.060 | − 0.011 | |
| Interest coverage C | 0.076*** | 0.073*** | 0.102*** | 0.075*** | 0.050** | 0.068*** | |
| Interest coverage D | − 0.002 | − 0.002 | − 0.008 | − 0.004 | − 0.002 | − 0.004 | |
| Operating margin | 0.024** | 0.053*** | 0.026** | 0.017* | 0.026** | 0.041** | |
| Total debt | − 0.021*** | − 0.029*** | − 0.027*** | − 0.020*** | − 0.024*** | − 0.025*** | |
| Size | 0.064*** | 0.034** | 0.034 | 0.057*** | 0.056*** | 0.036 | |
| Beta | 0.031 | 0.097 | − 0.010 | − 0.019 | 0.005 | 0.047 | |
| Idiosyncratic risk | 0.066 | 0.038 | 0.026 | 0.070 | 0.021 | 0.036 | |
| Dividend payer | 1.333*** | 0.825*** | 1.211*** | 1.473*** | 1.224*** | 1.474*** | |
| Market/Book | 0.065** | 0.132*** | 0.059* | 0.073** | 0.081*** | 0.082*** | |
| Retained earnings | 1.639*** | 0.820** | 1.446*** | 1.407*** | 1.848*** | 1.185** | |
| Capital expenditure | − 0.046 | − 0.079** | 0.000 | − 0.056* | − 0.044 | − 0.019 | |
| Cash holdings | − 1.196 | − 1.845** | − 1.670** | − 1.224* | − 1.600** | − 1.433* | |
| Tangibility | 0.195 | 1.089** | − 0.017 | 0.258 | − 0.243 | − 0.440 | |
| R&D | − 0.286 | − 7.665*** | − 3.477 | − 0.662 | − 2.584 | − 1.125 | |
| Time dummies | Y | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | Y | |
| *Lower boundaries* | | | | | | | |
| AAA\|AA | 15.767 | 17.252 | 14.784 | 14.927 | 15.961 | 15.390 | |
| AA\|A | 14.236 | 15.721 | 13.253 | 13.396 | 14.430 | 13.858 | |
| A\|BBB | 11.481 | 12.966 | 10.498 | 10.642 | 11.675 | 11.104 | |
| BBB\|BB | 7.920 | 9.405 | 6.937 | 7.080 | 8.114 | 7.542 | |
| BB\|B | 4.103 | 5.588 | 3.119 | 3.263 | 4.296 | 3.725 | |

**Table 10** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| B\|CCC | − 0.044 | 1.440 | − 1.028 | − 0.884 | 0.149 | − 0.422 |
| CCC\|CC | − 1.912 | − 0.427 | − 2.896 | − 2.752 | − 1.719 | − 2.290 |
| CC\|D | − 2.215 | − 0.730 | − 3.199 | − 3.055 | − 2.022 | − 2.593 |
| Weak instruments | 0.000 | 0.115 | 0.008 | 0.000 | 0.000 | 0.021 |
| $R^2$ | 0.370 | 0.370 | 0.370 | 0.370 | 0.370 | 0.370 |
| $N$ | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 |

This table displays the estimation results of the second stage of the instrumental variable approach for each CSP impact score in the North America sample. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 11** Panel Europe

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| $\widehat{CSP}$ | 0.059 | 0.078** | 0.017 | 0.042 | 0.061*** | 0.020 | 0.016 |
| Interest coverage A | 0.422*** | 0.424*** | 0.423*** | 0.446*** | 0.417*** | 0.419*** | 0.412*** |
| Interest coverage B | 0.152** | 0.123 | 0.163** | 0.145* | 0.098 | 0.164** | 0.186** |
| Interest coverage C | 0.048 | 0.042 | 0.054 | 0.051 | 0.032 | 0.049 | 0.051 |
| Interest coverage D | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |
| Operating margin | 0.027 | 0.046** | 0.009 | 0.020 | 0.058*** | 0.011 | 0.011 |
| Total debt | − 0.014* | − 0.013* | − 0.016** | − 0.015* | − 0.016** | − 0.016** | − 0.015** |
| Size | 0.071** | 0.060** | 0.096*** | 0.082*** | 0.059*** | 0.096*** | 0.099*** |
| Beta | − 0.117 | − 0.165 | − 0.078 | − 0.129 | − 0.194 | − 0.076 | − 0.082 |
| Idiosyncratic risk | − 0.241** | − 0.269** | − 0.235** | − 0.252** | − 0.274*** | − 0.239** | − 0.237** |
| Dividend payer | 1.210*** | 1.166*** | 1.257*** | 1.262*** | 1.307*** | 1.248*** | 1.311*** |
| Market/Book | 0.134*** | 0.139*** | 0.142*** | 0.130** | 0.189*** | 0.144*** | 0.123** |

**Table 11** continued

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| Retained earnings | 0.861 | 0.928 | 0.779 | 0.633 | 1.023 | 0.836 | 0.813 |
| Capital expenditure | 0.017 | 0.022 | 0.009 | 0.006 | 0.053 | 0.003 | 0.006 |
| Cash holdings | 0.368 | − 0.128 | 1.148 | 0.954 | 0.164 | 1.020 | 1.389 |
| Tangibility | − 0.515 | − 0.992 | − 0.078 | − 0.602 | − 0.638 | − 0.045 | 0.068 |
| R&D | 7.146 | 2.931 | 10.006 | 7.294 | − 6.141*** | 9.821 | 10.557 |
| GDP growth | 10.269*** | 15.221*** | 3.043*** | 5.682*** | 12.380*** | 4.282*** | 3.332*** |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | | |
| AAA\|AA | 22.226 | 22.892 | 20.788 | 21.769 | 21.081 | 21.030 | 21.069 |
| AA\|A | 19.367 | 20.027 | 17.943 | 18.922 | 18.212 | 18.189 | 18.220 |
| A\|BBB | 16.131 | 16.789 | 14.708 | 15.693 | 14.951 | 14.955 | 14.980 |
| BBB\|BB | 11.793 | 12.432 | 10.383 | 11.356 | 10.559 | 10.630 | 10.649 |
| BB\|B | 8.289 | 8.912 | 6.884 | 7.849 | 7.017 | 7.125 | 7.141 |
| B\|CCC | 4.876 | 5.474 | 3.488 | 4.448 | 3.535 | 3.727 | 3.736 |
| CCC\|CC | 3.585 | 4.186 | 2.192 | 3.159 | 2.234 | 2.433 | 2.436 |
| CC\|D | 2.982 | 3.587 | 1.585 | 2.554 | 1.636 | 1.827 | 1.832 |
| Weak instruments | 0.160 | 0.310 | 0.112 | 0.360 | 0.009 | 0.140 | 0.000 |
| $R^2$ | 0.392 | 0.394 | 0.392 | 0.392 | 0.398 | 0.392 | 0.392 |
| *N* | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | |
| $\widehat{CSP}$ | − 0.040* | − 0.041 | 0.078*** | − 0.001 | 0.004 | 0.067* |
| Interest coverage A | 0.426*** | 0.398*** | 0.424*** | 0.424*** | 0.423*** | 0.453*** |
| Interest coverage B | 0.157** | 0.160** | 0.116 | 0.160** | 0.160** | 0.147* |
| Interest coverage C | 0.043 | 0.059 | 0.059 | 0.055 | 0.054 | 0.027 |
| Interest coverage D | 0.001 | 0.004 | 0.004 | 0.001 | 0.001 | 0.003 |
| Operating margin | − 0.002 | − 0.012 | 0.029* | 0.004 | 0.004 | 0.012 |
| Total debt | − 0.021*** | − 0.024*** | − 0.018** | − 0.017** | − 0.017** | − 0.014* |
| Size | 0.121*** | 0.130*** | 0.051** | 0.105*** | 0.103*** | 0.078*** |

**Table 11** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| Beta | − 0.087 | − 0.151 | − 0.110 | − 0.067 | − 0.068 | − 0.124 |
| Idiosyncratic risk | − 0.254** | − 0.202* | − 0.169 | − 0.242** | − 0.238** | − 0.257** |
| Dividend payer | 1.550*** | 1.351*** | 1.142*** | 1.282*** | 1.289*** | 1.285*** |
| Market/Book | 0.188*** | 0.170*** | 0.162*** | 0.148*** | 0.150*** | 0.182*** |
| Retained earnings | 0.731 | 1.165 | 1.064 | 0.758 | 0.772 | 0.894 |
| Capital expenditure | − 0.013 | − 0.026 | 0.062 | 0.004 | 0.004 | − 0.007 |
| Cash holdings | 2.821* | 2.460 | 0.669 | 1.432 | 1.385 | 0.398 |
| Tangibility | 0.175 | − 0.095 | − 1.092 | 0.055 | 0.025 | 0.421 |
| R&D | 8.425 | 11.190 | 5.074 | 10.183 | 9.764 | 10.710 |
| GDP growth | − 1.434*** | − 1.934*** | 17.233*** | 0.780 | 1.244* | 9.929*** |
| Time dummies | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | |
| AAA\|AA | 19.281 | 18.458 | 21.235 | 20.210 | 20.329 | 23.701 |
| AA\|A | 16.442 | 15.624 | 18.378 | 17.373 | 17.490 | 20.843 |
| A\|BBB | 13.203 | 12.375 | 15.102 | 14.138 | 14.256 | 17.596 |
| BBB\|BB | 8.852 | 8.041 | 10.714 | 9.813 | 9.930 | 13.247 |
| BB\|B | 5.315 | 4.537 | 7.213 | 6.311 | 6.428 | 9.747 |
| B\|CCC | 1.889 | 1.123 | 3.740 | 2.916 | 3.035 | 6.279 |
| CCC\|CC | 0.591 | − 0.193 | 2.389 | 1.619 | 1.740 | 4.960 |
| CC\|D | − 0.011 | − 0.804 | 1.772 | 1.012 | 1.133 | 4.355 |
| Weak instruments | 0.002 | 0.090 | 0.037 | 0.422 | 0.004 | 0.000 |
| $R^2$ | 0.394 | 0.393 | 0.397 | 0.391 | 0.391 | 0.394 |
| *N* | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |

This table displays the estimation results of the second stage of the instrumental variable approach for each CSP impact score in the Europe sample. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the *p* value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 12** Panel Asia

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| $\widehat{CSP}$ | 0.028 | 0.024* | 0.025 | 0.017 | 0.065*** | 0.019 | 0.020 |
| *CSR country average* | | | | | | | |
| Interest coverage A | 0.369** | 0.385*** | 0.361** | 0.386*** | 0.312** | 0.406*** | 0.374** |
| Interest coverage B | − 0.032 | − 0.026 | − 0.026 | 0.000 | − 0.086 | − 0.016 | − 0.012 |
| Interest coverage C | 0.049 | 0.053 | 0.043 | 0.045 | 0.078** | 0.047 | 0.041 |
| Interest coverage D | − 0.004 | − 0.003 | − 0.004 | − 0.002 | − 0.004 | − 0.003 | 0.000 |
| Operating margin | 0.004 | 0.002 | 0.005 | 0.000 | 0.024 | 0.001 | 0.007 |
| Total debt | − 0.056*** | − 0.057*** | − 0.054*** | − 0.054*** | − 0.061*** | − 0.056*** | − 0.046*** |
| Size | 0.117*** | 0.121*** | 0.117*** | 0.129*** | 0.090*** | 0.125*** | 0.140*** |
| Beta | 0.029 | 0.021 | 0.046 | 0.032 | − 0.025 | 0.052 | − 0.026 |
| Idiosyncratic risk | − 0.135 | − 0.117 | − 0.148 | − 0.109 | − 0.185 | − 0.104 | − 0.122 |
| Dividend payer | 2.500* | 2.502* | 2.503* | 2.611* | 2.404 | 2.465* | 2.648* |
| Market/Book | − 0.677*** | − 0.671*** | − 0.702*** | − 0.679*** | − 0.533*** | − 0.724*** | − 0.781*** |
| Retained earnings | 3.312** | 3.182** | 3.370** | 2.948** | 4.203*** | 3.144** | 3.194** |
| Capital expenditure | − 0.160*** | − 0.159*** | − 0.159*** | − 0.157*** | − 0.198*** | − 0.152*** | − 0.155*** |
| Cash holdings | − 2.717 | − 2.991 | − 2.385 | − 2.727 | − 3.492* | − 2.799 | − 2.087 |
| Tangibility | 4.848*** | 4.801*** | 4.895*** | 4.718*** | 5.445*** | 4.776*** | 4.526*** |
| R&D | − 1.791*** | − 2.175*** | − 0.146 | 0.433*** | − 17.725*** | − 0.204 | − 0.292 |
| GDP growth | − 30.499*** | − 26.679*** | − 35.914*** | − 29.986*** | − 2.610*** | − 32.930*** | − 35.913*** |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| *Lower boundaries* | | | | | | | |
| AAA\|AA | 19.942 | 20.435 | 19.579 | 20.682 | 20.521 | 20.317 | 21.392 |
| AA\|A | 15.078 | 15.573 | 14.714 | 15.821 | 15.628 | 15.460 | 16.514 |
| A\|BBB | 11.904 | 12.401 | 11.537 | 12.649 | 12.425 | 12.290 | 13.331 |
| BBB\|BB | 7.955 | 8.455 | 7.591 | 8.702 | 8.486 | 8.347 | 9.382 |
| BB\|B | 4.280 | 4.784 | 3.926 | 5.029 | 4.831 | 4.685 | 5.725 |
| B\|CCC | 1.218 | 1.709 | 0.894 | 1.960 | 1.779 | 1.607 | 2.767 |
| CCC\|CC | − 0.861 | − 0.380 | − 1.166 | − 0.125 | − 0.264 | − 0.481 | 0.698 |
| CC\|D | − 0.862 | − 0.380 | − 1.166 | − 0.126 | − 0.264 | − 0.481 | 0.698 |

**Table 12** continued

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| Weak instruments | 0.001 | 0.002 | 0.006 | 0.000 | 0.124 | 0.006 | 0.000 |
| $R^2$ | 0.407 | 0.407 | 0.407 | 0.407 | 0.409 | 0.407 | 0.408 |
| $N$ | 823 | 823 | 823 | 823 | 823 | 823 | 823 |
| | Comm. | Hum. rights | Diversity | Employm. | Health | Training | |
| *Coefficients* | | | | | | | |
| $\widehat{CSP}$ | 0.014 | 0.016 | 0.024 | − 0.011 | 0.018 | − 0.010 | |
| *CSR country average* | | | | | | | |
| Interest coverage A | 0.398*** | 0.423*** | 0.376** | 0.411*** | 0.379** | 0.427*** | |
| Interest coverage B | − 0.003 | − 0.021 | − 0.011 | 0.034 | − 0.010 | 0.042 | |
| Interest coverage C | 0.044 | 0.050 | 0.038 | 0.042 | 0.058 | 0.038 | |
| Interest coverage D | − 0.002 | − 0.004 | − 0.007 | − 0.001 | − 0.006 | 0.000 | |
| Operating margin | 0.000 | 0.007 | 0.011 | 0.003 | 0.004 | 0.001 | |
| Total debt | − 0.051*** | − 0.053*** | − 0.057*** | − 0.051*** | − 0.050*** | − 0.046*** | |
| Size | 0.130*** | 0.130*** | 0.115*** | 0.149*** | 0.130*** | 0.150*** | |
| Beta | 0.056 | 0.106 | 0.068 | 0.137 | 0.051 | 0.049 | |
| Idiosyncratic risk | − 0.128 | − 0.115 | − 0.098 | − 0.090 | − 0.126 | − 0.080 | |
| Dividend payer | 2.511* | 2.303 | 2.679* | 2.542* | 2.337 | 2.507* | |
| Market/Book | − 0.711*** | − 0.740*** | − 0.662*** | − 0.773*** | − 0.762*** | − 0.785*** | |
| Retained earnings | 3.151** | 3.101** | 3.186** | 2.688 | 3.146** | 2.836** | |
| Capital expenditure | − 0.159*** | − 0.145** | − 0.151*** | − 0.156** | − 0.150** | − 0.140** | |
| Cash holdings | − 2.672 | − 2.200 | − 2.284 | − 2.764 | − 2.636 | − 2.469 | |
| Tangibility | 4.944*** | 5.002*** | 4.712*** | 4.682*** | 4.276*** | 4.751*** | |
| R&D | 3.302 | 1.262 | − 0.888 | 4.612 | 2.896 | 5.215 | |
| GDP growth | − 37.023*** | − 33.464*** | − 31.486*** | − 36.219*** | − 37.608*** | − 36.836*** | |
| Time dummies | Y | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | Y | |
| *Lower boundaries* | | | | | | | |

**Table 12** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| AAA\|AA | 20.343 | 20.405 | 19.543 | 20.773 | 20.070 | 21.061 |
| AA\|A | 15.485 | 15.541 | 14.681 | 15.919 | 15.211 | 16.202 |
| A\|BBB | 12.312 | 12.366 | 11.509 | 12.747 | 12.032 | 13.025 |
| BBB\|BB | 8.369 | 8.427 | 7.529 | 8.810 | 8.099 | 9.098 |
| BB\|B | 4.713 | 4.768 | 3.816 | 5.169 | 4.463 | 5.466 |
| B\|CCC | 1.668 | 1.690 | 0.721 | 2.087 | 1.444 | 2.389 |
| CCC\|CC | − 0.394 | − 0.397 | − 1.387 | 0.012 | − 0.594 | 0.326 |
| CC\|D | − 0.396 | − 0.398 | − 1.387 | 0.012 | − 0.596 | 0.326 |
| Weak instruments | 0.000 | 0.000 | 0.000 | 0.130 | 0.006 | 0.080 |
| $R^2$ | 0.407 | 0.407 | 0.409 | 0.406 | 0.406 | 0.406 |
| $N$ | 823 | 823 | 823 | 823 | 823 | 823 |

This table displays the estimation results of the second stage of the instrumental variable approach for each CSP impact score in the Asia sample. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 13** First stage panel North America

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| Intercept | − 23.276*** | − 23.946*** | − 22.884*** | − 31.443*** | − 6.299 | − 14.551** | 33.676*** |
| Political orientation | − 0.149*** | − 0.160*** | − 0.139*** | − 0.192*** | − 0.074* | − 0.156*** | − 0.076*** |
| Interest coverage A | − 0.939** | − 1.060* | − 0.804* | − 1.032* | − 0.015 | − 1.410** | 0.226 |
| Interest coverage B | 0.147 | 0.297 | − 0.009 | 0.032 | 0.550 | − 0.051 | 0.567 |
| Interest coverage C | − 0.104 | 0.096 | − 0.298 | − 0.011 | 0.524* | 0.011 | − 0.274 |
| Interest coverage D | 0.041 | 0.007 | 0.074* | 0.024 | − 0.010 | 0.001 | 0.005 |
| Operating margin | − 0.504*** | − 0.535*** | − 0.482*** | − 0.429*** | − 0.600*** | − 0.436*** | − 0.435*** |
| Total debt | 0.152*** | 0.187*** | 0.118*** | 0.189*** | 0.217*** | 0.126*** | 0.053 |
| Size | 1.028*** | 1.016*** | 1.046*** | 1.056*** | 0.648*** | 1.014*** | 0.435*** |
| Beta | 0.379 | 0.891 | − 0.107 | 1.031 | 1.080 | 0.645 | − 0.959 |
| Idiosyncratic risk | 0.515 | 0.299 | 0.730 | 0.170 | 0.274 | 0.401 | − 0.140 |
| Dividend payer | 8.395*** | 9.890*** | 6.879*** | 8.944*** | 8.380*** | 9.117*** | 3.119* |
| Market/Book | − 0.213 | − 0.182 | − 0.261 | − 0.014 | − 0.390 | − 0.167 | − 0.084 |
| Retained earnings | 10.940*** | 9.047** | 13.040*** | 8.833** | 7.150* | 9.240*** | 7.817** |
| Capital expenditure | − 0.616** | − 0.638* | − 0.608** | − 0.758** | − 0.136 | − 0.622* | − 0.043 |
| Cash holdings | 7.950 | 12.379 | 3.756 | 20.125** | 6.950 | 9.362 | − 7.573 |
| Tangibility | 19.869*** | 25.111*** | 14.714*** | 33.177*** | 5.731 | 23.839*** | − 5.916 |
| R&D | 98.526*** | 119.169*** | 78.435** | 86.700** | 144.280*** | 98.253*** | 71.776** |
| GDP growth | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| Weak instruments | 0.000 | 0.000 | 0.000 | 0.000 | 0.060 | 0.000 | 0.003 |
| $R^2$ | 0.448 | 0.413 | 0.410 | 0.418 | 0.314 | 0.352 | 0.214 |
| *N* | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 |

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | |
| Intercept | − 14.295** | 11.335 | − 21.880*** | − 30.079*** | − 5.951 | − 13.753** |

**Table 13** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| Political orientation | − 0.170*** | − 0.066 | − 0.086*** | − 0.132*** | − 0.117*** | − 0.092** |
| Interest coverage A | − 0.333 | − 0.382 | − 1.163** | − 0.574 | − 0.332 | − 1.467*** |
| Interest coverage B | − 0.067 | 0.397 | 0.458 | − 0.741 | − 1.118** | 0.239 |
| Interest coverage C | − 0.299 | − 0.080 | − 0.543* | − 0.205 | 0.304 | − 0.038 |
| Interest coverage D | 0.045 | 0.019 | 0.105** | 0.074 | 0.030 | 0.055 |
| Operating margin | − 0.403*** | − 0.497*** | − 0.244** | − 0.167* | − 0.317*** | − 0.501*** |
| Total debt | 0.093** | 0.123** | 0.129*** | 0.052 | 0.132*** | 0.106** |
| Size | 0.894*** | 0.684*** | 0.901*** | 0.842*** | 0.759*** | 0.930*** |
| Beta | 0.208 | − 0.671 | 0.715 | 1.284 | 0.667 | − 0.148 |
| Idiosyncratic risk | 0.269 | 0.427 | 0.742 | 0.131 | 1.096* | 0.618 |
| Dividend payer | 7.424*** | 8.681*** | 5.589*** | 2.592 | 7.303*** | 1.794 |
| Market/Book | 0.053 | − 0.743** | 0.114 | − 0.136 | − 0.289 | − 0.245 |
| Retained earnings | 12.166*** | 14.068*** | 9.052*** | 14.667*** | 4.165 | 13.804*** |
| Capital expenditure | − 0.608** | 0.135 | − 0.990*** | − 0.258 | − 0.462 | − 0.760** |
| Cash holdings | 1.762 | 8.084 | 7.941 | 2.007 | 9.341 | 4.713 |
| Tangibility | 16.676*** | − 3.682 | 11.623** | 11.499** | 20.277*** | 19.110*** |
| R&D | 37.902 | 98.805*** | 66.691** | 37.881 | 72.300** | 33.874 |
| GDP growth | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** | 0.000*** |
| Time dummies | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | |
| Weak instruments | 0.000 | 0.115 | 0.008 | 0.000 | 0.000 | 0.021 |
| $R^2$ | 0.310 | 0.280 | 0.308 | 0.274 | 0.322 | 0.262 |
| $N$ | 4709 | 4709 | 4709 | 4709 | 4709 | 4709 |

This table displays the estimation results of the first stage of the instrumental variable approach for each CSP impact score in the North America panel. The second stage is reported in Sect. 5.2. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 14** First stage panel Europe

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| Intercept | 19.575 | 12.715 | 31.175 | 42.046* | − 53.920 | 42.661** | 120.410*** |
| CSR country average | − 0.053 | − 0.117 | − 0.031 | − 0.143* | − 0.166* | − 0.132 | − 0.187** |
| Regulatory framework | 0.057 | 0.117 | 0.004 | − 0.069 | 0.517 | 0.002 | − 0.197 |
| Anti self− dealing | 1.752 | − 3.001 | 5.821 | 2.961 | − 21.102** | − 0.344 | − 12.878* |
| Corruption | − 0.149 | − 1.054 | 0.548 | − 0.067 | − 4.914 | 1.128 | 4.521** |
| Union density | 0.048 | 0.094 | − 0.004 | 0.046 | 0.238* | 0.074 | 0.018 |
| Skilled labor | 1.444 | 2.262 | 0.561 | 1.097 | 3.611 | 0.595 | − 5.470* |
| Power distance | 0.176** | 0.202** | 0.151* | 0.144* | 0.342** | 0.145* | 0.354*** |
| Individualism | − 0.037 | 0.040 | − 0.112 | − 0.112 | 0.466*** | − 0.089 | − 0.424*** |
| Interest coverage A | − 0.062 | − 0.143 | 0.026 | − 0.527 | − 0.163 | 0.027 | 0.147 |
| Interest coverage B | 0.194 | 0.559 | − 0.085 | 0.406 | 1.163 | − 0.112 | − 1.585** |
| Interest coverage C | 0.184 | 0.236 | 0.106 | 0.137 | 0.499 | 0.353 | 0.366 |
| Interest coverage D | 0.009 | 0.005 | 0.015 | 0.023 | − 0.008 | − 0.034 | 0.014 |
| Operating margin | − 0.401*** | − 0.540*** | − 0.280*** | − 0.402*** | − 0.840*** | − 0.307*** | − 0.335** |
| Total debt | − 0.051 | − 0.026 | − 0.076 | − 0.042 | 0.023 | − 0.052 | − 0.129 |
| Size | 0.573*** | 0.590*** | 0.547*** | 0.547*** | 0.767*** | 0.488*** | 0.365*** |
| Beta | 0.775 | 1.025 | 0.650 | 1.346 | 1.404 | 0.337 | − 0.676 |
| Idiosyncratic risk | − 0.031 | 0.328 | − 0.402 | 0.204 | 0.594 | − 0.182 | − 0.475 |
| Dividend payer | 1.731 | 2.337 | 1.545 | 0.814 | 1.189 | 2.225 | − 0.020 |
| Market/Book | 0.346 | 0.233 | 0.446 | 0.434 | − 0.381 | 0.339 | 2.520*** |
| Retained earnings | 0.624 | 0.332 | 1.395 | 5.376 | − 0.640 | − 2.360 | 1.714 |
| Capital expenditure | − 0.364 | − 0.340 | − 0.481 | − 0.124 | − 0.956* | − 0.049 | − 0.780* |
| Cash holdings | 17.807** | 19.916** | 16.727** | 10.230 | 23.633 | 22.209** | 5.940 |
| Tangibility | 10.794* | 14.678* | 8.269 | 15.806* | 14.830 | 5.449 | 6.368 |
| R&D | 59.895* | 97.150*** | 26.059 | 71.754* | 273.861*** | 14.775 | − 14.689 |
| GDP growth | − 98.903** | − 136.019*** | − 62.564 | − 99.273* | − 131.479 | − 101.008* | 69.976 |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| Weak instruments | 0.160 | 0.310 | 0.112 | 0.360 | 0.009 | 0.140 | 0.000 |

**Table 14** continued

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| $R^2$ | 0.437 | 0.429 | 0.361 | 0.365 | 0.406 | 0.303 | 0.251 |
| *N* | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| | Comm. | Hum. rights | Diversity | Employm. | Health | Training | |
| *Coefficients* | | | | | | | |
| Intercept | 9.519 | 10.485 | 46.773 | 8.995 | 42.035 | 41.664** | |
| CSR country average | − 0.280*** | − 0.063 | − 0.191** | − 0.110 | − 0.195** | − 0.138* | |
| Regulatory framework | 0.233 | 0.100 | 0.316 | 0.109 | − 0.658*** | 0.468*** | |
| Anti self− dealing | 28.803*** | 9.843 | − 4.246 | 3.634 | 14.768** | − 7.000* | |
| Corruption | − 0.342 | 0.588 | − 2.581 | 1.123 | 4.306* | − 3.502* | |
| Union density | − 0.113 | 0.184* | − 0.048 | − 0.051 | − 0.115 | 0.072 | |
| Skilled labor | 6.015** | 3.511 | − 5.276 | 0.530 | 2.716 | − 0.434 | |
| Power distance | − 0.060 | 0.201* | 0.124 | 0.063 | 0.169 | 0.191*** | |
| Individualism | − 0.203 | − 0.114 | 0.107 | − 0.062 | − 0.294*** | 0.155* | |
| Interest coverage A | 0.282 | − 0.780 | 0.150 | 0.719 | 0.345 | − 0.594 | |
| Interest coverage B | − 0.020 | 0.004 | 0.594 | − 0.170 | 0.222 | 0.280 | |
| Interest coverage C | − 0.292 | 0.138 | − 0.022 | − 0.363 | 0.476 | 0.448* | |
| Interest coverage D | 0.024 | 0.099 | − 0.054 | 0.140*** | − 0.070 | − 0.029 | |
| Operating margin | − 0.273** | − 0.456*** | − 0.325** | − 0.104 | − 0.122 | − 0.082 | |
| Total debt | − 0.123* | − 0.135 | − 0.018 | − 0.024 | 0.023 | − 0.059 | |
| Size | 0.378*** | 0.661*** | 0.662*** | 0.419*** | 0.470*** | 0.395*** | |
| Beta | 0.946 | − 1.490 | 0.655 | 3.248 | 0.048 | 0.801 | |
| Idiosyncratic risk | − 0.323 | 0.971 | − 1.064 | − 1.070 | − 0.888 | 0.107 | |
| Dividend payer | 5.854* | 1.757 | 1.525 | 3.976 | − 2.057 | 0.501 | |
| Market/Book | 0.550 | 0.351 | 0.069 | 0.180 | − 0.482 | − 0.186 | |
| Retained earnings | − 1.499 | 10.031 | − 0.301 | − 3.531 | 1.753 | 0.470 | |
| Capital expenditure | − 0.353 | − 0.723 | − 1.091* | − 0.005 | − 0.315 | − 0.062 | |
| Cash holdings | 31.671** | 25.870* | 14.190 | − 10.724 | 6.013 | 18.768** | |
| Tangibility | − 0.848 | − 4.501 | 17.815* | 21.325*** | 3.854 | − 2.880 | |

**Table 14** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| R&D | − 13.985 | 9.589 | 88.379 | − 6.061 | 135.060** | 3.622 |
| GDP growth | − 35.386 | 15.482 | − 224.664*** | − 113.689 | − 50.685 | − 93.949* |
| Time dummies | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | |
| Weak instruments | 0.002 | 0.090 | 0.037 | 0.422 | 0.004 | 0.000 |
| $R^2$ | 0.196 | 0.293 | 0.339 | 0.231 | 0.259 | 0.280 |
| $N$ | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |

This table displays the estimation results of the first stage of the instrumental variable approach for each CSP impact score in the Europe panel. The second stage is reported in Sect. 5.2. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 15** First stage panel Asia

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | | |
| Intercept | − 18.853 | − 6.364 | − 27.039 | 9.217 | − 0.749 | − 18.994 | 82.363*** |
| CSR country average | 0.040 | 0.010 | − 0.026 | − 0.014 | 0.163 | − 0.109 | − 0.633*** |
| Regulatory framework | 0.272 | 0.369** | 0.242 | 0.553*** | − 0.054 | 0.514*** | 0.745*** |
| Corruption | − 0.900 | − 1.039 | − 0.751 | − 0.971 | − 1.973 | 0.490 | − 3.106** |
| Union density | − 0.564 | − 0.362 | − 0.800** | − 0.623* | − 0.524 | 0.022 | − 1.287*** |
| Interest coverage A | 1.772 | 1.447 | 2.158 | 2.007 | 1.618 | 0.669 | 2.582* |
| Interest coverage B | 2.068** | 1.955** | 2.140** | 1.395 | 1.878** | 1.955** | 1.769 |

**Table 15** continued

| | Ov. CSP | Environm. | Social | Emission | Env. inno. | Resources | Prod. resp. |
|---|---|---|---|---|---|---|---|
| Interest coverage C | − 0.271 | − 0.497 | − 0.032 | − 0.225 | − 0.585 | − 0.375 | 0.130 |
| Interest coverage D | 0.078 | 0.045 | 0.112* | 0.016 | 0.034 | 0.063 | − 0.080 |
| Operating margin | − 0.129 | − 0.040 | − 0.228 | 0.113 | − 0.419* | 0.069 | − 0.444** |
| Total debt | 0.105 | 0.168 | 0.037 | 0.072 | 0.103 | 0.240** | − 0.380** |
| Size | 0.875*** | 0.799*** | 0.962*** | 0.722*** | 0.790*** | 0.789*** | 0.094 |
| Beta | 1.748 | 2.275 | 1.340 | 2.663 | 1.756 | 1.063 | 5.401* |
| Idiosyncratic risk | 1.499 | 1.163 | 1.904 | 1.256 | 0.781 | 1.079 | 1.218 |
| Dividend payer | − 1.065 | − 1.504 | − 0.845 | − 8.679 | 1.233 | 0.406 | − 9.946 |
| Market/Book | − 2.570 | − 3.531* | − 1.756 | − 4.665** | − 2.693 | − 2.435 | 0.900 |
| Retained earnings | − 23.759* | − 19.319 | − 28.457** | − 14.975 | − 24.920* | − 17.234 | − 26.391 |
| Capital expenditure | 0.021 | 0.112 | − 0.089 | 0.033 | 0.325 | 0.126 | − 0.295 |
| Cash holdings | 13.454 | 25.022 | 1.694 | 20.470 | 22.328 | 16.636 | − 9.986 |
| Tangibility | 3.896 | 4.037 | 4.003 | 10.750 | − 1.749 | 1.531 | 21.824 |
| R&D | 189.006*** | 230.004*** | 151.300** | 183.260*** | 322.650*** | 207.690*** | 193.795** |
| GDP growth | − 209.588** | − 393.821*** | − 60.013 | − 408.751*** | − 395.080*** | − 249.452*** | − 102.799 |
| Time dummies | Y | Y | Y | Y | Y | Y | Y |
| Industry dummies | Y | Y | Y | Y | Y | Y | Y |
| Weak instruments | 0.001 | 0.002 | 0.006 | 0.000 | 0.124 | 0.006 | 0.000 |
| $R^2$ | 0.518 | 0.540 | 0.440 | 0.527 | 0.491 | 0.489 | 0.310 |
| $N$ | 823 | 823 | 823 | 823 | 823 | 823 | 823 |

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| *Coefficients* | | | | | | |
| Intercept | 3.641 | − 13.335 | − 39.581 | 9.310 | − 20.580 | 1.438 |
| CSR country average | − 0.223 | 0.057 | 0.190 | 0.027 | − 0.461*** | − 0.443*** |
| Regulatory framework | 0.450*** | 0.452** | 0.341 | − 0.364** | 0.243 | − 0.044 |
| Corruption | 1.797 | − 2.882* | 0.772 | − 3.106* | 3.623** | − 0.458 |
| Union density | − 1.029*** | − 0.422 | − 0.786 | − 0.581 | − 0.014 | − 0.731* |
| Interest coverage A | 0.893 | − 0.054 | 1.564 | 0.029 | 1.754 | 1.541 |

**Table 15** continued

| | Comm. | Hum. rights | Diversity | Employm. | Health | Training |
|---|---|---|---|---|---|---|
| Interest coverage B | 2.254** | 2.689** | 1.435 | 0.742 | 2.177** | 1.281 |
| Interest coverage C | − 0.088 | − 0.653 | 0.219 | 0.215 | − 0.931* | 0.004 |
| Interest coverage D | 0.029 | 0.125 | 0.208*** | 0.051 | 0.268*** | 0.060 |
| Operating margin | 0.004 | − 0.329 | − 0.356 | 0.082 | − 0.128 | − 0.013 |
| Total debt | − 0.025 | 0.008 | 0.051 | − 0.132 | 0.063 | 0.254* |
| Size | 0.822*** | 0.658*** | 1.064*** | 0.755*** | 0.595*** | 0.941*** |
| Beta | 1.447 | − 1.727 | 0.000 | 6.283* | 1.763 | − 2.317 |
| Idiosyncratic risk | 2.294 | 1.297 | 0.783 | − 0.031 | 1.432 | 2.092 |
| Dividend payer | − 1.227 | 9.888 | − 9.322 | 2.910 | 10.512 | − 2.045 |
| Market/Book | − 3.245 | − 1.106 | − 3.083 | 0.149 | − 0.626 | − 1.767 |
| Retained earnings | − 28.758* | − 21.882 | − 26.177* | − 21.655 | − 12.370 | − 11.858 |
| Capital expenditure | 0.256 | − 0.690 | − 0.309 | − 1.002 | 0.141 | 0.773 |
| Cash holdings | 18.083 | − 9.972 | − 3.591 | − 17.905 | 5.800 | 9.632 |
| Tangibility | − 1.906 | − 4.852 | 7.833 | − 10.331 | 31.452** | − 13.154 |
| R&D | 46.100 | 136.451 | 161.037** | 32.543 | 95.522 | 81.380 |
| GDP growth | − 108.918 | − 142.871 | − 153.630 | 153.696 | − 128.524 | 45.023 |
| Time dummies | Y | Y | Y | Y | Y | |
| Industry dummies | Y | Y | Y | Y | Y | |
| Weak instruments | 0.000 | 0.000 | 0.000 | 0.130 | 0.006 | 0.080 |
| $R^2$ | 0.368 | 0.359 | 0.466 | 0.352 | 0.300 | 0.324 |
| $N$ | 823 | 823 | 823 | 823 | 823 | 823 |

This table displays the estimation results of the first stage of the instrumental variable approach for each CSP impact score in the Asia panel. The second stage is reported in Sect. 5.2. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 16** Robustness checks

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| *U.S. average CSP on state level* | | | | | | |
| $\widehat{CSP}$ | | 0.040*** | | 0.044*** | | 0.032** |
| Intercept | − 31.250** | | − 17.871 | | − 37.630*** | |
| Dummy North Am. | − 11.405*** | 0.522 | − 11.419*** | 0.574* | − 12.635*** | 0.354 |
| Dummy Asia | − 20.021*** | 1.310*** | − 16.589*** | 1.187*** | − 24.717*** | 1.309*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.505 | 0.364 | 0.478 | 0.365 | 0.457 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *All instruments included (individualism added)* | | | | | | |
| $\widehat{CSP}$ | | 0.044*** | | 0.048*** | | 0.034** |
| Intercept | − 45.776*** | | − 39.546** | | − 46.232*** | |
| Dummy North Am. | − 12.550*** | 0.608* | − 13.540*** | 0.665** | − 13.081*** | 0.417 |
| Dummy Asia | − 15.213*** | 1.373*** | − 8.741** | 1.249*** | − 22.067*** | 1.349*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.507 | 0.365 | 0.480 | 0.366 | 0.458 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *North America sample including the anti-self-dealing index as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.039** | | 0.036** | | 0.042** |
| Intercept | 951.611*** | | 1024.607*** | | 890.375*** | |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.448 | 0.370 | 0.413 | 0.370 | 0.410 | 0.370 |
| $N$ | 4709 | | 4709 | | 4709 | |
| *Europe sample including the political orientation as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.071 | | 0.097*** | | 0.017 |
| Intercept | 31.653*** | | 31.273** | | 36.173*** | |
| Weak instruments | 0.150 | | 0.449 | | 0.114 | |
| $R^2$ | 0.436 | 0.393 | 0.428 | 0.395 | 0.362 | 0.392 |
| $N$ | 1500 | | 1500 | | 1500 | |

**Table 16** continued

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| *Asia sample including the power distance as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.019 | | 0.037** | | − 0.013 |
| Intercept | − 40.934* | | 1.348 | | − 68.981*** | |
| Weak instruments | 0.003 | | 0.004 | | 0.010 | |
| $R^2$ | 0.522 | 0.416 | 0.545 | 0.417 | 0.445 | 0.415 |
| $N$ | 823 | | 823 | | 823 | |
| Stage | Emission | | Env. inno. | | Resources | |
| Dependent variable | Stage 1<br>Emission | Stage 2<br>Cr. rat. | Stage 1<br>Env. inno. | Stage 2<br>Cr. rat. | Stage 1<br>Resources | Stage 2<br>Cr. rat. |
| *U.S. average CSP on state level* | | | | | | |
| $\widehat{CSP}$ | | 0.038*** | | 0.069*** | | 0.038*** |
| Intercept | − 8.656 | | 2.384 | | − 8.752 | |
| Dummy North Am. | − 11.450*** | 0.541* | − 9.530*** | 0.722*** | − 12.229*** | 0.415 |
| Dummy Asia | − 18.419*** | 1.135*** | − 9.784** | 1.289*** | − 18.822*** | 1.128*** |
| Weak instruments | 0.000 | | 0.109 | | 0.000 | |
| $R^2$ | 0.476 | 0.365 | 0.386 | 0.365 | 0.401 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *All instruments included (individualism added)* | | | | | | |
| $\widehat{CSP}$ | | 0.041*** | | 0.071*** | | 0.041*** |
| Intercept | − 31.345 | | − 31.759 | | − 22.800 | |
| Dummy North Am. | − 13.369*** | 0.610** | − 13.125*** | 0.726*** | − 13.252*** | 0.487 |
| Dummy Asia | − 10.658** | 1.175*** | 4.101 | 1.327*** | − 14.151*** | 1.168*** |
| Weak instruments | 0.000 | | 0.010 | | 0.000 | |
| $R^2$ | 0.478 | 0.366 | 0.390 | 0.366 | 0.402 | 0.365 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *North America sample including the anti-self-dealing index as instrument* | | | | | | |

**Table 16** continued

| Stage | Emission | | Env. inno. | | Resources | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Emission | Stage 2<br>Cr. rat. | Stage 1<br>Env. inno. | Stage 2<br>Cr. rat. | Stage 1<br>Resources | Stage 2<br>Cr. rat. |
| $\widehat{CSP}$ | | 0.030** | | 0.079*** | | 0.037** |
| Intercept | 1228.816*** | | 478.812* | | 1006.511*** | |
| Weak instruments | 0.000 | | 0.060 | | 0.000 | |
| $R^2$ | 0.418 | 0.370 | 0.314 | 0.370 | 0.352 | 0.370 |
| *N* | 4709 | | 4709 | | 4709 | |
| *Europe sample including the political orientation as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.048 | | 0.070*** | | 0.019 |
| Intercept | 51.097*** | | − 25.451 | | 48.718*** | |
| Weak instruments | 0.328 | | 0.053 | | 0.114 | |
| $R^2$ | 0.365 | 0.392 | 0.405 | 0.399 | 0.304 | 0.392 |
| *N* | 1500 | | 1500 | | 1500 | |
| *Asia sample including the power distance as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.020 | | 0.099*** | | 0.040* |
| Intercept | − 3.906 | | 25.556 | | 1.491 | |
| Weak instruments | 0.000 | | 0.073 | | 0.004 | |
| $R^2$ | 0.528 | 0.416 | 0.503 | 0.421 | 0.498 | 0.417 |
| *N* | 823 | | 823 | | 823 | |

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable | Stage 1<br>Prod. resp. | Stage 2<br>Cr. rat. | Stage 1<br>Comm. | Stage 2<br>Cr. rat. | Stage 1<br>Hum. rights | Stage 2<br>Cr. rat. | Stage 1<br>Diversity | Stage 2<br>Cr. rat. |
| *U.S. average CSP on state level* | | | | | | | | |
| $\widehat{CSP}$ | | 0.015 | | 0.020 | | 0.016 | | 0.046*** |
| Intercept | 28.154* | | − 30.982** | | − 10.844 | | 13.486 | |

**Table 16** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| Dummy North Am. | − 14.028*** | − 0.067 | − 3.537* | − 0.143 | − 12.531*** | − 0.013 | − 10.763*** | 0.380 |
| Dummy Asia | − 28.248*** | 0.910*** | − 14.870*** | 0.852*** | − 23.288*** | 0.996** | − 24.244*** | 1.369*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.238 | 0.363 | 0.285 | 0.363 | 0.324 | 0.363 | 0.370 | 0.365 |
| $N$ | 7032 | | 7032 | | 7032 | | 7032 | |
| *All instruments included (individualism added)* | | | | | | | | |
| $\widehat{CSP}$ | | 0.011 | | 0.023* | | 0.022 | | 0.048*** |
| Intercept | 42.988** | | − 47.238*** | | − 27.420 | | − 6.875 | |
| Dummy North Am. | − 13.357*** | − 0.102 | − 4.543* | − 0.103 | − 14.516*** | 0.128 | − 11.989*** | 0.417* |
| Dummy Asia | − 32.921*** | 0.833*** | − 9.604 | 0.861*** | − 17.002*** | 1.095*** | − 17.750*** | 1.414*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.238 | 0.363 | 0.286 | 0.364 | 0.324 | 0.363 | 0.372 | 0.366 |
| $N$ | 7032 | | 7032 | | 7032 | | 7032 | |
| *North America sample including the anti-self-dealing index as instrument* | | | | | | | | |
| $\widehat{CSP}$ | | 0.076** | | 0.034** | | 0.088*** | | 0.067** |
| Intercept | 532.946*** | | 1099.437*** | | 445.579 | | 544.423** | |
| Weak instruments | 0.003 | | 0.000 | | 0.115 | | 0.008 | |
| $R^2$ | 0.214 | 0.370 | 0.310 | 0.370 | 0.280 | 0.370 | 0.308 | 0.370 |
| $N$ | 4709 | | 4709 | | 4709 | | 4709 | |
| *Europe sample including the political orientation as instrument* | | | | | | | | |
| $\widehat{CSP}$ | | 0.011 | | − 0.040 | | − 0.036 | | 0.070** |
| Intercept | 78.308*** | | 54.605*** | | 39.176** | | 3.771 | |
| Weak instruments | 0.000 | | 0.009 | | 0.161 | | 0.051 | |

**Table 16** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent Variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| $R^2$ | 0.249 | 0.392 | 0.190 | 0.394 | 0.292 | 0.392 | 0.335 | 0.395 |
| $N$ | 1500 | | 1500 | | 1500 | | 1500 | |
| *Asia sample including the power distance as instrument* | | | | | | | | |
| $\widehat{CSP}$ | | − 0.003 | | − 0.013 | | 0.021 | | 0.025 |
| Intercept | 25.018 | | − 54.099*** | | 5.099 | | − 55.807** | |
| Weak instruments | 0.000 | | 0.002 | | 0.001 | | 0.002 | |
| $R^2$ | 0.312 | 0.415 | 0.366 | 0.416 | 0.363 | 0.416 | 0.467 | 0.417 |
| $N$ | 823 | | 823 | | 823 | | 823 | |

| Stage | Employm. | | Health | | Training | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Employm. | Stage 2 Cr. rat. | Stage 1 Health | Stage 2 Cr. rat. | Stage 1 Training | Stage 2 Cr. rat. |
| *U.S. average CSP on state level* | | | | | | |
| $\widehat{CSP}$ | | − 0.017 | | 0.033* | | 0.011 |
| Intercept | − 76.749*** | | − 2.778 | | − 17.999 | |
| Dummy North Am. | − 9.913*** | − 0.581* | − 12.081*** | 0.316 | − 23.028*** | − 0.001 |
| Dummy Asia | − 18.272*** | 0.326 | − 23.882*** | 1.323*** | − 23.953*** | 0.903** |
| Weak instruments | 0.000 | | 0.002 | | 0.001 | |
| $R^2$ | 0.309 | 0.363 | 0.329 | 0.363 | 0.359 | 0.363 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *All instruments included (individualism added)* | | | | | | |
| $\widehat{CSP}$ | | − 0.024 | | 0.036* | | 0.013 |
| Intercept | − 55.929*** | | − 11.284 | | − 22.951 | |
| Dummy North Am. | − 8.905*** | − 0.659** | − 12.534*** | 0.387 | − 23.147*** | 0.057 |
| Dummy Asia | − 25.605*** | 0.158 | − 21.191*** | 1.370*** | − 22.657*** | 0.922* |

**Table 16** continued

| Stage | Employm. | | Health | | Training | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Employm. | Stage 2 Cr. rat. | Stage 1 Health | Stage 2 Cr. rat. | Stage 1 Training | Stage 2 Cr. rat. |
| Weak instruments | 0.000 | | 0.004 | | 0.001 | |
| $R^2$ | 0.310 | 0.364 | 0.329 | 0.364 | 0.361 | 0.363 |
| $N$ | 7032 | | 7032 | | 7032 | |
| *North America sample including the anti-self-dealing index as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.044** | | 0.050** | | 0.063** |
| Intercept | 833.028*** | | 760.514*** | | 590.837** | |
| Weak instruments | 0.000 | | 0.000 | | 0.021 | |
| $R^2$ | 0.274 | 0.370 | 0.322 | 0.370 | 0.262 | 0.370 |
| $N$ | 4709 | | 4709 | | 4709 | |
| *Europe sample including the political orientation as instrument* | | | | | | |
| $\widehat{CSP}$ | | 0.010 | | 0.008 | | 0.067* |
| Intercept | 12.839 | | 62.697*** | | 37.887*** | |
| Weak instruments | 0.385 | | 0.004 | | 0.000 | |
| $R^2$ | 0.231 | 0.391 | 0.258 | 0.391 | 0.280 | 0.394 |
| $N$ | 1500 | | 1500 | | 1500 | |
| *Asia sample including the power distance as instrument* | | | | | | |
| $\widehat{CSP}$ | | − 0.081* | | 0.036 | | 0.000 |
| Intercept | − 37.575* | | 13.693 | | − 39.659* | |
| Weak instruments | 0.117 | | 0.000 | | 0.038 | |
| $R^2$ | 0.362 | 0.421 | 0.316 | 0.417 | 0.334 | 0.418 |
| $N$ | 823 | | 823 | | 823 | |

This table displays the estimation results of our robustness checks referring to both stages of the instrumental variable approach for each CSP impact score. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

significant. In the case of *diversity*, the pressure of the market seems so strong that smaller variation suffices for a significant impact. In the Asia panel, not even *diversity* is significant, although obtaining the most intensive effects among social components in Europe and North America—likely due to cultural reasons. Previous literature has provided similar implications for Asia by finding limiting or reducing the effects of diversity aspects on firm performance. Based on a sample of Asian countries (Hong Kong, South Korea, Malaysia, and Singapore), Low et al. (2015) primarily find a positive effect of the numbers of female board directors on firm performance, although it is substantially reduced in countries with higher female economic participation and empowerment likely due to tokenism. Li and Chen (2018) only find a positive relationship between board gender diversity and firm performance for Chinese firms if they do not exceed a critical size. Darmadi (2011) even found a negative relationship between the diversity of board members and financial performance for Indonesia.

When comparing our results with those of earlier studies on credit risk, we find accordance with Jiraporn et al. (2014) in the sense that overall CSP has a positive impact on credit ratings in North America. Stellner et al. (2015) do not find such a relationship for their Europe sample. In contrast, we find a significant positive impact of both overall CSP and some of its components. In agreement with Oikonomou et al. (2014), product characteristics are relevant in this context. Further, we identify the workforce categories of employment quality and diversity as being drivers inside the workforce pillar. We can confirm the first empirical evidence of Attig et al. (2013), with CSP strengths and concerns related to primary stakeholder management (i.e. community relations, diversity, employee relations, environmental performance, and product characteristics) being linked to credit ratings and extending their work in terms of causality and a more sophisticated CSP measurement approach, respectively.

## 6 Robustness checks

We prove the robustness of our results concerning the specification of instruments in the first stage, to the period selection, missing data, and the relevance of environmental sensitive industries. Regression coefficients of CSP variables are presented in Tables 16 and 17. At first, we address the average CSP performance of surrounding firms used as an instrument based on the research of Jiraporn et al. (2014). While in the standard analysis, the average CSP for the USA is calculated based on the country level, we demonstrate the robustness of our results when surrounding firms are defined as located in the same state. All results remain almost unchanged. Also, in the main analysis, instruments and controls are subject to a selection process based on VIFs. To prove the robustness of our results for the entire sample, we include the individualism variable, which was discarded in the selection process. Referring to the three regional panels, we replace one instrument in each. Again, we derive similar results to our main findings.

During recent years, there have been several changes in the political alignment of some countries, e.g., since 2017, US climate politics have shifted from renewable

**Table 17** Robustness checks

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| *Subset till 2018* | | | | | | |
| $\widehat{CSP}$ | | 0.040*** | | 0.043*** | | 0.031* |
| Intercept | − 31.370** | | − 19.509 | | − 36.185** | |
| Dummy North Am. | − 11.161*** | 0.493 | − 11.100*** | 0.551* | − 12.410*** | 0.321 |
| Dummy Asia | − 19.937*** | 1.272*** | − 16.489*** | 1.155*** | − 24.628*** | 1.263*** |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.506 | 0.363 | 0.478 | 0.363 | 0.459 | 0.362 |
| *N* | 6887 | | 6887 | | 6887 | |
| *Subset till 2017* | | | | | | |
| $\widehat{CSP}$ | | 0.044*** | | 0.047*** | | 0.035** |
| Intercept | − 29.561* | | − 17.317 | | − 35.599** | |
| Dummy North Am. | − 12.785*** | 0.524 | − 12.412*** | 0.548* | − 14.155*** | 0.350 |
| Dummy Asia | − 21.923*** | 1.337*** | − 18.358*** | 1.184*** | − 26.733*** | 1.336*** |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.504 | 0.354 | 0.477 | 0.354 | 0.456 | 0.353 |
| *N* | 6050 | | 6050 | | 6050 | |
| *Subset till 2016* | | | | | | |
| $\widehat{CSP}$ | | 0.051*** | | 0.049*** | | 0.044** |
| Intercept | − 30.040 | | − 16.775 | | − 37.723** | |
| Dummy North Am. | − 14.356*** | 0.564 | − 13.563*** | 0.490 | − 15.949*** | 0.452 |
| Dummy Asia | − 23.547*** | 1.408*** | − 19.905*** | 1.161*** | − 28.463*** | 1.492*** |
| Weak instruments | 0 | | 0 | | 0 | |
| $R^2$ | 0.497 | 0.345 | 0.471 | 0.346 | 0.446 | 0.344 |
| *N* | 5214 | | 5214 | | 5214 | |
| *Imputted input variables* | | | | | | |
| $\widehat{CSP}$ | | 0.033** | | 0.038*** | | 0.020 |
| Intercept | − 28.430** | | − 18.411 | | − 35.395*** | |
| Dummy North Am. | − 12.647*** | 0.229 | − 11.860*** | 0.326 | − 14.407*** | − 0.052 |

**Table 17** continued

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| Dummy Asia | − 20.014*** | 1.242*** | − 17.263*** | 1.171*** | − 24.156*** | 1.108*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.482 | 0.348 | 0.455 | 0.349 | 0.433 | 0.348 |
| $N$ | 11879 | | 11879 | | 11879 | |
| *Interaction between CSP and environmental sensitive industries included* | | | | | | |
| $\widehat{CSP}$ | | 0.040*** | | 0.043*** | | 0.032** |
| Interaction $\widehat{CSP}$ & env. sens. | | 0.003 | | 0.003 | | 0.002 |
| Intercept | − 30.795** | | − 17.518 | | − 37.065*** | |
| Dummy North Am. | − 11.463*** | 0.529 | − 11.467*** | 0.576* | − 12.700*** | 0.367 |
| Dummy Asia | − 20.150*** | 1.320*** | − 16.682*** | 1.195*** | − 24.875*** | 1.326*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.506 | 0.364 | 0.478 | 0.365 | 0.459 | 0.364 |
| $N$ | 7032 | | 7032 | | 7032 | |
| Stage | Emission | | Env. inno. | | Resources | |
| Dependent variable | Stage 1<br>Emission | Stage 2<br>Cr. rat. | Stage 1<br>Env. inno. | Stage 2<br>Cr. rat. | Stage 1<br>Resources | Stage 2<br>Cr. rat. |
| *Subset till 2018* | | | | | | |
| $\widehat{CSP}$ | | 0.038*** | | 0.065*** | | 0.037** |
| Intercept | − 8.251 | | 4.695 | | − 12.128 | |
| Dummy North Am. | − 10.941*** | 0.530* | − 9.643*** | 0.653*** | − 12.083*** | 0.392 |
| Dummy Asia | − 18.028*** | 1.108*** | − 10.058** | 1.231*** | − 18.738*** | 1.094*** |
| Weak Instruments | 0.000 | | 0.113 | | 0.000 | |

**Table 17** continued

| Stage | Emission | | Env. inno. | | Resources | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Emission | Stage 2 Cr. rat. | Stage 1 Env. inno. | Stage 2 Cr. rat. | Stage 1 Resources | Stage 2 Cr. rat. |
| $R^2$ | 0.475 | 0.364 | 0.385 | 0.363 | 0.404 | 0.363 |
| $N$ | 6887 | | 6887 | | 6887 | |
| *Subset till 2017* | | | | | | |
| $\widehat{CSP}$ | | 0.040*** | | 0.066*** | | 0.041*** |
| Intercept | − 8.281 | | 4.280 | | − 8.870 | |
| Dummy North Am. | − 11.159*** | 0.484 | − 10.986*** | 0.585*** | − 13.303*** | 0.399 |
| Dummy Asia | − 19.247*** | 1.095*** | − 11.692** | 1.224*** | − 20.569*** | 1.124*** |
| Weak Instruments | 0.000 | | 0.141 | | 0.000 | |
| $R^2$ | 0.473 | 0.355 | 0.383 | 0.354 | 0.406 | 0.354 |
| $N$ | 6050 | | 6050 | | 6050 | |
| *Subset till 2016* | | | | | | |
| $\widehat{CSP}$ | | 0.039*** | | 0.064*** | | 0.044*** |
| Intercept | − 7.879 | | 0.959 | | − 10.201 | |
| Dummy North Am. | − 11.241*** | 0.375 | − 12.157*** | 0.441** | − 13.840*** | 0.372 |
| Dummy Asia | − 19.726*** | 1.020*** | − 13.540*** | 1.165*** | − 21.322*** | 1.112*** |
| Weak instruments | 0 | | 0.013 | | 0 | |
| $R^2$ | 0.465 | 0.346 | 0.376 | 0.345 | 0.406 | 0.345 |
| $N$ | 5214 | | 5214 | | 5214 | |
| *Imputted input variables* | | | | | | |
| $\widehat{CSP}$ | | 0.035*** | | 0.048*** | | 0.034** |
| Intercept | − 13.464 | | 5.127 | | − 10.578 | |
| Dummy North Am. | − 11.701*** | 0.310 | − 10.279*** | 0.261 | − 12.705*** | 0.200 |
| Dummy Asia | − 17.767*** | 1.122*** | − 13.227*** | 1.158*** | − 18.100*** | 1.113*** |
| Weak instruments | 0.000 | | 0.024 | | 0.000 | |
| $R^2$ | 0.449 | 0.349 | 0.376 | 0.349 | 0.379 | 0.348 |
| $N$ | 11879 | | 11879 | | 11879 | |
| *Interaction between CSP and environmental sensitive industries included* | | | | | | |

**Table 17** continued

| Stage | Emission | | Env. inno. | | Resources | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Emission | Stage 2 Cr. rat. | Stage 1 Env. inno. | Stage 2 Cr. rat. | Stage 1 Resources | Stage 2 Cr. rat. |
| $\widehat{CSP}$ | | 0.037*** | | 0.069*** | | 0.037** |
| Interaction $\widehat{CSP}$ & env. sens. | | 0.004 | | 0.002 | | 0.004 |
| Intercept | − 8.119 | | 2.627 | | − 8.577 | |
| Dummy North Am. | − 11.534*** | 0.540* | − 9.563*** | 0.730*** | − 12.246*** | 0.416 |
| Dummy Asia | − 18.529*** | 1.142*** | − 9.875** | 1.298*** | − 18.900*** | 1.136*** |
| Weak instruments | 0.000 | | 0.104 | | 0.000 | |
| $R^2$ | 0.476 | 0.366 | 0.387 | 0.365 | 0.401 | 0.365 |
| $N$ | 7032 | | 7032 | | 7032 | |

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| *Subset till 2018* | | | | | | | | |
| $\widehat{CSP}$ | | 0.013 | | 0.020 | | 0.014 | | 0.045*** |
| Intercept | 24.795 | | − 25.823* | | − 18.750 | | 15.698 | |
| Dummy North Am. | − 14.002*** | − 0.108 | − 3.307 | − 0.163 | − 12.399*** | − 0.060 | − 10.209*** | 0.355 |
| Dummy Asia | − 28.070*** | 0.853*** | − 14.843*** | 0.820*** | − 23.247*** | 0.929** | − 23.697*** | 1.332*** |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.239 | 0.362 | 0.283 | 0.362 | 0.328 | 0.362 | 0.372 | 0.364 |
| $N$ | 6887 | | 6887 | | 6887 | | 6887 | |
| *Subset till 2017* | | | | | | | | |
| $\widehat{CSP}$ | | 0.017 | | 0.021 | | 0.019 | | 0.048*** |
| Intercept | 21.787 | | − 24.667* | | − 27.185 | | 14.822 | |
| Dummy North Am. | − 14.648*** | − 0.113 | − 3.979* | − 0.221 | − 12.716*** | − 0.040 | − 10.911*** | 0.318 |

**Table 17** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| Dummy Asia | − 29.185*** | 0.865*** | − 15.823*** | 0.800*** | − 24.520*** | 0.979** | − 24.773*** | 1.330*** |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.237 | 0.352 | 0.267 | 0.353 | 0.331 | 0.352 | 0.365 | 0.355 |
| *N* | 6050 | | 6050 | | 6050 | | 6050 | |
| *Subset till 2016* | | | | | | | | |
| $\widehat{CSP}$ | | 0.026* | | 0.024 | | 0.023 | | 0.052*** |
| Intercept | 27.835 | | − 17.269 | | − 41.055** | | 16.338 | |
| Dummy North Am. | − 15.403*** | − 0.060 | − 4.828** | − 0.294 | − 13.667*** | − 0.045 | − 12.338*** | 0.253 |
| Dummy Asia | − 30.934*** | 0.961*** | − 15.744*** | 0.776*** | − 25.637*** | 0.996** | − 25.406*** | 1.292*** |
| Weak Instruments | 0.000 | | 0.000 | | 0.000 | | 0.001 | |
| $R^2$ | 0.228 | 0.344 | 0.243 | 0.344 | 0.329 | 0.344 | 0.351 | 0.346 |
| *N* | 5214 | | 5214 | | 5214 | | 5214 | |
| *Imputted input variables* | | | | | | | | |
| $\widehat{CSP}$ | | − 0.004 | | 0.013 | | − 0.001 | | 0.033*** |
| Intercept | 26.230* | | − 31.706*** | | − 4.031 | | − 2.906 | |
| Dummy North Am. | − 14.702*** | − 0.534** | − 4.418** | − 0.372** | − 13.449*** | − 0.506 | − 7.764*** | 0.006 |
| Dummy Asia | − 24.820*** | 0.658** | − 13.392*** | 0.807*** | − 20.085*** | 0.679* | − 18.151*** | 1.191*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.225 | 0.348 | 0.255 | 0.348 | 0.320 | 0.348 | 0.331 | 0.349 |

**Table 17** continued

| Stage | Prod. resp. | | Comm. | | Hum. rights | | Diversity | |
|---|---|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Prod. resp. | Stage 2 Cr. rat. | Stage 1 Comm. | Stage 2 Cr. rat. | Stage 1 Hum. rights | Stage 2 Cr. rat. | Stage 1 Diversity | Stage 2 Cr. rat. |
| *N* | 11879 | | 11879 | | 11879 | | 11879 | |
| *Interaction between CSP and environmental sensitive industries included* | | | | | | | | |
| $\widehat{CSP}$ | | 0.015 | | 0.020 | | 0.016 | | 0.047*** |
| Interaction $\widehat{CSP}$ & env. sens. | | 0.004 | | 0.005 | | 0.002 | | 0.000 |
| Intercept | 29.460* | | − 30.205** | | − 10.321 | | 13.639 | |
| Dummy North Am. | − 14.232*** | − 0.062 | − 3.652* | − 0.140 | − 12.608*** | − 0.004 | − 10.783*** | 0.386 |
| Dummy Asia | − 28.578*** | 0.923*** | − 15.064*** | 0.861*** | − 23.409*** | 1.013** | − 24.288*** | 1.382*** |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.240 | 0.363 | 0.286 | 0.364 | 0.324 | 0.363 | 0.370 | 0.366 |
| *N* | 7032 | | 7032 | | 7032 | | 7032 | |

| Stage | Employm. | | Health | | Training | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1 Employm. | Stage 2 Cr. rat. | Stage 1 Health | Stage 2 Cr. rat. | Stage 1 Training | Stage 2 Cr. rat. |
| *Subset till 2018* | | | | | | |
| $\widehat{CSP}$ | | − 0.018 | | 0.032 | | 0.013 |
| Intercept | − 60.364*** | | − 3.146 | | − 16.327 | |
| Dummy North Am. | − 10.654*** | − 0.619** | − 11.714*** | 0.282 | − 22.638*** | 0.028 |
| Dummy Asia | − 19.324*** | 0.259 | − 23.468*** | 1.275*** | − 23.638*** | 0.901** |
| Weak Instruments | 0.000 | | 0.001 | | 0.001 | |
| $R^2$ | 0.300 | 0.362 | 0.331 | 0.362 | 0.364 | 0.361 |

**Table 17** continued

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| *N* | 6887 | | 6887 | | 6887 | |
| *Subset till 2017* | | | | | | |
| $\widehat{CSP}$ | | − 0.025* | | 0.028 | | 0.015 |
| Intercept | − 62.117*** | | − 0.623 | | − 18.583 | |
| Dummy North Am. | − 11.369*** | − 0.790** | − 12.889*** | 0.151 | − 23.894*** | 0.001 |
| Dummy Asia | − 19.470*** | 0.047 | − 25.035*** | 1.185** | − 25.786*** | 0.890* |
| Weak Instruments | 0.000 | | 0.007 | | 0.000 | |
| $R^2$ | 0.292 | 0.353 | 0.330 | 0.352 | 0.361 | 0.352 |
| *N* | 6050 | | 6050 | | 6050 | |
| *Subset till 2016* | | | | | | |
| $\widehat{CSP}$ | | − 0.029* | | 0.030 | | 0.022 |
| Intercept | − 64.058*** | | − 2.951 | | − 13.069 | |
| Dummy North Am. | − 12.992*** | − 0.937*** | − 14.359*** | 0.131 | − 27.274*** | 0.132 |
| Dummy Asia | − 20.635*** | − 0.126 | − 27.305*** | 1.226** | − 29.408*** | 1.010** |
| Weak Instruments | 0.000 | | 0.074 | | 0.000 | |
| $R^2$ | 0.276 | 0.344 | 0.327 | 0.343 | 0.356 | 0.343 |
| *N* | 5214 | | 5214 | | 5214 | |
| *Imputted input variables* | | | | | | |
| $\widehat{CSP}$ | | − 0.010 | | 0.012 | | 0.006 |
| Intercept | − 67.318*** | | − 19.590 | | − 18.772* | |
| Dummy North Am. | − 11.631*** | − 0.642** | − 13.401*** | − 0.251 | − 24.207*** | − 0.324 |
| Dummy Asia | − 18.643*** | 0.486 | − 24.487*** | 0.944** | − 23.588*** | 0.812* |
| Weak instruments | 0.000 | | 0.000 | | 0.000 | |
| $R^2$ | 0.282 | 0.348 | 0.312 | 0.348 | 0.357 | 0.348 |
| *N* | 11879 | | 11879 | | 11879 | |
| *Interaction between CSP and environmental sensitive industries included* | | | | | | |
| $\widehat{CSP}$ | | − 0.017 | | 0.032 | | 0.013 |

**Table 17** continued

| Stage | Ov. CSP | | Environm. | | Social | |
|---|---|---|---|---|---|---|
| Dependent variable | Stage 1<br>Ov. CSP | Stage 2<br>Cr. rat. | Stage 1<br>Environm. | Stage 2<br>Cr. rat. | Stage 1<br>Social | Stage 2<br>Cr. rat. |
| Interaction $\widehat{CSP}$ & env. sens. | | 0.000 | | 0.007 | | 0.002 |
| Intercept | − 76.362*** | | − 2.338 | | − 17.918 | |
| Dummy North Am. | − 9.856*** | − 0.581* | − 12.145*** | 0.327 | − 22.881*** | 0.049 |
| Dummy Asia | − 18.281*** | 0.337 | − 24.000*** | 1.345*** | − 24.003*** | 0.945** |
| Weak instruments | 0.000 | | 0.002 | | 0.000 | |
| $R^2$ | 0.309 | 0.363 | 0.329 | 0.364 | 0.362 | 0.363 |
| $N$ | 7032 | | 7032 | | 7032 | |

This table displays the estimation results of our robustness checks referring to both stages of the instrumental variable approach for each CSP impact score. Coefficients of all variables are displayed including the significance level marked by asterisks. They are regarded as being significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ value is below these levels. The lower boundaries of the rating categories according to Sect. 4 are also displayed

**Table 18** Marginal effects panel North America

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| *Overall CSP* | | | | | | | | | |
| AAA | 2.602*** | 4.980*** | − 2.559*** | − 4.826*** | − 0.192*** | − 0.004*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.507*** | 3.803*** | 1.977*** | − 6.928*** | − 0.351*** | − 0.008*** | 0.000 | 0.000*** | 0.000** |
| A | 0.508*** | 1.633*** | 7.634*** | − 8.694*** | − 1.056*** | − 0.025*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.087*** | 0.307*** | 4.288*** | 0.294 | − 4.825*** | − 0.148*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.006*** | 0.020*** | 0.369*** | 7.242*** | − 5.527*** | − 2.071*** | − 0.002 | − 0.032*** | − 0.004** |
| B | 0.000*** | 0.001*** | 0.021*** | 0.725*** | 9.006*** | − 9.092*** | − 0.027 | − 0.556*** | − 0.078** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.107*** | 3.841*** | − 0.140 | − 0.182 | − 3.096*** | − 0.533** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.112*** | 3.992*** | − 0.445 | − 0.173 | − 2.982*** | − 0.507** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.033*** | 1.410*** | 6.503*** | − 0.507 | − 5.822*** | − 1.617** |
| *Environment* | | | | | | | | | |
| AAA | 2.419*** | 4.630*** | − 2.379*** | − 4.487*** | − 0.178*** | − 0.004*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.401*** | 3.536*** | 1.838*** | − 6.441*** | − 0.326*** | − 0.007*** | 0.000 | 0.000*** | 0.000** |
| A | 0.473*** | 1.518*** | 7.098*** | − 8.083*** | − 0.982*** | − 0.023*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.080*** | 0.286*** | 3.986*** | 0.273 | − 4.486*** | − 0.137*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.005*** | 0.019*** | 0.343*** | 6.733*** | − 5.139*** | − 1.926*** | − 0.001 | − 0.029*** | − 0.004** |
| B | 0.000*** | 0.001*** | 0.019*** | 0.674*** | 8.373*** | − 8.453*** | − 0.025 | − 0.517*** | − 0.072** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.099*** | 3.571*** | − 0.130 | − 0.169 | − 2.878*** | − 0.496** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.104*** | 3.711*** | − 0.413 | − 0.161 | − 2.772*** | − 0.472** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.031*** | 1.311*** | 6.046*** | − 0.471 | − 5.413*** | − 1.504** |
| *Social* | | | | | | | | | |
| AAA | 2.778*** | 5.315*** | − 2.732*** | − 5.152*** | − 0.205*** | − 0.005*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.608*** | 4.060*** | 2.111*** | − 7.396*** | − 0.375*** | − 0.008*** | 0.000 | 0.000*** | 0.000** |
| A | 0.543*** | 1.743*** | 8.149*** | − 9.281*** | − 1.127*** | − 0.026*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.092*** | 0.328*** | 4.577*** | 0.314 | − 5.151*** | − 0.158*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.006*** | 0.021*** | 0.394*** | 7.730*** | − 5.900*** | − 2.211*** | − 0.002 | − 0.034*** | − 0.005** |
| B | 0.000*** | 0.001*** | 0.022*** | 0.774*** | 9.613*** | − 9.705*** | − 0.029 | − 0.593*** | − 0.083** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.114*** | 4.100*** | − 0.149 | − 0.194 | − 3.305*** | − 0.569** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.120*** | 4.261*** | − 0.475 | − 0.185 | − 3.183*** | − 0.542** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.036*** | 1.505*** | 6.942*** | − 0.541 | − 6.215*** | − 1.727** |
| *Emission* | | | | | | | | | |
| AAA | 2.013*** | 3.853*** | − 1.980*** | − 3.734*** | − 0.148*** | − 0.003*** | 0.000 | 0.000*** | 0.000** |

**Table 18** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| AA | 1.166*** | 2.943*** | 1.530*** | − 5.360*** | − 0.271*** | − 0.006*** | 0.000 | 0.000*** | 0.000** |
| A | 0.393*** | 1.263*** | 5.907*** | − 6.727*** | − 0.817*** | − 0.019*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.067*** | 0.238*** | 3.317*** | 0.227 | − 3.733*** | − 0.114*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.004*** | 0.016*** | 0.285*** | 5.603*** | − 4.276*** | − 1.603*** | − 0.001 | − 0.024*** | − 0.003** |
| B | 0.000*** | 0.001*** | 0.016*** | 0.561*** | 6.968*** | − 7.034*** | − 0.021 | − 0.430*** | − 0.060** |
| CCC | 0.000*** | 0.000*** | 0.002*** | 0.083*** | 2.972*** | − 0.108 | − 0.141 | − 2.396*** | − 0.412** |
| CC | 0.000*** | 0.000*** | 0.002*** | 0.087*** | 3.088*** | − 0.343 | − 0.134 | − 2.307*** | − 0.392** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.026*** | 1.091*** | 5.032*** | − 0.394 | − 4.505*** | − 1.251** |
| *Environmental innovation* | | | | | | | | | |
| AAA | 5.230*** | 10.008*** | − 5.144*** | − 9.700*** | − 0.385*** | − 0.009*** | 0.000 | 0.000*** | 0.000** |
| AA | 3.028*** | 7.644*** | 3.973*** | − 13.924*** | − 0.705*** | − 0.016*** | 0.000 | 0.000*** | 0.000** |
| A | 1.022*** | 3.282*** | 15.344*** | − 17.474*** | − 2.122*** | − 0.050*** | 0.000 | − 0.001*** | 0.000** |
| BBB | 0.174*** | 0.617*** | 8.617*** | 0.591 | − 9.698*** | − 0.297*** | 0.000 | − 0.004*** | − 0.001** |
| BB | 0.011*** | 0.040*** | 0.741*** | 14.554*** | − 11.108*** | − 4.163*** | − 0.003 | − 0.064*** | − 0.009** |
| B | 0.001*** | 0.002*** | 0.041*** | 1.457*** | 18.100*** | − 18.273*** | − 0.055 | − 1.117*** | − 0.156** |
| CCC | 0.000*** | 0.000*** | 0.006*** | 0.215*** | 7.719*** | − 0.281 | − 0.365 | − 6.223*** | − 1.071** |
| CC | 0.000*** | 0.000*** | 0.006*** | 0.226*** | 8.022*** | − 0.893 | − 0.348 | − 5.993*** | − 1.020** |
| D | 0.000*** | 0.000*** | 0.002*** | 0.067*** | 2.833*** | 13.071*** | − 1.019 | − 11.703*** | − 3.250** |
| *Resources* | | | | | | | | | |
| AAA | 2.484*** | 4.754*** | − 2.443*** | − 4.608*** | − 0.183*** | − 0.004*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.439*** | 3.631*** | 1.888*** | − 6.615*** | − 0.335*** | − 0.008*** | 0.000 | 0.000*** | 0.000** |
| A | 0.485*** | 1.559*** | 7.289*** | − 8.301*** | − 1.008*** | − 0.024*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.083*** | 0.293*** | 4.094*** | 0.281 | − 4.607*** | − 0.141*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.005*** | 0.019*** | 0.352*** | 6.914*** | − 5.277*** | − 1.978*** | − 0.001 | − 0.030*** | − 0.004** |
| B | 0.000*** | 0.001*** | 0.020*** | 0.692*** | 8.598*** | − 8.681*** | − 0.026 | − 0.531*** | − 0.074** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.102*** | 3.667*** | − 0.134 | − 0.174 | − 2.956*** | − 0.509** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.107*** | 3.811*** | − 0.425 | − 0.166 | − 2.847*** | − 0.485** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.032*** | 1.346*** | 6.209*** | − 0.484 | − 5.559*** | − 1.544** |
| *Product responsibility* | | | | | | | | | |
| AAA | 5.083*** | 9.727*** | − 5.000*** | − 9.428*** | − 0.374*** | − 0.008*** | 0.000 | 0.000*** | 0.000** |
| AA | 2.944*** | 7.429*** | 3.862*** | − 13.534*** | − 0.685*** | − 0.015*** | 0.000 | 0.000*** | 0.000** |
| A | 0.993*** | 3.190*** | 14.913*** | − 16.984*** | − 2.063*** | − 0.048*** | 0.000 | − 0.001*** | 0.000** |

**Table 18** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| BBB | 0.169*** | 0.600*** | 8.376*** | 0.573 | − 9.425*** | − 0.288*** | 0.000 | − 0.004*** | − 0.001** |
| BB | 0.011*** | 0.039*** | 0.720*** | 14.146*** | − 10.797*** | − 4.046*** | − 0.003 | − 0.062*** | − 0.008** |
| B | 0.001*** | 0.002*** | 0.040*** | 1.416*** | 17.592*** | − 17.761*** | − 0.054 | − 1.086*** | − 0.152** |
| CCC | 0.000*** | 0.000*** | 0.006*** | 0.209*** | 7.504*** | − 0.275 | − 0.355 | − 6.047*** | − 1.041** |
| CC | 0.000*** | 0.000*** | 0.006*** | 0.220*** | 7.797*** | − 0.869 | − 0.339 | − 5.824*** | − 0.991** |
| D | 0.000*** | 0.000*** | 0.002*** | 0.065*** | 2.754*** | 12.703*** | − 0.991 | − 11.374*** | − 3.159** |
| *Community* | | | | | | | | | |
| AAA | 2.278*** | 4.359*** | − 2.240*** | − 4.225*** | − 0.168*** | − 0.004*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.319*** | 3.329*** | 1.731*** | − 6.065*** | − 0.307*** | − 0.007*** | 0.000 | 0.000*** | 0.000** |
| A | 0.445*** | 1.429*** | 6.683*** | − 7.611*** | − 0.924*** | − 0.022*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.076*** | 0.269*** | 3.753*** | 0.257 | − 4.224*** | − 0.129*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.005*** | 0.018*** | 0.323*** | 6.339*** | − 4.838*** | − 1.813*** | − 0.001 | − 0.028*** | − 0.004** |
| B | 0.000*** | 0.001*** | 0.018*** | 0.635*** | 7.883*** | − 7.959*** | − 0.024 | − 0.487*** | − 0.068** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.094*** | 3.363*** | − 0.123 | − 0.159 | − 2.710*** | − 0.467** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.098*** | 3.494*** | − 0.390 | − 0.152 | − 2.610*** | − 0.444** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.029*** | 1.234*** | 5.692*** | − 0.444 | − 5.097*** | − 1.416** |
| *Human rights* | | | | | | | | | |
| AAA | 5.842*** | 11.181*** | − 5.747*** | − 10.836*** | − 0.430*** | − 0.010*** | 0.000 | 0.000*** | 0.000** |
| AA | 3.383*** | 8.539*** | 4.439*** | − 15.555*** | − 0.788*** | − 0.018*** | 0.000 | 0.000*** | 0.000** |
| A | 1.141*** | 3.666*** | 17.141*** | − 19.521*** | − 2.371*** | − 0.056*** | 0.000 | − 0.001*** | 0.000** |
| BBB | 0.194*** | 0.690*** | 9.627*** | 0.660 | − 10.834*** | − 0.332*** | 0.000 | − 0.005*** | − 0.001** |
| BB | 0.012*** | 0.045*** | 0.828*** | 16.259*** | − 12.410*** | − 4.651*** | − 0.003 | − 0.071*** | − 0.010** |
| B | 0.001*** | 0.002*** | 0.046*** | 1.628*** | 20.221*** | − 20.414*** | − 0.062 | − 1.248*** | − 0.175** |
| CCC | 0.000*** | 0.000*** | 0.007*** | 0.240*** | 8.624*** | − 0.314 | − 0.408 | − 6.952*** | − 1.197** |
| CC | 0.000*** | 0.000*** | 0.007*** | 0.252*** | 8.962*** | − 0.998 | − 0.389 | − 6.695*** | − 1.139** |
| D | 0.000*** | 0.000*** | 0.002*** | 0.075*** | 3.165*** | 14.602*** | − 1.139 | − 13.073*** | − 3.631** |
| *Diversity* | | | | | | | | | |
| AAA | 4.479*** | 8.571*** | − 4.405*** | − 8.307*** | − 0.330*** | − 0.007*** | 0.000 | 0.000*** | 0.000** |
| AA | 2.594*** | 6.546*** | 3.403*** | − 11.925*** | − 0.604*** | − 0.014*** | 0.000 | 0.000*** | 0.000** |
| A | 0.875*** | 2.810*** | 13.140*** | − 14.965*** | − 1.818*** | − 0.043*** | 0.000 | − 0.001*** | 0.000** |
| BBB | 0.149*** | 0.529*** | 7.380*** | 0.505 | − 8.305*** | − 0.254*** | 0.000 | − 0.003*** | 0.000** |
| BB | 0.010*** | 0.034*** | 0.635*** | 12.465*** | − 9.514*** | − 3.565*** | − 0.003 | − 0.054*** | − 0.007** |

**Table 18** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| B | 0.001*** | 0.002*** | 0.036*** | 1.248*** | 15.501*** | − 15.649*** | − 0.047 | − 0.957*** | − 0.134** |
| CCC | 0.000*** | 0.000*** | 0.005*** | 0.184*** | 6.612*** | − 0.241 | − 0.312 | − 5.329*** | − 0.918** |
| CC | 0.000*** | 0.000*** | 0.005*** | 0.193*** | 6.871*** | − 0.766 | − 0.298 | − 5.132*** | − 0.874** |
| D | 0.000*** | 0.000*** | 0.002*** | 0.057*** | 2.427*** | 11.193*** | − 0.872 | − 10.023*** | − 2.784** |
| *Employment* | | | | | | | | | |
| AAA | 2.940*** | 5.624*** | − 2.890*** | − 5.452*** | − 0.217*** | − 0.005*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.702*** | 4.295*** | 2.234*** | − 7.826*** | − 0.396*** | − 0.009*** | 0.000 | 0.000*** | 0.000** |
| A | 0.574*** | 1.844*** | 8.623*** | − 9.820*** | − 1.193*** | − 0.028*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.098*** | 0.347*** | 4.843*** | 0.332 | − 5.450*** | − 0.167*** | 0.000 | − 0.002*** | 0.000** |
| BB | 0.006*** | 0.023*** | 0.417*** | 8.180*** | − 6.243*** | − 2.340*** | − 0.002 | − 0.036*** | − 0.005** |
| B | 0.000*** | 0.001*** | 0.023*** | 0.819*** | 10.172*** | − 10.269*** | − 0.031 | − 0.628*** | − 0.088** |
| CCC | 0.000*** | 0.000*** | 0.003*** | 0.121*** | 4.339*** | − 0.159 | − 0.205 | − 3.497*** | − 0.602** |
| CC | 0.000*** | 0.000*** | 0.003*** | 0.127*** | 4.509*** | − 0.503 | − 0.196 | − 3.368*** | − 0.573** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.038*** | 1.593*** | 7.345*** | − 0.573 | − 6.577*** | − 1.827** |
| *Health* | | | | | | | | | |
| AAA | 3.309*** | 6.334*** | − 3.256*** | − 6.138*** | − 0.244*** | − 0.005*** | 0.000 | 0.000*** | 0.000** |
| AA | 1.916*** | 4.837*** | 2.514*** | − 8.811*** | − 0.446*** | − 0.010*** | 0.000 | 0.000*** | 0.000** |
| A | 0.647*** | 2.077*** | 9.710*** | − 11.058*** | − 1.343*** | − 0.031*** | 0.000 | 0.000*** | 0.000** |
| BBB | 0.110*** | 0.391*** | 5.454*** | 0.373 | − 6.137*** | − 0.188*** | 0.000 | − 0.003*** | 0.000** |
| BB | 0.007*** | 0.025*** | 0.469*** | 9.210*** | − 7.030*** | − 2.634*** | − 0.002 | − 0.040*** | − 0.005** |
| B | 0.000*** | 0.001*** | 0.026*** | 0.922*** | 11.454*** | − 11.564*** | − 0.035 | − 0.707*** | − 0.099** |
| CCC | 0.000*** | 0.000*** | 0.004*** | 0.136*** | 4.885*** | − 0.179 | − 0.231 | − 3.937*** | − 0.678** |
| CC | 0.000*** | 0.000*** | 0.004*** | 0.143*** | 5.077*** | − 0.567 | − 0.221 | − 3.792*** | − 0.645** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.042*** | 1.793*** | 8.270*** | − 0.645 | − 7.405*** | − 2.056** |
| *Training* | | | | | | | | | |
| AAA | 4.195*** | 8.030*** | − 4.127*** | − 7.782*** | − 0.309*** | − 0.007*** | 0.000 | 0.000*** | 0.000** |
| AA | 2.429*** | 6.132*** | 3.188*** | − 11.171*** | − 0.566*** | − 0.013*** | 0.000 | 0.000*** | 0.000** |
| A | 0.820*** | 2.633*** | 12.310*** | − 14.020*** | − 1.703*** | − 0.040*** | 0.000 | − 0.001*** | 0.000** |
| BBB | 0.140*** | 0.495*** | 6.914*** | 0.474 | − 7.780*** | − 0.238*** | 0.000 | − 0.003*** | 0.000** |
| BB | 0.009*** | 0.032*** | 0.595*** | 11.677*** | − 8.912*** | − 3.340*** | − 0.002 | − 0.051*** | − 0.007** |
| B | 0.000*** | 0.002*** | 0.033*** | 1.169*** | 14.522*** | − 14.660*** | − 0.044 | − 0.896*** | − 0.125** |
| CCC | 0.000*** | 0.000*** | 0.005*** | 0.172*** | 6.194*** | − 0.225 | − 0.293 | − 4.993*** | − 0.860** |

**Table 18** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| CC | 0.000*** | 0.000*** | 0.005*** | 0.181*** | 6.436*** | − 0.717 | − 0.280 | − 4.808*** | − 0.818** |
| D | 0.000*** | 0.000*** | 0.001*** | 0.054*** | 2.273*** | 10.487*** | − 0.818 | − 9.389*** | − 2.608** |

This table displays marginal effects at means for panel America. The marginal effects of the CSP describe the impact on the predicted probabilities per actual accured rating class if the CSP impact score increases ceteris paribus by 1% point. Displayed effects in rows must sum up to zero because they are changes to probabilities summing up to 100%. Marginal effects are shown in per mille and are regarded as significant on the level of 1% (***), 5% (**) or 10% (*) when the *p* value is below these levels

**Table 19** Marginal effects panel Europe

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| *Overall CSP* | | | | | | | | | |
| AAA | 3.285* | 11.511** | − 12.804*** | − 1.964** | − 0.027* | − 0.001 | 0.000 | 0.000 | 0.000 |
| AA | 1.269** | 10.705** | − 7.040** | − 4.856*** | − 0.075** | − 0.002* | 0.000 | 0.000 | 0.000 |
| A | 0.201* | 2.942** | 11.067*** | − 13.706*** | − 0.488** | − 0.015** | 0.000 | 0.000* | 0.000 |
| BBB | 0.022* | 0.363** | 6.891*** | − 3.293** | − 3.845** | − 0.134** | − 0.001 | − 0.003* | − 0.001 |
| BB | 0.001* | 0.021** | 0.544** | 13.946*** | − 12.304*** | − 2.130** | − 0.010 | − 0.057* | − 0.012 |
| B | 0.000 | 0.001* | 0.015** | 1.134** | 13.099*** | − 11.602** | − 0.348 | − 1.868** | − 0.432 |
| CCC | 0.000 | 0.001 | 0.024* | 1.756* | 13.030*** | − 13.081** | − 0.223 | − 1.233** | − 0.274 |
| CC | 0.000 | 0.000* | 0.003* | 0.254** | 6.326** | 2.335 | − 1.380 | − 5.652** | − 1.886* |
| D | 0.000 | 0.000 | 0.002 | 0.141* | 3.954** | 8.112** | − 2.147 | − 6.829** | − 3.233 |
| *Environment* | | | | | | | | | |
| AAA | 4.338* | 15.131*** | − 16.876*** | − 2.558** | − 0.035** | − 0.001* | 0.000 | 0.000 | 0.000 |
| AA | 1.668** | 14.118*** | − 9.325*** | − 6.360*** | − 0.097*** | − 0.003** | 0.000 | 0.000* | 0.000 |
| A | 0.266** | 3.911*** | 14.475*** | − 18.009*** | − 0.623*** | − 0.019** | 0.000 | 0.000* | 0.000 |
| BBB | 0.029** | 0.469*** | 8.980*** | − 4.249*** | − 5.050*** | − 0.173*** | − 0.001 | − 0.004** | − 0.001 |
| BB | 0.002** | 0.028*** | 0.704*** | 18.371*** | − 16.244*** | − 2.761*** | − 0.012 | − 0.072** | − 0.015 |
| B | 0.000* | 0.001** | 0.019*** | 1.436*** | 17.211*** | − 15.185*** | − 0.457 | − 2.452*** | − 0.572* |
| CCC | 0.000 | 0.001* | 0.030** | 2.264** | 17.204*** | − 17.264*** | − 0.288 | − 1.592** | − 0.356 |
| CC | 0.000 | 0.000** | 0.004** | 0.311** | 7.991*** | 3.670 | − 1.863 | − 7.540*** | − 2.574* |

**Table 19** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| D | 0.000 | 0.000* | 0.002* | 0.187** | 5.295*** | 10.284** | − 2.740 | − 8.913*** | − 4.116 |
| *Social* | | | | | | | | | |
| AAA | 0.950 | 3.265 | − 3.649 | − 0.559 | − 0.008 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.361 | 3.027 | − 1.965 | − 1.401 | − 0.022 | − 0.001 | 0.000 | 0.000 | 0.000 |
| A | 0.058 | 0.831 | 3.168 | − 3.909 | − 0.142 | − 0.004 | 0.000 | 0.000 | 0.000 |
| BBB | 0.007 | 0.104 | 1.978 | − 0.952 | − 1.098 | − 0.038 | 0.000 | − 0.001 | 0.000 |
| BB | 0.000 | 0.006 | 0.157 | 3.972 | − 3.505 | − 0.608 | − 0.003 | − 0.017 | − 0.003 |
| B | 0.000 | 0.000 | 0.004 | 0.328 | 3.736 | − 3.311 | − 0.100 | − 0.536 | − 0.123 |
| CCC | 0.000 | 0.000 | 0.007 | 0.480 | 3.737 | − 3.700 | − 0.068 | − 0.374 | − 0.083 |
| CC | 0.000 | 0.000 | 0.001 | 0.072 | 1.784 | 0.731 | − 0.403 | − 1.637 | − 0.549 |
| D | 0.000 | 0.000 | 0.000 | 0.038 | 1.076 | 2.464 | − 0.642 | − 1.964 | − 0.973 |
| **Emission** | | | | | | | | | |
| AAA | 2.352 | 7.986 | − 8.956 | − 1.362 | − 0.019 | − 0.001 | 0.000 | 0.000 | 0.000 |
| AA | 0.878 | 7.409 | − 4.754 | − 3.477 | − 0.054 | − 0.002 | 0.000 | 0.000 | 0.000 |
| A | 0.143 | 2.062 | 7.736 | − 9.587 | − 0.343 | − 0.010 | 0.000 | 0.000 | 0.000 |
| BBB | 0.016 | 0.256 | 4.829 | − 2.318 | − 2.686 | − 0.093 | 0.000 | − 0.002 | 0.000 |
| BB | 0.001 | 0.015 | 0.382 | 9.751 | − 8.611 | − 1.482 | − 0.007 | − 0.040 | − 0.008 |
| B | 0.000 | 0.000 | 0.010 | 0.792 | 9.163 | − 8.099 | − 0.246 | − 1.316 | − 0.305 |
| CCC | 0.000 | 0.001 | 0.016 | 1.197 | 9.148 | − 9.111 | − 0.162 | − 0.890 | − 0.198 |
| CC | 0.000 | 0.000 | 0.002 | 0.181 | 4.490 | 1.528 | − 0.962 | − 3.931 | − 1.308 |
| D | 0.000 | 0.000 | 0.001 | 0.094 | 2.647 | 6.015 | − 1.571 | − 4.797 | − 2.389 |
| **Environmental innovation** | | | | | | | | | |
| AAA | 3.149** | 12.064*** | − 13.088*** | − 2.097*** | − 0.027** | − 0.001* | 0.000 | 0.000 | 0.000 |
| AA | 1.311*** | 11.068*** | − 7.488*** | − 4.819*** | − 0.070*** | − 0.002** | 0.000 | 0.000* | 0.000 |
| A | 0.205** | 3.040*** | 11.240*** | − 14.010*** | − 0.461*** | − 0.014*** | 0.000 | 0.000* | 0.000 |
| BBB | 0.021** | 0.349*** | 6.890*** | − 3.223*** | − 3.903*** | − 0.131*** | − 0.001 | − 0.003** | − 0.001 |
| BB | 0.001** | 0.020*** | 0.529*** | 14.339*** | − 12.697*** | − 2.120*** | − 0.009 | − 0.053** | − 0.011* |
| B | 0.000* | 0.001** | 0.013*** | 1.069*** | 13.384*** | − 11.794*** | − 0.345 | − 1.893*** | − 0.434* |
| CCC | 0.000* | 0.001** | 0.019** | 1.524*** | 13.646*** | − 13.294*** | − 0.241 | − 1.355** | − 0.300 |
| CC | 0.000* | 0.000** | 0.002** | 0.188*** | 5.195*** | 5.067* | − 1.666 | − 6.416*** | − 2.370* |

**Table 19** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| D | 0.000 | 0.000* | 0.002* | 0.144** | 4.160*** | 7.697** | − 2.034* | − 6.938*** | − 3.031* |
| *Resources* | | | | | | | | | |
| AAA | 1.105 | 3.774 | − 4.223 | − 0.646 | − 0.009 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.419 | 3.498 | − 2.263 | − 1.627 | − 0.026 | − 0.001 | 0.000 | 0.000 | 0.000 |
| A | 0.067 | 0.966 | 3.658 | − 4.521 | − 0.164 | − 0.005 | 0.000 | 0.000 | 0.000 |
| BBB | 0.008 | 0.121 | 2.287 | − 1.096 | − 1.273 | − 0.044 | 0.000 | − 0.001 | 0.000 |
| BB | 0.000 | 0.007 | 0.182 | 4.598 | − 4.064 | − 0.698 | − 0.003 | − 0.019 | − 0.004 |
| B | 0.000 | 0.000 | 0.005 | 0.376 | 4.325 | − 3.828 | − 0.116 | − 0.620 | − 0.143 |
| CCC | 0.000 | 0.000 | 0.008 | 0.562 | 4.317 | − 4.293 | − 0.077 | − 0.424 | − 0.094 |
| CC | 0.000 | 0.000 | 0.001 | 0.083 | 2.071 | 0.831 | − 0.465 | − 1.888 | − 0.633 |
| D | 0.000 | 0.000 | 0.001 | 0.044 | 1.253 | 2.830 | − 0.739 | − 2.269 | − 1.120 |
| *Product responsibilty* | | | | | | | | | |
| AAA | 0.859 | 3.047* | − 3.373* | − 0.525 | − 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.342 | 2.833* | − 1.890 | − 1.265* | − 0.020* | − 0.001* | 0.000 | 0.000 | 0.000 |
| A | 0.053 | 0.775* | 2.919* | − 3.613* | − 0.129* | − 0.004* | 0.000 | 0.000 | 0.000 |
| BBB | 0.006 | 0.095* | 1.821* | − 0.867* | − 1.019* | − 0.035* | 0.000 | − 0.001 | 0.000 |
| BB | 0.000 | 0.006* | 0.144* | 3.676* | − 3.244* | − 0.561* | − 0.003 | − 0.015* | − 0.003 |
| B | 0.000 | 0.000 | 0.004* | 0.304* | 3.467* | − 3.087* | − 0.090 | − 0.488* | − 0.111 |
| CCC | 0.000 | 0.000 | 0.007 | 0.488 | 3.401* | − 3.463* | − 0.056 | − 0.310* | − 0.068 |
| CC | 0.000 | 0.000 | 0.001 | 0.069 | 1.707 | 0.541 | − 0.356 | − 1.480* | − 0.482 |
| D | 0.000 | 0.000 | 0.000 | 0.038 | 1.057 | 2.116* | − 0.562 | − 1.808* | − 0.840 |
| *Community* | | | | | | | | | |
| AAA | − 2.212* | − 7.910*** | 8.719*** | 1.384** | 0.019** | 0.001* | 0.000 | 0.000 | 0.000 |
| AA | − 0.855** | − 7.198*** | 4.594*** | 3.404*** | 0.053*** | 0.002** | 0.000 | 0.000 | 0.000 |
| A | − 0.142** | − 2.029*** | − 7.504*** | 9.341*** | 0.324*** | 0.010** | 0.000 | 0.000* | 0.000 |
| BBB | − 0.015** | − 0.244*** | − 4.671*** | 2.211*** | 2.628*** | 0.089*** | 0.000 | 0.002* | 0.000 |
| BB | − 0.001** | − 0.014*** | − 0.364*** | − 9.524*** | 8.429*** | 1.423*** | 0.006 | 0.038** | 0.008 |
| B | 0.000* | 0.000** | − 0.010** | − 0.740*** | − 8.956*** | 7.895*** | 0.237 | 1.281** | 0.294* |
| CCC | 0.000 | − 0.001* | − 0.016** | − 1.232** | − 8.842*** | 8.990*** | 0.141 | 0.788** | 0.173 |
| CC | 0.000 | 0.000** | − 0.002** | − 0.145*** | − 3.875*** | − 2.591 | 1.044 | 4.117** | 1.452* |

**Table 19** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| D | 0.000 | 0.000* | − 0.001* | − 0.091** | − 2.634** | − 5.679** | 1.478 | 4.694** | 2.233 |
| **Human rights** | | | | | | | | | |
| AAA | − 2.402 | − 7.749** | 8.853** | 1.280* | 0.018* | 0.001 | 0.000 | 0.000 | 0.000 |
| AA | − 0.884* | − 7.308** | 4.803** | 3.335** | 0.052** | 0.002* | 0.000 | 0.000 | 0.000 |
| A | − 0.139* | − 1.982** | − 7.666** | 9.437** | 0.340** | 0.010* | 0.000 | 0.000 | 0.000 |
| BBB | − 0.016* | − 0.248** | − 4.773** | 2.307** | 2.635** | 0.092** | 0.000 | 0.002 | 0.000 |
| BB | − 0.001 | − 0.015** | − 0.375** | − 9.585** | 8.453** | 1.468** | 0.007 | 0.040* | 0.008 |
| B | 0.000 | 0.000* | − 0.011* | − 0.793** | − 9.029** | 8.043** | 0.232 | 1.276* | 0.282 |
| CCC | 0.000 | 0.000* | − 0.012** | − 0.930** | − 9.136** | 8.542** | 0.197 | 1.100 | 0.239 |
| CC | 0.000 | 0.000* | − 0.002* | − 0.154** | − 3.960** | − 2.505 | 1.039 | 4.169* | 1.413 |
| D | 0.000 | 0.000 | − 0.001* | − 0.084* | − 2.409** | − 6.377* | 1.610 | 4.817** | 2.445 |
| *Diversity* | | | | | | | | | |
| AAA | 4.085** | 15.441*** | − 16.836*** | − 2.654*** | − 0.035** | − 0.001* | 0.000 | 0.000 | 0.000 |
| AA | 1.714*** | 14.221*** | − 9.772*** | − 6.071*** | − 0.089*** | − 0.003** | 0.000 | 0.000* | 0.000 |
| A | 0.263** | 3.850*** | 14.470*** | − 17.972*** | − 0.593*** | − 0.018*** | 0.000 | 0.000* | 0.000 |
| BBB | 0.027** | 0.445*** | 8.905*** | − 4.209*** | − 4.988*** | − 0.174*** | − 0.001 | − 0.004** | − 0.001 |
| BB | 0.002** | 0.025*** | 0.676*** | 18.377*** | − 16.130*** | − 2.851*** | − 0.012 | − 0.073** | − 0.014* |
| B | 0.000* | 0.001** | 0.020*** | 1.559*** | 17.336*** | − 15.737*** | − 0.399 | − 2.301*** | − 0.479* |
| CCC | 0.000* | 0.000** | 0.013** | 1.072*** | 15.962*** | − 12.548*** | − 0.578 | − 3.221** | − 0.701 |
| CC | 0.000* | 0.000** | 0.004** | 0.300*** | 7.647*** | 4.204 | − 1.842 | − 7.872*** | − 2.441* |
| D | 0.000 | 0.000* | 0.002** | 0.164** | 4.667*** | 11.700*** | − 2.896* | − 9.399*** | − 4.238* |
| *Employment* | | | | | | | | | |
| AAA | − 0.052 | − 0.177 | 0.199 | 0.030 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | − 0.020 | − 0.164 | 0.106 | 0.077 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | − 0.003 | − 0.045 | − 0.172 | 0.213 | 0.008 | 0.000 | 0.000 | 0.000 | 0.000 |
| BBB | 0.000 | − 0.006 | − 0.108 | 0.052 | 0.060 | 0.002 | 0.000 | 0.000 | 0.000 |
| BB | 0.000 | 0.000 | − 0.009 | − 0.216 | 0.191 | 0.033 | 0.000 | 0.001 | 0.000 |
| B | 0.000 | 0.000 | 0.000 | − 0.018 | − 0.203 | 0.180 | 0.005 | 0.029 | 0.007 |
| CCC | 0.000 | 0.000 | 0.000 | − 0.026 | − 0.204 | 0.201 | 0.004 | 0.021 | 0.005 |
| CC | 0.000 | 0.000 | 0.000 | − 0.004 | − 0.095 | − 0.044 | 0.022 | 0.090 | 0.031 |

**Table 19** continued

| Predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| D | 0.000 | 0.000 | 0.000 | − 0.002 | − 0.058 | − 0.137 | 0.035 | 0.107 | 0.054 |
| *Health* | | | | | | | | | |
| AAA | 0.225 | 0.762 | − 0.855 | − 0.130 | − 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.084 | 0.706 | − 0.455 | − 0.330 | − 0.005 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.014 | 0.194 | 0.742 | − 0.916 | − 0.033 | − 0.001 | 0.000 | 0.000 | 0.000 |
| BBB | 0.002 | 0.024 | 0.464 | − 0.223 | − 0.257 | − 0.009 | 0.000 | 0.000 | 0.000 |
| BB | 0.000 | 0.001 | 0.037 | 0.930 | − 0.821 | − 0.142 | − 0.001 | − 0.004 | − 0.001 |
| B | 0.000 | 0.000 | 0.001 | 0.076 | 0.875 | − 0.774 | − 0.023 | − 0.126 | − 0.029 |
| CCC | 0.000 | 0.000 | 0.002 | 0.112 | 0.875 | − 0.866 | − 0.016 | − 0.088 | − 0.019 |
| CC | 0.000 | 0.000 | 0.000 | 0.017 | 0.416 | 0.177 | − 0.095 | − 0.385 | − 0.130 |
| D | 0.000 | 0.000 | 0.000 | 0.009 | 0.248 | 0.588 | − 0.153 | − 0.460 | − 0.232 |
| *Training* | | | | | | | | | |
| AAA | 3.565* | 13.246*** | − 14.467*** | − 2.311** | − 0.032** | − 0.001* | 0.000 | 0.000 | 0.000 |
| AA | 1.480** | 12.263*** | − 8.327*** | − 5.332*** | − 0.082*** | − 0.002** | 0.000 | 0.000* | 0.000 |
| A | 0.228** | 3.337*** | 12.511*** | − 15.517*** | − 0.542*** | − 0.017** | 0.000 | 0.000* | 0.000 |
| BBB | 0.025** | 0.403*** | 7.772*** | − 3.680*** | − 4.361*** | − 0.153*** | − 0.001 | − 0.004* | − 0.001 |
| BB | 0.001** | 0.024*** | 0.614*** | 15.831*** | − 13.966*** | − 2.420*** | − 0.010 | − 0.062** | − 0.012 |
| B | 0.000* | 0.001** | 0.017** | 1.298*** | 14.865*** | − 13.343*** | − 0.363 | − 2.027** | − 0.448* |
| CCC | 0.000* | 0.001** | 0.017** | 1.327** | 14.906*** | − 13.472*** | − 0.356 | − 1.986* | − 0.438 |
| CC | 0.000 | 0.000** | 0.003** | 0.242*** | 6.256*** | 4.422 | − 1.700 | − 6.882*** | − 2.340* |
| D | 0.000 | 0.000* | 0.002* | 0.164* | 4.549** | 8.700** | − 2.283 | − 7.784*** | − 3.349 |

This table displays marginal effects at means for panel Europe. The marginal effects of the CSP describe the impact on the predicted probabilities per actual accured rating class if the CSP impact score increases ceteris paribus by 1% point. Displayed effects in rows must sum up to zero because they are changes to probabilities summing up to 100%. Marginal effects are shown in per mille and are regarded as significant on the level of 1% (***), 5% (**) or 10% (*) when the $p-$ value is below these levels

**Table 20** Marginal effects panel Asia

| predicted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AAA | AA | A | BBB | BB | B | CCC | CC | D |
| *Overall CSP* | | | | | | | | | |
| AAA | 0.630 | 4.449* | − 4.717** | − 0.354 | − 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.326* | 6.223** | − 5.853** | − 0.682** | − 0.014** | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.031* | 3.040** | 1.691** | − 4.612** | − 0.146** | − 0.004* | 0.000 | 0.000 | 0.000 |
| BBB | 0.002* | 0.288** | 4.198** | − 2.704** | − 1.732** | − 0.050* | − 0.002 | 0.000 | 0.000 |
| BB | 0.000 | 0.025** | 0.562** | 6.264** | − 6.274** | − 0.550* | − 0.025 | 0.000 | − 0.004 |
| B | 0.000 | 0.001 | 0.032 | 1.493 | 4.129 | − 5.153* | − 0.438 | 0.000 | − 0.065 |
| CCC | 0.000 | 0.000 | 0.000 | 0.011 | 0.425 | 4.851* | 0.063 | − 0.001 | − 5.349 |
| D | 0.000 | 0.000 | 0.000 | 0.014 | 0.522 | 5.273* | − 1.016 | − 0.001** | − 4.792 |
| *Environment* | | | | | | | | | |
| AAA | 0.572 | 3.888* | − 4.145** | − 0.309 | − 0.006 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.291* | 5.524** | − 5.196** | − 0.606** | − 0.012** | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.028* | 2.696*** | 1.513** | − 4.103** | − 0.131** | − 0.003* | 0.000 | 0.000 | 0.000 |
| BBB | 0.002* | 0.257*** | 3.734*** | − 2.409*** | − 1.539** | − 0.044* | − 0.002 | 0.000 | 0.000 |
| BB | 0.000 | 0.023** | 0.502** | 5.560** | − 5.570** | − 0.490** | − 0.022 | 0.000 | − 0.003 |
| B | 0.000 | 0.001 | 0.029 | 1.335 | 3.650 | − 4.576* | − 0.384 | 0.000 | − 0.056 |
| CCC | 0.000 | 0.000 | 0.000 | 0.010 | 0.367 | 4.284* | 0.103 | 0.000 | − 4.764 |
| D | 0.000 | 0.000 | 0.000 | 0.012 | 0.447 | 4.649** | − 0.815 | 0.000** | − 4.293 |
| *Social* | | | | | | | | | |
| AAA | 0.586 | 3.957 | − 4.224* | − 0.312 | − 0.006 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.295 | 5.651** | − 5.315** | − 0.619** | − 0.013* | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.028 | 2.760** | 1.526* | − 4.178** | − 0.133* | − 0.003 | 0.000 | 0.000 | 0.000 |
| BBB | 0.002 | 0.261** | 3.807** | − 2.444* | − 1.578* | − 0.046 | − 0.002 | 0.000 | 0.000 |
| BB | 0.000 | 0.023* | 0.516** | 5.675* | − 5.690* | − 0.499 | − 0.023 | 0.000 | − 0.003 |
| B | 0.000 | 0.001 | 0.029 | 1.366 | 3.737 | − 4.663 | − 0.408 | 0.000 | − 0.062 |
| CCC | 0.000 | 0.000 | 0.000 | 0.011 | 0.405 | 4.431 | 0.005 | − 0.002 | − 4.850 |
| D | 0.000 | 0.000 | 0.000 | 0.013 | 0.500 | 4.812* | − 0.989 | − 0.002* | − 4.334 |
| *Emission* | | | | | | | | | |
| AAA | 0.386 | 2.654 | − 2.825* | − 0.211 | − 0.004 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.197 | 3.753* | − 3.530* | − 0.412** | − 0.008* | 0.000 | 0.000 | 0.000 | 0.000 |

**Table 20** continued

| predicted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AAA | AA | A | BBB | BB | B | CCC | CC | D |
| A | 0.019 | 1.832* | 1.028* | − 2.787* | − 0.089* | − 0.002 | 0.000 | 0.000 | 0.000 |
| BBB | 0.001 | 0.175** | 2.535** | − 1.635** | − 1.044* | − 0.030* | − 0.001 | 0.000 | 0.000 |
| BB | 0.000 | 0.015** | 0.340** | 3.778* | − 3.784* | − 0.333* | − 0.015 | 0.000 | − 0.002 |
| B | 0.000 | 0.001 | 0.019 | 0.904 | 2.486 | − 3.109 | − 0.263 | 0.000 | − 0.039 |
| CCC | 0.000 | 0.000 | 0.000 | 0.007 | 0.252 | 2.914 | 0.061 | − 0.001 | − 3.233 |
| D | 0.000 | 0.000 | 0.000 | 0.008 | 0.306 | 3.159* | − 0.557 | − 0.001* | − 2.915 |
| *Envionmental innovation* | | | | | | | | | |
| AAA | 1.536 | 9.996** | − 10.757*** | − 0.759** | − 0.015 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.752** | 14.626*** | − 13.797*** | − 1.548*** | − 0.031*** | − 0.001* | 0.000 | 0.000 | 0.000 |
| A | 0.071* | 7.145*** | 3.809*** | − 10.678*** | − 0.338*** | − 0.009* | 0.000 | 0.000 | 0.000 |
| BBB | 0.005* | 0.652*** | 9.829*** | − 6.210*** | − 4.149*** | − 0.122** | − 0.005 | 0.000 | − 0.001 |
| BB | 0.000* | 0.060*** | 1.373*** | 14.649*** | − 14.733*** | − 1.284*** | − 0.058 | 0.000 | − 0.009 |
| B | 0.000 | 0.003 | 0.079 | 3.638 | 9.473 | − 12.019** | − 1.016 | 0.000 | − 0.157 |
| CCC | 0.000 | 0.000 | 0.001 | 0.028 | 1.053 | 11.622** | − 0.177 | − 0.001* | − 12.526 |
| D | 0.000 | 0.000 | 0.001 | 0.041 | 1.501 | 13.124*** | − 4.424 | − 0.001*** | − 10.242 |
| *Resources* | | | | | | | | | |
| AAA | 0.467 | 2.958 | − 3.186 | − 0.234 | − 0.005 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.228 | 4.329 | − 4.070 | − 0.477 | − 0.010 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.022 | 2.111 | 1.192 | − 3.219 | − 0.103 | − 0.003 | 0.000 | 0.000 | 0.000 |
| BBB | 0.002 | 0.202 | 2.925 | − 1.885 | − 1.207 | − 0.035 | − 0.001 | 0.000 | 0.000 |
| BB | 0.000 | 0.018 | 0.397 | 4.349 | − 4.360 | − 0.385 | − 0.017 | 0.000 | − 0.002 |
| B | 0.000 | 0.001 | 0.023 | 1.054 | 2.851 | − 3.585 | − 0.300 | 0.000 | − 0.044 |
| CCC | 0.000 | 0.000 | 0.000 | 0.008 | 0.286 | 3.352 | 0.091 | − 0.001 | − 3.736 |
| D | 0.000 | 0.000 | 0.000 | 0.009 | 0.344 | 3.625 | − 0.590 | − 0.001 | − 3.388 |
| *Product responsibility* | | | | | | | | | |
| AAA | 0.479 | 3.027 | − 3.267 | − 0.235 | − 0.005 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.233 | 4.461* | − 4.203* | − 0.482* | − 0.010* | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.022 | 2.169* | 1.228* | − 3.312* | − 0.105* | − 0.003 | 0.000 | 0.000 | 0.000 |
| BBB | 0.002 | 0.206* | 3.022* | − 1.950* | − 1.241* | − 0.036 | − 0.002 | 0.000 | 0.000 |
| BB | 0.000 | 0.018* | 0.406* | 4.496* | − 4.500* | − 0.398 | − 0.020 | 0.000 | − 0.003 |

**Table 20** continued

| predicted | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AAA | AA | A | BBB | BB | B | CCC | CC | D |
| B | 0.000 | 0.001 | 0.024 | 1.134 | 2.823 | − 3.600 | − 0.332 | 0.000 | − 0.050 |
| CCC | 0.000 | 0.000 | 0.000 | 0.009 | 0.338 | 3.453 | 0.057 | 0.000 | − 3.857 |
| D | 0.000 | 0.000 | 0.000 | 0.010 | 0.376 | 3.614 | − 0.349 | 0.000 | − 3.651 |
| *Community* | | | | | | | | | |
| AAA | 0.334 | 2.140 | − 2.302 | − 0.169 | − 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.163 | 3.121 | − 2.933 | − 0.344 | − 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.016 | 1.525 | 0.843 | − 2.308 | − 0.074 | − 0.002 | 0.000 | 0.000 | 0.000 |
| BBB | 0.001 | 0.144 | 2.098 | − 1.341 | − 0.875 | − 0.026 | − 0.001 | 0.000 | 0.000 |
| BB | 0.000 | 0.013 | 0.288 | 3.127 | − 3.137 | − 0.276 | − 0.013 | 0.000 | − 0.002 |
| B | 0.000 | 0.001 | 0.016 | 0.758 | 2.062 | − 2.580 | − 0.223 | 0.000 | − 0.034 |
| CCC | 0.000 | 0.000 | 0.000 | 0.006 | 0.220 | 2.446 | 0.004 | − 0.002 | − 2.674 |
| D | 0.000 | 0.000 | 0.000 | 0.007 | 0.274 | 2.664 | − 0.564 | − 0.002 | − 2.379 |
| *Human rights* | | | | | | | | | |
| AAA | 0.395 | 2.548 | − 2.739 | − 0.200 | − 0.004 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.195 | 3.707 | − 3.488 | − 0.405 | − 0.008 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.018 | 1.809 | 1.012 | − 2.749 | − 0.088 | − 0.002 | 0.000 | 0.000 | 0.000 |
| BBB | 0.001 | 0.172 | 2.509 | − 1.614 | − 1.037 | − 0.030 | − 0.001 | 0.000 | 0.000 |
| BB | 0.000 | 0.015 | 0.342 | 3.723 | − 3.735 | − 0.329 | − 0.015 | 0.000 | − 0.002 |
| B | 0.000 | 0.001 | 0.020 | 0.909 | 2.429 | − 3.066 | − 0.255 | 0.000 | − 0.038 |
| CCC | 0.000 | 0.000 | 0.000 | 0.007 | 0.246 | 2.877 | 0.069 | − 0.001 | − 3.197 |
| D | 0.000 | 0.000 | 0.000 | 0.008 | 0.301 | 3.130 | − 0.570 | − 0.001 | − 2.869 |
| *Diversity* | | | | | | | | | |
| AAA | 0.471 | 4.261 | − 4.369* | − 0.357 | − 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.283* | 5.383** | − 5.063** | − 0.591** | − 0.012** | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.027* | 2.634** | 1.460** | − 3.995** | − 0.123** | − 0.003* | 0.000 | 0.000 | 0.000 |
| BBB | 0.002* | 0.247** | 3.607** | − 2.337** | − 1.477** | − 0.041* | − 0.002 | 0.000 | 0.000 |
| BB | 0.000* | 0.021** | 0.457*** | 5.464** | − 5.444** | − 0.474** | − 0.021 | 0.000 | − 0.003 |
| B | 0.000 | 0.001 | 0.025 | 1.237 | 3.655 | − 4.491* | − 0.373 | 0.000 | − 0.054 |
| CCC | 0.000 | 0.000 | 0.000 | 0.009 | 0.354 | 4.197* | 0.021 | − 0.002 | − 4.580 |
| D | 0.000 | 0.000 | 0.000 | 0.011 | 0.423 | 4.520* | − 0.790 | − 0.002** | − 4.163 |

**Table 20** continued

| predicted | AAA | AA | A | BBB | BB | B | CCC | CC | D |
|---|---|---|---|---|---|---|---|---|---|
| *Employment* | | | | | | | | | |
| AAA | − 0.281 | − 1.629 | 1.780 | 0.127 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | − 0.130 | − 2.481 | 2.332 | 0.274 | 0.006 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | − 0.013 | − 1.210 | − 0.675 | 1.837 | 0.059 | 0.002 | 0.000 | 0.000 | 0.000 |
| BBB | − 0.001 | − 0.115 | − 1.672 | 1.070 | 0.696 | 0.021 | 0.001 | 0.000 | 0.000 |
| BB | 0.000 | − 0.011 | − 0.232 | − 2.480 | 2.491 | 0.221 | 0.010 | 0.000 | 0.001 |
| B | 0.000 | − 0.001 | − 0.013 | − 0.611 | − 1.629 | 2.057 | 0.171 | 0.000 | 0.026 |
| CCC | 0.000 | 0.000 | 0.000 | − 0.005 | − 0.165 | − 1.934 | − 0.032 | 0.001 | 2.135 |
| D | 0.000 | 0.000 | 0.000 | − 0.006 | − 0.202 | − 2.096 | 0.379 | 0.001 | 1.923 |
| *Health* | | | | | | | | | |
| AAA | 0.472 | 2.545 | − 2.817 | − 0.196 | − 0.004 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | 0.210 | 4.022 | − 3.782 | − 0.441 | − 0.009 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | 0.020 | 1.958 | 1.091 | − 2.971 | − 0.096 | − 0.002 | 0.000 | 0.000 | 0.000 |
| BBB | 0.001 | 0.186 | 2.713 | − 1.734 | − 1.130 | − 0.034 | − 0.002 | 0.000 | 0.000 |
| BB | 0.000 | 0.017 | 0.381 | 4.012 | − 4.035 | − 0.356 | − 0.017 | 0.000 | − 0.002 |
| B | 0.000 | 0.001 | 0.022 | 0.994 | 2.640 | − 3.316 | − 0.294 | 0.000 | − 0.046 |
| CCC | 0.000 | 0.000 | 0.000 | 0.008 | 0.291 | 3.145 | 0.044 | − 0.002 | − 3.485 |
| D | 0.000 | 0.000 | 0.000 | 0.010 | 0.356 | 3.406 | − 0.636 | − 0.002 | − 3.134 |
| *Training* | | | | | | | | | |
| AAA | − 0.255 | − 1.419 | 1.562 | 0.110 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| AA | − 0.116 | − 2.211 | 2.079 | 0.243 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 |
| A | − 0.011 | − 1.079 | − 0.595 | 1.631 | 0.053 | 0.001 | 0.000 | 0.000 | 0.000 |
| BBB | − 0.001 | − 0.102 | − 1.491 | 0.951 | 0.624 | 0.019 | 0.001 | 0.000 | 0.000 |
| BB | 0.000 | − 0.010 | − 0.212 | − 2.201 | 2.217 | 0.196 | 0.009 | 0.000 | 0.001 |
| B | 0.000 | − 0.001 | − 0.012 | − 0.549 | − 1.445 | 1.831 | 0.153 | 0.000 | 0.023 |
| CCC | 0.000 | 0.000 | 0.000 | − 0.004 | − 0.151 | − 1.738 | − 0.001 | 0.000 | 1.894 |
| D | 0.000 | 0.000 | 0.000 | − 0.005 | − 0.184 | − 1.878 | 0.359 | 0.000 | 1.707 |

This table displays marginal effects at means for panel Asia. The marginal effects of the CSP describe the impact on the predicted probabilities per actual accured rating class if the CSP impact score increases ceteris paribus by 1% point. Displayed effects in rows must sum up to zero because they are changes to probabilities summing up to 100%. Marginal effects are shown in per mille and are regarded as significant on the level of 1% (***), 5% (**) or 10% (*) when the $p$ − value is below these levels

energies back to a stronger focus on fossil fuels. Hence, we analyze whether our findings are subject to any development in recent years. We run estimations with a sample reduced by observations of the most recent year in the sample, and also the same for the second and the third recent year. As a result, we see no substantial deviations in the CSP effects for any of those time variations in the sample. In this context, we also address the case of missing data. After matching the final dataset, each combination of credit rating, CSP, and control variables per time and company is dismissed if any data value relating to these variables is missing. To measure the impact of the missing control variables' data, we implement a mean imputation according to Schafer (1997). Instead of discarding missing observations, we substitute them by the mean. Again, the corresponding estimations support our main result.

As the industry appears to be significant in terms of the impact of environmental CSP dimensions (Khan et al. 2016), we additionally analyze the impact of the industry through an interaction of CSP with a dummy variable expressing whether a firm belongs to the "NAICs Codes of Environmental Sensitive Industries" published by the US Small Business Administration. In our sample, we find no evidence that the impact is stronger there.

## 7 Conclusion

While the corresponding literature has researched the general impact of overall CSP on credit risk, the identification of the actual drivers on a lower aggregation level of CSP has so far not been addressed adequately. We supplement earlier studies by using CSP measures based on the more sophisticated and more transparent methodology of Asset4. Moreover, international data coverage allows us to analyze (and compare) the three regions of North America, Europe, and Asia with a consistent methodology and data set. Compared with the majority of previous studies, our analysis focuses on single components of CSP. We account for the requirements of both the consideration of endogeneity regarding the impact of CSP on credit ratings and recent credit risk modeling by applying the instrumental variable approach in terms of the two-stage predictor substitution with an established credit risk model in the second stage. This approach allows us in particular to provide clearer indications of a causal relationship in terms of how CSP components impact credit ratings in contrast to the common approaches, which only reveal correlational relationships.

We initially estimate the impact of overall CSP on credit ratings to confirm the findings of the previous literature. Then we investigate which of the CSP dimensions can improve the quality of credit rating predictions. Each of the three environmental categories has a significant positive impact while environmental innovation is most distinct. As part of social performance, measures for community and diversity (involving equal opportunities) are significant. With respect to differences between North America, Europe, and Asia, the impact of social performance is driven by the extent of diversity only in North America and Europe,

which has no impact in Asia and is likely due to cultural reasons. Product innovation is still the determining driver within the environmental performance of all regions.

The identification of the drivers of impact for CSP on credit ratings has important implications for practice. Some of the CSP dimensions generally act in a risk-mitigating manner in terms of default risk, for which credit ratings are a proxy. From this point of view, investments in CSP are not a waste of resources. Moreover, because better credit ratings are associated with lower financing costs, our results help to target investments in CSP for the purpose of referring cost reductions efficiently. In particular investments in product innovation and diversity appear to have the highest impact.

With the identification of these CSP components that lead to lower credit risk, our analysis shows that some, but not all aspects of CSP produce favorable effects beyond a philanthropic rationale. However, as a limitation, it has to be noted that real-world causality in the context of this relationship can only be proven by means of natural or quasi-experiments, therefore confirming the necessity for continued research in the future.



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