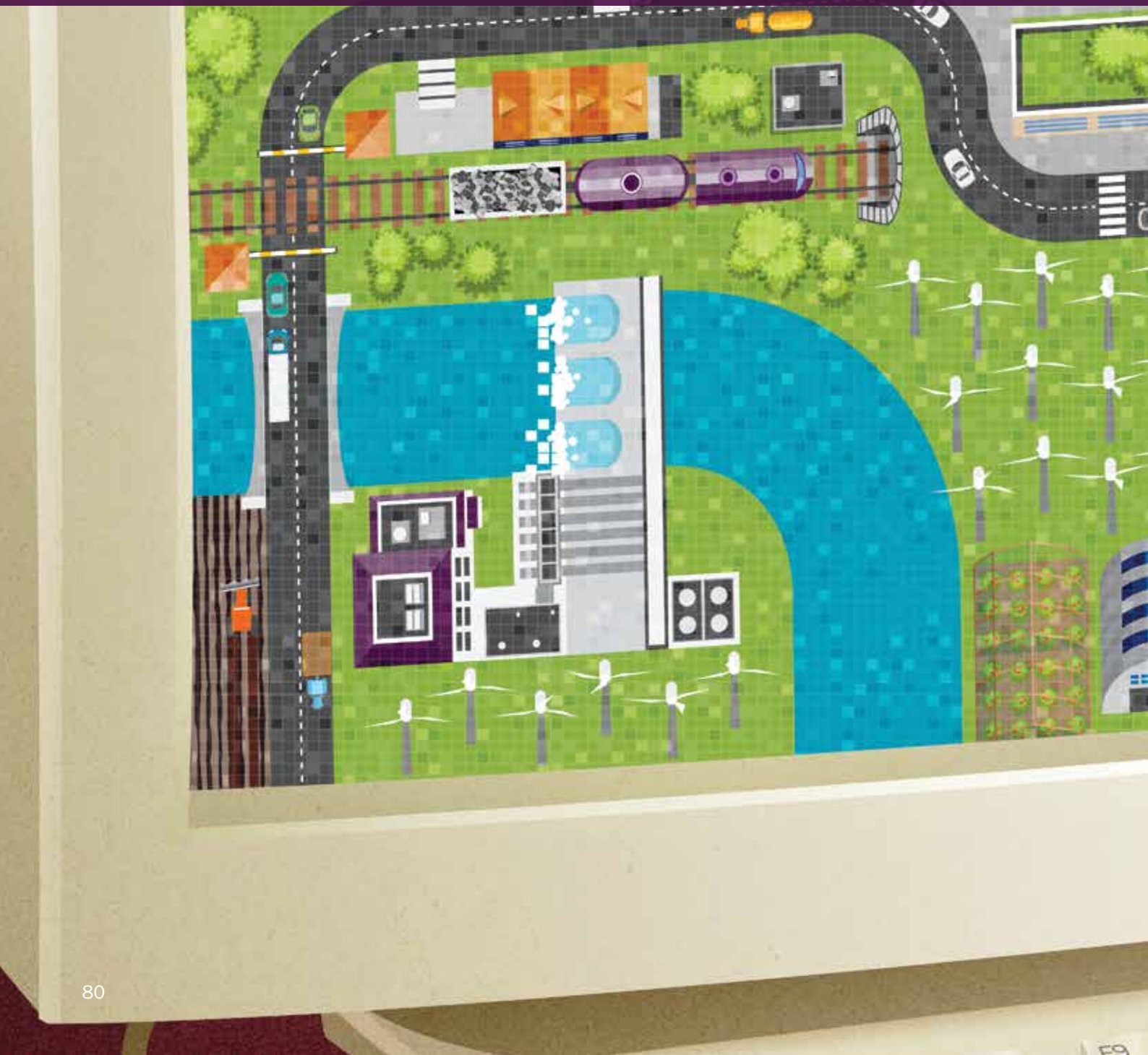
4

FIRMS' GREEN GOVERNANCE



While greenhouse gas emissions in the EBRD regions have fallen since the 1990s, there remains ample scope to make firms' production processes more energy efficient. The quality of firms' green management – the way they address environmental issues and monitor energy usage and pollution – varies widely both between and within countries. In the EBRD regions and comparator economies, there is a lack of green leaders and the majority of firms continue to perform poorly in terms of green credentials. Foreign firms, exporters and listed companies generally perform best in this area. Financing constraints can hinder green investment, limiting firms' ability to reduce emissions. However, for many firms it is not insufficient funding that prevents investment in this area – it is the low priority that managers assign to such investment.

Introduction

The EBRD regions have seen a substantial reduction in carbon dioxide (CO_2) emissions from energy usage in the period since 1990 – the baseline year for the emission cuts agreed in the Kyoto Protocol. However, this reduction partly reflects the collapse in output at the beginning of the transition from central planning to market economies. What is more, since the early 2000s emissions have started to rise again. Many countries in the EBRD regions are still among the world's most carbon-intensive economies.

Production structures will need to change significantly if energy efficiency is to be increased and the carbon footprints of firms in transition countries are to be reduced. This green transition can only succeed if firms' owners set clear, measurable and realistic environmental objectives. At the same time, firms' managers will need to be given the right incentives to achieve those targets (and those incentives must not be distorted by the subsidising of fossil fuels).[1] Managers also need to be equipped with the right know-how if they are to deliver on environmental and climate change-related targets. This chapter takes a detailed look at firms' green governance, examining the links between green objectives, green management practices and green investment.

It starts by defining green management in terms of firms' strategic objectives regarding the environment and climate change, their managerial structure, their setting of green targets and the way that they monitor such targets. It describes the ways in which these aspects of green management differ across and within the economies of the EBRD regions. It also looks at investment in energy efficiency and the reduction of pollution, exploring the external and internal drivers of such green investment. Lastly, it looks at the extent to which financial and managerial constraints hinder green investment and thwart firms' efforts to reduce greenhouse gas emissions.

Green management

Measuring green management practices

Nowadays, the ability to handle environmental, social and governance (ESG) issues in a proactive manner is part and parcel of effective firm management. However, information on firms' ESG practices is often only available for listed companies, particularly when it comes to the quality of green management. In the EBRD regions, relatively few firms are listed, with many stock markets remaining underdeveloped. Consequently, few firms disclose ESG information. To help fill that gap, the most recent round of Enterprise Surveys carried out by the EBRD, the EIB and the World Bank Group (which was still in the process of being conducted as this *Transition Report* went to print) included a special Green Economy module with the aim of systematically collecting information on firms' green management practices and other aspects of firm behaviour relating to climate change.

The information collected by those surveys covers four main types of green management practice. The first concerns the question of whether firms have strategic objectives pertaining to the environment and climate change. The second looks at whether firms employ a manager with an explicit mandate to deal with green issues. (It is also important to see who that environmental manager reports to, since research suggests that the link between a firm's strategic objectives and its day-to-day actions depends crucially on its organisational structure. Generally speaking, the closer the person with environmental responsibilities is to the firm's most senior manager, the more able they are to solve problems and overcome ill-defined incentives.[2]) The third concerns the question of whether firms have clear and attainable environmental targets. And the fourth looks at whether firms actively and frequently monitor their energy and water usage, as well as CO_2 emissions and other pollutants, in order to reduce their environmental footprint.[3]

[1] See Schweiger and Stepanov (2019).

[2] See Martin et al. (2012) and Yong et al. (2018).

[3] Energy usage is just one source of greenhouse gas emissions, albeit an important one. Other sources include physical and chemical processing and the transportation of materials, products, waste and employees (see World Resources Institute and World Business Council for Sustainable Development, 2004).

0.23

CORRELATION BETWEEN THE QUALITY OF FIRMS' GENERAL MANAGEMENT AND THE QUALITY OF THEIR GREEN MANAGEMENT

International patterns in terms of green management

The quality of firms' green management can be quantified on the basis of their answers to several specific questions in the Enterprise Surveys (see Box 4.1). This exercise shows that the quality of firms' green management, averaged at country level, is positively correlated with the average quality of *general* management practices (that is to say, firms' general approach to operations, monitoring, targets and incentives; see Chapter 3). This positive correlation is, however, relatively modest, with a coefficient of 0.23.

As Chart 4.1 shows, firms in Latvia tend, on average, to have the best green management practices in the EBRD regions, followed by firms in Greece, Slovenia and North Macedonia. Of the comparator economies in that sample, the Czech Republic, Malta and Spain are all in the top half of the list, while Portugal scores fairly poorly – not much different from the average levels seen in Kosovo and Lebanon. Turkish firms score worst in terms of the average quality of green management.

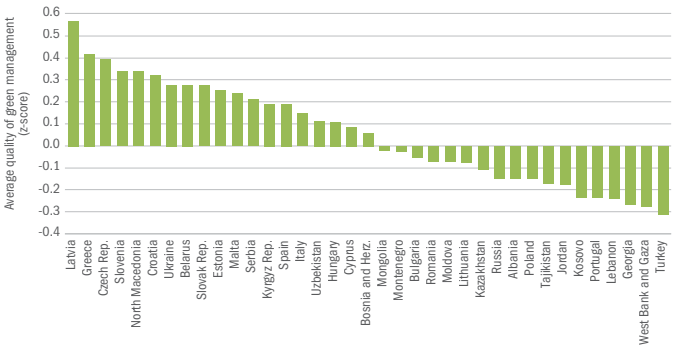
As Chart 4.2 shows, there are marked differences across the EBRD regions in the four scores underlying the overall rating. For example, many firms in eastern Europe and the Caucasus (EEC) and Central Asia excel when it comes to monitoring. In other words, they frequently collect data on energy and water usage and the emission of pollutants. However, they are less adept at translating that monitoring into specific targets. Comparator economies outside the EBRD regions, on the other hand, do not score so well when it comes to the environmental responsibilities of management. That is to say, relatively few firms in those countries have a manager with explicit responsibilities in the area of climate change and the environment (or, if they have one, that manager is relatively lowly in terms of the firm's hierarchy).

All in all, 18 per cent of firms in the EBRD regions and the Czech Republic report having strategic objectives relating to the environment or climate change, a percentage similar to that seen in the comparator economies of Italy, Malta, Portugal and Spain (20 per cent). However, this average masks large differences between countries. For instance, only 7 per cent of all Turkish firms have such strategic objectives, compared with a third of firms in Slovenia.

A total of 12 per cent of firms in the EBRD regions and the Czech Republic have a manager responsible for environmental and climate change-related issues, with that figure ranging from

CHART 4.1.

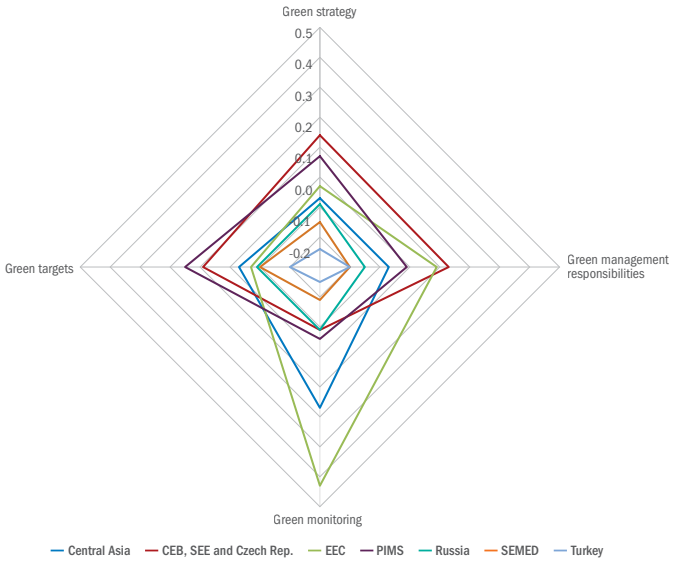
The average quality of firms' green management differs across economies



Source: Enterprise Surveys and authors' calculations.

CHART 4.2.

The four main aspects of green management



Source: Enterprise Surveys and authors' calculations.
Note: "PIMS" means Portugal, Italy, Malta and Spain.

ONLY
12.2%
OF FIRMS HAVE A MANAGER RESPONSIBLE FOR ENVIRONMENTAL AND CLIMATE CHANGE-RELATED ISSUES

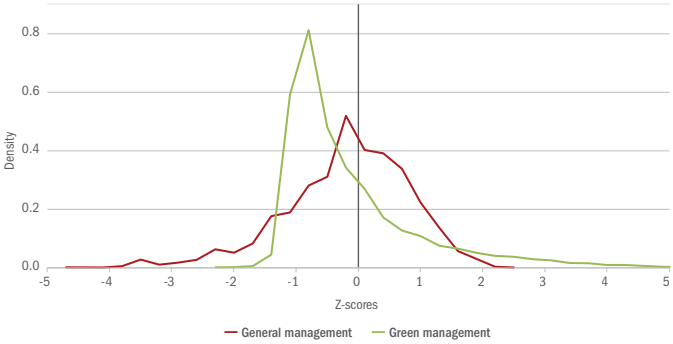
ONLY
18.3%
OF FIRMS HAVE STRATEGIC OBJECTIVES RELATING TO ENVIRONMENTAL ISSUES

just 3 per cent in Turkey to 28 per cent in the Czech Republic. In central Europe and the Baltic states (CEB) and the Czech Republic, almost three-quarters of those managers report directly to the firm's CEO, its board of directors or its owners, compared with just 18 per cent in Russia. Turkey and the economies of the southern and eastern Mediterranean (SEMED) score worst in this regard.

When it comes to monitoring, the EEC region has the highest score for all four subcomponents – energy, water, CO_2 and other pollutants. Comparator economies are fairly close behind in terms of the monitoring of CO_2 emissions, but they tend to lag when it comes to the monitoring of energy and water usage and other pollutants. That being said, regional averages mask significant differences across countries within those regions. For example, 19 per cent of firms in Latvia monitor their CO_2 emissions, compared with only 6 per cent in Poland. Lastly, comparator economies lead the way in terms of having explicit green targets. In contrast, only 15 per cent of Turkish firms report having energy consumption targets, compared with an average of 32 per cent of firms across all other economies.

CHART 4.3.

The quality of firms' green management varies considerably within countries



Source: Enterprise Surveys and authors' calculations.
Note: Cross-country differences in the sectoral composition of the sample are controlled for. Density is calculated by dividing the number of values that fall into each class by the number of observations in the set and the width of the class.

Distribution of green management scores

Although there are substantial differences across countries in terms of the average quality of green management, most of the variation (92 per cent) is found *within* economies, even after accounting for cross-country differences in sectoral composition. As with general management scores, there are firms with low and high green management scores in every economy (see Chart 4.3). Importantly, however, green management scores are much less evenly distributed than general management scores. Namely, there is a large mass of firms with green management scores that are just below average (that is to say, slightly to the left of zero) and a long thin tail of firms with good green management scores. This pattern is also evident within each individual country.

92%

OF ALL VARIATION IN THE QUALITY OF FIRMS' GREEN MANAGEMENT PRACTICES IS OBSERVED ACROSS FIRMS WITHIN THE SAME COUNTRY

Differences in the quality of green management across sectors

There are several factors that may explain the large differences in green management scores across firms within a given country, as shown by the green line in Chart 4.3. The analysis below looks first at internal factors – firm-level characteristics such as size and ownership structure – before turning to external factors, such as customer pressure, losses due to extreme weather, or pollution caused by other firms.

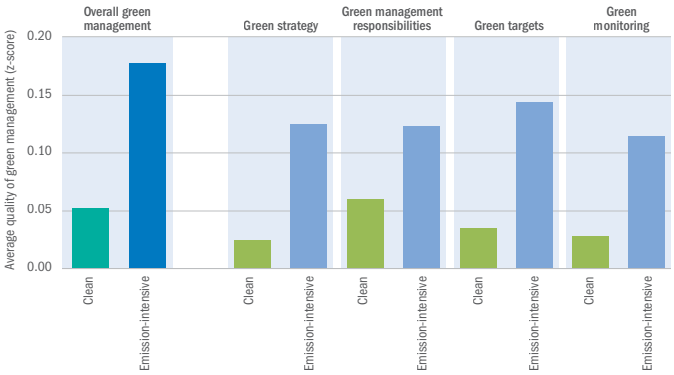
A firm's willingness and ability to adopt good green management practices (and the extent to which it is legally obliged to do so) will be dependent first of all on its sector or industry. A firm's sector provides a rough indication of the amount of pollution that it is likely to generate. It also determines the extent to which the firm is obliged to monitor its pollutant emissions and report them to national or international regulatory bodies, such as the European Pollutant Release and Transfer Register (E-PRTR), or participate in an emissions trading system.

Using data on average CO_2 emissions per unit of value added,[4] we can identify emission-intensive sectors, which are defined here as industries covered by the Enterprise Surveys that have above-median emissions. The following sectors are emission-intensive on the basis of that definition: paper products, printing and publishing, coke, petroleum, chemical products,

[4] See De Haas and Popov (2019). Alternative classifications yield a similar set of industries. See, for instance, Broner et al. (2016).

CHART 4.4.

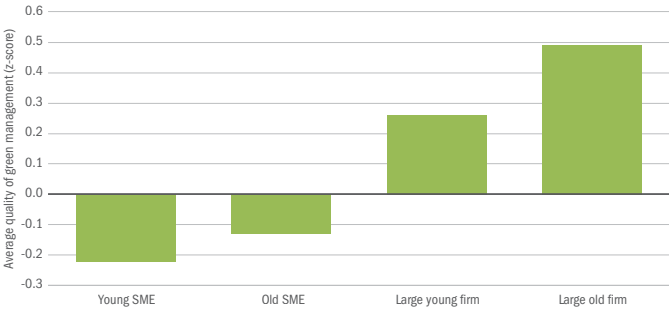
Firms in emission-intensive sectors tend, on average, to have better green management



Source: Enterprise Surveys and authors' calculations.
Note: Sectors are based on ISIC Rev. 3.1. Clean sectors include food, beverages and tobacco (15-16), textiles, textile products, leather and footwear (17-19), wood (20), fabricated metal products, machinery and equipment (28-33), transport equipment (34-35) and construction (45). Emission-intensive sectors include paper and paper products (21), printing and publishing (22), coke and petroleum (23), chemical products (24), rubber and plastic products (25), non-metallic mineral products (26), basic metals (27), land transport (60), water transport (61) and air transport (62). Wholesale and retail (50-52), hotels and restaurants (55), supporting and auxiliary transport activities (63), post and telecommunications (64) and IT (72) cannot be classified as either clean or emission-intensive owing to data availability issues.

CHART 4.5.

Older and larger firms tend to have better green management



Source: Enterprise Surveys and authors' calculations.
Note: SMEs have fewer than 100 employees; young firms are less than five years old.

rubber and plastic products, non-metallic mineral products, basic metals, land transport, water transport and air transport. Firms operating in these emission-intensive sectors in the EBRD regions and the Czech Republic tend, on average, to have better green management practices (see first two bars in Chart 4.4). This also holds for the four main subcomponents of green management (see other bars in Chart 4.4). This partly reflects pressure from regulators and customers. The same pattern, with a few exceptions, holds within each region as well.

Larger and older firms have better green management practices

It is perhaps not too surprising that firms which have at least 100 employees and are at least five years old tend, on average, to have higher green management scores (see Chart 4.5). As firms grow, they may eventually reach a size at which they are obliged to monitor their emissions. They may also face increasing pressure from consumers to reduce their impact on the environment. For instance, providers of takeaway coffee and food have experienced growing pressure to switch to recyclable cups and containers. For young small and medium-sized enterprises (SMEs), emphasising their environmental credentials could also prove to be a unique selling point.

One such SME is Croatian company Include, which manufactures solar-powered smart benches for municipal parks and streets that can charge mobile phones, act as 4G Wi-Fi hotspots, provide street lighting and collect temperature and air pollution data. Another is Ukrainian company SolarGaps, which has developed the world's first ever smart blinds. These automatically track the sun throughout the day, adjusting their position to ensure the optimal angle for generating solar electricity, helping to power devices in a home, apartment or office.

The positive correlations between firm size and the quality of green management and between firm age and quality generally also hold in firm-level regressions: large old firms tend, on average, to have better green management scores than young SMEs (see Table 4.1). Meanwhile, the average green management scores of old SMEs are worse than those of young SMEs, and the average green management scores of large young firms are not significantly different from those of young SMEs. Unlike the simple averages presented above, Table 4.1 also takes account of the sectors and countries where firms operate.

TABLE 4.1.

Determinants of the quality of firms' green management

Dependent variable	Green management score	
	(1)	(2)
Old SME (indicator)	-0.079* (0.044)	-0.095** (0.041)
Large young firm (indicator)	0.149 (0.119)	0.074 (0.113)
Large old firm (indicator)	0.214*** (0.046)	0.138*** (0.041)
25% or more foreign-owned (indicator)	0.236*** (0.053)	0.219*** (0.044)
Direct exporter (indicator)	0.187*** (0.037)	0.139*** (0.031)
Listed (indicator)	0.212*** (0.054)	0.191*** (0.047)
Sole proprietorship (indicator)	-0.108** (0.041)	-0.070* (0.040)
Financial reports audited (indicator)	0.390*** (0.028)	0.262*** (0.024)
General management score (z-score)	0.172*** (0.014)	0.128*** (0.012)
Customer pressure (indicator)		0.853*** (0.040)
Monetary losses due to extreme weather (indicator)		0.167*** (0.049)
Monetary losses due to pollution caused by others (indicator)		0.335*** (0.110)
Energy tax/levy (indicator)		0.454*** (0.036)
Observations	7,362	7,294
R^2	0.220	0.342

Source: Enterprise Surveys and authors' calculations.
Note: Estimated using ordinary least squares. All regressions include country, sector, locality, accuracy and truthfulness fixed effects. Old firms are at least five years old; large firms have at least 100 employees. Omitted size category: young SME (firm with fewer than 100 employees). Standard errors clustered at four-digit industry level are reported in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively.

Foreign-owned and listed firms have better green management practices, as do exporters

When it comes to the impact that foreign ownership has on the environment, the results of existing studies are mixed. In general, foreign ownership often improves firm-level productivity by transferring cutting-edge technology, management practices and knowledge to acquired firms and encouraging product and process innovation. Indeed, multinationals tend to use more advanced technology and production methods than their domestic counterparts, which can improve environmental outcomes.[5] This has sometimes been referred to as the "pollution halo effect". At the same time, however, firms in polluting industries may also relocate to countries with less stringent environmental regulations (termed "pollution havens") in response to costly regulations in their home countries, increasing pollution levels both in their host countries and globally.[6]

Evidence from the Enterprise Surveys suggests that the positive impact of foreign ownership tends to dominate in the EBRD regions and the Czech Republic (although pollution haven effects cannot be ruled out on the basis of those data). Firms where foreign investors hold a stake of 25 per cent or more tend, on average, to have higher green management scores than domestically owned counterparts and firms where foreign investors hold a stake of less than 25 per cent (see Chart 4.6). This relationship continues to hold when other factors are taken into account (see Table 4.1).

Foreign ownership is not the only way in which firms can learn about state-of-the-art green management practices. They can also do so by competing in international markets. Indeed, data from the Enterprise Surveys confirm that firms which export tend to have better green management than firms which do not (see Chart 4.6 and Table 4.1).

Another factor is whether a firm is listed on a stock exchange. Listed firms tend to be subject to greater scrutiny and under more pressure (from institutional investors, for example) to report on ESG issues. Although listed firms make up a relatively small percentage of all companies in the EBRD regions, the regression results in Table 4.1 confirm that listed firms do, on average, tend to have better green management. In contrast, sole proprietorships face the least scrutiny and tend to have lower green management scores.

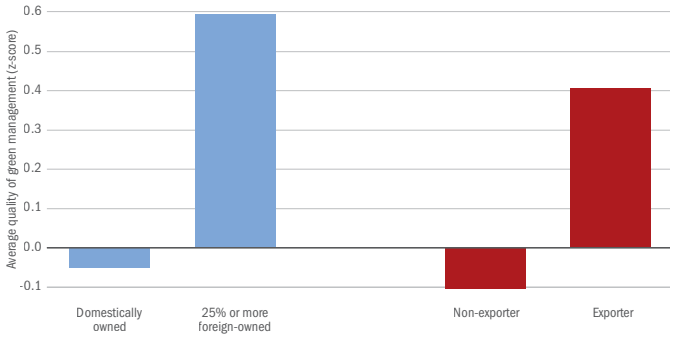
1 IN 7 FIRMS

REPORT THAT CUSTOMERS PRESSURE THEM TO OBTAIN ENVIRONMENTAL CERTIFICATION OR COMPLY WITH ENVIRONMENTAL STANDARDS

[5] See, for instance, EBRD (2014), Cole et al. (2005), Dean et al. (2009) and Brucal et al. (2019).
[6] See, for instance, Cai et al. (2016).

CHART 4.6.

Foreign firms and exporters have better green management



Source: Enterprise Surveys and authors' calculations.

CHART 4.7.

Firms exposed to extreme weather events tend to have better green management

Source: Enterprise Surveys and authors' calculations.

10.3%

OF FIRMS HAVE EXPERIENCED MONETARY LOSSES DUE TO EXTREME WEATHER EVENTS OVER THE LAST THREE YEARS

Customer pressure can lead to improved green management practices

External factors – such as customer pressure and environmental regulations, as well as firms' own experiences of pollution and extreme weather events – can also prompt firms to reduce their environmental impact. About one in seven firms in the EBRD regions and the Czech Republic report that at least some of their customers require environmental certificates or adherence to certain environmental standards as a precondition for doing business. In every region, green management scores tend, on average, to be much higher for firms that have experienced such customer pressure than for those that have not. Indeed, in the regression analysis, the improvement in green management that is associated with facing customer pressure is almost four times the size of that associated with foreign ownership.

Firms that are exposed to extreme weather or pollution have better green management practices

Firms with direct, first-hand experience of environmental and climate change-related problems – for example, firms that have suffered monetary losses due to extreme weather events or have been negatively affected by pollution produced by nearby firms – may be more inclined to enhance their green credentials. Data from the Enterprise Surveys reveal that about 10 per cent of all firms in the EBRD regions and the Czech Republic have experienced monetary losses due to extreme weather events over the last three years. For instance, Moldova, North Macedonia and Romania all experienced severe flooding in 2016, and heatwaves and droughts have become a common occurrence in many countries during the summer months. Similarly, severe hailstorms have occurred in Croatia, Poland, Romania and Slovenia.

In all regions, firms that have experienced monetary losses due to extreme weather events tend, on average, to have higher green management scores than firms that have not experienced such losses (see Chart 4.7). While these data are cross-sectional and do not provide a timeline of events, it is conceivable that some firms have improved their green management practices in response to suffering losses (for a discussion of climate risk governance, see Box 4.2). The same is true of the 2.4 per cent of firms that report having experienced monetary losses as a result of pollution not caused by their own activities. The results in Table 4.1 confirm that these relationships continue to hold when other factors are taken into account.

Environmental regulations also affect the quality of green management

Another important external factor is environmental regulations, which can be proxied by energy taxes or levies (see also Box 4.3 on energy efficiency standards). Where energy is expensive, firms have an incentive to use less of it. The resulting positive impact on the environment is especially large where energy is generated using fossil fuels. The estimates in Table 4.1 suggest that firms which are subject to an energy tax or levy have substantially better green management practices than firms which are not. That effect is about twice the size of the impact of being under foreign ownership or listed on a stock exchange. In fact, a formal comparison of the sizes of all the estimates reported in Table 4.1 reveals that the two most important drivers of green management scores are both external factors: customer pressure and being subject to an energy tax or levy.

THE GREEN MANAGEMENT SCORES OF FIRMS THAT ARE SUBJECT TO AN ENERGY TAX ARE, ON AVERAGE,

16.1%

OF A STANDARD DEVIATION HIGHER THAN THOSE OF FIRMS THAT ARE NOT SUBJECT TO SUCH TAXES

Green investment

Evidence on green investment

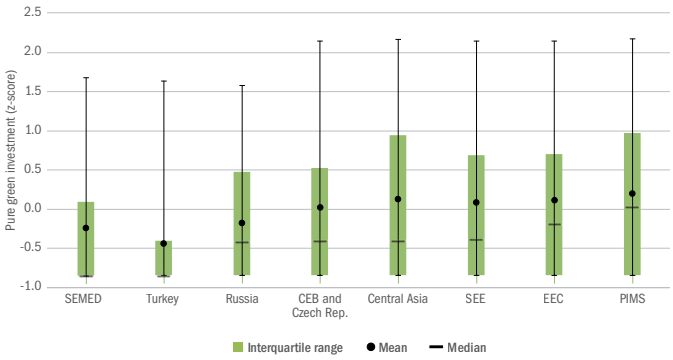
In addition to improving their green management practices, firms can also invest in measures that directly reduce their environmental impact. In the Enterprise Surveys, firms are asked about various types of green investment. Some of these reduce firms' environmental impact as a by-product of achieving other objectives. For instance, as innovation proceeds, new vintages of assets such as machines and vehicles tend to be more energy efficient than the outdated models they replace. Thus, investment in new assets may also lead to improvements in energy efficiency. Improvements to heating and cooling systems, machinery and equipment upgrades, vehicle upgrades and improvements to lighting systems all fall into this category. In the analysis that follows, these four types of investment are referred to as "mixed" green investment.

With other types of investment, the aim of improving the firm's environmental footprint is explicit and the main reason for undertaking the investment. Such measures include: on-site generation of green energy; energy management; waste minimisation, recycling and waste management; measures controlling air pollution; other pollution control measures; water management; and energy efficiency measures. These seven types of investment are classified as "pure" green investment.

Evidence from the most recent round of Enterprise Surveys indicates that more than a quarter of respondent firms in the EBRD regions have not engaged in either mixed or pure green investment over the last three years, while 52 per cent have engaged in both. Firms that engage in pure green investment tend to implement only one pure type of measure. The most popular pure green measure in the EBRD regions is waste minimisation, recycling and waste management (implemented by 43 per cent of firms), followed by energy efficiency measures (34 per cent)

CHART 4.8.

The prevalence of pure green investment in different regions



Source: Enterprise Surveys and authors' calculations.
Note: The lines show the 5th and 95th percentiles of the distribution.

and investment in energy management (33 per cent). The least common is measures controlling pollutants other than air pollution (14 per cent). These patterns vary across the EBRD regions. In the EEC region and Turkey, for example, energy efficiency measures are the most popular, whereas energy management is the most common type of measure in Russia, Central Asia and the SEMED region. Improvements to lighting systems and machinery and equipment upgrades are the two most common types of mixed green investment.

On the basis of firms' answers, mixed and pure green investment indices have been created, using an approach similar to that employed for green management practices (see Box 4.1 for details). As with green management practices, most of the variation in pure green investment (90 per cent) is within countries, rather than across them, after accounting for differences in sectoral composition (see Chart 4.8).

61.9%

PERCENTAGE OF FIRMS THAT HAVE UNDERTAKEN "PURE" GREEN INVESTMENT IN THE LAST THREE YEARS

Factors explaining differences in green investment

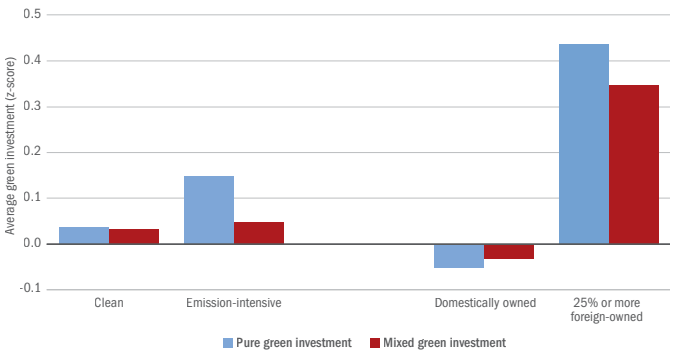
Firms in emission-intensive sectors are more likely to be aware of the need to reduce their impact on the environment and thus more likely to engage in green investment. Indeed, Chart 4.9 shows that levels of pure and mixed green investment are typically higher for firms in sectors with above-median CO_2 emissions per unit of value added. However, that difference is only statistically significant for pure green investment.

Unsurprisingly, large firms (whether young or old) tend, on average, to have higher pure and mixed green investment scores, perhaps because they may find it easier to access bank financing in order to fund such measures. Similarly, as in the case of green management practices, the type of firm ownership also affects green investment. Foreign owners tend to introduce cutting-edge technology, which may require investment in specific green measures. Evidence from the Enterprise Surveys suggests that foreign-owned firms in the EBRD regions tend, on average, to have higher pure and mixed green investment scores, with a particularly large differential relative to domestically owned firms when it comes to pure green measures (see Chart 4.9). As was the case with green management practices, listed firms also tend to have higher green investment scores (and again, this is particularly true of pure green investment).

Firms may need to engage in green investment in order to meet their customers' expectations or comply with regulations. Indeed, firms with customers that require certificates or adherence to environmental standards tend, on average, to have higher green investment scores than those that do not face such pressure, and their pure green investment scores tend to be higher than their mixed investment scores (see Chart 4.10). The pure and mixed investment scores of firms that are subject to an energy tax or levy are broadly similar to each other, and both are higher than the corresponding scores of firms that are not subject to such taxes/levies. Exporters are also more likely to adopt investment measures that reduce their environmental impact.

CHART 4.9.

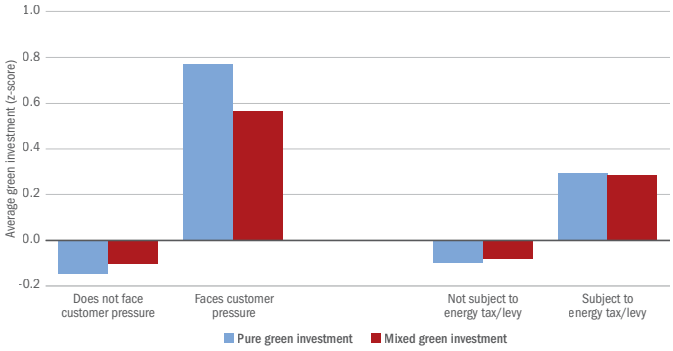
Firms in emission-intensive sectors and foreign-owned firms are more likely to engage in green investment



Source: Enterprise Surveys and authors' calculations.
Note: For details of clean and emission-intensive sectors, see the note accompanying Chart 4.4.

CHART 4.10.

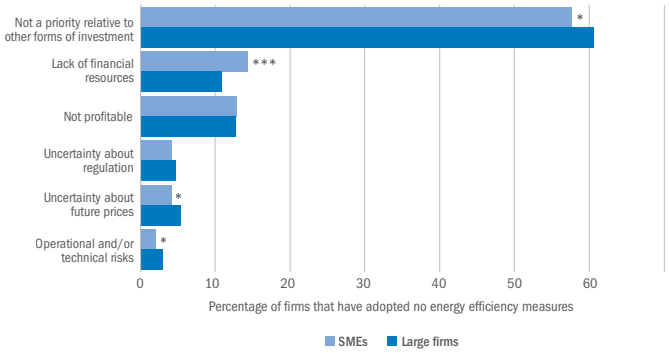
Firms that face customer pressure or are subject to energy taxes/levies tend to have higher green investment scores



Source: Enterprise Surveys and authors' calculations.

CHART 4.11.

Reasons for not investing in energy efficiency measures



Source: Enterprise Surveys and authors' calculations.
Note: * and *** denote statistical significance at the 10 and 1 per cent levels respectively, based on t-tests for differences in sample means. SMEs have fewer than 100 employees; large firms have 100 or more.

Why do so many firms refrain from investing in energy efficiency?

Despite the potential environmental and efficiency benefits of investment aimed at reducing firms' impact on the environment, there are many firms that refrain from implementing such measures. In order to better understand the rationale behind these decisions, the Enterprise Surveys ask firms that have decided not to adopt one specific type of pure green investment – energy efficiency measures – about their reasons for forgoing such measures.

Overall, more than 60 per cent of respondent firms that have not implemented energy efficiency measures report that this is not a priority relative to other types of investment. (In the SEMED region, this figure is even higher, at more than 74 per cent.) The second and third most cited reasons are a lack of financial resources (14 per cent) and the unprofitability of such investment (13 per cent). In Turkey and Central Asia, the perceived lack of profitability was the second most common reason for both SMEs and large firms alike.

Across the board, financial constraints are more of an obstacle for SMEs than they are for large firms (see Chart 4.11). Large firms, on the other hand, are more likely to worry about the uncertainty surrounding future prices and operational or technical risks relating to energy efficiency measures.

60.8%
OF FIRMS THAT HAVE NOT INVESTED IN ENERGY EFFICIENCY MEASURES OVER THE PAST THREE YEARS REPORT THAT OTHER TYPES OF INVESTMENT ARE A HIGHER PRIORITY

Access to credit, the quality of green management and green investment

Bearing in mind that a lack of financial resources is the second most common reason cited by firms that have not adopted energy efficiency measures, this section provides more structured analysis of the relationship between firms' ability to access bank credit, their green management credentials and their propensity to undertake green investment. In the analysis that follows, a firm is regarded as credit-constrained if its survey answers indicate that it needed credit in the past year but was either rejected by a bank when it applied for credit or was discouraged from applying in the first place.

In order to assess the link between credit constraints and green management on the one hand and green investment on the other, one needs to bear in mind that both the extent to which a firm is credit-constrained and the quality of its green management can themselves be influenced by the firm's investment decisions. To alleviate such concerns, the following analysis estimates the impact that credit constraints and green management have on investment in two stages. The first stage isolates the shares of credit constraints (see column 1 of Table 4.2) and green management (see column 2) that are purely due to exogenous factors ("instrumental variables") and therefore unlikely to be affected by green investment. Those predicted shares of credit constraints and green management are then used in the second stage (see columns 3 to 6) to estimate the causal impact on green investment. More details regarding this approach can be found in the notes accompanying Table 4.2.

The first stage exploits exogenous variation in credit constraints across different localities. The supply of bank credit tightened significantly in emerging Europe in the wake of the global financial crisis. Importantly, this deleveraging varied greatly across localities on the basis of the funding structures of local banks.[7] Banks that, before the crisis, had mainly financed themselves using short-term and relatively unstable wholesale funding had to deleverage a lot. In contrast, banks that could count on a stable deposit base turned out to be much more stable lenders.[8] In this context, the instrumental variable measures average dependence on wholesale funding in 2007 (just before the outbreak of the global financial crisis) across all bank branches within 5 km of the firm, the assumption (as borne out by international evidence) being that smaller firms typically only access banks that are located nearby.[9] Column 1 of Table 4.2 confirms that firms in localities where banks were hit hard by the crisis were more likely to be credit-constrained in the years that followed, everything else being equal. Reassuringly, the availability of local funding is not correlated with the quality of firms' green management (see column 2).

[7] See De Haas et al. (2015), De Haas et al. (2016) and Beck et al. (2018).
[8] See De Haas and Van Lelyveld (2014). Wholesale funding is defined as all non-deposit-based debt funding of banks.
[9] For instance, the median Belgian SME borrower in Degryse and Ongena (2005) was located 2.5 km from the lending bank branch. In the US data featured in Petersen and Rajan (2002) and Agarwal and Hauswald (2010), the corresponding median distances were 3.7 km and 4.2 km respectively.

In order to identify exogenous variation in the quality of firms' green management, this analysis uses a dummy variable indicating whether a firm has experienced monetary losses due to extreme weather events such as storms, floods, droughts or landslides over the last three years. Likewise, a second instrument indicates whether a firm has experienced monetary losses due to pollution caused by another firm over the last three years. As shown earlier, energy efficiency and climate-related issues tend to be more important to firms that have experienced unexpected losses as a result of extreme weather and pollution, with such events incentivising them to take green management practices more seriously. The results in column 2 of Table 4.2 are in line with those findings.

With these first-stage results in hand, columns 3 to 6 look at how exogenous variation in credit constraints and the quality of green management influences firms' ability and willingness to invest. The dependent variable in column 3 indicates whether a firm has undertaken *any* type of investment in fixed assets over the past three years, while column 4 looks at investment in fixed assets excluding pure green investment. The dependent variable in column 5 is a standardised measure of the number of mixed green investment projects that a firm has implemented over the past three years, and the dependent variable in column 6 is an equivalent measure for pure green investment. A comparison of the coefficients in columns 3 to 6 yields two striking results.

14.5%

OF FIRMS THAT HAVE REFRAINED FROM INVESTING IN ENERGY EFFICIENCY MEASURES OVER THE LAST THREE YEARS REPORT THAT THIS STEMS FROM A LACK OF FINANCIAL RESOURCES

First, firms with better green management are consistently more likely to undertake investment projects involving at least some green components (but not investment projects without any green components), with the coefficient estimated for pure green investment being higher than that estimated for mixed green investment. A 1 standard deviation increase in a firm's green management score is associated with an 18 per cent increase in the probability of a firm undertaking mixed green investment and a 24 per cent increase in the likelihood of a firm undertaking pure green investment.

TABLE 4.2.

Credit constraints, green management and green investment

	First stage		Second stage			
Dependent variable	**Credit-constrained**	**Green management (z-score)**	**Investment in fixed assets**	**Investment in fixed assets excluding pure green investment**	**Mixed green investment (z-score)**	**Pure green investment (z-score)**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Local banks' dependence on wholesale funding	0.004*** (0.001)	0.002 (0.001)				
Monetary losses due to extreme weather	-0.065** (0.026)	0.401*** (0.058)				
Monetary losses due to external pollution	0.111** (0.044)	0.529*** (0.127)				
Credit-constrained			-0.801*** (0.194)	-0.246* (0.139)	-0.781*** (0.286)	-0.311 (0.347)
Green management			0.213*** (0.053)	-0.022 (0.029)	0.565*** (0.089)	0.734*** (0.085)
Observations	4,646	4,646	4,646	4,646	4,602	4,646
R^2	0.574	0.201	0.322	0.109	0.140	0.346
F-statistic	62.21	23.49				

Source: Enterprise Surveys, Banking Environment and Performance Survey II (BEPS II), Bureau Van Dijk's Orbis database and authors' calculations.

Note: This table shows the results of instrumental variables regressions explaining the impact that credit constraints and the quality of green management have on green investment at firm level. Columns 1 and 2 show the first-stage regressions, where the dependent variable is credit-constrained (column 1) or green management (column 2). The dependent variables in the second stage are: a dummy indicating whether the firm has invested in any fixed assets in the past year (column 3); a dummy indicating whether the firm has invested in fixed assets other than pure green investment (column 4); the z-score for mixed green investment over the past three years (column 5); and the z-score for pure green investment over the past three years (column 6). The first-stage instruments are a branch-weighted measure of average dependence on wholesale funding across all banks within 5 km of the firm and dummies indicating whether the firm has recently experienced monetary losses due to extreme weather events or pollution caused by other firms. The mixed green investment score is a z-score based on the following types of investment: improvements to heating and cooling systems; machinery and equipment upgrades; vehicle upgrades; and improvements to lighting systems. The pure green investment score is a z-score based on the following types of investment: energy management; waste minimisation, recycling and waste management; water management; on-site generation of green energy; measures controlling air pollution; other pollution control measures; and energy efficiency measures. All regressions include firm-level controls (indicators for exporter status, listed firm, sole proprietorship and audited financial reports, as well as the log of firm age), as well as country, sector, locality, accuracy and truthfulness fixed effects. Standard errors clustered at four-digit industry level are shown in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively.

Second, while credit constraints reduce the likelihood of firms undertaking investment, including mixed green investment, they have no significant impact on pure green investment. In other words, a "horse race" between financial and managerial constraints suggests that where the primary goal of an investment project is to reduce pollution or increase energy efficiency, the quality of green management is the most important factor. These findings also suggest that credit constraints mainly hinder measures involving substantial investment in fixed assets (which can potentially be used as collateral for loans) – that is to say, machinery, vehicles, and waste and recycling systems (see Table 4.3). Most of the other coefficients for credit constraints have the expected negative sign but are imprecisely estimated. At the same time, the importance of the quality of green management for green investment comes through across all types of measure.

Credit constraints, green management, firms' performance and energy consumption

This subsection looks at the impact that credit constraints and the quality of green management have on firms' performance. Financial constraints and green management practices both appear to matter, but in different ways (see Table 4.4). As expected, credit constraints have a negative impact on both sales per worker (a measure of labour productivity; see column 1) and overall sales (see column 2). When firms are financially constrained and cannot invest as much as they would like, their capital-to-labour ratio may be lower than that of similar firms in the same country and sector. Indeed, the analysis above showed that such firms tend to reduce their investment in fixed assets. Output per worker is likely to be correspondingly lower, and this may, in turn, negatively affect total sales.

However, there is no statistically significant relationship between the quality of a firm's green management and the firm's productivity or sales once the endogeneity of green management has been accounted for. Column 3 does, however, provide some weak evidence that better green management is associated with lower levels of electricity consumption per unit of sales, in line with the findings of earlier studies.[10] This may reflect the fact that firms with better green management undertake more green investment, as discussed earlier.

Credit constraints and greenhouse gas emissions

If credit constraints prevent firms from undertaking some green investment projects – especially those of a mixed nature (see Table 4.2) – one might expect that, perhaps with some lag, they could also hamper firms' ability to reduce the emission of greenhouse gases and other pollutants. In order to investigate that question, this subsection examines changes in the levels of greenhouse gas emissions and other air pollutants produced by 1,819 industrial facilities in 10 eastern European countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia) in the period 2007-17. The green dots in Chart 4.12 show the locations of those various facilities. For each facility, the European Pollutant Release and Transfer Register (E-PRTR) provides data on annual emissions of greenhouse gases, ammonia, carbon monoxide, sulphur oxides and other noxious air pollutants.

As before, this analysis exploits exogenous differences in local credit conditions in the aftermath of the global financial crisis. Because the E-PRTR does not contain information on firms' financial situations, it is impossible to link local bank lending conditions to firm-level credit constraints.

TABLE 4.3.

Credit constraints, green management and individual types of green investment

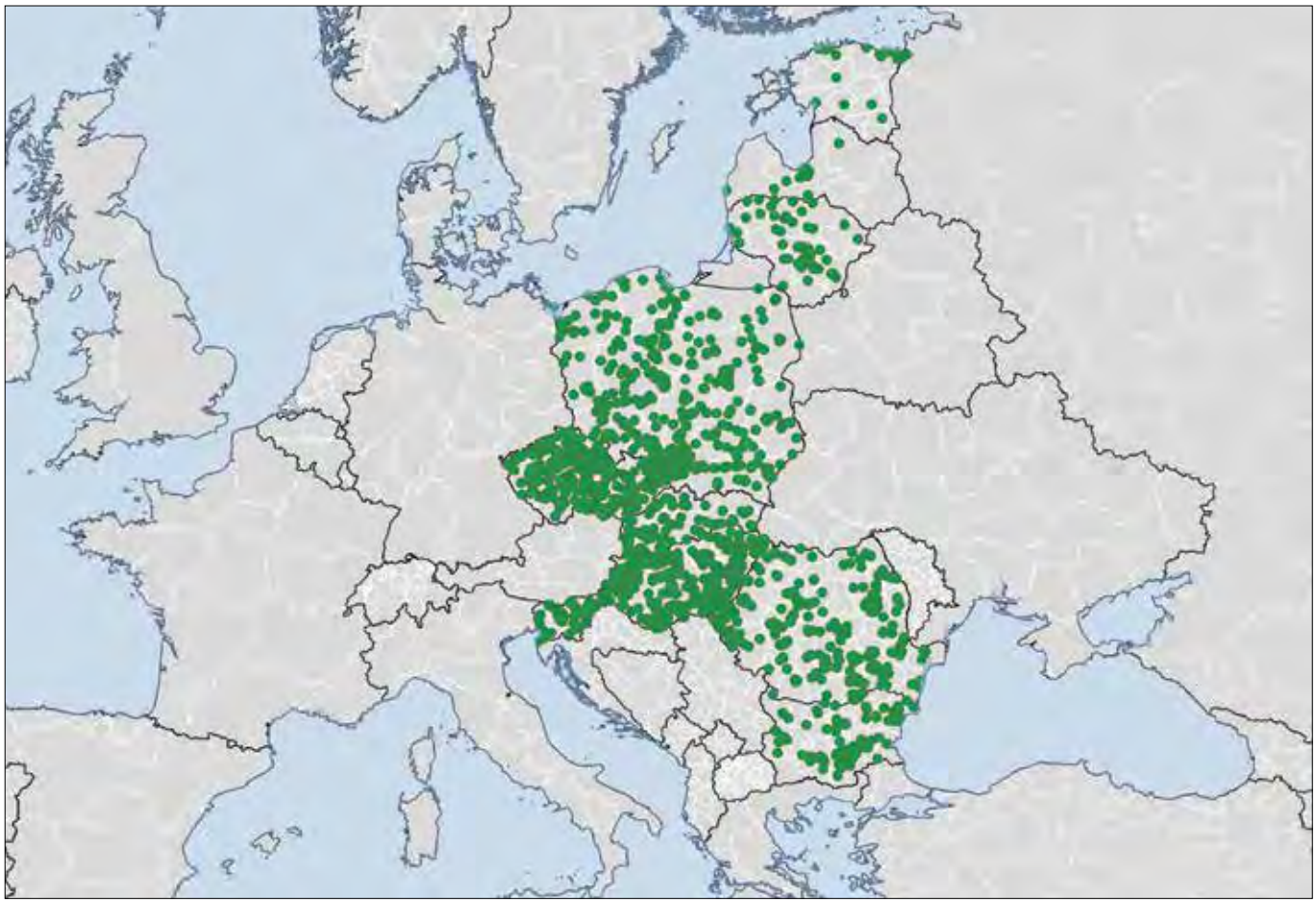
Dependent variable	Mixed green investment				Pure green investment						
	Improved heating/ cooling system	Machinery upgrade	Vehicle upgrade	Improved lighting	Generation of green energy	Energy management	Waste and recycling	Measures controlling air pollution	Water management	Other pollution control measures	Energy eficiency measures
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Credit-constrained	-0.264 (0.182)	-0.463*** (0.144)	-0.269* (0.139)	-0.153 (0.186)	-0.147 (0.115)	0.033 (0.168)	-0.480*** (0.181)	-0.035 (0.126)	-0.263* (0.135)	0.310* (0.181)	-0.073 (0.168)
Green management	0.243*** (0.045)	0.221*** (0.045)	0.194*** (0.038)	0.186*** (0.044)	0.139*** (0.033)	0.211*** (0.041)	0.198*** (0.044)	0.206*** (0.041)	0.231*** (0.039)	0.214*** (0.048)	0.237*** (0.050)
Observations	4,511	4,542	4,526	4,547	4,418	4,535	4,484	4,396	4,460	4,464	4,646
R^2	0.407	0.496	0.418	0.559	0.215	0.480	0.402	0.359	0.329	0.138	0.505

Source: Enterprise Surveys, BEPS II, Bureau Van Dijk's Orbis database and authors' calculations.
Note: This table shows the results of second-stage instrumental variables regressions explaining the impact that credit constraints and the quality of green management have on the probability of a firm undertaking mixed green investment (columns 1 to 4) or pure green investment (columns 5 to 11). Standard errors clustered at four-digit industry level are shown in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively. For more details, see the note accompanying Table 4.2.

[10] See Martin et al. (2012).

CHART 4.12.

Geographical distribution of industrial facilities across emerging Europe



Source: E-PRTR.
Note: Based on the locations of 1,819 industrial facilities in Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia in the period 2007-17, as recorded in the E-PRTR.

TABLE 4.4.

Green management and real outcomes at firm level

Dependent variable	Labour productivity (log)	Sales (log)	Electricity intensity of sales (kWh/US$; log)
	(1)	(2)	(3)
Credit-constrained	-2.036*** (0.726)	-1.014** (0.488)	-0.053 (0.203)
Green management	0.325 (0.208)	0.030 (0.140)	-0.091* (0.049)
Observations	4,060	4,043	1,887
R^2	0.982	0.986	0.422

Source: Enterprise Surveys, BEPS II, Bureau Van Dijk's Orbis database and authors' calculations.
Note: This table shows the results of instrumental variables regressions explaining the impact that credit constraints and the quality of green management have on firm-level labour productivity (column 1), sales (column 2) and the electricity intensity of sales (column 3). Labour productivity is defined as the ratio of sales to employment and is winsorised at 1 per cent. The electricity intensity of sales is defined as the ratio of the amount of electricity consumed in kWh to sales and is winsorised at 5 per cent. Standard errors clustered at four-digit industry level are shown in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively. For more details, see the note accompanying Table 4.2.

It is, however, possible to establish a direct link between local credit conditions and changes in facility-level air pollution. In particular, the regression analysis in Table 4.5 estimates the impact that local credit constraints have on total air pollution (see columns 1 and 2) and total greenhouse gas emissions (see columns 3 and 4) at the level of industrial facilities. The explanatory variable is the average dependence on wholesale funding of all bank branches within 15 km of an industrial facility in 2007. In the case of facilities that are part of a larger group (which make up 44 per cent of the sample), the distance is calculated relative to the parent company. Because many of these facilities are fairly large (relative to the typical respondent firm in the Enterprise Surveys), this analysis looks at bank branches within a larger radius (15 km, rather than 5 km). This reflects the fact that larger firms, which are typically more transparent and less risky, tend to be able to borrow across larger distances than smaller firms.

The negative coefficient for the dummy variable for the post-2007 period reflects a secular decline in pollution. The average industrial facility reduced its greenhouse gas emissions by 12 per cent in the period 2008-17 (in localities where banks had an average funding structure). The interaction term between the post-2007 dummy and the measure of wholesale funding is positive, large and statistically significant. This means that the decline in emissions was smaller in those localities where banks had to deleverage more in the wake of the global financial crisis, suggesting that credit constraints not only hindered firms' mixed green investment (see Table 4.2), but also, as a result, hampered their ability to produce in a less polluting manner.

Initially, the impact of credit constraints on greenhouse gas emissions was small (see Chart 4.13, which shows the estimated coefficients for the interactions between each year dummy and the measure of local credit constraints). It takes time for investment to materialise, and thus for differential access to bank credit to translate into differing levels of greenhouse gas emissions. The size of the coefficient quickly picks up after the sixth year (2013), though the difference between the two types of firm (those with easy local access to bank credit and those without) is statistically significant as of 2010. The difference in annual emission levels stabilises after around eight years at about 3.6 percentage points.

These results are robust to using credit conditions around the facilities themselves, rather than conditions around the locations of parent companies. The magnitude of the coefficients is slightly smaller in these specifications, suggesting that at least some industrial groups operate an internal capital market in which the parent company raises debt funding and allocates it across various affiliated facilities.

TABLE 4.5.

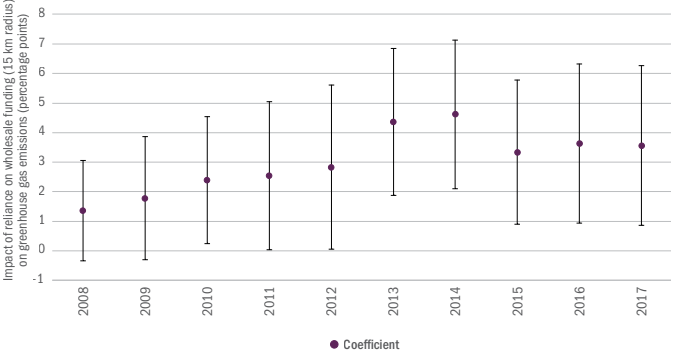
Local credit shocks and facility-level air pollution (2007-17)

Dependent variable	Log of total emissions of air pollutants + 1		Log of total greenhouse gas emissions + 1	
	(1)	(2)	(3)	(4)
Local banks' dependence on wholesale funding	-0.043** (0.022)	-0.044** (0.022)	-0.029 (0.032)	-0.030 (0.032)
Post-2007	-0.797** (0.336)	-0.796** (0.336)	-1.360 (0.900)	-1.360 (0.900)
Post-2007* Local banks' dependence on wholesale funding	0.012*** (0.004)	0.012*** (0.004)	0.026** (0.012)	0.026** (0.012)
Observations	3,638	3,638	3,638	3,638
R^2	0.435	0.436	0.408	0.408

Source: E-PRTR, BEPS II, Bureau Van Dijk's Orbis database and authors' calculations.
Note: This table shows the results of difference-in-difference regressions explaining the impact that local credit constraints have on total air pollution (columns 1 and 2) and total greenhouse gas emissions (columns 3 and 4) at the level of industrial facilities. If raw data on total air pollution and greenhouse gas emissions are missing, they are assumed to be zero. Local banks' dependence on wholesale funding measures the average dependence on wholesale funding of all bank branches located within 15 km of the industrial facility – or, in the case of multi-facility firms, the parent company – in 2007. Post-2007 is a dummy variable that is 0 in 2007 and 1 thereafter. All regressions control for the latitude and longitude of the facility, country and sector fixed effects, and (in columns 2 and 4) whether the facility is owned by a private company, the state, a financial institution/bank, or an individual or family. Standard errors clustered by parent company are shown in parentheses, and *, ** and *** denote statistical significance at the 10, 5 and 1 per cent levels respectively.

CHART 4.13.

Impact of local credit shocks on facility-level greenhouse gas emissions, by year



Source: E-PRTR, BEPS II, Bureau Van Dijk's Orbis database and authors' calculations.
Note: These coefficients are estimated by using a difference-in-difference regression to explain the impact that local credit constraints have on the logarithm of greenhouse gas emissions (in kilograms of CO_2) in every year after 2007 (the base year). The lines show the 95 per cent confidence interval. See also the note accompanying Table 4.5.

Conclusion

Greenhouse gas emissions in the EBRD regions have fallen substantially since the 1990s, but if the regions' economies are to fulfil their commitments under the Paris Agreement, those improvements will need to continue. This, in turn, will require further improvements to the green credentials of the regions' firms. While some firms in the EBRD regions (as well as comparator countries) have excellent green management practices, most continue to perform poorly in this regard. Firms with weaker green management practices may be aware of the importance of monitoring their impact on the environment, but lack the organisational structures necessary to set and achieve targets in this area.

Credit constraints hamper investment by firms, including investment with environmental benefits. However, when it comes to pure green investment (such as improvements in energy management, the generation of green energy and controls on air pollution), access to finance is not the main constraint. The empirical analysis in this chapter shows that whether a firm undertakes such investment projects – many of which have uncertain outcomes and involve large externalities – depends primarily on the strength of the firm's green management practices.

Indeed, many firms refrain from undertaking pure green investment for the simple reason that managers believe it to be a low priority relative to other types of investment. While firms may, in principle, want to reduce their environmental impact, they often face more pressing matters in the short term. In the face of financial and time constraints, managers may prioritise non-green investment, even where green investment would have a positive, albeit small, net present value.

In line with that interpretation, this chapter also shows that firms tend to bump green management and investment up their priority list when environmental issues suddenly become more important to them in the wake of exposure to adverse weather events or external pollution, as well as in response to customer pressure. This suggests that behavioural barriers could also be preventing the adoption of better green management practices. Experience of negative environmental effects may focus minds and make firms more aware of such opportunities.

Thus, improving the availability of credit is just one element of the broad policy mix that is necessary to stimulate green investment and improve firms' green management practices. Governments may also have to compel firms to produce in a more energy efficient manner using environmental standards or other regulations (see Box 4.3) or via subsidies that are contingent on the use of specific green technologies. Targeted green credit lines can also encourage firms to prioritise green investment (see Box 4.4 for details of the EBRD's Green Economy Transition approach). However, an important precondition for the success of such interventions is effective enforcement of regulations in a corruption-free environment.[11] Lastly, firms are also known to improve their green credentials in response to pressure from their customers. With this in mind, voluntary environmental standards may help to leverage the power of peer pressure and consumer awareness in order to further reduce firms' environmental footprints.

BOX 4.1.

MEASURING GREEN MANAGEMENT PRACTICES AND GREEN INVESTMENT

The most recent round of Enterprise Surveys conducted by the EBRD, the EIB and the World Bank Group included a special Green Economy module, which sought to gather information on key aspects of firm behaviour relating to climate change (including green management practices). In most economies, the response rate for the Green Economy module was in excess of 95 per cent.

As regards green management practices, firms were asked: one question about strategic objectives relating to environmental or climate change issues; two questions about managers responsible for environmental and climate change issues and their reporting lines; nine questions about the monitoring of energy and water usage, greenhouse gas emissions and other pollutants over the last three years, as well as external audits; and three questions about targets relating to energy consumption and emissions (with questions relating to water usage and pollutants other than greenhouse gas emissions being answered only by manufacturing firms).

The scores for each question were normalised such that they had a mean of 0 and a standard deviation of 1 (turning them into z-scores). Those z-scores were then aggregated to produce average z-scores for each of the four types of green management practice. Overall z-scores for all green management practices were then constructed as unweighted averages of the four types of practice. A z-score above zero indicates that a firm's management practices are better than the sample average.

As regards green investment, firms were asked whether they had invested in any of the seven types of pure green investment (on-site generation of green energy; energy management; waste minimisation, recycling and waste management; measures controlling air pollution; other pollution control measures; water management; and energy efficiency measures) or any of the four types of mixed green investment (improvements to heating and cooling systems; machinery upgrades; vehicle upgrades; and improvements to lighting systems). Again, the scores for each question were normalised such that they had a mean of 0 and a standard deviation of 1. Those z-scores were then aggregated to produce average z-scores for pure and mixed green investment and normalised such that they had a mean of 0 and a standard deviation of 1.

[11] See, for example, Duflo et al. (2013) for an analysis of corruption among third-party pollution auditors in India.

BOX 4.2.

CORPORATE CLIMATE GOVERNANCE

As discussed elsewhere in this chapter, the management of environmental risks and the fostering of better environmental performance can have a positive impact on a firm's financial outcomes. The strength of this relationship depends, among other things, on the type of industry in question, the firm's location, and the quality of governance in the country where the firm is located.[12]

The management of risks caused by climate change can be particularly challenging, given the uncertain nature and timing of such effects and because firms' investment decisions today may impose societal costs in the future. Firms face twin risks in this regard: (i) the risk of a decline in the profitability of high-carbon sectors (termed "transition risk"); and (ii) the risk of potential damage from climate change (termed "physical risk"). The total financial value that is at risk from climate change has been estimated at between 2 and 17 per cent of the total value of financial assets today.[13]

Companies also face litigation risk as a result of a failure to develop an adequate response to climate change. An increasing number of legal claims are being brought by investors against firms and company directors or officers for failing to account for possible risks to carbon-intensive assets or for failing to disclose physical climate risks in financial reporting. Such climate-liability risks can be mitigated if companies develop long-term strategies and disclosure policies for climate-related risks.

Against that background, there is now a growing emphasis on improving firms' management of climate-related risks and opportunities and their disclosure to investors. The most prominent market-driven initiative in this area is the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD). In 2017 the TCFD published recommendations advocating voluntary climate-related financial disclosures for regulated financial and non-financial organisations.[14] Those recommendations are structured around four thematic areas (governance, strategy, risk management, and metrics and targets) and are based on the premise that climate-related risks may have a significant financial impact on companies and, as such, warrant public disclosure. In 2018 the EBRD became the first multilateral development bank to pledge support for the TCFD, alongside more than 800 companies and financial institutions holding a total of more than US$ 40 trillion in assets.

While climate-related disclosure remains voluntary at present, stricter national regulations and growing shareholder pressure are likely to increase board-level engagement on this issue in the short to medium term. Firms are also likely to face mandatory disclosure in the years to come. For example, France recently became the first country to require investors to disclose information about their contributions to climate goals, compelling institutional investors to provide information on the methodology applied under the "comply or explain" approach. In June 2019 the EU's Technical Expert Group on Sustainable Finance published non-binding guidelines aimed at helping insurance firms, banks and listed companies to disclose the impact that climate change has on their business, as well as the impact that their activities have on the environment.[15] Meanwhile, the Network for Greening the Financial System, a group of central banks and financial regulators, has put forward recommendations aimed at making climate risk management a standard component of financial supervision across a range of advanced and emerging market economies.

Despite these initiatives, the implementation of climate governance measures at company level is, in practice, still at an early stage. Against that background, a recent study by the EBRD analysed recent legal and regulatory trends, as well as emerging climate-related disclosure practices among firms in the EBRD regions, detailing a number of good practices in the area of climate-related corporate governance.[16]

Senior buy-in at the highest level is crucial for effective corporate climate governance. However, even with the right buy-in, developing an approach to climate-related corporate governance may still take several years, requiring close cooperation between finance, risk management and audit teams, as well as local business units in order to account for local climate-related risks and effects. Furthermore, companies may also need to establish partnerships with experts and scientific organisations in order to translate scientific data into workable and operational action plans and improve access to data. More mature companies should also carry out climate scenario modelling tests to feed into the analysis of risks and opportunities and support organisational decision-making processes.

Governance of climate risks also needs to be supported by regular meetings of designated governance bodies and training for key managerial staff. Companies are expected to provide enhanced disclosure in line with international standards in order to ensure that they engage with investors in an open and transparent manner.

[12] See Manrique and Martí-Ballester (2017) and Xie et al. (2019).
[13] See Dietz et al. (2016).
[14] See TCFD (2017).
[15] See European Commission (2019).
[16] See Haralampieva (2019).

BOX 4.3.

ENERGY EFFICIENCY STANDARDS AND GREEN TRANSITION

In the absence of improvements in energy efficiency, global energy usage would have increased by 65 per cent between 2000 and 2017, instead of the 33 per cent that was actually recorded, according to the International Energy Agency (IEA).[17] Investment in energy efficiency can lower energy bills and prevent premature deaths associated with air pollution. However, despite these benefits, many efficiency savings remain untapped. The IEA estimates that two-thirds of the cost-effective energy efficiency measures that are available today may not be implemented by 2040.

The energy intensity of output in the EBRD regions has declined significantly since the early 1990s, but it remains much higher than the levels seen in other economies with comparable levels of income. Indeed, there are seven countries in the EBRD regions that feature among the world's 20 most energy-intensive economies.[18]

A key obstacle to firms' investment in energy efficiency is the under-pricing of energy, whereby prices do not typically reflect environmental externalities. Under-pricing of energy remains widespread in the EBRD regions, as do fossil fuel subsidies.[19] Non-price barriers may also play a role. Firms may be unaware of available opportunities to improve energy efficiency, or they may be financially constrained. Policy responses to such informational and financial barriers include government information campaigns and the introduction of targeted energy efficiency credit products offered by banks.

Energy efficiency standards can also be a valuable policy tool when it comes to encouraging energy efficiency in buildings, equipment and consumer appliances.[20] Prescriptive standards introduce a specific requirement, such as the thermal insulation value for windows that is set by building regulations. Minimum energy performance standards, which leave it to producers to decide how they achieve the overall target set for a particular product, are frequently set for vehicles, appliances and buildings. In contrast, class average standards (which are commonly applied to car fleets) set a minimum average level of efficiency across various products, allowing manufacturers to meet that overall standard at the lowest possible cost.

Standards can be either compulsory or voluntary. Japan's Top Runner programme, for instance, sets energy efficiency standards for energy-intensive products at or beyond the level of the most efficient model in the market at a given point in time. This incentivises companies to make ever more efficient models. Companies that comply with those standards are allowed to use a dedicated label, while non-compliance can result in companies being named publicly. This initiative involves close cooperation between the government and industry to ensure that standards are realistic. It is estimated that this programme has reduced energy consumption in the road transport sector by 5 per cent.[21]

Furthermore, many countries label buildings on the basis of their energy performance, rather than applying mandatory standards. In the EU, for example, energy performance certificates are typically required when a building is sold or rented. Many economies in the EBRD regions have successfully implemented the EU's Energy Labelling Regulation (which puts in place a framework for establishing energy efficiency standards for equipment and appliances) and the Ecodesign Directive.

Energy efficiency standards follow several general principles. First, the benefits of achieving a standard need to outweigh the costs, and any impact on low-income households needs to be well understood. Second, standards such as fuel efficiency requirements for vehicles should be continually updated to reflect technological advances. And third, standards need to be adequately enforced. This requires a combination of monitoring systems, penalties for non-compliance and tax credits to incentivise improvements in energy efficiency.

[17] See IEA (2018).
[18] See EBRD (2017).
[19] See, for instance, Schweiger and Stepanov (2019).
[20] See Wiel and McMahon (2005).
[21] See OECD (2010).

BOX 4.4.

THE GREEN ECONOMY TRANSITION APPROACH

High levels of carbon intensity and climate vulnerability remain key issues for many economies in the EBRD regions. The desire to help firms move towards lower-carbon production structures and create more climate-resilient economies lies at the heart of the EBRD's Green Economy Transition (GET) approach, which is closely aligned with the United Nations' Sustainable Development Goals and the Paris Agreement.

GET programmes provide financing to firms and work closely with governments with a view to creating regulatory environments that promote investment in green buildings, renewable energy, green cities and other related areas. EBRD clients also benefit from feasibility studies, energy audits and other technical assistance packages, which help companies to deploy innovative tools that accelerate market responses to climate change. Between 2006 and the end of 2018, a total of 1,649 projects were financed under the GET initiative, helping to reduce greenhouse gas emissions by the equivalent of around 100 million tonnes of CO_2 a year.

Under the GET initiative's Green Economy Financing Facility (GEFF) programme, the EBRD has worked with more than 140 local financial institutions, which have been lending to businesses and homeowners wanting to invest in green technology. By the end of 2018, more than 180,000 green technology upgrades had been financed under the GEFF programme, reducing emissions by more than 8 million tonnes of CO_2 a year.[22]

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[22] These figures correspond to finance provided by the EBRD (and, where applicable, its co-financing partners).

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