ESG Investing: From Sin Stocks to Smart Beta
Online Technical Appendix

Fabio Alessandrini* and Eric Jondeau†

June 2019

Abstract

This document provides supplementary material to the paper "ESG Investing: From Sin Stocks to Smart Beta." It provides additional results on the performance of passive portfolio over the 2013–2018 sample (Section A), on the risk factor exposure of E, S, and G portfolios (Section B), and on the risk factor exposure of smart beta strategies (Section C).

---

*University of Lausanne and Banque Cantonale Vaudoise. Faculty of Business and Economics, CH 1015 Lausanne, Switzerland. Fabio.Alessandrini@unil.ch.

†University of Lausanne and Swiss Finance Institute. Faculty of Business and Economics, CH 1015 Lausanne, Switzerland. Eric.Jondeau@unil.ch.

A Performance of Passive Portfolios Based on ESG Scores (2013–2018)

Table A1: Performance of portfolios based on ESG scores

	MSCI bench mark	0% excl.	10% excl.	25% excl.	50% excl.	0% excl.	10% excl.	25% excl.	50% excl.
		Panel A: Industry-adjusted average score				**Panel B: Environmental score**			
World									
Average score	–	5.30	5.61	6.07	6.92	5.92	6.18	6.52	7.20
Ann. return (%)	8.12	8.17	8.26	8.16	8.32	8.17	8.27	8.70	9.16
Ann. std dev. (%)	10.72	10.68	10.70	10.76	10.85	10.68	10.64	10.64	10.73
Sharpe ratio	0.71	0.72	0.73	0.71	0.72	0.72	0.73	0.77	0.81
Tracking error (%)	–	0.11	0.26	0.60	1.17	0.11	0.38	0.68	1.29
The U.S.									
Average score	–	4.83	5.15	5.65	6.50	5.93	6.22	6.61	7.36
Ann. return (%)	12.20	12.24	12.30	12.53	13.05	12.24	12.30	13.00	13.67
Ann. std dev. (%)	10.76	10.78	10.75	10.73	10.61	10.78	10.67	10.69	10.65
Sharpe ratio	1.09	1.09	1.10	1.12	1.19	1.09	1.11	1.17	1.24
Tracking error (%)	–	0.16	0.42	0.92	1.75	0.16	0.54	1.06	1.65
Europe									
Average score	–	6.52	6.92	7.38	8.26	6.52	6.80	7.17	7.92
Ann. return (%)	4.91	4.80	4.98	5.15	6.16	4.80	4.72	4.73	5.12
Ann. std dev. (%)	12.76	12.75	12.86	12.71	12.82	12.75	12.82	12.82	12.96
Sharpe ratio	0.35	0.34	0.35	0.37	0.44	0.34	0.33	0.33	0.36
Tracking error (%)	–	0.21	0.68	1.01	1.68	0.18	0.49	0.96	1.82
Pacific									
Average score	–	5.58	5.88	6.29	7.12	5.80	6.13	6.52	7.27
Ann. return (%)	5.98	6.02	6.13	6.21	6.33	6.02	5.81	6.09	6.85
Ann. std dev. (%)	12.16	12.17	12.13	12.26	12.44	12.17	12.11	12.19	12.14
Sharpe ratio	0.45	0.46	0.47	0.47	0.47	0.46	0.44	0.46	0.53
Tracking error (%)	–	0.08	0.38	0.76	1.60	0.06	0.50	0.84	1.77
Emerging countries									
Average score	–	4.45	4.71	5.09	5.86	4.95	5.28	5.69	6.37
Ann. return (%)	2.29	2.16	2.41	3.03	3.29	2.16	2.14	2.62	2.75
Ann. std dev. (%)	14.51	14.21	14.29	14.40	14.38	14.21	14.33	14.49	14.73
Sharpe ratio	0.13	0.12	0.14	0.18	0.20	0.12	0.12	0.15	0.15
Tracking error (%)	–	0.72	1.08	1.22	2.34	0.72	1.09	1.36	2.30

Table A4 (Continued)

	MSCI bench mark	0% excl.	10% excl.	25% excl.	50% excl.	0% excl.	10% excl.	25% excl.	50% excl.
		Panel C: Social score				**Panel D: Governance score**			
World									
Average score	–	4.42	4.68	5.07	5.71	5.37	5.71	6.10	7.08
Ann. return (%)	8.12	8.17	8.12	7.99	7.67	8.17	8.23	8.44	9.01
Ann. std dev. (%)	10.72	10.68	10.80	10.85	11.19	10.68	10.62	10.63	10.72
Sharpe ratio	0.71	0.72	0.71	0.69	0.64	0.72	0.73	0.75	0.80
Tracking error (%)	–	0.11	0.30	0.62	1.35	0.14	0.58	0.76	1.23
The U.S.									
Average score	–	4.15	4.42	4.79	5.38	5.24	5.65	6.08	7.11
Ann. return (%)	12.20	12.24	12.23	11.91	11.58	12.24	12.21	12.77	13.49
Ann. std dev. (%)	10.76	10.78	10.92	10.96	11.12	10.78	10.63	10.69	11.26
Sharpe ratio	1.09	1.09	1.08	1.04	1.00	1.09	1.10	1.15	1.16
Tracking error (%)	–	0.18	0.52	0.93	1.78	0.19	0.81	1.02	2.00
Europe									
Average score	–	4.82	5.08	5.53	6.26	5.89	6.36	6.82	7.69
Ann. return (%)	4.91	4.80	5.13	4.77	5.11	4.80	5.17	5.96	6.40
Ann. std dev. (%)	12.76	12.75	12.78	13.20	13.77	12.75	12.52	12.49	12.50
Sharpe ratio	0.35	0.34	0.36	0.33	0.34	0.34	0.38	0.44	0.47
Tracking error (%)	–	0.19	0.59	1.33	2.32	0.21	0.97	1.44	2.26
Pacific									
Average score	–	4.75	5.01	5.32	5.86	5.37	5.79	6.23	6.95
Ann. return (%)	5.98	6.02	6.04	6.01	6.35	6.02	6.46	6.30	6.97
Ann. std dev. (%)	12.16	12.17	12.26	12.36	12.84	12.17	12.10	11.99	11.87
Sharpe ratio	0.45	0.46	0.45	0.45	0.46	0.46	0.49	0.49	0.55
Tracking error (%)	–	0.06	0.52	1.01	1.82	0.16	0.70	1.29	2.51
Emerging countries									
Average score	–	4.34	4.55	4.87	5.40	4.64	4.92	5.29	6.13
Ann. return (%)	2.29	2.16	2.53	3.20	3.56	2.19	2.18	2.41	2.85
Ann. std dev. (%)	14.51	14.21	14.25	14.27	14.89	14.22	14.24	14.17	13.87
Sharpe ratio	0.13	0.12	0.14	0.19	0.21	0.12	0.12	0.14	0.17
Tracking error (%)	–	0.72	1.08	1.26	2.52	0.70	1.23	1.87	2.97

Note: The table reports summary statistics on portfolios based on the ESG screening based on the industry-adjusted average ESG score, the environmental score, the social score, and the governance score, in Panels A to D, respectively. Statistics are: the average score, the annualized average return, the annualized standard deviation, the Sharpe ratio, and the annualized tracking error (relative to the MSCI standard benchmark of the respective region). Column 1 corresponds to the MSCI benchmark portfolio for the region considered. For each panel, columns correspond to the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores.

B Exposure of Passive Portfolios Based on ESG Scores

Table A2: Factor exposure of portfolios based on E score

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
World					**World**				
Ann. α	0.09	0.12	0.36	0.85*	Ann. α	0.15	0.15	0.47*	0.90*
Market	0.98*	0.98*	0.98*	0.97*	Market	1.07*	1.07*	1.11*	1.06*
SMB	−0.07*	−0.09*	−0.12*	−0.13*	SMB	−0.02	−0.04*	−0.05*	−0.10*
HML	0.02*	0.02*	0.03*	0.02	HML	0.02*	0.02*	0.02	0.02
MOM	−0.01*	−0.01*	−0.02*	−0.02	RMW	0.00	0.01	−0.01	−0.01
					CMA	0.09*	0.09*	0.13*	0.09*
The U.S.					**The U.S.**				
Ann. α	0.13	0.18	0.49	0.82	Ann. α	0.16	0.18	0.60*	1.01*
Market	0.99*	0.99*	0.99*	0.98*	Market	1.05*	1.03*	1.12*	1.16*
SMB	−0.02*	−0.05*	−0.08*	−0.13*	SMB	0.01	−0.02	−0.01	−0.03
HML	0.01	0.00	−0.02	−0.02	HML	0.00	0.00	−0.03*	−0.04
MOM	0.00	−0.01	−0.02*	−0.03*	RMW	0.01	0.01	−0.01	−0.05*
					CMA	0.06*	0.04*	0.14*	0.19*
Europe					**Europe**				
Ann. α	−0.01	−0.05	0.09	0.54	Ann. α	−0.04	−0.13	0.02	0.39
Market	1.00*	1.00*	0.99*	1.00*	Market	1.01*	1.00*	1.00*	0.96*
SMB	−0.03*	−0.04*	−0.07*	−0.09*	SMB	−0.02*	−0.05*	−0.08*	−0.15*
HML	0.00	0.01	0.01	0.02	HML	0.00	0.01	0.01	0.02
MOM	0.00	0.01	0.01	0.04*	RMW	0.02*	0.03*	0.03	0.05
					CMA	0.01	0.00	0.00	−0.03
Pacific					**Pacific**				
Ann. α	−0.25	−0.46	−0.30	−0.33	Ann. α	−0.24	−0.42	−0.23	−0.22
Market	0.99*	0.98*	0.98*	0.94*	Market	0.99*	1.02*	1.05*	1.07*
SMB	0.01	0.01	0.00	0.03	SMB	0.02	0.04	0.06	0.13*
HML	0.04*	0.04*	0.05*	0.05	HML	0.04*	0.03*	0.05*	0.04
MOM	−0.01	−0.02*	−0.02*	−0.02	RMW	0.01	0.02	0.03	−0.01
					CMA	0.00	0.03	0.08	0.14
Emerging countries					**Emerging countries**				
Ann. α	−0.25	−0.66	−0.58	0.23	Ann. α	0.01	−0.02	−0.02	0.08
Market	0.97*	0.98*	0.98*	0.99*	Market	0.96*	0.96*	0.94*	0.96*
SMB	−0.23*	−0.25*	−0.28*	−0.31*	SMB	−0.27*	−0.28*	−0.33*	−0.38*
HML	−0.02	−0.03	−0.02	0.00	HML	−0.03	−0.05*	−0.04	−0.03
MOM	−0.06*	−0.08*	−0.08*	−0.09*	RMW	−0.04	−0.04	−0.03	−0.07
					CMA	−0.03	−0.04	−0.06	−0.05

Note: The table reports summary statistics on portfolios based on the E score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A3: Factor exposure of portfolios based on S score

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
World					**World**				
Ann. α	0.07	0.04	−0.05	−0.01	Ann. α	0.12	0.02	−0.11	−0.26
Market	0.98*	0.98*	0.98*	0.99*	Market	1.06*	1.04*	1.00*	0.89*
SMB	−0.07*	−0.07*	−0.08*	−0.07*	SMB	−0.02	−0.03*	−0.08*	−0.14*
HML	0.02*	0.04*	0.06*	0.08*	HML	0.02*	0.04*	0.06*	0.10*
MOM	−0.01*	−0.01*	−0.01	0.00	RMW	0.00	0.01	0.01	0.04
					CMA	0.08*	0.06*	0.02	−0.10 *
The U.S.					**The U.S.**				
Ann. α	0.16	−0.05	−0.10	−0.55	Ann. α	0.20	0.02	−0.09	−0.71
Market	0.99*	1.00*	0.99*	0.99*	Market	1.06*	1.08*	1.06*	0.97*
SMB	−0.02*	−0.03*	−0.05*	−0.10*	SMB	0.02	0.03	0.00	−0.09*
HML	0.00	0.00	0.00	−0.06*	HML	0.00	−0.01	0.00	−0.03
MOM	−0.01	−0.01	−0.01	−0.02	RMW	0.01	0.00	0.03	0.07*
					CMA	0.07*	0.09*	0.08*	−0.03
Europe					**Europe**				
Ann. α	−0.03	0.19	0.19	0.28	Ann. α	−0.07	0.16	0.12	0.10
Market	1.00*	1.00*	1.00*	1.00*	Market	1.01*	1.01*	1.00*	0.93*
SMB	−0.03*	−0.03*	−0.04	−0.02	SMB	−0.01	−0.04	−0.08*	−0.14*
HML	0.00	0.02*	0.05*	0.10*	HML	0.00	0.02*	0.05*	0.08*
MOM	−0.01	0.01	0.03*	0.08*	RMW	0.02*	0.03	0.04	0.09
					CMA	0.01*	0.01	−0.01	−0.06
Pacific					**Pacific**				
Ann. α	−0.33	−0.50	−0.22	0.10	Ann. α	−0.31	−0.42	−0.11	0.30
Market	0.99*	0.98*	0.99*	1.01*	Market	1.00*	1.03*	1.09*	1.24*
SMB	0.01	0.03	−0.01	0.00	SMB	0.03*	0.06*	0.03*	0.10*
HML	0.04*	0.05*	0.04*	0.07*	HML	0.04*	0.05*	0.04	0.06*
MOM	−0.01	−0.01	−0.01	−0.01	RMW	0.02	0.04*	0.02	−0.04
					CMA	0.01	0.05	0.10*	0.26*
Emerging countries					**Emerging countries**				
Ann. α	−0.24	−0.15	0.55	1.68	Ann. α	0.01	0.00	0.03	0.05
Market	0.97*	0.97*	0.97*	0.98*	Market	0.95*	0.94*	0.94*	0.94*
SMB	−0.23*	−0.22*	−0.26*	−0.35*	SMB	−0.27*	−0.25*	−0.27*	−0.34*
HML	−0.02	−0.02	−0.02	−0.04	HML	−0.04	−0.03	−0.02	−0.02
MOM	−0.06*	−0.07*	−0.07*	−0.05*	RMW	−0.04	−0.01	0.04	0.15*
					CMA	−0.04	−0.05	−0.05	−0.05

Note: The table reports summary statistics on portfolios based on the S score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A4: Factor exposure of portfolios based on G score

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					Panel B: 5 FFF			
World					**World**				
Ann. α	0.08	−0.23	−0.29	−0.13	Ann. α	0.14	−0.15	−0.18	−0.01
Market	0.98*	0.98*	0.98*	0.99*	Market	1.07*	1.06*	1.06*	1.08*
SMB	−0.07*	−0.06*	−0.07*	−0.08*	SMB	−0.01	−0.03	−0.05	−0.06
HML	0.02*	0.00	−0.02*	−0.03	HML	0.02*	−0.01	−0.03	−0.04
MOM	−0.01*	0.00	0.00	0.00	RMW	0.00	0.00	−0.01	−0.02
					CMA	0.09*	0.08*	0.09*	0.09
The U.S.					**The U.S.**				
Ann. α	0.15	−0.43	−0.33	−0.11	Ann. α	0.19	−0.45	−0.34	−0.13
Market	0.99*	0.99*	0.98*	1.00*	Market	1.06*	0.96*	0.97*	1.00*
SMB	−0.03*	−0.01	−0.02	−0.02	SMB	0.01	−0.03	−0.04	−0.04
HML	0.01	−0.03*	−0.04*	−0.07*	HML	0.01	−0.02	−0.04*	−0.08*
MOM	−0.01	0.00	0.00	0.01	RMW	0.01	−0.01	0.00	0.02
SMB					CMA	0.07*	−0.03	−0.02	0.00
Europe					**Europe**				
Ann. α	−0.01	−0.18	0.15	0.43	Ann. α	−0.04	−0.19	0.21	0.34
Market	1.00*	1.00*	1.00*	0.98*	Market	1.02*	1.00*	1.00*	0.97*
SMB	−0.02*	−0.02	−0.01	0.00	SMB	−0.01	−0.04*	−0.04	−0.05
HML	0.00	−0.05*	−0.08*	−0.09*	HML	0.00	−0.05*	−0.09*	−0.10*
MOM	0.00	0.00	0.03*	0.03	RMW	0.02*	0.00	0.01	0.06
					CMA	0.02*	0.00	0.01	−0.01
Pacific					**Pacific**				
Ann. α	−0.34	−0.11	−0.19	0.03	Ann. α	−0.32	−0.06	−0.13	0.26
Market	0.99*	0.98*	0.97*	0.97*	Market	0.99*	1.02*	1.05*	1.19*
SMB	0.02	0.04	0.07*	0.11*	SMB	0.03*	0.07*	0.10*	0.21*
HML	0.04*	0.01	−0.02	0.00	HML	0.04*	0.01	−0.02	−0.01
MOM	−0.01*	0.00	0.01	0.00	RMW	0.01	−0.02	−0.05*	−0.07
					CMA	0.01	0.05	0.09	0.24*
Emerging countries					**Emerging countries**				
Ann. α	−0.21	−0.28	−0.10	−0.69	Ann. α	0.02	0.00	0.03	0.03
Market	0.97*	0.96*	0.96*	0.95*	Market	0.96*	0.93*	0.92*	0.91*
SMB	−0.23*	−0.21*	−0.21*	−0.29*	SMB	−0.26*	−0.25*	−0.26*	−0.38*
HML	−0.02	−0.03	−0.05*	−0.07	HML	−0.04*	−0.04	−0.08*	−0.11*
MOM	−0.06*	−0.07*	−0.07*	−0.08*	RMW	−0.04	−0.03	−0.06	−0.12
					CMA	−0.03	−0.05	−0.06	−0.07

Note: The table reports summary statistics on portfolios based on the G score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

C Exposure of Smart Beta Portfolios Based on ESG Scores

Table A5: Factor exposure of smart beta portfolios based on size

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	-1.52	-1.18	-0.91	0.65	Ann. α	-0.88	-0.39	-0.55	0.47
Market	1.03^*	1.02^*	1.01^*	1.03^*	Market	1.16^*	1.21^*	1.16^*	1.23^*
SMB	1.48^*	1.43^*	1.39^*	1.23^*	SMB	2.38^*	2.34^*	2.25^*	2.10^*
HML	0.34^*	0.36^*	0.33^*	0.32^*	HML	0.33^*	0.34^*	0.35^*	0.38^*
MOM	-0.21^*	-0.21^*	-0.17^*	-0.12^*	RMW	-0.07	-0.10	0.08	0.33^*
					CMA	0.41	0.46	0.43	0.48^*
Panel B: The U.S.					**The U.S.**				
Ann. α	1.50	1.93	2.84	1.36	Ann. α	1.92	2.42	3.36^*	1.84
Market	1.02^*	1.00^*	1.00^*	1.06^*	Market	0.98^*	0.97^*	1.07^*	1.12^*
SMB	1.21^*	1.21^*	1.12^*	1.08^*	SMB	1.86^*	1.80^*	1.71^*	1.64^*
HML	0.03	0.06	0.08	0.02	HML	0.14	0.14	0.13^*	0.06
MOM	-0.25^*	-0.21^*	-0.17^*	-0.14^*	RMW	-0.04	-0.08	-0.04	-0.02
					CMA	0.16	0.17	0.27	0.27
Panel C: Europe					**Europe**				
Ann. α	-0.47	-0.27	-0.20	0.50	Ann. α	-0.50	-0.13	0.29	0.83
Market	1.00^*	1.02^*	1.04^*	0.98^*	Market	0.71^*	0.75^*	0.85^*	0.70^*
SMB	1.02^*	1.03^*	1.00^*	1.04^*	SMB	1.17^*	1.19^*	1.18^*	1.14^*
HML	0.09	0.06	0.03	0.07	HML	0.17	0.12	0.05	0.11
MOM	-0.11^*	-0.10^*	-0.07^*	-0.06^*	RMW	-0.05	-0.07	-0.11	-0.13
					CMA	-0.15^*	-0.12^*	-0.04	-0.13^*
Panel D: Pacific					**Pacific**				
Ann. α	1.39	1.28	1.20	2.74	Ann. α	1.52	1.39	1.33^*	2.91
Market	1.03^*	1.00^*	1.00^*	1.00^*	Market	0.87^*	0.82^*	0.83^*	0.92^*
SMB	0.97^*	0.96^*	0.94^*	0.89^*	SMB	1.37^*	1.31^*	1.27^*	1.28^*
HML	0.16^*	0.13	0.04	0.01	HML	0.11^*	0.08^*	0.00	-0.04
MOM	-0.13^*	-0.12^*	-0.10^*	-0.11^*	RMW	0.03	0.04	0.06	0.03
					CMA	-0.02	-0.07	-0.05	0.05
Panel E: Emerging countries					**Emerging countries**				
Ann. α	1.77	1.39	-0.62	0.17	Ann. α	2.22	1.54	-0.57	-0.22
Market	0.96^*	0.97^*	0.99^*	1.00^*	Market	0.82^*	0.81^*	0.79^*	0.86^*
SMB	0.39^*	0.36^*	0.38^*	0.28^*	SMB	0.45^*	0.42^*	0.43^*	0.31^*
HML	0.06	0.05	-0.05	-0.11	HML	0.06	0.06	-0.04	-0.07
MOM	-0.16^*	-0.17^*	-0.16^*	-0.17^*	RMW	-0.06	-0.03	-0.02	0.06
					CMA	-0.14	-0.16	-0.20^*	-0.16

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A6: Factor exposure of smart beta portfolios based on low beta

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	0.40	0.69	1.38	1.89	Ann. α	1.39	1.68	2.33	2.47
Market	0.56*	0.57*	0.58*	0.63*	Market	0.55*	0.56*	0.57*	0.58*
SMB	0.25*	0.25*	0.24*	0.22*	SMB	0.06	0.04	0.08	0.08
HML	−0.07	−0.09	−0.08	−0.09	HML	−0.15	−0.17	−0.17	−0.13
MOM	0.11*	0.12*	0.09*	0.08*	RMW	−0.20	−0.19	−0.21	−0.11
					CMA	0.01	0.01	0.01	−0.03
Panel B: The U.S.					**The U.S.**				
Ann. α	1.93	1.99	2.24	2.90	Ann. α	2.09	2.23	2.56	3.14*
Market	0.71*	0.72*	0.74*	0.76*	Market	0.48*	0.63*	0.78*	0.82*
SMB	0.04	0.04	0.02	−0.03	SMB	−0.29	−0.17	−0.07	−0.09
HML	0.04	0.04	0.04	0.04	HML	0.00	−0.02	−0.02	−0.01
MOM	0.09*	0.07	0.05	0.04	RMW	−0.22*	−0.19*	−0.17*	−0.12
					CMA	−0.26	−0.10	0.05	0.07
Panel C: Europe					**Europe**				
Ann. α	0.35	0.68	0.66	1.04	Ann. α	0.47	0.85	0.85	1.04
Market	0.87*	0.86*	0.88*	0.87*	Market	0.79*	0.81*	0.86*	0.82*
SMB	0.26*	0.24*	0.19*	0.15*	SMB	0.15	0.14	0.09	0.02
HML	−0.17*	−0.16*	−0.13*	−0.09*	HML	−0.19*	−0.18*	−0.15*	−0.11*
MOM	0.08*	0.06*	0.06*	0.06*	RMW	0.05	0.03	0.03	0.08
					CMA	−0.05	−0.02	−0.01	−0.04
Panel D: Pacific					**Pacific**				
Ann. α	2.99	2.91	3.65	4.29*	Ann. α	2.60	2.52	3.28	4.02*
Market	0.60*	0.61*	0.64*	0.67*	Market	−0.08	−0.08	−0.01	0.21
SMB	0.61*	0.66*	0.61*	0.57*	SMB	0.17	0.23	0.17	0.24
HML	−0.13	−0.15*	−0.16*	−0.22*	HML	−0.09	−0.09	−0.11	−0.17*
MOM	0.21*	0.21*	0.22*	0.21*	RMW	−0.06	−0.03	−0.03	−0.08
					CMA	−0.69*	−0.69*	−0.66*	−0.43
Panel E: Emerging countries					**Emerging countries**				
Ann. α	−1.00	−0.79	0.88	1.92	Ann. α	0.17	0.35	2.00	2.77
Market	0.79*	0.78*	0.79*	0.81*	Market	0.75*	0.75*	0.80*	0.87*
SMB	−0.01	−0.01	−0.01	−0.15	SMB	−0.20*	−0.19	−0.17	−0.28
HML	−0.19*	−0.18*	−0.18*	−0.18*	HML	−0.23*	−0.23*	−0.22*	−0.21*
MOM	0.05	0.05	0.06	0.05	RMW	−0.16*	−0.15	−0.14	−0.10
					CMA	−0.06	−0.06	−0.01	0.04

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A7: Factor exposure of smart beta portfolios based on dividend yield

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	−1.52	−1.20	−0.65	−0.05	Ann. α	−0.88	−0.70	−0.29	−0.26
Market	1.11*	1.11*	1.11*	1.10*	Market	1.81*	1.91*	1.85*	1.82*
SMB	0.81*	0.68*	0.62*	0.52*	SMB	1.88*	1.83*	1.70*	1.63*
HML	0.30*	0.30*	0.23*	0.26*	HML	0.28*	0.29*	0.24*	0.32*
MOM	−0.20*	−0.22*	−0.21*	−0.21*	RMW	0.09	0.13	0.15	0.34
					CMA	0.94*	1.02*	0.95*	0.93*
Panel B: The U.S.					**The U.S.**				
Ann. α	2.69	2.37	2.54	2.49	Ann. α	3.28	2.97	3.11	2.91
Market	0.82*	0.83*	0.83*	0.87*	Market	1.04*	1.04*	1.06*	1.01*
SMB	0.26*	0.28*	0.26*	0.18*	SMB	0.61*	0.63*	0.60*	0.44*
HML	0.29*	0.25*	0.22*	0.18*	HML	0.31*	0.27*	0.22*	0.20*
MOM	−0.18*	−0.18*	−0.15*	−0.14*	RMW	−0.24	−0.25	−0.21	−0.18
					CMA	0.30	0.29	0.31	0.20
Panel C: Europe					**Europe**				
Ann. α	1.09	1.24	1.13	1.06	Ann. α	0.48	0.75	0.64	0.71
Market	0.97*	0.98*	0.98*	0.97*	Market	0.87*	0.91*	0.90*	0.92*
SMB	0.33*	0.30*	0.28*	0.23*	SMB	0.58*	0.55*	0.49*	0.41*
HML	0.18*	0.17*	0.17*	0.16*	HML	0.32*	0.29*	0.28*	0.25*
MOM	−0.21*	−0.21*	−0.18*	−0.15*	RMW	0.02	−0.01	0.01	0.00
					CMA	−0.06	−0.03	−0.05	−0.02
Panel D: Pacific					**Pacific**				
Ann. α	3.30	3.19	3.60*	3.98*	Ann. α	3.99*	3.86*	4.30*	4.72*
Market	1.08*	1.05*	1.03*	1.05*	Market	1.64*	1.56*	1.60*	1.71*
SMB	0.40*	0.42*	0.34*	0.30*	SMB	0.75*	0.73*	0.70*	0.70*
HML	−0.30*	−0.28*	−0.28*	−0.31*	HML	−0.35*	−0.32*	−0.31*	−0.34*
MOM	−0.07	−0.06	−0.08*	−0.08*	RMW	−0.14	−0.10	−0.03	−0.02
					CMA	0.69	0.63	0.69	0.78
Panel E: Emerging countries					**Emerging countries**				
Ann. α	3.39*	3.37*	4.24*	4.57*	Ann. α	3.75*	3.75	4.69*	4.55*
Market	0.82*	0.82*	0.84*	0.84*	Market	0.82*	0.83*	0.86*	0.86*
SMB	0.05	0.01	−0.05	−0.10	SMB	0.12	0.06	−0.02	−0.09
HML	0.07	0.07	0.00	−0.07	HML	0.08	0.08	0.00	−0.06
MOM	−0.15*	−0.15*	−0.15*	−0.11*	RMW	−0.03	−0.03	−0.04	0.02
					CMA	−0.01	−0.01	−0.02	−0.02

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A8: Factor exposure of smart beta portfolios based on value

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	−0.20	−0.49	−0.36	0.62	Ann. α	1.06	0.44	0.47	1.09
Market	1.07*	1.06*	1.01*	1.04*	Market	1.39*	1.36*	1.48*	1.27*
SMB	0.59*	0.55*	0.48*	0.33*	SMB	0.89*	0.86*	0.96*	0.62*
HML	1.08*	1.06*	1.01*	0.85*	HML	0.98*	0.99*	0.95*	0.82*
MOM	−0.01	−0.01	−0.07	−0.04	RMW	−0.25	−0.14	−0.09	−0.07
					CMA	0.33*	0.31	0.48*	0.24
Panel B: The U.S.					**The U.S.**				
Ann. α	1.08	0.73	0.36	0.11	Ann. α	1.41	1.14	0.65	0.33
Market	1.01*	1.01*	1.00*	1.01*	Market	1.26*	1.26*	1.20*	1.02*
SMB	0.56*	0.54*	0.49*	0.51*	SMB	0.90*	0.83*	0.79*	0.72*
HML	0.60*	0.57*	0.51*	0.33*	HML	0.57*	0.53*	0.50*	0.36*
MOM	−0.05*	−0.04*	−0.07*	−0.09*	RMW	0.03	−0.03	0.00	−0.07
					CMA	0.27*	0.27*	0.21*	0.01
Panel C: Europe					**Europe**				
Ann. α	0.11	0.11	0.78	1.19	Ann. α	0.22	0.23	0.89	1.33
Market	1.02*	1.04*	1.03*	1.02*	Market	1.04*	1.07*	1.07*	1.01*
SMB	0.55*	0.54*	0.49*	0.46*	SMB	0.65*	0.66*	0.60*	0.55*
HML	0.63*	0.57*	0.51*	0.42*	HML	0.63*	0.57*	0.51*	0.43*
MOM	−0.02	−0.03	−0.03	−0.05	RMW	0.08	0.09	0.08	−0.03
					CMA	0.02	0.04	0.04	−0.02
Panel D: Pacific					**Pacific**				
Ann. α	1.40	1.46	1.20	2.42	Ann. α	1.36	1.41	1.17	2.22
Market	1.02*	1.00*	0.97*	0.96*	Market	0.77*	0.71*	0.69*	0.63*
SMB	0.59*	0.61*	0.66*	0.59*	SMB	0.59*	0.58*	0.65*	0.59*
HML	0.49*	0.47*	0.40*	0.32*	HML	0.48*	0.47*	0.41*	0.31*
MOM	0.01	0.02	0.02	0.01	RMW	−0.05	−0.01	0.04	−0.09
					CMA	−0.26*	−0.31*	−0.31*	−0.36*
Panel E: Emerging countries					**Emerging countries**				
Ann. α	−1.37	−2.71	−2.34	−2.28	Ann. α	−0.38	−1.92	−1.17	−0.93
Market	0.94*	0.95*	0.94*	0.90*	Market	0.88*	0.85*	0.84*	0.74*
SMB	0.08	0.04	0.05	−0.02	SMB	0.05	0.00	−0.03	−0.11
HML	0.41*	0.42*	0.44*	0.39*	HML	0.38*	0.39*	0.41*	0.34*
MOM	−0.12*	−0.12*	−0.11*	−0.14*	RMW	−0.13	−0.11	−0.16	−0.19
					CMA	−0.10	−0.14*	−0.14*	−0.21*

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A9: Factor exposure of smart beta portfolios based on quality

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	−0.99	−0.91	−0.16	0.40	Ann. α	−1.39	−1.39	−0.96	−0.46
Market	1.06*	1.06*	1.05*	1.01*	Market	0.83*	0.78*	0.72*	0.76*
SMB	0.51*	0.51*	0.45*	0.33*	SMB	0.42*	0.40*	0.30*	0.24*
HML	−0.31*	−0.36*	−0.37*	−0.27*	HML	−0.25*	−0.30*	−0.28*	−0.17*
MOM	0.09*	0.08*	0.08*	0.06*	RMW	0.22*	0.21*	0.30*	0.33*
					CMA	−0.20	−0.26*	−0.31*	−0.23*
Panel B: The U.S.					**The U.S.**				
Ann. α	0.02	0.02	0.62	0.97	Ann. α	−0.19	−0.15	0.43	0.65
Market	1.02*	1.01*	0.99*	1.00*	Market	0.77*	0.83*	0.79*	0.70*
SMB	0.48*	0.44*	0.39*	0.35*	SMB	0.46*	0.46*	0.41*	0.28*
HML	−0.28*	−0.25*	−0.23*	−0.19*	HML	−0.24*	−0.23*	−0.20*	−0.15*
MOM	0.01	0.01	0.00	0.02	RMW	0.08	0.09*	0.08	0.11*
					CMA	−0.26*	−0.19	−0.22*	−0.32*
Panel C: Europe					**Europe**				
Ann. α	1.56*	1.88*	2.13*	2.30*	Ann. α	1.50	1.70*	1.94*	2.11*
Market	0.96*	0.96*	0.97*	0.97*	Market	0.90*	0.89*	0.91*	0.93*
SMB	0.57*	0.51*	0.42*	0.42*	SMB	0.58*	0.50*	0.43*	0.41*
HML	−0.22*	−0.22*	−0.21*	−0.19*	HML	−0.22*	−0.21*	−0.20*	−0.19*
MOM	0.02	0.02	0.00	0.02	RMW	0.13*	0.15*	0.12*	0.17*
					CMA	−0.05	−0.06	−0.05	−0.03
Panel D: Pacific					**Pacific**				
Ann. α	2.57*	2.57*	2.23*	1.16	Ann. α	2.70*	2.81*	2.59*	1.63
Market	1.08*	1.05*	1.05*	1.07*	Market	1.00*	1.04*	1.13*	1.25*
SMB	0.24*	0.29*	0.30*	0.28*	SMB	0.16*	0.25*	0.29*	0.32*
HML	−0.44*	−0.42*	−0.37*	−0.34*	HML	−0.41*	−0.39*	−0.32*	−0.28*
MOM	0.03	0.02	0.02	0.02	RMW	0.09	0.15*	0.21*	0.25*
					CMA	−0.09	−0.03	0.08	0.18
Panel E: Emerging countries					**Emerging countries**				
Ann. α	1.58	2.02	2.64	4.59	Ann. α	1.67	2.06	1.95	3.56*
Market	0.99*	0.98*	1.01	1.01*	Market	0.87*	0.89*	0.91*	0.87*
SMB	0.13	0.12	0.16	0.04	SMB	0.08	0.09	0.13	0.01
HML	−0.35*	−0.38*	−0.42*	−0.35*	HML	−0.36*	−0.38*	−0.40*	−0.33*
MOM	0.01	−0.01	0.03	0.06	RMW	−0.04	−0.03	0.06	0.10
					CMA	−0.12*	−0.11*	−0.11*	−0.14*

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.

Table A10: Factor exposure of smart beta portfolios based on momentum

	0% excl.	10% excl.	25% excl.	50% excl.		0% excl.	10% excl.	25% excl.	50% excl.
	Panel A: 3 FFF + Momentum					**Panel B: 5 FFF**			
Panel A: World					**World**				
Ann. α	−2.42	−3.00	−2.52	−0.81	Ann. α	−2.20	−2.61	−2.01	−0.12
Market	1.07*	1.06*	1.05*	0.99*	Market	−0.89*	−0.66*	−0.59*	−0.21
SMB	0.68*	0.62*	0.58*	0.43*	SMB	−1.65*	−1.51*	−1.49*	−1.17*
HML	0.19*	0.19*	0.18*	0.20*	HML	0.16	0.13	0.12	0.12
MOM	0.75*	0.71*	0.68*	0.54*	RMW	−0.09	−0.10	−0.14	−0.18
					CMA	−2.08*	−1.84*	−1.76*	−1.28*
Panel B: The U.S.					**The U.S.**				
Ann. α	−0.14	0.33	0.34	0.18	Ann. α	0.06	0.60	0.62	0.21
Market	1.01*	0.99*	0.98*	0.99*	Market	0.52*	0.56*	0.70*	0.68*
SMB	0.57*	0.55*	0.48*	0.35*	SMB	−0.26	−0.20	−0.12	−0.21
HML	0.06	0.05	0.04	0.04	HML	−0.17	−0.17*	−0.17*	−0.12
MOM	0.50*	0.46*	0.41*	0.37*	RMW	−0.16	−0.18	−0.13	−0.02
					CMA	−0.48*	−0.41	−0.25	−0.31
Panel C: Europe					**Europe**				
Ann. α	−0.42	0.03	−0.14	0.39	Ann. α	0.59	1.03	0.86	1.46
Market	1.02*	1.02*	1.02*	1.03*	Market	0.79*	0.81*	0.85*	0.85*
SMB	0.50*	0.47*	0.40*	0.41*	SMB	0.01	−0.01	−0.03	−0.03
HML	0.07*	0.07*	0.07*	0.06	HML	−0.15*	−0.15*	−0.13*	−0.15*
MOM	0.46*	0.44*	0.41*	0.41*	RMW	0.04	0.04	0.02	−0.01
					CMA	−0.17	−0.15	−0.11	−0.12
Panel D: Pacific					**Pacific**				
Ann. α	0.58	0.11	−0.04	0.18	Ann. α	−0.11	−0.50	−0.60	−0.45
Market	0.96*	0.97*	0.95*	0.93*	Market	0.02	0.08	0.12	0.10
SMB	0.35*	0.39*	0.45*	0.39*	SMB	−0.64*	−0.56*	−0.42*	−0.46*
HML	0.09*	0.11*	0.10*	0.11*	HML	0.22*	0.25*	0.23*	0.22*
MOM	0.46*	0.46*	0.43*	0.42*	RMW	−0.08	−0.03	−0.04	−0.08
					CMA	−1.03*	−0.96*	−0.88*	−0.90*
Panel E: Emerging countries					**Emerging countries**				
Ann. α	−0.63	−0.49	−0.50	1.13	Ann. α	−0.90	−0.65	−0.83	0.96
Market	0.93*	0.93*	0.94*	0.93*	Market	0.92*	0.90*	0.90*	0.93*
SMB	0.00	−0.03	−0.04	−0.18*	SMB	−0.37*	−0.42*	−0.42*	−0.54*
HML	−0.11*	−0.16*	−0.16*	−0.18*	HML	−0.13	−0.18*	−0.18*	−0.20*
MOM	0.36*	0.34*	0.34*	0.30*	RMW	0.03	0.01	0.03	0.01
					CMA	0.01	−0.01	−0.02	−0.01

Note: The table reports summary statistics on portfolios based on the industry-adjusted average ESG score. Statistics are: the annualized alpha (in %) and the sensitivity to risk factors. Columns 1 to 4 correspond to the four-factor model; columns 5 to 9 correspond to the five-factor model. Columns correspond to the the portfolio with no exclusion and the portfolios excluding the firms with the 10%, 25%, and 50% lowest scores. A "*" indicates that the parameter estimate is significant at the 5% level.