

Online Appendix for

“Managerial and Financial Barriers during the Green Transition”

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A The Enterprise Surveys

The Enterprise Surveys (ES) are a firm-level survey of a representative sample of an economy's private sector. They cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, and competition. The survey universe consists of the majority of manufacturing, retail and services sectors (wholesale, hotels, restaurants, transport, storage, communications, IT) and construction. This corresponds to firms classified with ISIC Rev 3.1 codes 15-37, 45, 50-52, 55, 60-64, and 72. Only formal (registered) companies with five or more employees are eligible for an interview; there are no restrictions on their age. In some larger economies, such as Turkey and Ukraine, the survey design allows stratification by some of the sectors with the largest contribution to employment and value added. Firms with 100 percent government/state ownership are not eligible to participate in the ES. Due to sensitive survey questions addressing business-government relations and bribery, private contractors (rather than a government agency) are hired to collect the data. Confidentiality of the survey respondents and the sensitive information they provide is necessary to ensure the greatest degree of survey participation, integrity and confidence in the quality of the data.

The ES follow a robust methodology that has been in use since 2008. The survey sample frame is ideally derived from the universe of eligible firms obtained from the country's statistical office or, where this is not available, from other sources. The sample frame has information on firm size (number of employees or size class), business sector, and geographic region within a country. These are the strata used for stratified random sampling. Firm size classes are 5-19 (small), 20-99 (medium), and 100+ employees (large firms). The majority of firms in most economies are small and medium-sized and the ES oversample large firms. The main sector breakdown is usually manufacturing, retail, and other services. For larger economies, specific manufacturing sub-sectors are selected as additional strata on the basis of employment, value-added, and total number of establishments figures. Geographic regions within a country are selected based on which cities/regions collectively contain the majority of economic activity.

Once the simple random samples are selected within each size, sector and region group, firms are contacted in a prescribed order over the phone using a screener questionnaire to determine their eligibility to participate in the survey. If they are eligible, the interviewer schedules a face-to-face

interview. Refusal to participate can occur at the screening stage or at the interview stage. The percentage of ineligible firms as well as the refusals at both the screener and interview stage vary by country. Detailed information on this is available in the Report on sampling and implementation, available on the following website (<https://www.beeps-ebrd.com/data/2018-2020/>). The team working on the ES puts a high level of effort into making sure that all contractors follow the methodology closely, including by checking the detailed progress reports on which firms were contacted on a weekly basis, and identifying and correcting any issues as soon as possible.

Table OA.1 contains the interview response and refusal rates (relative to firms eligible to participate in ES) by country, sector and size for the sample used in this paper. The average (median) firm in our sample has 95 (24) employees.

Table OA.1: Interview Response and Refusal Rates by Country, Sector and Size

Relative to eligible Country	By country Response		Refusal		By country and sector				Refusal				By country and size				Refusal			
	Response		Response		Manuf.	Oth. serv.	Retail		Manuf.	Oth. serv.	Retail		Small	Medium	Large		Small	Medium	Large	
Albania	98.7		1.0		98.4	98.5	99.2		1.6	0.8	0.8		98.1	99.1	99.0		1.9	0.0	1.0	
Armenia	100.0		0.0		100.0	100.0	100.0		0.0	0.0	0.0		100.0	100.0	100.0		0.0	0.0	0.0	
Azerbaijan	76.5		23.5		83.8	70.9	78.5		16.2	29.1	21.5		84.0	75.0	69.0		16.0	25.0	31.0	
Belarus	98.5		1.5		98.6	97.8	99.2		1.4	2.2	0.8		98.3	98.0	99.4		1.7	2.0	0.6	
Bosnia and Herz.	85.8		14.2		86.4	92.1	79.3		13.6	7.9	20.7		84.1	83.6	87.2		15.9	16.4	12.8	
Bulgaria	51.6		48.4		49.8	50.3	59.5		50.2	49.7	40.5		49.6	50.8	56.7		50.4	49.2	43.3	
Croatia	78.4		21.6		75.6	82.8	77.7		24.4	17.2	22.3		75.1	75.6	87.3		24.9	24.4	12.7	
Czech Republic	39.5		59.6		36.2	46.6	43.9		62.5	53.0	56.1		47.0	39.4	30.7		52.5	57.8	69.3	
Estonia	37.3		62.7		44.5	35.3	32.7		55.5	64.7	67.3		32.5	39.9	50.5		67.5	60.1	49.5	
Georgia	89.0		10.3		89.6	87.6	90.2		10.4	12.0	6.8		88.2	89.6	90.6		10.7	9.9	9.4	
Hungary	100.0		0.0		100.0	100.0	100.0		0.0	0.0	0.0		100.0	100.0	100.0		0.0	0.0	0.0	
Latvia	80.1		12.9		77.8	75.6	88.1		12.4	16.3	9.6		75.0	82.7	85.4		15.8	10.1	12.5	
Lithuania	49.9		50.1		45.7	56.1	49.1		54.3	43.9	50.9		68.9	47.7	36.0		31.1	52.3	64.0	
Moldova	100.0		0.0		100.0	100.0	100.0		0.0	0.0	0.0		100.0	100.0	100.0		0.0	0.0	0.0	
North Macedonia	90.3		9.8		85.9	93.0	92.2		14.1	7.0	7.8		87.7	93.0	90.8		12.3	7.0	9.2	
Poland	59.2		39.9		56.1	68.1	75.9		43.0	31.3	23.5		65.3	53.9	53.7		33.8	45.3	45.4	
Romania	79.2		12.0		81.3	73.2	78.1		11.1	14.8	11.9		85.6	76.4	74.0		8.6	14.9	13.3	
Serbia	89.4		10.6		91.9	89.1	87.0		8.1	10.9	13.0		92.2	90.9	84.6		7.8	9.1	15.4	
Slovak Republic	80.9		19.1		87.9	73.8	79.0		12.1	26.2	21.0		80.2	77.0	87.6		19.8	23.0	12.4	
Slovenia	42.2		57.8		37.8	49.2	40.5		62.2	50.8	59.5		42.2	46.3	34.4		57.8	53.7	65.6	
Turkey	89.6		2.5		88.3	92.1	92.9		2.6	2.3	2.4		88.6	90.3	90.2		2.0	2.1	3.9	
Ukraine	28.6		71.3		33.6	18.3	28.0		66.2	81.7	71.7		27.3	28.6	31.1		72.6	71.0	68.8	
Overall	74.8		24.0		75.0	75.0	76.0		23.7	23.7	23.1		75.9	74.4	74.5		22.9	24.2	24.5	

Notes: Response refers to interview response rate, defined as the number of completed interviews as a percentage of firms eligible to participate in the ES. Refusal refers to interview refusal rate, defined as the number of interview refusals as a percentage of firms eligible to participate in the ES. Manuf. - manufacturing; Oth. serv. - other services. *Source:* Authors' calculations based on the EBRD-EIB-WBG Enterprise Surveys progress reports.

A.1 Details of the Survey Questions and Green and General Management Practices Scoring

A.1.1 Fixed investment

K.4	In fiscal year [Insert last complete fiscal year], did this establishment purchase any new or used fixed assets, such as machinery, vehicles, equipment, land or buildings, including expansion and renovations of existing structures?
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Yes	1
No	2
Don't know (spontaneous)	-9

A.1.2 Green Investment

BMGC.23	Over the last three years, did this establishment adopt any of the following measures?
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	Yes	No	Does not apply	Don't know
Heating and cooling improvements	1	2	-7	-9
More climate-friendly energy generation on site	1	2	-7	-9
Machinery and equipment upgrades	1	2	-7	-9
Energy management	1	2	-7	-9
Waste minimization, recycling and waste management	1	2	-7	-9
Air pollution control measures	1	2	-7	-9
Water management	1	2	-7	-9
Upgrades of vehicles	1	2	-7	-9
Improvements to lighting systems	1	2	-7	-9
Other pollution control measures	1	2	-7	-9

A.1.3 Green Management Practices

Strategic Objectives

Practice 1

BMGA.1	In fiscal year [Insert last complete fiscal year], did this firm have strategic objectives that mention environmental or climate change issues?
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	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0

Green Issues Manager

Practice 2

BMGA.3*	In fiscal year [Insert last complete fiscal year], whom did the manager responsible for environmental and climate change issues directly report to?
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	Original answer	Green management score
The CEO, Board, or Owners	1	1
A manager directly reporting to the CEO, Board, or Owners	2	$\frac{2}{3}$
A manager not reporting directly to the CEO, Board, or Owners	3	$\frac{1}{3}$
Don't know (spontaneous)	-9	0
No manager responsible for environmental and climate change issues/Don't know (spontaneous) (BMGA.2)	2/-9	0

Practice 3

BMGC.22* Is the manager responsible for environmental and climate change issues evaluated against how well the establishment performs on energy consumption, CO₂ emissions or other pollution or environmental targets?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0
No manager responsible for environmental and climate change issues/Don't know (spontaneous) (BMGA.2)	2/-9	0

Environmental Targets

Practice 4

BMGC.17* Over the last three years, what sort of targets for energy consumption did this establishment have?

	Original answer	Green management score
Quantity targets only	1	$\frac{1}{2}$
Expenditure targets only	2	$\frac{1}{2}$
Both quantity and expenditure targets	3	1
Don't know (spontaneous)	-9	0
Refusal (spontaneous)	-8	0
No targets for energy consumption/Don't know (spontaneous) (BMGC.16)	2/-9	0

Practice 5

BMGC.19* Over the last three years, what sort of targets for CO₂ emissions did this establishment have?

	Original answer	Green management score
Only quantity per unit of output targets	1	$\frac{1}{2}$
Only absolute quantity targets	2	$\frac{1}{2}$
Absolute and per unit of output quantity targets	3	1
Don't know (spontaneous)	-9	0
Refusal (spontaneous)	-8	0
No targets for CO ₂ emissions/Don't know (spontaneous) (BMGC.18)	2/-9	0

Practice 6

BMGC.21* Over the last three years, did this establishment have targets for pollution emissions other than CO₂?

	Original answer	Green management score
Only quantity per unit of output targets	1	$\frac{1}{2}$
Only absolute quantity targets	2	$\frac{1}{2}$
Absolute and per unit of output quantity targets	3	1
Don't know (spontaneous)	-9	0
Refusal (spontaneous)	-8	0
No targets for CO ₂ emissions/Don't know (spontaneous) (BMGC.20)	2/-9	0

Environmental Monitoring

Practice 7

BMGC.2* Over the last three years, how often did this establishment monitor its energy consumption?

	Original answer	Green management score
Annually	1	$\frac{1}{8}$
Biannually / Every six months	2	$\frac{1}{4}$
Quarterly	3	$\frac{3}{8}$
Monthly	4	$\frac{1}{2}$
Weekly	5	$\frac{5}{8}$
Daily	6	$\frac{3}{4}$
Hourly	7	$\frac{7}{8}$
More than once in an hour	8	1
Don't know (spontaneous)	-9	0
No monitoring of energy consumption/Don't know (spontaneous) (BMGC.1)	2/-9	0

Practice 8

BMGC.3* Over the last three years, did this establishment complete an external audit of its energy consumption?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0
No monitoring of energy consumption/Don't know (spontaneous) (BMGC.1)	2/-9	1

Practice 9 (Manufacturing only)

BMGC.5* Over the last three years, how often did this establishment monitor its water usage?

	Original answer	Green management score
Annually	1	$\frac{1}{8}$
Biannually / Every six months	2	$\frac{1}{4}$
Quarterly	3	$\frac{3}{8}$
Monthly	4	$\frac{1}{2}$
Weekly	5	$\frac{5}{8}$
Daily	6	$\frac{3}{4}$
Hourly	7	$\frac{7}{8}$
More than once in an hour	8	1
Don't know (spontaneous)	-9	0
No monitoring of water usage/Don't know (spontaneous) (BMGC.4)	2/-9	0

Practice 10 (Manufacturing only)

BMGC.6* Over the last three years, did this establishment complete an external audit of its water usage?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0
No monitoring of water usage/Don't know (spontaneous) (BMGC.4)	2/-9	1

Practice 11

 BMGC.9* Over the last three years, how often did this establishment monitor its CO₂ emissions?

	Original answer	Green management score
Annually	1	$\frac{1}{8}$
Biannually / Every six months	2	$\frac{1}{4}$
Quarterly	3	$\frac{3}{8}$
Monthly	4	$\frac{1}{2}$
Weekly	5	$\frac{5}{8}$
Daily	6	$\frac{3}{4}$
Hourly	7	$\frac{7}{8}$
More than once in an hour	8	1
Don't know (spontaneous)	-9	0
No monitoring of CO ₂ emissions/Don't know (spontaneous) (BMGC.8)	2/-9	0
Did not emit CO ₂ /Don't know (spontaneous) (BMGC.7)	2/-9	0

Practice 12

 BMGC.10* Over the last three years, did this establishment complete an external audit of its CO₂ emissions?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0
No monitoring of water usage/Don't know (spontaneous) (BMGC.8)	2/-9	1
Did not emit CO ₂ /Don't know (spontaneous) (BMGC.7)	2/-9	1

Practice 13

 BMGC.11* Over the last three years, did this establishment monitor CO₂ emissions along its supply chain?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0

Practice 14 (Manufacturing only)

 BMGC.14* Over the last three years, how often did this establishment monitor its emissions of pollutants other than CO₂?

	Original answer	Green management score
Annually	1	$\frac{1}{8}$
Biannually / Every six months	2	$\frac{1}{4}$
Quarterly	3	$\frac{3}{8}$
Monthly	4	$\frac{1}{2}$
Weekly	5	$\frac{5}{8}$
Daily	6	$\frac{3}{4}$
Hourly	7	$\frac{7}{8}$
More than once in an hour	8	1
Don't know (spontaneous)	-9	0
No monitoring of emissions of pollutants other than CO ₂ /Don't know (spontaneous) (BMGC.13)	2/-9	0
Did not emit pollutants other than CO ₂ /Don't know (spontaneous) (BMGC.12)	2/-9	0

Practice 15 (Manufacturing only)

BMGC.15* Over the last three years, did this establishment complete an external audit of its water usage?

	Original answer	Green management score
Yes	1	1
No	2	0
Don't know (spontaneous)	-9	0
No monitoring of emissions of pollutants other than CO ₂ /Don't know (spontaneous) (BMGC.13)	2/-9	1
Did not emit pollutants other than CO ₂ /Don't know (spontaneous) (BMGC.12)	2/-9	1

A.1.4 General Management Practices

Operations

Practice 1

BMR.1 Over the last complete fiscal year [Insert last complete fiscal year], what best describes what happened at this establishment when a problem in the production process arose?

	Original answer	General management score
We fixed it but did not take further action	1	$\frac{1}{3}$
We fixed it and took action to make sure it did not happen again	2	$\frac{2}{3}$
We fixed it and took action to make sure that it did not happen again, and had a continuous improvement process to anticipate problems like these in advance	3	1
No action was taken	4	0
Don't know (spontaneous)	-9	0
Does not apply (spontaneous)	-7	1

Monitoring

Practice 2

BMR.3*	Over the last complete fiscal year [Insert last complete fiscal year], how many performance indicators were monitored at this establishment?		
		Original	General
		answer	management score
	1-2 indicators	1	$\frac{1}{3}$
	3-9 indicators	2	$\frac{2}{3}$
	10 or more indicators	3	1
	Don't know (spontaneous)	-9	0
	No performance indicators monitored/Don't know (spontaneous) (BMR.2)	2/-9	0

Targets

Practice 3

BMR.5*	Over the last complete fiscal year [Insert last complete fiscal year], what best describes the time frame of production targets at this establishment?		
		Original	General
		answer	management score
	Main focus was on short term, less than one year	1	$\frac{1}{3}$
	Main focus was on long term, one year or more	2	1
	Combination of short-term and long-term targets	3	$\frac{2}{3}$
	Don't know (spontaneous)	-9	0
	No production targets/Don't know (spontaneous) (BMR.4)	2/-9	0

Practice 4

BMR.6* Over the last complete fiscal year [Insert last complete fiscal year], how easy or difficult was it for this establishment to achieve its production targets overall?

	Original answer	General management score
Achieved without much effort	1	0
Achieved with some effort	2	$\frac{1}{3}$
Achieved with normal amount of effort	3	$\frac{2}{3}$
Achieved with more than normal effort	4	1
Only achieved with extraordinary effort	5	0
Targets were not achieved	6	0
Don't know (spontaneous)	-9	0
No production targets/Don't know (spontaneous) (BMR.4)	2/-9	0

Practice 5

BMR.7* Over the last complete fiscal year [Insert last complete fiscal year], who was aware of the production targets at this establishment?

	Original answer	General management score
Only senior managers	1	0
Most managers and some production workers	2	$\frac{1}{3}$
Most managers and most production workers	3	$\frac{2}{3}$
All managers and most production workers	4	1
Don't know (spontaneous)	-9	0
No production targets/Don't know (spontaneous) (BMR.4)	2/-9	0

Incentives

Practice 6

BMR.9*	Over the last complete fiscal year [Insert last complete fiscal year], what was the primary way non-managers were promoted at this establishment?		
		Original answer	General management score
	Their own performance	1	1
	Their team's performance	2	$\frac{3}{4}$
	The establishment's performance	3	$\frac{1}{2}$
	The firm's performance	4	$\frac{1}{4}$
	Don't know (spontaneous)	-9	0
	No performance bonuses/Don't know (spontaneous) (BMR.8)	2/-9	0

Practice 7

BMR.10	Over the last complete fiscal year [Insert last complete fiscal year], what were managers' performance bonuses mostly based on?		
		Original answer	General management score
	Based solely on performance and ability	1	1
	Based partly on performance and ability, and partly on other factors (for example, tenure or family connections)	2	$\frac{2}{3}$
	Based mainly on factors other than performance and ability (for example, tenure or family connections)	3	$\frac{1}{3}$
	Non-managers are normally not promoted	4	0
	Don't know (spontaneous)	-9	0
	Does not apply (spontaneous)	-7	0

BMR.11	Over the last complete fiscal year [Insert last complete fiscal year], when was an under-performing non-manager reassigned or dismissed?
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	Original answer	General management score
Within 6 months of identifying under-performance	1	1
After 6 months of identifying under-performance	2	$\frac{1}{2}$
Rarely or never	3	0
Don't know (spontaneous)	-9	0
Does not apply (spontaneous)	-7	0

A.1.5 Descriptive statistics by country and industry

Table OA.2: Pairwise correlations between key dependent variables

	Fixed asset investment (indicator)	Machinery upgrade	Vehicle upgrade	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control
Fixed asset investment	1.000							
Machinery upgrade	0.399	1.000						
Vehicle upgrade	0.308	0.452	1.000					
Heat/cool/light	0.255	0.398	0.314	1.000				
Green energy generation	0.095	0.223	0.223	0.225	1.000			
Waste and recycling	0.249	0.378	0.299	0.404	0.235	1.000		
Energy / water management	0.197	0.395	0.294	0.420	0.334	0.416	1.000	
Air / other pollution control	0.166	0.315	0.295	0.308	0.351	0.361	0.436	1.000

Notes: This table contains the pairwise correlations between the key dependent variables. Table A1 contains all variable definitions.

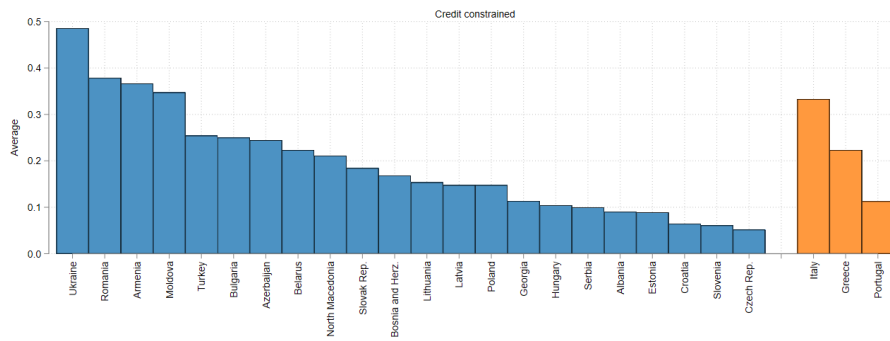
Table OA.3: Pairwise correlations between credit constraints and green management

	Credit constrained	Loan needed	Rejected	Discouraged	Green management
Credit constrained	1.000				
Loan needed	0.565	1.000			
Rejected	0.169		1.000		
Discouraged	0.950		-0.148	1.000	
Green management	-0.026	0.060	-0.006	-0.100	1.000

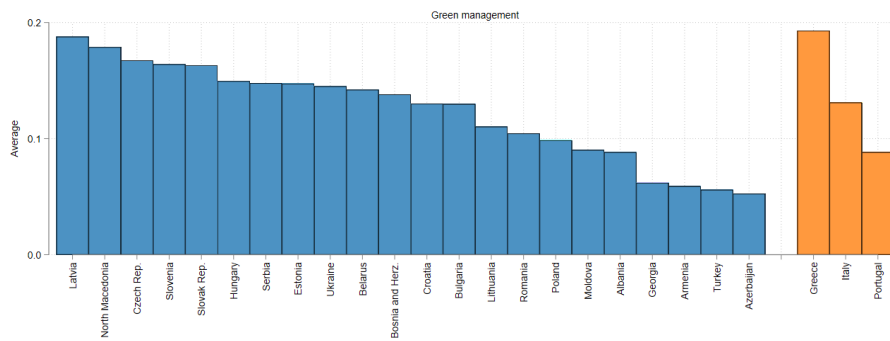
Notes: This table contains the pairwise correlations between the credit constraints and green management variables. Table A1 contains all variable definitions.

Figure OA.1: Descriptive statistics by country

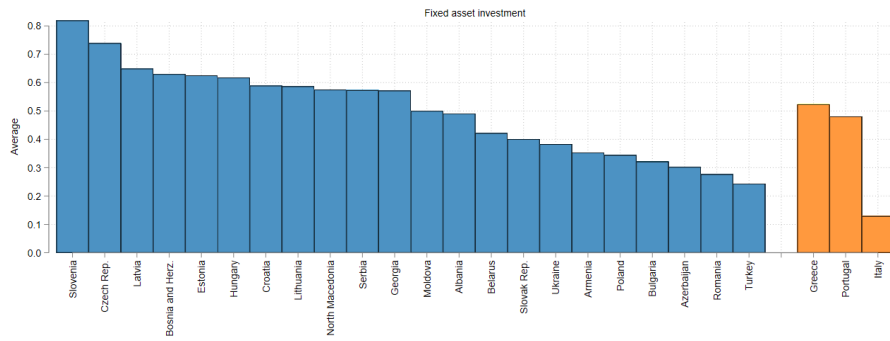
Panel A: Credit constrained



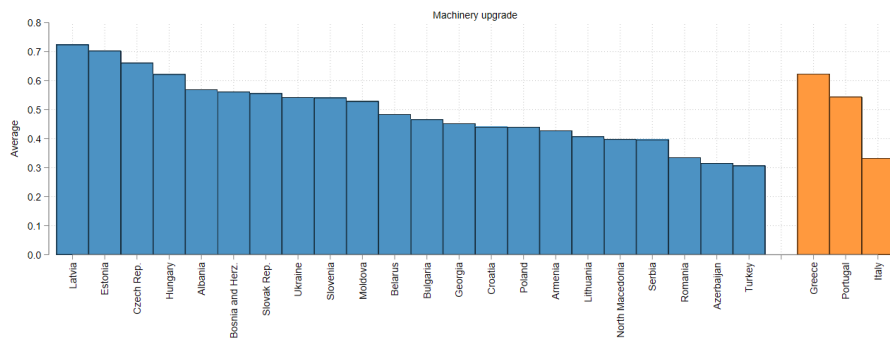
Panel B: Green management



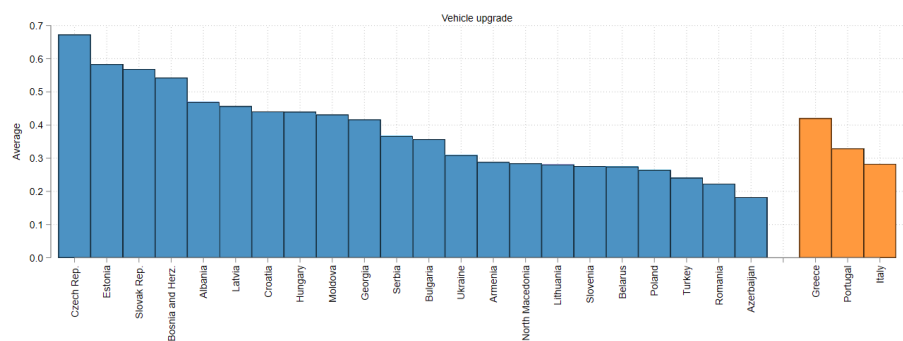
Panel C: Fixed asset investment



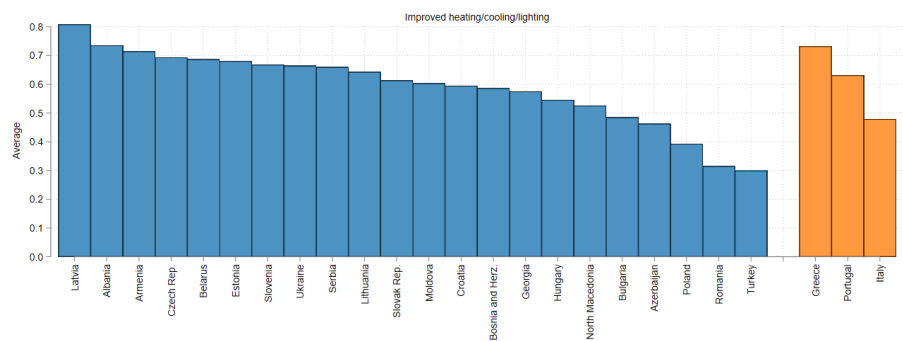
Panel D: Machinery upgrade



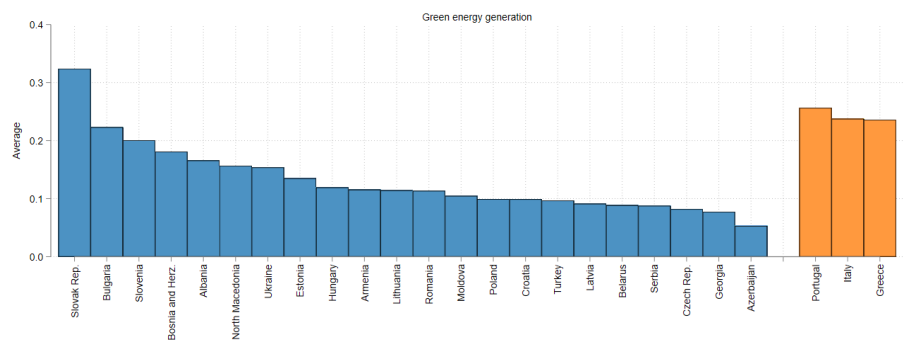
Panel E: Vehicle upgrade



Panel F: Improved heating/cooling/lighting



Panel G: Green energy generation



Panel H: Waste and recycling

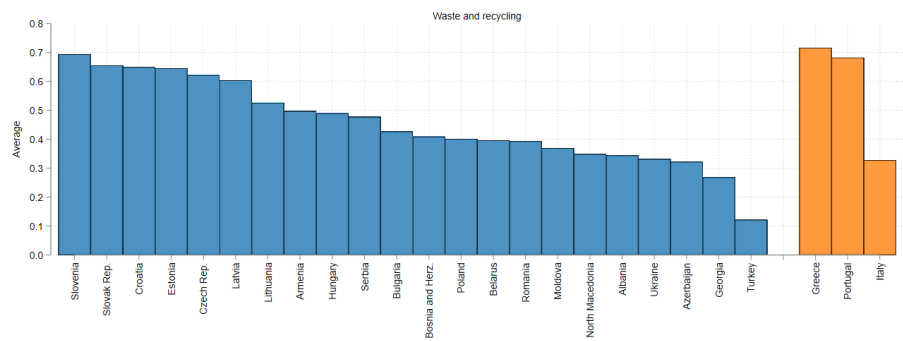
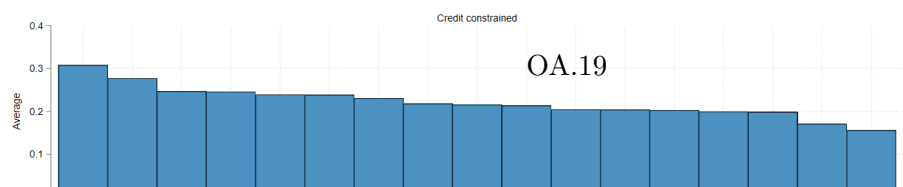
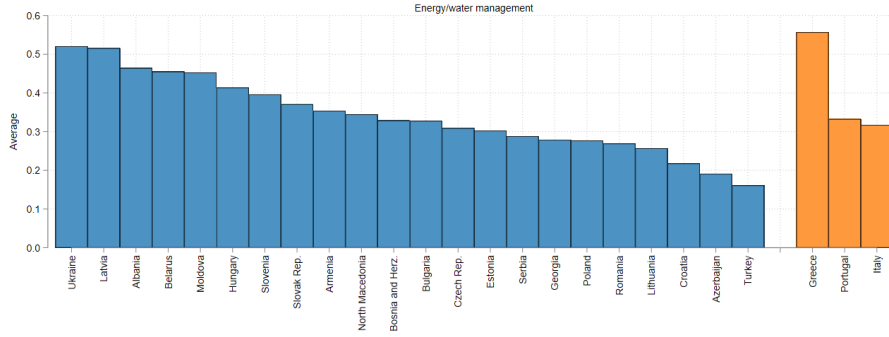


Figure OA.2: Descriptive statistics by sector

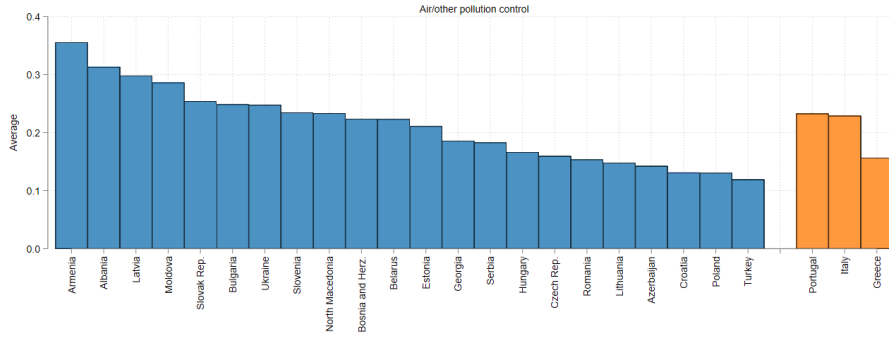
Panel A: Credit constrained



Panel I: Energy/water management



Panel J: Air/other pollution control



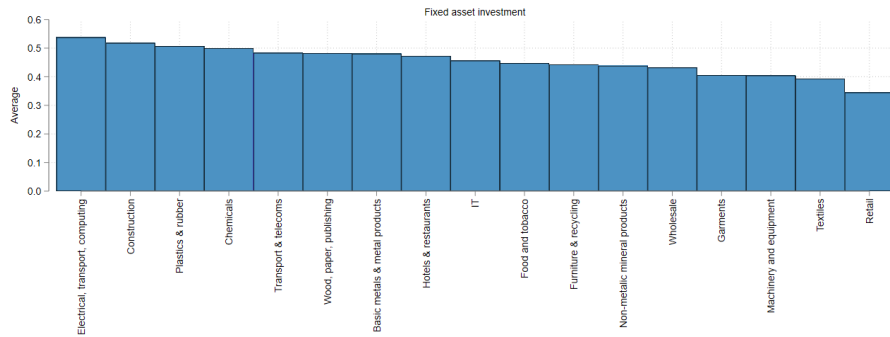
Notes: These charts show the averages by country of the main outcome variables and key dependent variables for the sample used in the paper as well as Greece, Italy and Portugal as comparators.

B Region and Sector Definitions

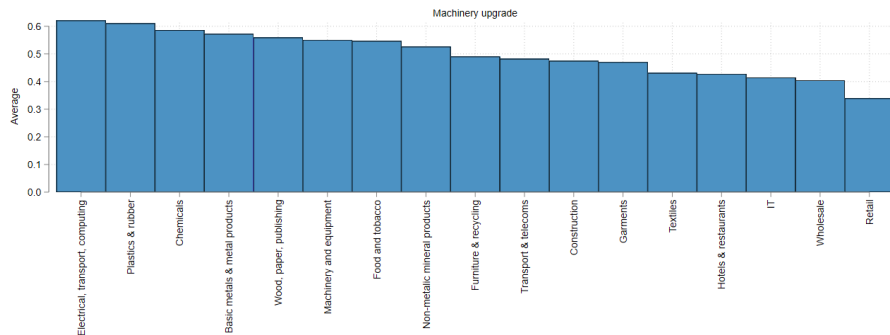
In this paper, regions correspond to the NUTS 1 regions (so-called major socio-economic regions) for EU members and candidate countries. For non-EU member or candidate countries, we followed the NUTS regulation on minimum and maximum population thresholds for the size of the NUTS regions (see <https://ec.europa.eu/eurostat/web/nuts/principles-and-characteristics>). Specifically, NUTS 1 regions have a minimum of three and maximum of seven million inhabitants. There are two exceptions to this rule: a) the West region in Ukraine has more than 7 million inhabitants, but cannot be split as this was the ES stratification region, and b) the West region in Azerbaijan has fewer than 3 million inhabitants; it does not make sense to join it with another region in Azerbaijan due to its location and the underlying ES stratification regions.

In practice, this means that there is one NUTS 1 region per country for Albania, Armenia, Bosnia and Herzegovina, Croatia, Czech Republic, Estonia, Georgia, Latvia, Lithuania, Moldova, Montenegro, North Macedonia, Slovak Republic, and Slovenia; two NUTS 1 regions in Azerbaijan,

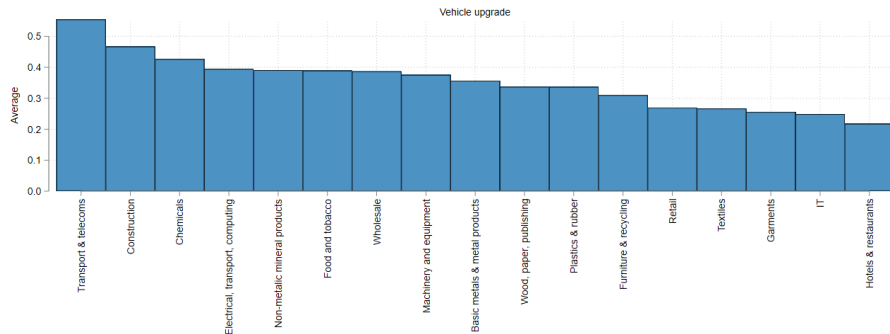
Panel C: Fixed asset investment



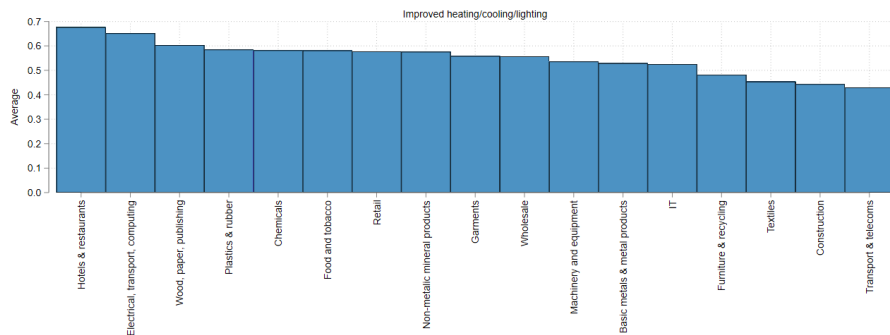
Panel D: Machinery upgrade



Panel E: Vehicle upgrade

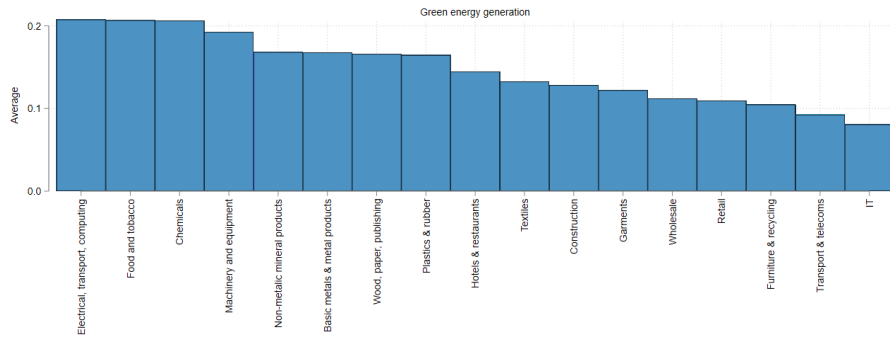


Panel F: Improved heating/cooling/lighting

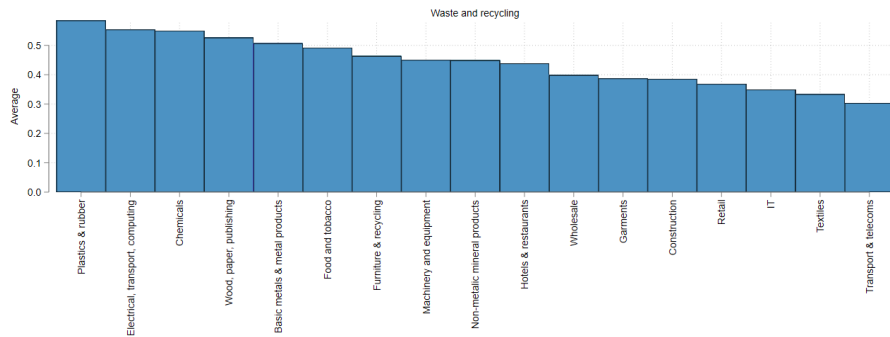


Belarus, Bulgaria and Serbia; three NUTS 1 regions in Hungary; four NUTS 1 regions in Romania; six NUTS 1 regions in Poland and Ukraine; and 12 NUTS 1 regions in Turkey. Table OB.1 contains

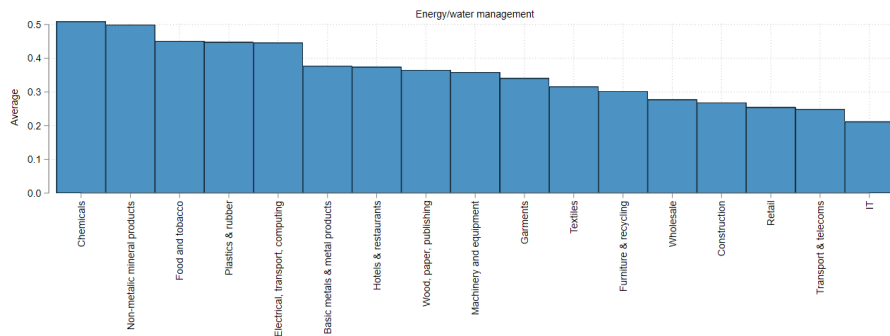
Panel G: Green energy generation



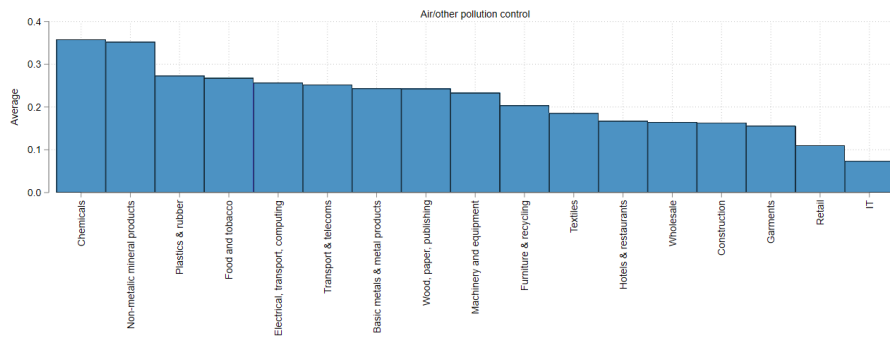
Panel H: Waste and recycling



Panel I: Energy/water management



Panel J: Air/other pollution control



Notes: These charts show the averages by sector of the main outcome variables and key dependent variables for the sample used in the paper.

detailed information on the ES stratification regions and NUTS 1 regions used in our analysis.

Table OB.1: ES Stratification Regions and NUTS 1 Regions

	ES stratification regions	NUTS 1 regions	Notes
Albania	Central Albania	Entire country	ES stratification regions correspond to NUTS 2.
	Northern Albania		
	Southern Albania		
Armenia	Gyumri (Shirak)	Entire country	Based on official regions. Not covered: Aragatsotn, Ararat, Armavir, Gegharkunik, Kotayk, Syunik, Tavush, Vayots Dzor.
	Vanadzor (Lori)		
	Yerevan		
Azerbaijan	Baku and Absheron	Baku, Absheron and Center	Based on official economic regions. Not covered: Nagorno Karabakh, Kalbajar-Lachin, Nakhchivan (disputed/landlocked).
	Center (Aran, Daglig-Shirvan, Quba-Khachmaz, Lankaran)		
	West (Ganja-Qazakh, Shaki-Zaqatala)	West	
Belarus	Minsk	Minsk and Minskaya	Based on official economic regions
	Minskaya		
	Brestskaya, Grodnenskaya	Rest of the country	
	Gomelskaya, Mogilevskaya		
	Vitebskaya		
Bosnia and Herzegovina	Bosnia and Hercegovina (Bosna, Herzegovina-Neretva, West Herzegovina)	Entire country	Based on official administrative regions.
	Republika Srpska and Distrikt Brcko		
	Sarajevo		
Bulgaria	Severen tsentralen	Northern and Eastern Bulgaria	ES stratification regions correspond to NUTS 2.
	Severoiztochen		
	Severozapaden		
	Yugoiztochen	South-Western and South-Central Bulgaria	
	Yugozapaden		
	Yuzhen tsentralen		
Croatia	Jadranska Hrvatska	Entire country	ES stratification regions correspond to NUTS 2.
	Kontinentalna Hrvatska		
Czech Republic	Central (Prague & Central Bohemia)	Entire country	ES stratification regions combine NUTS 2 regions.
	East (Central Moravia and Moravian-Silesian)		
	North (Severozapad and Severovychod)		
	South (Jihozapad and Jihovychod)		
Estonia	Laane-Eesti, Kesk-Eesti ja Kirde-Eesti	Entire country	ES stratification regions combine NUTS 3 regions.
	Louna-Eesti		
	Pohja-Eesti		
Georgia	Center (Imereti, Shida Kartli, Samtskhe-Javakheti, Mtskheta-Mtianeti, Racha-Lechkhumi and Kvemo Svaneti)	Entire country	ES stratification regions combine official regions. Not covered: South Osetia, Abkhazia.
	East (Kakheti, Kvemo Kartli)		

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Table OB.1 – continued from previous page			
	ES stratification regions	NUTS 1 regions	Notes
	North and West (Adjara, Guria, Samegrelo, Zemo Svaneti)		
	Tbilisi		
Hungary	Central Hungary	Central Hungary	ES stratification regions correspond to NUTS 2, with Budapest and Pest combined into NUTS 1.
	Central Transdanubia	Transdanubia	
	Western Transdanubia		
	Southern Trandanubia		
	Northern Great Plain	Great Plain and North	
	Northern Hungary		
	Southern Great Plain		
Latvia	Kurzeme & Zemgale	Entire country	ES stratification regions combine NUTS 3 regions.
	Riga & Pieriga		
	Vidzeme & Latgale		
Lithuania	Kaunas & Klaipeda	Entire country	ES stratification regions combine NUTS 3 regions.
	Rest of the country (Tauragė, Telšiai, Panevėžys, Šiauliai, Utena, Alytus, Marijampolė)		
	Vilnius		
Moldova	Center (Chisinau, Anenii Noi, Causeni, Calarasi, Criuleni, Hincesti, Ialoveni, Leova, Nisporeni, Orhei, Straseni, Ungheni, Telenesti)	Entire country	ES stratification regions are close to administrative regions, with a few exceptions.
	North (Balti, Briceni, Donduseni, Drochia, Edinet, Falesti, Floresti, Glodeni, Rezina, Riscani, Singerei, Ocnita, Soroca, Soldanesti)		
	South (Gaugazia, Comrat, Cahul, Cantemir, Cimislia, Taraclia, Bender, Tiraspol, Basarabeasca, Dubasari, Stefan Voda)		
Montenegro	Entire country	Entire country	ES stratification region corresponds to NUTS 1.
North Macedonia	Eastern Macedonia (Severoistocen, Istocen, Jugoistocen, Vardarski)	Entire country	ES stratification regions combine NUTS 3 regions.
	Skopje		
	Western Macedonia (Poloski, Pelagoniski, Jugozapaden)		
Poland	Central	Central	ES stratification regions correspond to NUTS 1.
	Eastern	Eastern	
	Northern	Northern	
	Northwestern	Northwestern	
	Southern	Southern	
	Southwestern	Southwestern	

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Table OB.1 – continued from previous page			
	ES stratification regions	NUTS 1 regions	Notes
Romania	Nord-Vest	Macroregion one	ES stratification regions correspond to NUTS 2.
	Centru		
	Nord-Est	Macroregion two	
	Sud-Est		
	Sud-Muntenia	Macroregion three	
	Buchuresti-Ilfov		
	Vest	Macroregion four	
	Sud-Vest Oltenia		
Serbia	Belgrade	Serbia-North	ES stratification regions are based on statistical regions. NUTS 1 regions are based on a proposal by the Government of Serbia.
	Vojvodina		
	South Serbia (Sumadija and Western Serbia, Southern and Eastern Serbia)	Serbia-South	
Slovak Republic	Bratislava	Entire country	ES stratification regions correspond to NUTS 2.
	Central Slovakia (Stredne Slovensko)		
	Eastern Slovakia (Vychodne Slovensko)		
	Western Slovakia (Zapadne Slovensko)		
Slovenia	Eastern Slovenija	Entire country	ES stratification regions correspond to NUTS 2.
	Western Slovenija		
Turkey	Aegean	Aegean	ES stratification regions correspond to NUTS 1.
	Central Anatolia	Central Anatolia	
	Central East Anatolia	Central East Anatolia	
	East Black Sea	East Black Sea	
	East Marmara	East Marmara	
	Istanbul	Istanbul	
	Mediterranean	Mediterranean	
	Northeast Anatolia	Northeast Anatolia	
	Southeast Anatolia	Southeast Anatolia	
	West Anatolia	West Anatolia	
	West Black Sea	West Black Sea	
	West Marmara	West Marmara	
Ukraine	Cherkaska, Chernihivska	Cherkaska, Chernihivska,	ES stratification regions combine proposed NUTS3 regions (in parentheses). Not covered: Donetsk, Luhansk, Crimea.
	Vinnytska, Zhytomyrska	Vinnytska, Zhytomyrska	
	Dnipropetrovska, Kharkivska	Dnipropetrovska, Kharkivska	
	Khersonska, Mykolayivska, Odeska	Khersonska, Mykolayivska, Odeska	
	Kirovohradska, Poltavska	Kirovohradska, Poltavska,	
	Sumska, Zaporizka	Sumska, Zaporizka	
	Kyiv	Kyiv	

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Table OB.1 – continued from previous page			
ES stratification regions		NUTS 1 regions	Notes
West	(Chernivtsi, Ivano-Frankivsk, Khmelnytskyi, Lviv, Rivne, Ternopil, Volyn, Zakarpattia)	West	
<i>Sources:</i> https://ec.europa.eu/eurostat/web/nuts/background. , https://en.wikipedia.org/wiki/Statistical_regions_of_Serbia , and https://interreg.eu/country/ukraine/ .			

The ES generally use three stratification sectors (manufacturing, retail, and other services) but more for larger countries. Details can be found in the Report on Sampling and Implementation at <https://www.beeps-ebrd.com/data/2018-2020/>. Importantly, the ES collect more detailed information on the main activity, product or service, corresponding to 4-digit ISIC Rev. 3.1 sectors. We use this information to define 34 2-digit ISIC Rev 3.1 sectors (these are the sectors covered by the ES) and then combine them into 17 sectors that we use in the analysis. Table OB.2 contains the exact concordance between the 2-digit ISIC Rev. 3.1 sectors and the 17 sectors we use.

C European Pollutant Release and Transfer Register

Since 2007, the European Pollutant Release and Transfer Register (E-PRTR) provides key environmental data from industrial facilities in European Union Member States as well as Iceland, Liechtenstein, Norway, Switzerland, Serbia and the UK. Annual data are reported by some 34,000 industrial facilities covering 65 economic activities. These activities are listed in Annex I of the Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register. They cover the energy sector; production and processing of metals; mineral industry; chemical industry; waste and wastewater management; paper and wood production and processing; intensive livestock production and aquaculture; animal and vegetable products from the food and beverage sector; and other activities. For most of these, only facilities above a specified capacity threshold are required to report their pollutant releases. In certain activities, such as the chemical industry, all facilities are subject to reporting.

Subject to reporting thresholds, each industrial facility provides information to their national authority on the quantities of pollutants released to air, water and land in kilograms (kg). This data covers 91 key pollutants including heavy metals, pesticides, greenhouse gases and dioxins (see

Table OB.2: Mapping Between 2-digit ISIC Rev. 3.1 Sectors and Sectors Used in the Analysis

	2-digit ISIC 3.1 sectors covered by ES	Sectors used in the analysis
Manufacturing	Food (15)	15
	Tobacco (16)	
	Textiles (17)	17
	Garments (18)	18
	Leather (19)	
	Wood (20)	20
	Paper (21)	
	Publishing, printing, and recorded media (22)	
	Refined petroleum product (23)	24
	Chemicals (24)	
	Plastics & rubber (25)	25
	Non metallic mineral products (26)	26
	Basic metals (27)	28
	Fabricated metal products (28)	
	Machinery and equipment (29)	29
	Office, accounting and computing machinery (30)	30
	Electrical machinery (31)	
	Radio, television and communication equipment (32)	
	Precision instruments (33)	
	Motor vehicles, trailers and semi-trailers (34)	
	Other transport equipment (35)	
	Furniture (36)	36
	Recycling (37)	
Retail	Retail (52)	52
Other services	Construction (45)	45
	Services of motor vehicles (50)	51
	Wholesale (51)	
	Hotel and Restaurants (55)	55
	Land transport; transport via pipelines (60)	60
	Water transport (61)	
	Air transport (62)	
	Supporting and auxiliary transport services (63)	
	Post and telecommunications (64)	
	IT (72)	72

Source: Enterprise Surveys and authors' work.

Table OC.1 for thresholds for reporting pollutants released to air, the focus of our paper). The operator of each facility is required to annually report to its competent authority releases to air, water and land of any pollutant for which the applicable threshold value specified in Table OC.1 is exceeded. The releases could be due to deliberate, accidental, routine and non-routine activities.

We use data from the E-PRTR database version 18 (E-PRTR v18), which covers the period 2007-17 (published in February 2020 and available from <https://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-23>).¹ Out of 91 E-PRTR pollutants to air, water, and land, 63 E-PRTR pollutants were released to air according to E-PRTR v18. We focus on facilities in Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia that were present in E-PRTR in all years between 2007 and 2017, as well as facilities in the above mentioned countries plus Croatia and Serbia that appear in the E-PRTR database in all years in the period 2015-17.

We concentrate on releases of CO₂, NO_x, SO_x and hazardous air pollutants, where the latter are calculated as the weighted sum of releases of all pollutants released to air available in E-PRTR v18 for which inhalation toxicity weights are available in the United States Environmental Protection Agency (EPA)'s Risk-Screening Environmental Indicators (RSEI) model (see Table OC.1 for availability and inhalation toxicity weights). The reasons for focusing on selected pollutants reflect both their importance and impact on the environment as well as data availability. In particular, CO₂ is the primary greenhouse gas emitted through human activities; it accounted for almost three quarters of global GHG emissions in 2016, measured on the basis of CO₂e (Ritchie and Roser, 2020) as well as 77.1-78.6 percent of GHG emissions in the countries in our sample between 2007-17. About 15 percent of industrial facilities present in all years between 2007-17 report CO₂ emissions above the threshold reporting value. This share is much lower for other greenhouse gases which is an additional reason why we focus only on CO₂ emissions rather than include all other greenhouse gases weighted by their global warming potential expressed in CO₂-equivalents (CO₂e). Only a handful of facilities reported emissions of perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆) above their respective threshold reporting values.

CO₂, NO_x and SO_x also result from burning fuel but their environmental impact is different

¹This is the most recent version before E-PRTR was incorporated into the Industrial Reporting database.

(Shelyapina, Rodríguez-Iznaga and Petranovskii, 2021). They are one of the five main air pollutants on which EU member states must report annual emissions; the other three are NH_3 , non-methane volatile organic compounds (NMVOCs) and $\text{PM}_{2.5}$.² Close to 18 percent of industrial facilities present in all years during the period 2007-17 report NO_x emissions above the threshold reporting value, while almost 15 percent report SO_x emissions above the threshold. E-PRTR does not have data on $\text{PM}_{2.5}$ emissions and PM_{10} emissions are reported by less than 7 percent of industrial facilities present in all years during the period 2007-17. Even fewer of those facilities report NMVOCs emissions (2.6 percent). Over 90 percent of NH_3 emissions are primarily generated in the agricultural sector,³ hence we omit them here.

In terms of the impact on the environment, emissions of NO_x and SO_x cause acid deposition, which leads to changes in soil and water quality and damage to forests, crops and other vegetation, and to adverse effects on aquatic ecosystems in rivers and lakes. Moreover, NO_x is also a tropospheric ozone precursor, which reacts in the atmosphere in the presence of sunlight to form ozone; tropospheric ozone is a contributor to climate change. High levels of ozone can cause adverse impacts on health and can damage crops and other vegetation.⁴

We include hazardous air pollutant emissions in the analysis as they are the pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. We set missing values for releases of specific pollutants to their reporting threshold values. The actual amount of the pollutant released is not known in those cases as the facility operators are not required to report them, but they are somewhere below the reporting threshold value. Our results can thus be viewed as conservative estimates of the effect of credit constraints and green management practices on pollutant releases.

²Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC; <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2284&from=EN>.

³See <https://www.eea.europa.eu/data-and-maps/indicators/eea-32-ammonia-nh3-emissions-1>.

⁴See <https://www.eea.europa.eu/data-and-maps/indicators/en09-emissions-co2-so2-and/emissions-co2-so2-and-nox>.

Table OC.1: E-PRTR Air Pollutants: Reporting Thresholds and Inhalation Toxicity Weights

<i>Pollutant group</i>	<i>Pollutant</i>	<i>Threshold for releases, kg/year</i>	<i>Inhalation toxicity weight</i>
Greenhouse gases	Carbon dioxide (CO ₂)	100 million	
	Hydro-fluorocarbons (HFCs)	100	
	Methane (CH ₄)	100,000	
	Nitrous oxide (N ₂ O)	10,000	
	Perfluocarbons (PFCs)	100	
	Sulphur hexafluoride (SF ₆)	50	
Other gases	Ammonia (NH ₃)	10,000	7
	Carbon monoxide (CO)	500,000	
	Chlorine and inorganic compounds (as HCl)	10,000	23,000
	Chlorofluorocarbons (CFCs)	1	5
	Fluorine and inorganic compounds (as HF)	5,000	17
	Halons	1	
	Hydrochlorofluorocarbons (HCFCs)	1	0.07
	Hydrogen Cyanide (HCN)	200	4,400
	Nitrogen oxides (NO _x /NO ₂)	100,000	
	Non-methane volatile organic compounds (NMVOC)	100,000	
	Sulphur oxides (SO _x /SO ₂)	150,000	
Heavy metals	Arsenic and compounds (as As)	20	15,000,000
	Cadmium and compounds (as Cd)	10	
	Chromium and compounds (as Cr)	100	43,000,000
	Copper and compounds (as Cu)	100	1,500
	Lead and compounds (as Pb)	200	
	Mercury and compounds (as Hg)	10	12,000
	Nickel and compounds (as Ni)	50	930,000
	Zinc and compounds (as Zn)	200	100
Pesticides	1,2,3,4,5,6- hexachlorocyclohexane (HCH)	10	6,400,000
	Alachlor ^a	-	80,000
	Aldrin	1	18,000,000
	Atrazine ^a	-	56
	Chlordane ^a	1	360,000
	Chlordecone	1	
	Chlorfenvinphos ^a	-	
	Chlorpyrifos ^a	-	1,000
	DDT ^a	1	
	Diuron ^a	-	19,000

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Table OC.1 – continued from previous page

<i>Pollutant group</i>	<i>Pollutant</i>	<i>Threshold for releases, kg/year</i>	<i>Inhalation toxicity weight</i>
	Endosulphan ^a	-	
	Endrin ^a	1	
	Heptachlor ^a	1	4,600,000
	Isodrin ^a	-	0
	Isoproturon ^a	-	
	Lindane ^a	1	110,000
	Mirex ^a	1	
	Simazine ^a	-	12,000
	Toxaphene ^a	1	1,100,000
	Tribtylin and compounds ^a	-	
	Trifluralin ^a	-	770
	Triphenyltin and compounds ^a	-	18,000,000
Chlorinated organic substances	1,1,1-trichloroethane	100	0.7
	1,1,2,2-tetrachloroethane	50	210,000
	1,2-dichloroethane (EDC)	1,000	93,000
	Brominated diphenylethers (PBDE)	-	140
	Chloro-alkanes, C10-C13 ^a	-	
	Dichloromethane (DCM)	1,000	36
	Dieldrin ^a	1	
	Halogenated Organic Compounds (AOX)	-	
	Hexabromobiphenyl ^a	0.1	
	Hexachlorobenzene (HCB)	10	1,600,000
	Hexachlorobutadiene (HCBd) ^a	-	
	PCDD+PCFD (Dioxins+furans) (as Teq)	0.0001	
	Pentachlorobenzene	1	1,300
	Pentachlorophenol (PCP)	10	18,000
	Polychlorinated biphenyls (PCB)	0.1	360,000
	Tetrachloroethylene (PER)	2,000	930
	Tetrachloromethane (TCM)	100	
	Trichlorobenzenes (TCBs) (all isomers)	10	18
	Trichloroethylene	2,000	15,000
	Trichloromethane	500	
	Vinyl chloride	1,000	
Other organic substances	Anthracene	50	3.3
	Benzene	1,000	28,000
	Benzo(g,h,i)perylene	-	20,000

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Table OC.1 – continued from previous page

<i>Pollutant group</i>	<i>Pollutant</i>	<i>Threshold for releases, kg/year</i>	<i>Inhalation toxicity weight</i>
	Di- (2-ethyl hexyl) phthalate (DEHP)	10	8,600
	Ethyl benzene	-	890
	Ethylene oxide	1,000	
	Fluoranthene	-	
	Naphthalene	100	12,000
	Nonylphenol and nonylphenol ethoxylates (NP / NPEs) ^a	-	0
	Octylphenols and octylphenol ethoxylates ^a	-	
	Organotin compounds (as total Sn) ^a	-	
	Phenols (as total C)	-	120,000
	Polycyclic Aromatic hydrocarbons (PAHs)	50	390,000
	Toluene	-	0.7
	Total Organic Carbon (TOC) (as total C or COD / 3)	-	
	Xylenes	-	35
Inorganic substances	Asbestos	1	170,000,000
	Chlorides (as total Cl)	-	
	Cyanides (as total CN) ^a	-	
	Fluorides (as total F)	-	
	Particulate matter (PM ₁₀)	50,000	
	Total Nitrogen	-	
	Total Phosphorus ^a	-	50,000

Notes: ^a E-PRTR v18 database does not contain any values for the release of these pollutants to air. Unless otherwise specified any pollutant specified in Annex II is reported as the total mass of that pollutant or, where the pollutant is a group of substances, as the total mass of the group. A hyphen (-) indicates that the parameter and medium in question do not trigger a reporting requirement. GHGs - greenhouse gases.

Source: Annex II of the Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending the Council Directives 91/689/EEC and 96/61/EC <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:033:0001:0017:EN:PDF>. Inhalation toxicity weights are taken from the United States Environmental Protection Agency (EPA)'s Risk-Screening Environmental Indicators (RSEI) model version 2.3.9 from December 2020 (<https://www.epa.gov/rsei/rsei-toxicity-data-and-calculations>).

D Additional Tables and Figures

D.1 Summary Statistics for Selected Green Management Components

Table OD.1 shows the summary statistics for selected green management components. The numbers refer to the percentage of firms with a particular characteristic. For example, in Albania, 14.6 percent of firms have strategic objectives that mention environmental or climate change issues and 8.5 percent have a manager responsible for environmental and climate change issues. More than half (54.4 percent) of Albanian firms monitored their energy consumption, while only 15.5 percent monitored their water consumption. Less than 1 in 3 Albanian firms said that they emitted CO₂ in the three years prior to the survey, but less than a fifth of them (5.7/29.5) monitored their CO₂ emissions. Just over a fifth of Albanian firms had energy consumption targets, but only 4.6 percent had targets for CO₂ emissions.

D.2 Credit Constraints, Green Management, and Green Investments

Table OD.2 provides a battery of additional diagnostic tests in support of our instrumentation strategy used in Panel B, Table 2, with the first stage reported in Table 1.

Table OD.3 shows that the regression results in Table 2 are robust to restricting the sample to clusters with at least 3 observations. The magnitude and the significance of the estimated coefficients is very similar to those in Table 2. Tables OD.4 to OD.6 show that the regression results in Table 2 are robust to different versions of the green management measure. Table OD.4 combines the questions into a green management z-score as in Kling et al. (2007). That is, we normalize the scores for each question such that they have a mean of 0 and a standard deviation of 1. Those z-scores are then aggregated to produce average z-scores for each of the four areas of green management practices: (i) strategic objectives related to the environment and climate change; (iii) managers with an explicit green mandate; (3) environmental targets; and (iv) monitoring of energy/water usage and of various emissions. Lastly, we construct an overall z-score for green management practices as the unweighted average of the four types of practices. As usual, a z-score above zero indicates that a firm's management practices are better than the sample average.

Table OD.5 uses for green management the first principal component resulting from a Principal Component Analysis (PCA) using all the individual questions on green management practices.

Table OD.6 also uses PCA but now takes the first principal component of firms' scores on the four main green management areas. In all three cases, the results are quantitatively and qualitatively virtually unchanged.

Table OD.7 shows that the regression results in Table 2 are robust to adding the following firm-level controls: indicators for exporter status, listed firm, sole proprietorship and audited financial accounts, as well as the log of firm age. The magnitude and the significance of the estimated coefficients is very similar to those in Table 2.

Table OD.1: Summary Statistics for Selected Green Management Components by Country

Country	Env. and climate change strategic objectives	Env. and climate change manager	Energy consumption monitoring	Water consumption monitoring*	Emit CO ₂	Monitor CO ₂ emissions	Monitor CO ₂ emissions along supply chain	Energy consumption targets	CO ₂ emissions targets
Albania	14.6	8.5	54.4	15.5	29.5	5.7	4.3	21.7	4.6
Armenia	13.8	4.3	13.3	8.8	20.9	7.5	7.2	7.5	1.4
Azerbaijan	7.1	2.6	62.3	29.2	5.9	0.6	1.3	4.5	0.0
Belarus	9.4	17.2	88.0	77.6	22.5	17.0	1.3	36.9	7.6
Bosnia and Herz.	23.0	10.4	58.5	52.6	14.9	7.8	5.9	22.2	4.4
Bulgaria	25.0	13.9	36.2	27.1	5.0	3.8	8.2	33.1	8.8
Croatia	21.8	17.8	69.0	59.0	16.5	10.2	4.3	19.8	6.9
Czech Republic	26.1	22.6	85.5	74.6	22.8	10.0	2.3	39.1	5.8
Estonia	20.7	18.8	75.1	64.9	33.2	14.6	5.4	39.1	6.9
Georgia	11.8	8.1	46.6	43.2	9.9	5.2	4.2	13.1	2.7
Hungary	27.5	14.8	54.2	45.1	21.5	6.6	1.8	40.8	5.5
Latvia	22.5	17.2	79.9	64.5	36.3	20.9	6.1	52.9	12.3
Lithuania	13.2	7.4	64.2	55.7	32.0	6.5	3.5	32.9	5.8
Moldova	12.3	5.6	71.4	68.7	26.6	12.6	9.3	25.3	5.2
North Macedonia	31.4	19.6	72.6	62.0	7.1	4.1	6.8	42.9	6.1
Poland	18.8	15.9	38.6	24.4	14.1	6.5	4.4	17.7	4.9
Romania	17.7	15.2	52.8	50.5	11.6	7.3	6.4	17.4	6.3
Serbia	14.0	16.2	75.4	58.1	32.3	5.9	2.2	47.8	5.5
Slovak Republic	31.7	18.2	47.2	38.0	11.1	6.2	3.8	33.6	7.3
Slovenia	29.2	13.4	82.2	69.8	28.7	7.9	6.8	34.7	7.4
Turkey	7.4	3.2	50.6	37.2	4.9	1.7	3.0	14.7	3.5
Ukraine	18.6	15.5	82.4	67.2	17.2	11.0	9.9	41.0	7.2
Overall	18.2	12.7	59.5	46.7	16.6	7.5	5.0	28.1	5.7

Notes: This table presents summary statistics for selected green management components by country. They represent the percentage of all firms included in our analysis with a particular characteristic. Env. - environmental. * - Manufacturing only. *Sources:* EBRD-EIB-WBG Enterprise Surveys.

Table OD.2: 2nd Stage IV Diagnostics

Dependent variable →	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water manage- ment	Air / other pollution control	Log (energy cost per sales)
Credit constrained	-0.296** (0.142)	-0.325** (0.141)	-0.328** (0.130)	-0.076 (0.140)	-0.028 (0.094)	-0.105 (0.145)	-0.179 (0.132)	-0.099 (0.104)	0.590 (0.557)
Green management	1.060*** (0.257)	0.923*** (0.198)	1.143*** (0.180)	1.055*** (0.228)	1.146*** (0.155)	1.129*** (0.189)	1.555*** (0.182)	1.207*** (0.154)	-1.785*** (0.554)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118
R ²	0.118	0.145	0.093	0.217	0.088	0.228	0.225	0.239	0.132
Kleibergen-Paap rk LM statistic	42.644	42.644	42.644	42.644	42.644	42.644	42.644	42.644	29.673
Kleibergen-Paap rk LM statistic p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Stock-Wright LM S statistic	34.798	24.591	40.578	26.624	46.964	28.402	44.853	42.454	12.299
Stock-Wright S stat p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015
Anderson-Rubin Wald test	7.913	5.039	8.668	6.577	6.270	6.606	8.966	6.596	2.633
Anderson-Rubin Wald test p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.033
Anderson-Rubin chi2 test	31.898	20.312	34.941	26.513	25.273	26.628	36.142	26.591	10.634
Anderson-Rubin chi2 test p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031
Cragg-Donald F statistic	27.333	27.333	27.333	27.333	27.333	27.333	27.333	27.333	17.485
Kleibergen-Paap Wald rk F statistic	15.903	15.903	15.903	15.903	15.903	15.903	15.903	15.903	10.339
Hansen J statistic	1.049	1.039	6.331	4.030	2.992	7.323	1.835	1.874	0.642
Hansen J p-value	0.592	0.595	0.042	0.133	0.224	0.026	0.399	0.392	0.725

Notes: This table provides several diagnostic tests related to the instrumentation strategy used in Panel B of Table 2.

Table OD.3: Credit Constraints, Green Management, and Green Investments—Restricting the Sample to Clusters with at least 3 Observations

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: OLS									
Credit constrained	-0.099*** (0.014) [0.000]	-0.036*** (0.013) [0.017 / 0.020]	-0.042*** (0.013) [0.002 / 0.003]	-0.040*** (0.014) [0.010 / 0.006]	-0.017 (0.011) [0.189 / 0.080]	-0.028** (0.012) [0.014 / 0.047]	-0.031** (0.013) [0.017 / 0.022]	-0.001 (0.012) [0.964 / 0.949]	0.043 (0.047) [0.445]
Green management	0.451*** (0.039) [0.000]	0.668*** (0.039) [0.000 / 0.000]	0.617*** (0.042) [0.000 / 0.000]	0.720*** (0.037) [0.000 / 0.000]	0.581*** (0.046) [0.000 / 0.000]	0.785*** (0.036) [0.000 / 0.000]	1.065*** (0.037) [0.000 / 0.000]	0.949*** (0.033) [0.000 / 0.000]	-0.108 (0.126) [0.417]
R ²	0.180	0.191	0.175	0.224	0.170	0.256	0.270	0.275	0.210
Panel B: IV									
Credit constrained	-0.335** (0.149) [0.060]	-0.314** (0.139) [0.054 / 0.020]	-0.243** (0.121) [0.046 / 0.102]	-0.056 (0.144) [0.718 / 1.000]	-0.044 (0.096) [0.703 / 1.000]	-0.120 (0.146) [0.329 / 0.794]	-0.214 (0.131) [0.108 / 0.127]	-0.101 (0.102) [0.383 / 0.794]	0.453 (0.493) [0.363]
Green management	1.021*** (0.267) [0.000]	0.938*** (0.196) [0.000 / 0.000]	1.256*** (0.165) [0.000 / 0.000]	1.014*** (0.239) [0.001 / 0.000]	1.080*** (0.161) [0.000 / 0.000]	1.172*** (0.186) [0.000 / 0.000]	1.600*** (0.180) [0.000 / 0.000]	1.216*** (0.154) [0.000 / 0.000]	-1.107* (0.572) [0.074]
R ²	0.110	0.142	0.101	0.221	0.109	0.237	0.214	0.253	0.183
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,553	8,553	8,553	8,553	8,553	8,553	8,553	8,553	6,179
Clusters (localities)	678	678	678	678	678	678	678	678	635

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. The sample is restricted to clusters with at least 3 observations. All regressions include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table OB.1 provides information on regions and Table OB.2 on sectors. The square brackets contain, first, p-values taking into account spatial correlation following Colella, Lalive, Sakalli and Thoenig (2019) and, second, p-values under Bonferroni-Holm multiple hypothesis testing. Robust standard errors are clustered by locality and shown in parentheses. ***, **, * and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.4: Credit Constraints, Green Management, and Green Investments—Green Management z-score

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: OLS									
Credit constrained	-0.101*** (0.012)	-0.047*** (0.012)	-0.054*** (0.012)	-0.045*** (0.013)	-0.016* (0.010)	-0.037*** (0.011)	-0.032*** (0.011)	-0.001 (0.011)	0.011 (0.041)
Green management (z-score)	0.072*** (0.006)	0.111*** (0.005)	0.103*** (0.005)	0.113*** (0.005)	0.096*** (0.006)	0.124*** (0.005)	0.172*** (0.005)	0.161*** (0.005)	0.002 (0.019)
R ²	0.182	0.190	0.176	0.222	0.166	0.240	0.263	0.275	0.202
Panel B: IV									
Credit constrained	-0.318** (0.146)	-0.340** (0.144)	-0.355*** (0.135)	-0.096 (0.144)	-0.050 (0.097)	-0.122 (0.149)	-0.203 (0.135)	-0.120 (0.107)	0.667 (0.572)
Green management (z-score)	0.191*** (0.055)	0.158*** (0.036)	0.214*** (0.034)	0.188*** (0.048)	0.203*** (0.028)	0.195*** (0.037)	0.266*** (0.037)	0.209*** (0.028)	-0.323*** (0.106)
R ²	0.097	0.137	0.063	0.203	0.065	0.218	0.206	0.249	0.115
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management (z-score) and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. To compute the quality of green management z-score, the scores for each question are normalized such that they have a mean of 0 and a standard deviation of 1. Those z-scores are then aggregated to produce average z-scores for each of the four areas of green management practices: (i) strategic objectives related to the environment and climate change; (iii) managers with an explicit green mandate; (3) environmental targets; and (iv) monitoring of energy/water usage and of various emissions. An overall z-score for green management practices is constructed as the unweighted average of the four types of practices. All regressions include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, **, * and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.5: Credit Constraints, Green Management, and Green Investments—Green Management principal components 1 - all variables individually

Dependent variable →	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
Panel A: OLS									
Credit constrained	-0.102*** (0.012)	-0.049*** (0.012)	-0.055*** (0.012)	-0.047*** (0.013)	-0.017* (0.010)	-0.039*** (0.011)	-0.035*** (0.012)	-0.003 (0.011)	0.011 (0.041)
Green management (PCA 1)	0.030*** (0.003)	0.044*** (0.002)	0.042*** (0.003)	0.045*** (0.003)	0.040*** (0.003)	0.051*** (0.002)	0.071*** (0.003)	0.073*** (0.002)	0.005 (0.009)
R ²	0.178	0.178	0.166	0.209	0.150	0.226	0.237	0.266	0.202
Panel B: IV									
Credit constrained	-0.356** (0.152)	-0.352** (0.152)	-0.392*** (0.146)	-0.125 (0.153)	-0.069 (0.106)	-0.131 (0.155)	-0.230 (0.143)	-0.139 (0.115)	0.759 (0.620)
Green management (PCA 1)	0.103*** (0.036)	0.069*** (0.022)	0.117*** (0.023)	0.094*** (0.028)	0.092*** (0.016)	0.083*** (0.023)	0.125*** (0.023)	0.097*** (0.018)	-0.157** (0.069)
R ²	0.040	0.119	-0.022	0.166	0.036	0.205	0.154	0.233	0.098
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management (based on principal components analysis score, using all variables individually) and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. All regressions include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.6: Credit Constraints, Green Management, and Green Investments—Green Management principal components 2 - green management areas

Dependent variable →	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
Panel A: OLS									
Credit constrained	-0.100*** (0.012)	-0.046*** (0.012)	-0.053*** (0.012)	-0.044*** (0.013)	-0.016 (0.010)	-0.036*** (0.011)	-0.031*** (0.011)	-0.001 (0.011)	0.010 (0.041)
Green management (PCA 2)	0.054*** (0.004)	0.081*** (0.004)	0.073*** (0.004)	0.084*** (0.004)	0.066*** (0.004)	0.089*** (0.003)	0.127*** (0.003)	0.108*** (0.003)	-0.004 (0.013)
R ²	0.186	0.197	0.179	0.231	0.167	0.246	0.285	0.269	0.202
Panel B: IV									
Credit constrained	-0.299** (0.144)	-0.326** (0.141)	-0.331** (0.132)	-0.076 (0.142)	-0.024 (0.095)	-0.102 (0.147)	-0.178 (0.130)	-0.096 (0.106)	0.618 (0.557)
Green management (PCA 2)	0.126*** (0.032)	0.107*** (0.021)	0.136*** (0.020)	0.121*** (0.027)	0.125*** (0.017)	0.126*** (0.022)	0.178*** (0.021)	0.133*** (0.017)	-0.214*** (0.065)
R ²	0.117	0.151	0.093	0.224	0.102	0.234	0.247	0.253	0.125
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management (based on principal components analysis score, using all variables individually) and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. All regressions include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.7: Credit Constraints, Green Management, and Green Investments—Adding Firm-level Controls

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: OLS									
Credit constrained	-0.090*** (0.012)	-0.038*** (0.012)	-0.046*** (0.012)	-0.038*** (0.013)	-0.012 (0.009)	-0.029*** (0.011)	-0.024** (0.011)	0.005 (0.010)	-0.006 (0.040)
Green management	0.342*** (0.036)	0.605*** (0.034)	0.545*** (0.036)	0.654*** (0.031)	0.552*** (0.038)	0.702*** (0.032)	0.989*** (0.033)	0.884*** (0.028)	0.118 (0.109)
R ²	0.200	0.200	0.184	0.230	0.169	0.248	0.274	0.266	0.208
Panel B: IV									
Credit constrained	-0.285** (0.141)	-0.321** (0.142)	-0.325** (0.131)	-0.075 (0.140)	-0.031 (0.095)	-0.104 (0.145)	-0.180 (0.133)	-0.101 (0.104)	0.575 (0.549)
Green management	0.970*** (0.310)	0.850*** (0.244)	1.138*** (0.221)	1.020*** (0.273)	1.208*** (0.193)	1.083*** (0.233)	1.535*** (0.225)	1.195*** (0.192)	-1.804*** (0.676)
R ²	0.139	0.153	0.097	0.221	0.072	0.233	0.227	0.242	0.135
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. All regressions include the following firm-level controls: indicators for exporter status, listed firm, and log firm age. They also include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table A3 provides summary statistics, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, **, * and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.8: Firm-Level IV regressions: First Stage (alternative)

Dependent variable →	Columns 1-8, Table 2		Column 9, Table 2	
	Credit constrained (indicator)	Green management (0-1 score)	Credit constrained (indicator)	Green management (0-1 score)
	[1]	[2]	[3]	[4]
Leave-out mean credit constraints	0.225*** (0.036)		0.200*** (0.040)	
Change in average local Tier 1 ratio (% points)	0.004*** (0.002)		0.003 (0.002)	
EBA 2014 instrument (% points)	-0.018*** (0.007)		-0.019*** (0.007)	
Leave-out mean green management		0.251*** (0.045)		0.267*** (0.052)
Leave-out mean green investment	-0.014 (0.022)	-0.001 (0.010)	-0.040 (0.026)	0.010 (0.011)
Region FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	10,776	10,776	8,643	8,643
Clusters (localities)	2,502	2,502	2,118	2,118
R ²	0.145	0.198	0.134	0.214
F test of excluded instruments	20.936	30.625	13.318	26.907

Notes: This table presents the first-stage regressions corresponding to Table OD.9; columns 1-2 are the first stage regressions for results in columns 1-8 in Table OD.9 and columns 3-4 are the first stage regressions for results in column 9 in Table OD.9. Compared to our baseline IV approach, columns 1 and 3 now only include the credit-related instruments whereas columns 2 and 4 only include the green management instrument. All regressions include locality-level credit market controls (log local banks' average asset size in a 15 km radius and the number of bank branches in a 15 km radius) and population size class; indicators for no firms in other sectors in a 15 km radius with data on credit constraints and green management; and region and sector fixed effects. Table A1 contains all variable definitions, Table A3 provides summary statistics, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.9: Firm-Level Credit Constraints, Green Management, and Green Investments (alternative)

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water man- agement	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Credit constrained	-0.241* (0.139)	-0.276* (0.150)	-0.265* (0.143)	-0.018 (0.159)	0.032 (0.124)	-0.041 (0.160)	-0.095 (0.151)	-0.035 (0.127)	0.393 (0.549)
Green management	1.112*** (0.212)	0.993*** (0.256)	1.241*** (0.272)	1.104*** (0.218)	1.142*** (0.265)	1.198*** (0.255)	1.609*** (0.295)	1.240*** (0.270)	-1.805*** (0.625)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,796	10,796	10,796	10,796	10,796	10,796	10,796	10,796	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118
R ²	0.173	0.164	0.148	0.188	0.099	0.194	0.162	0.137	0.204

Notes: This table presents Instrumental Variables regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. All regressions include locality-level credit market controls (log local banks' average asset size in a 15 km radius and the number of bank branches in a 15 km radius); population size class; and region and sector fixed effects. The endogenous variables are instrumented as per Table OD.8. Table A1 contains all variable definitions, Table A3 provides summary statistics, Table OB.1 provides information on regions and Table OB.2 on sectors. The square brackets contain, first, p-values taking into account spatial correlation following Colella, Lalive, Sakalli and Thoenig (2019) and, second, p-values under Bonferroni-Holm multiple hypothesis testing. Table OD.8 provides the first stage of the IV regressions. Robust standard errors are clustered by locality and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.10: Credit Constraints, Green Management, and Green Investments—E-PRTR vs. non-EPRTR

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: OLS									
Credit constrained	-0.087*** (0.016)	-0.028* (0.015)	-0.061*** (0.016)	-0.025* (0.015)	-0.029** (0.012)	-0.007 (0.012)	-0.022 (0.014)	-0.006 (0.012)	0.003 (0.051)
Credit constrained × E-PRTR	-0.032 (0.026)	-0.043* (0.025)	0.020 (0.023)	-0.044 (0.027)	0.033* (0.019)	-0.066*** (0.023)	-0.020 (0.024)	0.015 (0.021)	0.022 (0.082)
Green management	0.434*** (0.060)	0.699*** (0.063)	0.676*** (0.048)	0.760*** (0.059)	0.567*** (0.052)	0.853*** (0.049)	1.048*** (0.056)	1.026*** (0.046)	-0.079 (0.172)
Green management × E-PRTR	0.013 (0.069)	-0.035 (0.073)	-0.096 (0.066)	-0.081 (0.069)	0.019 (0.072)	-0.141** (0.062)	0.004 (0.066)	-0.154*** (0.057)	0.063 (0.215)
E-PRTR	1.516* (0.894)	2.218** (0.955)	2.121** (0.855)	1.219 (0.879)	-0.067 (0.610)	1.159 (0.770)	1.688** (0.734)	1.297** (0.600)	-5.109* (2.611)
R ²	0.184	0.193	0.177	0.227	0.167	0.245	0.270	0.263	0.203
Panel B: IV									
Credit constrained	-0.551** (0.221)	-0.603** (0.249)	-0.630*** (0.242)	-0.210 (0.196)	-0.171 (0.146)	0.110 (0.202)	-0.230 (0.246)	-0.203 (0.184)	-0.047 (0.733)
Credit constrained × E-PRTR	0.413 (0.294)	0.462 (0.309)	0.483* (0.292)	0.275 (0.279)	0.245 (0.193)	-0.332 (0.286)	0.155 (0.292)	0.168 (0.220)	1.273 (1.090)
Green management	1.268*** (0.460)	1.230** (0.483)	1.106** (0.448)	1.380*** (0.413)	0.900*** (0.296)	1.540*** (0.415)	2.106*** (0.504)	1.585*** (0.326)	0.534 (1.120)
Green management × E-PRTR	-0.383 (0.517)	-0.526 (0.506)	-0.119 (0.474)	-0.514 (0.462)	0.225 (0.332)	-0.546 (0.452)	-0.735 (0.521)	-0.570 (0.361)	-3.505*** (1.280)
E-PRTR	0.725 (0.875)	1.488 (0.945)	1.399 (0.890)	0.655 (0.838)	-0.468 (0.630)	0.585 (0.793)	0.969 (0.760)	0.825 (0.636)	-4.905* (2.792)
R ²	0.065	0.069	0.027	0.198	0.093	0.215	0.199	0.219	0.078
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,776	10,776	10,776	10,776	10,776	10,776	10,776	10,776	8,643
Clusters (localities)	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,502	2,118

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints and the quality of green management and, on the other hand, firm-level investments in columns 1-8 and firm-level log energy cost per sales in column 9. E-PRTR is an indicator equal to 1 for firms in Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia, Slovak Republic, and Slovenia. All regressions include the following firm-level controls: indicators for exporter status, listed firm, and log firm age. They also include locality-level credit market controls (log average amount of assets of banks in a 15 km radius and the number of bank branches in a 15 km radius), the population size bracket as well as region and sector fixed effects. Table A1 contains all variable definitions, Table A3 provides summary statistics, Table OB.1 provides information on regions and Table OB.2 on sectors. Robust standard errors are clustered by locality and shown in parentheses. ***, **, * and * correspond to the 1%, 5%, and 10% level of statistical significance.

Table OD.11: Credit Constraints, Green Management, and Green Investments—E-PRTR vs. non-E-PRTR

	non-EPRTR			E-PRTR			p-value
	N	Mean	Standard error	N	Mean	Standard error	
	[1]	[2]	[3]	[4]	[5]	[6]	
Credit constrained	5,254	0.293	0.006	5,522	0.157	0.005	0.000
Green management	5,254	0.101	0.002	5,522	0.137	0.003	0.000
Fixed asset investment	5,254	0.396	0.007	5,522	0.504	0.007	0.000
Machinery upgrade	5,254	0.437	0.007	5,522	0.502	0.007	0.000
Vehicle upgrade	5,254	0.309	0.006	5,522	0.373	0.007	0.000
Heat/cool/light	5,254	0.543	0.007	5,522	0.562	0.007	0.053
Green energy generation	5,254	0.116	0.004	5,522	0.133	0.005	0.008
Waste and recycling	5,254	0.286	0.006	5,522	0.502	0.007	0.000
Energy / water management	5,254	0.349	0.007	5,522	0.340	0.006	0.298
Air / other pollution control	5,254	0.209	0.006	5,522	0.189	0.005	0.009

Notes: This table shows the results of two-sided t-tests of differences in means between firms in E-PRTR countries and non-E-PRTR countries in our sample. Table A1 contains all variable definitions, Table A3 provides summary statistics.

D.3 Green Management and General Management

Panel B of Table 2 shows a negative and statistically significant relationship between whether a firm is credit constrained and the likelihood that it makes a fixed asset investment as well as green investments with a fixed asset component, such as machinery and equipment upgrades and vehicle upgrades. However, it also shows a positive and statistically significant relationship between green management practices and fixed asset investment as well as all types of green investment. To check whether this is indeed driven by the quality of *green* management or by general management practices, we create and add a measure of firms' general management practices to the model.

The quality of general management practices can be assessed for a sample of firms with at least 20 employees; i.e. a smaller sample than in our main results. They were asked a selection of questions from the US Census Bureau's Management and Organizational Practices Survey (MOPS) (Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten and Van Reenen, 2019). The questions concerned four aspects of management—operations, monitoring, targets, and incentives—and offered unordered categorical responses. The operations question focused on how the firm handled a process-related problem, such as machinery breaking down. The monitoring question covered the collection of information on production indicators. The questions on targets focused on the timescale for production targets, as well as how difficult it was to achieve them and who was aware

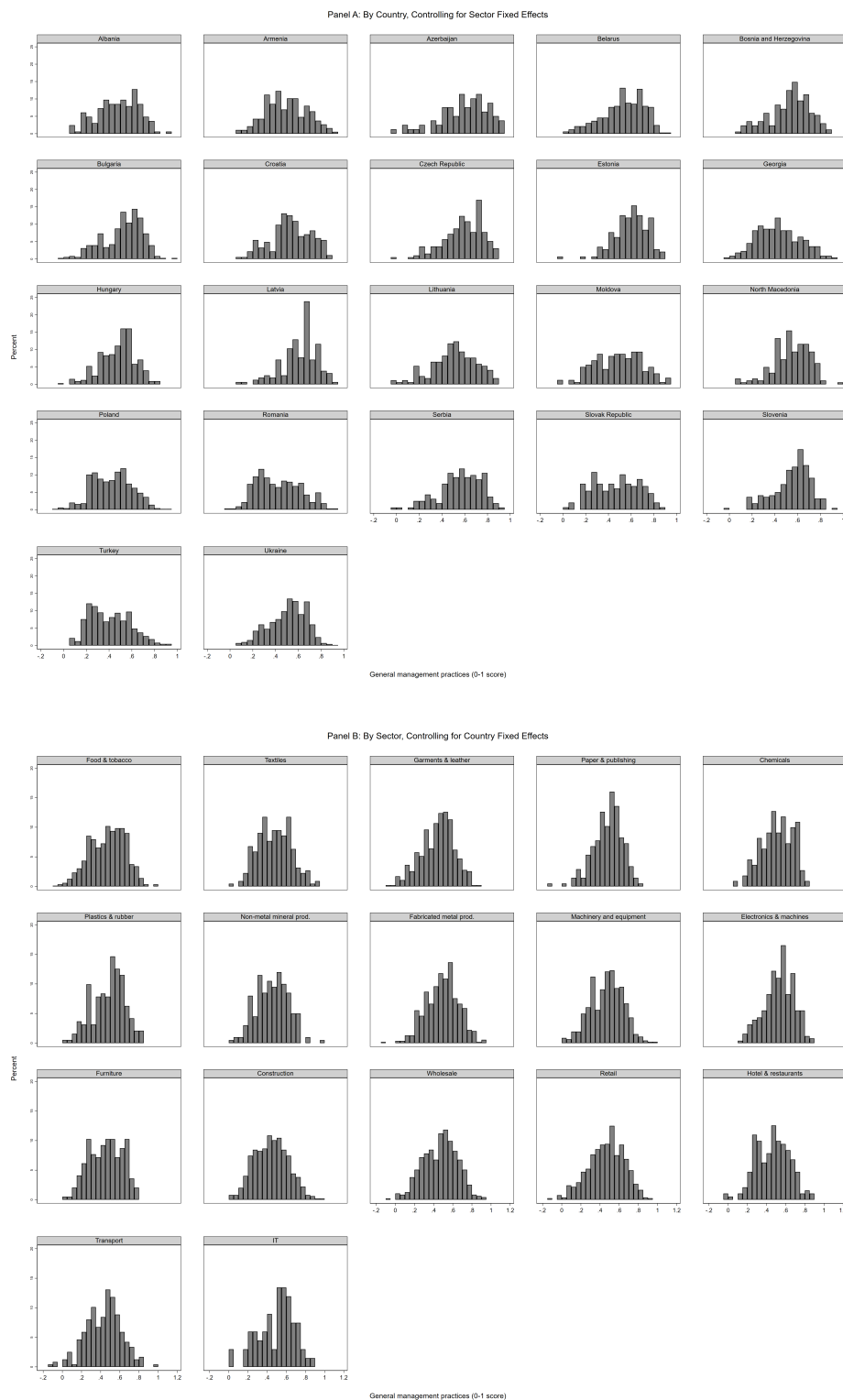
of them. Lastly, the incentives questions covered criteria governing promotion, practices for addressing poor performance by employees and the basis on which production targets achievement was rewarded.

Based on the firms' answers, their management practices can be assessed and assigned a rating. As the scaling varies across management practices, we assign a rating between 0 and 1 to each management practice (that is, each question; ratings assigned can be found in Online Appendix A.1.4). We then calculate unweighted averages using the scores for each individual area of the respective management practice, in order to prevent accentuating the target or incentives areas, which include multiple questions. Lastly, we compute an unweighted average across the scores for the four management areas.

Management practices of individual firms have scores of between 0 and 1, where the scores close to 0 denote 'bad' (below average) practices and the scores close to 1 indicate 'good' practices, and the higher score reflects a higher management practices quality. Figure OD.1 shows the distribution of the quality of general management by country (Panel A, controlling for sector fixed effects) and by sector (panel B, controlling for country fixed effects) in the sample we use in our analysis.

Table OD.12 provides the sample breakdown by country and Table OD.13 presents summary statistics. Compared with the sample used in the main paper, firms with at least 20 employees that also have information on general management practices are somewhat more likely to invest in fixed assets, as well as in all types of green investment. More than 53 percent invested in fixed assets, compared with over 45 percent in the larger sample used in the paper. Almost 80 percent of firms made at least one type of green investment, compared with less than 75 percent in the larger sample.

Figure OD.1: Distribution of the Quality of General Management by Country and Sector



Notes: These figures show the distribution of the quality of general management practices by country, controlling for sector fixed effects (Panel A) and by sector, controlling for country fixed effects (Panel B). Sector groupings can be found in Table OB.2 in Online Appendix B.

Table OD.12: Sample Breakdown by Country

Countries	Number of unique firms and facilities		
	Tables	Tables	Table OD.17
	OD.13-OD.14 (columns 1-8)	OD.13-OD.14 (column 9)	
Albania	164	156	0
Armenia	187	151	0
Azerbaijan	79	38	0
Belarus	326	274	0
Bosnia and Herzegovina	168	108	0
Bulgaria	354	242	0
Croatia	183	177	0
Czech Republic	194	186	129
Estonia	143	144	10
Georgia	219	187	0
Hungary	324	279	45
Latvia	155	139	7
Lithuania	170	158	14
Moldova	160	171	0
North Macedonia	181	138	0
Poland	496	110	222
Romania	325	316	0
Serbia	161	108	0
Slovak Republic	148	158	47
Slovenia	219	176	57
Turkey	884	809	0
Ukraine	712	452	0
<i>Total</i>	<i>5,952</i>	<i>4,677</i>	<i>531</i>

Source: EBRD-EIB-WBG Enterprise Surveys, E-PRTR v18 and EPER.

As for the explanatory variables, we find that a fifth of firms are credit constrained (20.1 percent). The *Green Management* variable is 0.153 on average but varies considerably between 0 and 0.95 (none of the firms scores 1 on all green management practices). The *General Management* variable varies between 0 and 0.94 (again, none of the firms scores 1 on all general management practices). We can now augment the OLS regression in Equation (1) as follows:

$$\begin{aligned}
 Y_i = & \beta_0 + \beta_1 \text{CreditConstrained}_i + \beta_2 \text{GreenManagement}_i \\
 & + \beta_3 \text{GeneralManagement}_i + \gamma' \mathbf{X}_i + \epsilon_i
 \end{aligned}
 \tag{OD.1}$$

where *General Management* is a score between 0 and 1 measuring the quality of general manage-

ment practices, and other variables are the same as in Equation (1).

Panel A of Table OD.14 shows that there is a negative and statistically significant relationship between whether a firm is credit constrained and the likelihood that it invests in fixed assets (column 1). Credit constraints are also negatively correlated with the probability of the firm making some types of green investments. Conversely, the quality of green management is correlated positively and significantly with all types of green investment, as well as fixed asset investment. Similarly, the quality of general management is also correlated positively and significantly with all types of green as well as fixed asset investment, although the magnitude of the general management coefficient is smaller than the magnitude of the green management coefficient for all types of green investment. The magnitude of the general management coefficient is larger than the magnitude of the green management coefficient for fixed asset investment.

Table OD.13: Summary Statistics

	N	Mean	Median	Std. Dev.	Min	Max
	[1]	[2]	[3]	[4]	[5]	[6]
<i>Table OD.14 (columns 1-8)</i>						
Fixed asset investment	5,952	0.532	1.000	0.499	0.000	1.000
Machinery upgrade	5,952	0.534	1.000	0.499	0.000	1.000
Vehicle upgrade	5,952	0.401	0.000	0.490	0.000	1.000
Heat/cool/light	5,952	0.604	1.000	0.489	0.000	1.000
Green energy generation	5,952	0.154	0.000	0.361	0.000	1.000
Waste and recycling	5,952	0.449	0.000	0.497	0.000	1.000
Energy / water management	5,952	0.413	0.000	0.492	0.000	1.000
Air / other pollution control	5,952	0.252	0.000	0.434	0.000	1.000
Credit constrained	5,952	0.201	0.000	0.400	0.000	1.000
Green management	5,952	0.153	0.052	0.200	0.000	0.949
General management	5,952	0.493	0.507	0.187	0.000	0.944
Exporter status (indicator)	5,952	0.347	0.000	0.476	0.000	1.000
Listed firm (indicator)	5,952	0.090	0.000	0.287	0.000	1.000
Sole proprietorship (indicator)	5,952	0.096	0.000	0.295	0.000	1.000
Audited financial accounts (indicator)	5,952	0.456	0.000	0.498	0.000	1.000
Log (firm age)	5,952	2.889	2.996	0.674	0.000	5.323
No. bank branches ('000)	5,952	0.193	0.068	0.319	0.001	2.379
Local banks' average asset size in 2007 (log)	5,952	15.162	15.139	1.526	11.471	17.622
Leave-out mean credit constraints	5,952	0.224	0.179	0.209	0.000	1.000
Change in average local Tier 1 ratio (% points)	5,952	5.154	4.549	7.203	-21.701	47.358
EBA 2014 instrument (% points)	5,952	5.343	4.653	3.106	0.140	22.035
Leave-out mean green management	5,952	0.148	0.106	0.156	0.000	0.922
Leave-out mean green investment	5,952	0.623	0.800	0.404	0.000	1.000
No data on leave-out mean credit constraint	5,952	0.006	0.000	0.075	0.000	1.000

Continued on next page

Table OD.13 – continued from previous page

	N	Mean	Median	Std. Dev.	Min	Max
	[1]	[2]	[3]	[4]	[5]	[6]
No data on leave-out green management	5,952	0.216	0.000	0.412	0.000	1.000
No data on leave-out green investment	5,952	0.213	0.000	0.410	0.000	1.000

Table OD.14 (column 9)

Log (energy cost per sales)	4,677	-3.883	-3.828	1.428	-10.597	0.113
Credit constrained	4,677	0.198	0.000	0.398	0.000	1.000
Green management	4,677	0.156	0.062	0.199	0.000	0.970
General management	4,677	0.497	0.514	0.187	0.000	0.944
Exporter status (indicator)	4,677	0.355	0.000	0.479	0.000	1.000
Listed firm (indicator)	4,677	0.095	0.000	0.293	0.000	1.000
Sole proprietorship (indicator)	4,677	0.084	0.000	0.277	0.000	1.000
Audited financial accounts (indicator)	4,677	0.484	0.000	0.500	0.000	1.000
Log (firm age)	4,677	2.891	2.996	0.678	0.000	5.323
No. bank branches ('000)	4,677	0.156	0.059	0.255	0.001	2.379
Local banks' average asset size in 2007 (log)	4,677	15.165	15.204	1.572	11.471	17.622
Leave-out mean credit constraints	4,677	0.221	0.184	0.203	0.000	1.000
Change in average local Tier 1 ratio (% points)	4,677	5.489	5.076	7.697	-21.701	47.358
EBA 2014 instrument (% points)	4,677	5.586	4.785	3.379	0.140	22.035
Leave-out mean green management	4,677	0.148	0.104	0.158	0.000	0.922
Leave-out mean green investment	4,677	0.621	0.804	0.407	0.000	1.000
No data on leave-out mean credit constraint	4,677	0.006	0.000	0.077	0.000	1.000
No data on leave-out green management	4,677	0.223	0.000	0.416	0.000	1.000
No data on leave-out green investment	4,677	0.219	0.000	0.414	0.000	1.000

Notes: Table A1 contains all variable definitions. *Sources:* EBRD-EIB-WBG Enterprise Surveys, Banking Environment and Performance Survey II, Bureau van Dijk's ORBIS database, European Pollutant Release and Transfer Register v18, and authors' calculations.

However, as discussed in Section 3.1, a firm's investment decisions can influence its green management practices and credit constraints. They may also influence its general management practices. To instrument the latter, we assume that general management practices are also a form of intangible capital and that local access to this form of capital is determined by knowledge diffusion from larger firms, which varies from area to area. We compute a "leave-out" (LO) instrument for general management as the average of general management of all firms in higher size deciles (based on the number of permanent, full-time employees, l , than firm i :

$$GeneralManagementsLO_i = \frac{1}{\#} \sum_{j \text{ s.t. } decile(j) > decile(i) \text{ \& } v(j)=v(i)} GeneralManagement_j \quad (OD.2)$$

For firms in the top size decile or firms that do not have any firms in higher size deciles, we

set *GeneralManagementsLO_i* equal to 0 and include an indicator identifying such cases in the regression as a control variable.

Consequently, our 2SLS framework comprises the first-stage equations

$$\begin{aligned}\Xi_i = & \delta_0 + \delta_1 \textit{CreditConstrainedLO}_i + \delta_2 \Delta \textit{Tier1}_i + \delta_3 \Delta \textit{Tier1H}_i \\ & + \delta_4 \textit{GreenManagementLO}_i + \delta_5 \textit{GeneralManagementLO}_i + \gamma' \mathbf{X}_i + \delta_6 \bar{Y}_{-i} + \epsilon_i\end{aligned}\tag{OD.3}$$

for $\Xi \in \{\textit{CreditConstrained}, \textit{GreenManagment}, \textit{GeneralManagement}\}$; and the second-stage equation

$$\begin{aligned}Y_i = & \beta_0 + \beta_1 \widehat{\textit{CreditConstrained}}_i + \beta_2 \widehat{\textit{GreenManagement}}_i \\ & + \beta_3 \widehat{\textit{GeneralManagement}}_i + \gamma' \mathbf{X}_i + \beta_4 \bar{Y}_{-i} + \varepsilon_i\end{aligned}\tag{OD.4}$$

where the instrumental variables are as detailed above, and other variables are described for the OLS estimation Equation (1).

The second-stage results in Panel B of Table OD.14 confirm that credit constraints significantly reduce the likelihood of green investments with a fixed asset component, such as machinery or vehicle upgrades. Some of these results are only statistically significant at the 10 percent level, due to a much smaller sample than in Table 2. The results also confirm that green management significantly affects the likelihood of firms making most types of green investment, but not fixed asset investment, machinery upgrades and improved heating, cooling or lighting. Conversely, and importantly, general management quality significantly affects the likelihood of firms investing in fixed assets, but *not* of making green investments (with the exception of improved heating, cooling and lighting and energy or water management, significant at the 10 percent level). The table also shows that these results, like the OLS ones, are generally robust to correcting the *p*-values for multiple hypothesis testing and for spatial correlation.

Table OD.14: Firm-level Credit Constraints, Green Management, General Management, and Green Investments

Dependent variable →	Fixed asset investment (indicator)	Machinery, equipment upgrades	Vehicle upgrades	Improved heating / cooling / lighting	Green energy generation	Waste and recycling	Energy / water management	Air / other pollution control	Log (energy cost per sales)
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Panel A: OLS									
Credit constrained	-0.083*** (0.016) [0.000]	-0.025 (0.017) [0.229 / 0.220]	-0.049*** (0.016) [0.007 / 0.012]	-0.043** (0.017) [0.043 / 0.022]	-0.024* (0.013) [0.100 / 0.174]	-0.037** (0.016) [0.062 / 0.083]	-0.028** (0.014) [0.049 / 0.180]	-0.003 (0.015) [0.845 / 0.811]	-0.047 (0.051) [0.478]
Green management	0.185*** (0.037) [0.000]	0.438*** (0.038) [0.000 / 0.000]	0.418*** (0.040) [0.000 / 0.000]	0.513*** (0.033) [0.000 / 0.000]	0.526*** (0.038) [0.000 / 0.000]	0.600*** (0.034) [0.000 / 0.000]	0.886*** (0.038) [0.000 / 0.000]	0.903*** (0.030) [0.000 / 0.000]	0.381*** (0.125) [0.004]
General management	0.544*** (0.039) [0.000]	0.435*** (0.040) [0.000 / 0.000]	0.290*** (0.040) [0.000 / 0.000]	0.318*** (0.041) [0.000 / 0.000]	0.053 (0.037) [0.170 / 0.180]	0.353*** (0.038) [0.000 / 0.000]	0.319*** (0.041) [0.000 / 0.000]	0.110*** (0.036) [0.008 / 0.002]	-0.455*** (0.124) [0.001]
R ²	0.245	0.219	0.186	0.268	0.168	0.278	0.283	0.277	0.249
Panel B: IV									
Credit constrained	-0.352 (0.219) [0.094]	-0.409 (0.251) [0.188 / 0.488]	-0.486* (0.234) [0.051 / 0.285]	-0.036 (0.227) [0.870 / 1.000]	0.038 (0.169) [0.843 / 1.000]	-0.186 (0.232) [0.461 / 1.000]	-0.160 (0.219) [0.494 / 1.000]	-0.159 (0.193) [0.432 / 1.000]	0.144 (0.715) [0.852]
Green management	0.021 (0.409) [0.957]	0.504 (0.428) [0.325 / 1.000]	0.875* (0.404) [0.065 / 0.377]	0.567 (0.383) [0.140 / 1.000]	1.526*** (0.348) [0.000 / 0.000]	0.701 (0.377) [0.115 / 0.557]	0.786* (0.401) [0.097 / 0.377]	1.380*** (0.339) [0.000 / 0.000]	-0.364 (1.247) [0.827]
General management	0.750** (0.257) [0.002]	0.303 (0.266) [0.259 / 1.000]	0.112 (0.254) [0.681 / 1.000]	0.511 (0.272) [0.123 / 0.377]	-0.261 (0.261) [0.371 / 1.000]	0.349 (0.264) [0.236 / 1.000]	0.514 (0.289) [0.127 / 0.377]	-0.075 (0.245) [0.779 / 1.000]	-0.667 (0.809) [0.559]
R ²	0.201	0.142	0.053	0.264	-0.065	0.266	0.270	0.223	0.236
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,952	5,952	5,952	5,952	5,952	5,952	5,952	5,952	4,677
Clusters (localities)	1,609	1,609	1,609	1,609	1,609	1,609	1,609	1,609	1,351

Notes: This table presents OLS (Panel A) and Instrumental Variables (Panel B) regressions to estimate the relation between, on the one hand, firm-level credit constraints, the quality of green management, and the quality of general management and, on the other hand, firm-level green investments. All regressions include locality-level credit market controls (log local banks' average asset size in a 15 km radius and the number of bank branches in a 15 km radius) and population size class; and region and sector fixed effects. Table A1 contains all variable definitions, Table OD.13 provides summary statistics, Table OB.1 provides information on regions and Table OB.2 on sectors. The square brackets contain, first, the p-values taking into account spatial correlation following Colella, Lalive, Sakalli and Thoenig (2019) and, second, the p-values under Bonferroni-Holm multiple hypothesis testing. Table 1 provides the first stage of the IV regressions in Panel B. Robust standard errors are clustered by locality and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

D.4 Robustness to Using an Inverse Hyperbolic Sine Transformation

Tables OD.15 and OD.16 show that the estimates reported in Tables 3 and 4 are robust to using an inverse hyperbolic sine rather than log transformation of the dependent variables.

Table OD.15: Facility-Level Credit Constraints, Green Management and Air Pollution

Dependent variable →	CO ₂	NO _x	SO _x	Hazardous air pollutants
	[1]	[2]	[3]	[4]
Local mean credit constraints	0.627** (0.285)	0.664* (0.341)	0.566* (0.295)	0.031 (0.082)
Local mean green management	-1.037** (0.444)	-1.077** (0.501)	-0.590 (0.427)	0.053 (0.115)
Region FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Observations	10,161	10,161	10,161	10,161
Clusters (facilities)	3,387	3,387	3,387	3,387
R ²	0.070	0.094	0.100	0.035

Notes: This table presents OLS regressions to estimate the relation between, on the one hand, local credit constraints and the quality of green management and, on the other hand, inverse hyperbolic sine transformation of facility-level CO₂, NO_x, SO_x emissions and emissions of hazardous air pollutants (using toxicity weights from EPA's Risk-Screening Environmental Indicators (RSEI) model, see Online Appendix C, Table OC.1 for details). Missing pollutant emission values are replaced with pollutant reporting threshold value. The sample consists of all facilities that appear in E-PRTR in all years between 2015-17. For each E-PRTR facility, values for the variables *Local mean credit constraints* and *Local mean green management* are calculated as averages of the predicted values from Table 1 across all firms in other sectors within a 15km radius around the industrial facility or, in the case of multi-facility firms the parent company. If there are no such firms within a 15km radius, the value is set to 0. All regressions include indicators for years 2016 and 2017; locality-level credit market controls (log local banks' average asset size in a 15km radius and the number of bank branches in a 15km radius around the industrial facility or, in the case of multi-facility firms the parent company); an indicator for missing local mean credit constraints/green management value (set to 0 in the variable itself); locality size controls; and region and sector fixed effects. Table A1 contains all variable definitions and Table A3 provides summary statistics. Bootstrapped standard errors are clustered by facility and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of significance.

Table OD.16: Local Credit Shocks and Air Pollution, 2007-17

Dependent variable →	CO ₂	NO _x	SO _x	Hazardous air pollutants	CO ₂	NO _x	SO _x	Hazardous air pollutants
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Local banks' reliance on wholesale funding	-0.111 (0.885)	-1.735* (0.963)	-7.829** (3.074)	-2.327 (1.767)	0.193 (0.696)	-0.713 (0.857)	-5.635* (2.963)	-1.232 (1.056)
Post 2007 × Local banks' reliance on wholesale funding	0.157* (0.091)	0.167* (0.093)	0.241** (0.107)	0.093** (0.043)				
Post 2007	-0.112** (0.045)	-0.184*** (0.047)	-0.257*** (0.055)	-0.054** (0.026)				
2008-2013 × Local banks' reliance on wholesale funding					0.107 (0.079)	0.102 (0.076)	0.187** (0.095)	0.082** (0.040)
2014-2017 × Local banks' reliance on wholesale funding					0.229* (0.118)	0.270** (0.128)	0.352** (0.138)	0.127** (0.054)
2008-2013					-0.078** (0.039)	-0.122*** (0.038)	-0.185*** (0.048)	-0.048** (0.024)
2014-2017					-0.161*** (0.058)	-0.280*** (0.065)	-0.380*** (0.072)	-0.072** (0.033)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,934	3,934	3,934	3,934	5,901	5,901	5,901	5,901
Clusters (facilities)	1,967	1,967	1,967	1,967	1,967	1,967	1,967	1,967
R ²	0.007	0.042	0.051	0.004	0.008	0.041	0.053	0.004

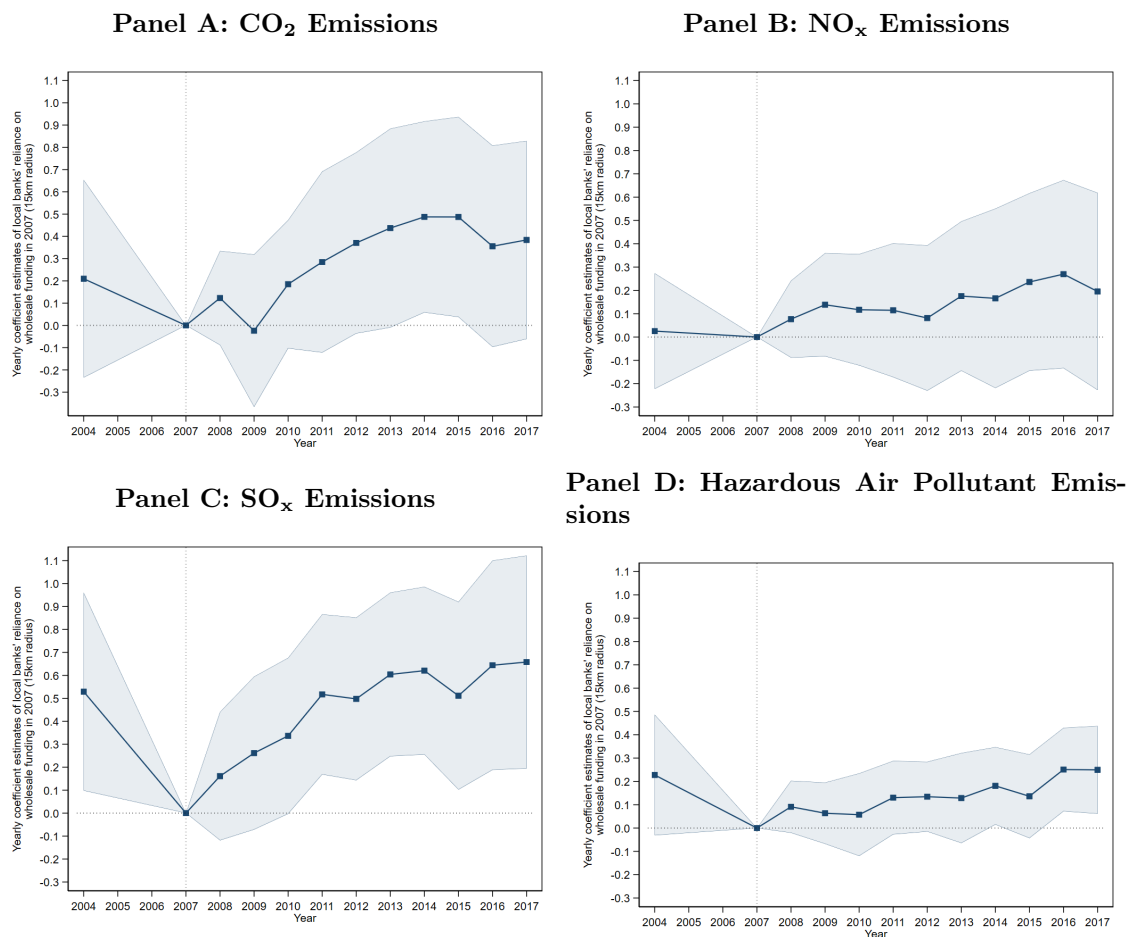
Notes: This table presents OLS regressions to estimate the relation between credit constraints and inverse hyperbolic sine transformation of facility-level CO₂, NO_x, SO_x emissions and emissions of hazardous air pollutants (using inhalation toxicity weights from EPA's Risk-Screening Environmental Indicators (RSEI) model, see Online Appendix C, Table OC.1 for details). Missing pollutant emission values are replaced with pollutant reporting threshold value. The sample consists of all facilities that appear in E-PRTR in all years between 2007-17. Local banks' reliance on wholesale funding (15 km) measures the average reliance (in 2007) on wholesale funding of all bank branches located in a circle with a 15 km radius around the industrial facility or, in the case of multi-facility firms the parent company. All regressions include locality-level credit market controls (log local banks' average asset size in a 15km radius and the number of bank branches in a 15km radius around the industrial facility or, in the case of multi-facility firms the parent company); and facility fixed effects. Table A1 contains all variable definitions and Table A3 provides summary statistics. Standard errors are clustered by facility and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

D.5 The Global Financial Crisis, Local Credit Shocks, and Industrial Emissions: 2004 2007-17

While the E-PRTR covers the period from 2007 onward, we are able to provide an indication of parallel trends assumption by using data for a subset of countries from the predecessor dataset, the European Pollutant Emission Register (EPER). EPER provides data on emissions to water and air of 50 key pollutants from large and medium-sized industrial point sources in the European Union in 2001 and 2004. In 2001, EPER covered 9,400 facilities in EU15, Hungary, and Norway. In 2004, the register covered approximately 12,000 facilities in EU25 and Norway. In our sample of EU countries, Hungary was covered in 2001 and 2004, while Czech Republic, Estonia, Latvia, Lithuania, Poland, Slovak Republic and Slovenia were covered in 2004, so we are able to use only the latter. We focus on the sample of 531 facilities that are present in 2004 as well as all years between 2007 and 2017.⁵ We replicate the results in Table 4 in Table OD.17 for that sub-sample of firms. While having 2004 data does not allow us to assess the presence of pre-trends, Figure OD.2 does show the absence of significant effects in the pre-treatment year 2004 for most pollutants we examine.

⁵Sample breakdown by country can be found in Table OD.12.

Figure OD.2: Local Credit Shocks and Air Pollution, 2004 & 2007-17



Notes: These charts summarize the coefficient estimates of difference-in-differences regressions to explain the impact of locality-level credit constraints on CO₂ emissions (log kg, Panel A), NO_x emissions (log kg, Panel B), SO_x emissions (log kg, Panel C), and hazardous air pollutant emissions (log using toxicity weights, Panel D) at the level of industrial facilities. Local banks' reliance on wholesale funding (15 km) measures the average reliance (in 2007) on wholesale funding of all bank branches located in a circle with a 15 km radius around the industrial facility or, in the case of multi-facility firms the parent company. The dots represent coefficient estimates of an interaction term between the variable Local banks' reliance on wholesale funding in 2007 and individual year dummies during 2007-17 and the shaded area represents the 95% confidence interval. Regressions control for the locality-level credit market controls (log average size of assets of banks in a 15km radius and the number of bank branches in a 15km radius around the industrial facility or, in the case of multi-facility firms the parent company); ; and facility and year fixed effects.

Table OD.17: Local Credit Shocks and Air Pollution, 2004 & 2007-17

Dependent variable →	CO ₂	NO _x	SO _x	Hazardous air pollutants	CO ₂	NO _x	SO _x	Hazardous air pollutants
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Local banks' reliance on wholesale funding	0.703 (1.266)	0.432 (0.870)	-3.412 (3.657)	-1.272* (0.759)	1.956 (1.647)	1.057 (1.459)	-5.037 (3.186)	-1.790* (0.997)
Post 2007 × Local banks' reliance on wholesale funding	0.208 (0.140)	0.144 (0.139)	0.216 (0.193)	0.041 (0.083)				
Post 2007	-0.091 (0.070)	-0.191*** (0.069)	-0.288*** (0.093)	-0.032 (0.046)				
2008-2013 × Local banks' reliance on wholesale funding					0.130 (0.134)	0.108 (0.117)	0.117 (0.181)	0.002 (0.083)
2014-2017 × Local banks' reliance on wholesale funding					0.332* (0.175)	0.211 (0.189)	0.346 (0.229)	0.096 (0.092)
2008-2013					-0.041 (0.067)	-0.135** (0.058)	-0.189** (0.086)	-0.011 (0.045)
2014-2017					-0.166* (0.086)	-0.281*** (0.094)	-0.424*** (0.113)	-0.063 (0.053)
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,062	1,062	1,062	1,062	1,593	1,593	1,593	1,593
Clusters (facilities)	531	531	531	531	531	531	531	531
R ²	0.010	0.133	0.148	0.005	0.012	0.132	0.156	0.011

Notes: This table presents OLS regressions to estimate the relation between credit constraints and log transformation of facility-level CO₂, NO_x, SO_x emissions and emissions of hazardous air pollutants (using inhalation toxicity weights from EPA's Risk-Screening Environmental Indicators (RSEI) model, see Online Appendix C for details). Missing pollutant emission values are replaced with pollutant reporting threshold value. The sample consists of all facilities that appear in EPER in 2004 and in E-PRTR in all years between 2007-17. Local banks' reliance on wholesale funding (15 km) measures the average reliance (in 2007) on wholesale funding of all bank branches located in a circle with a 15 km radius around the industrial facility or, in the case of multi-facility firms the parent company. All regressions include locality-level credit market controls (log average size of assets of banks in a 15km radius and the number of bank branches in a 15km radius around the industrial facility or, in the case of multi-facility firms the parent company); and facility fixed effects. Table A1 contains all variable definitions and Table A3 provides summary statistics. Standard errors are clustered by facility and shown in parentheses. ***, ** and * correspond to the 1%, 5%, and 10% level of statistical significance.

References

- Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen (2019) “What drives differences in management?” *American Economic Review*, Vol. 109, No. 5, pp. 1648–1683.
- Bureau van Dijk (2022) “Orbis,” <https://orbis.bvdinfo.com/> (accessed 2022-01-20). Subscription required.
- Colella, Fabrizio, Rafael Lalive, Seyhun Orcan Sakalli, and Mathias Thoenig (2019) “Inference with Arbitrary Clustering,” Discussion Paper 12584, IZA.
- European Bank for Reconstruction and Development (2012) “EBRD Banking Environment and Performance Survey II,” <https://www.ebrd.com/what-we-do/economics/data/banking-environment-and-performance-survey.html>. Not publicly available.
- (2022) “EBRD-EIB-WBG Enterprise Surveys 2018-20,” <https://www.beeps-ebrd.com/data/2018-2020/> (version as of 2022-02-08). Registration required for access; locality and GPS information not publicly available.
- European Environment Agency (2020) “European Pollutant Release and Transfer Register (E-PRTR) Database version 18,” <https://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-23> (accessed 2022-01-15).
- European Union (2006) “Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending the Council Directives 91/689/EEC and 96/61/EC,” *Official Journal of the European Union*, Vol. L33, pp. 1–17.
- (2016) “Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC,” *Official Journal of the European Union*, Vol. L344, pp. 1–31.
- Kling, Jeffrey R., Jeffrey B. Liebman, and Lawrence F. Katz (2007) “Experimental analysis of neighbourhood effects,” *Econometrica*, Vol. 75, No. 1, pp. 83–119.

- Ritchie, Hannah and Max Roser (2020) “CO₂ and Greenhouse Gas Emissions.” <https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions>.
- Shelyapina, Marina G., Inocente Rodríguez-Iznaga, and Vitalii Petranovskii (2021) “Materials for CO₂, SO_x, and NO_x Emission Reduction,” in Oxana Vasilievna Kharissova, Boris I. Kharisov, and Leticia M. Torres-Martínez eds. *Handbook of Nanomaterials and Nanocomposites for Energy and Environmental Applications*: Springer, Cham, pp. 2429–2458.
- United States Environmental Protection Agency (2022) “Risk-Screening Environmental Indicators model,” <https://www.epa.gov/rsei/rsei-toxicity-data-and-calculations/> (accessed 2022-02-03).