BUSINESS RESILIENCE IN THE PANDEMIC AND BEYOND

Adaptation, innovation, financing and climate action from Eastern Europe to Central Asia

Chapter 3

The green economy

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European Investment Bank
The EU bank

Business resilience in the pandemic and beyond: Adaptation, innovation, financing and climate action from Eastern Europe to Central Asia

About this publication

This is a joint publication of the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD), with contributions from the International Monetary Fund (IMF).

Contributors

Business resilience in the pandemic and beyond: Adaptation, innovation, financing and climate action from Eastern Europe to Central Asia is a joint publication of the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD), with contributions from the International Monetary Fund (IMF). The team was led by Debora Revoltella, Barbara Marchitto (EIB), Ralph De Haas (EBRD), Jaewoo Lee, Petia Topalova (IMF) and advised by Sergei Guriev (Sciences Po). Chapter contributors are as follows:

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Disclaimer

The views expressed in this publication are those of the authors and do not necessarily reflect the position of the EIB, EBRD or IMF.

Acknowledgements

The authors are grateful for the research assistance of Roberta Lesma and Till Kadereit.

Most of the material in this report is based on the EBRD-EIB-WBG Enterprises Survey, which was funded by the EIB Eastern Partnership Technical Assistance Trust Fund (EPTAFT) and The EBRD Shareholder Special Fund (SSF). This funding is gratefully acknowledged.

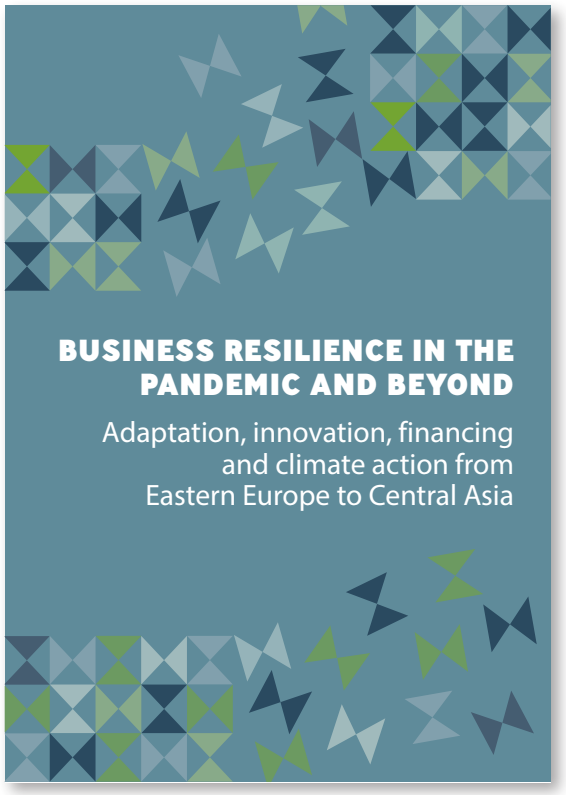
Published by the European Investment Bank

Printed on FSC® paper

eBook: QH-07-21-038-EN-E ISBN 978-92-861-5087-6 doi: 10.2867/19892
pdf: QH-07-21-038-EN-N ISBN 978-92-861-5086-9 doi: 10.2867/832329

Chapter 3
The green economy

Download the complete report:
https://www.eib.org/en/publications/business-resilience-in-the-pandemic-and-beyond
www.doi.org/10.2867/832329



Available as:

eBook: ISBN 978-92-861-5087-6
pdf: ISBN 978-92-861-5086-9

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CHAPTER III

The green economy

Summary

Global warming is a major threat to humanity. This chapter provides an overview of the environmental performance of economies in Eastern Europe and Central Asia to date, and uses firm-level data from the Enterprise Surveys to assess the readiness of the private sector for the green transition. The region has witnessed substantial reductions in carbon emissions since 1990 in absolute, per capita and per unit of GDP terms. But between 2005 and 2018, overall emissions decreased only in Central and Eastern Europe. In other sub-regions, the increase was driven primarily by GDP per capita growth and, in Central Asia and Turkey, by population growth. Moreover, despite halving since 1990, the average energy intensity of GDP in the region is still almost twice that in Southern Europe. Despite a shift away from coal and oil towards nuclear power and renewables, the region still relied on fossil fuels to generate three-quarters of its electricity in 2018. Furthermore, several countries still have generous fossil fuel subsidies, thus making the transition to a low-carbon future harder.

Firms' environmental footprints depend on the way they address environmental issues and monitor energy usage and pollution (in other words, their green management practices), on their environmental, social and governance (ESG) practices more broadly, as well as on the investments they make with or without explicit consideration for the environment. The chapter looks at these in turn. Green management practices assess whether firms have clear, measurable and realistic environmental objectives and whether their managers have the right incentives and expertise to achieve those targets. Firms in the region lag those in Southern Europe in terms of the average quality of green management practices, particularly in terms of specific targets with respect to energy and emissions. Analysis suggests that external factors, such as customer pressure and energy tax, play a more important role in determining the quality of green management practices than firm characteristics, such as size and age.

Turning to firms' ESG practices, information is often only available for listed companies. The chapter fills the gap and sheds some light on whether smaller firms in the region pay sufficient attention to ESG practices by introducing a "Corporate ESG Responsibility" composite indicator. Not surprisingly, firms in the region lag those in Southern Europe on ESG practices too, with those with fewer than 20 employees on average the weakest in every sub-region.

In addition to improving their green management and ESG practices, firms can also invest to enhance their energy efficiency and/or reduce their negative environmental impact. Firms are more likely to invest in a higher number of green measures if they experience fewer financial constraints and have better green management practices. Despite this, many firms do not implement them, primarily because they do not view them as a priority relative to other investments. Taken together, the chapter's findings suggest that policymakers will need to provide a business environment that is conducive to green investment and encourages all firms to improve their green management practices and, more broadly, their corporate ESG responsibility.

3.1. Introduction

Global warming is widely recognised as posing a major threat to humanity. It results in long-term changes in weather patterns, including rising sea levels and frequent extreme weather events, which have started to cause widespread economic damage and loss of human life. The Intergovernmental Panel on Climate Change (IPCC) has warned that global emissions must drop to net zero by 2050 to avoid the most catastrophic impacts of climate change (IPCC, 2019). Business models will need to adapt and build around the economics of low-carbon emissions to mitigate potential losses from exposure to physical and transition risks.

Climate change and many other environmental problems do not observe national borders and can only be managed through timely collective action. The 2015 Paris Agreement on climate change (UN, 2015) provides an opportunity for countries to strengthen the global response to climate change by keeping global temperature rises well below 2°C – and ideally as low as 1.5°C – relative to pre-industrial levels.

The scale and urgency of what is required over the next 30 years will pose unprecedented challenges for the governments across the globe. It will require them to play a more central role, guiding, enforcing and coordinating the transition to a low-carbon economy. The pandemic has shown just how vulnerable the global economic system can be in the face of system-wide risks. Hence, the need to transition to a green economy[1] remains urgent even as governments prioritise public health and battle the economic fallout from the pandemic in the short term.

The rest of this chapter is organised as follows. Section 3.2 describes trends in carbon emissions and energy supply in the region since the early 1990s, drivers behind the changes and energy intensity trends. Section 3.3 then turns to the private sector, relying on data from the EBRD-EIB-WBG Enterprise Surveys, which included a special Green Economy module with the aim of systematically collecting information on firms' green management practices and various other aspects of firms' behaviour relating to climate change.

The chapter focuses on firms' green management practices, assessing whether firms have clear, measurable and realistic environmental objectives and whether their managers have the right incentives and expertise to achieve those targets. Section 3.4 and Box 1 describe the first corporate environment, social and governance (ESG) responsibility composite indicator covering small and medium-sized enterprises (SMEs) in Europe and Central Asia. Section 3.5 then examines the extent to which financial and managerial constraints hinder green investment. Section 3.6 analyses the links between energy intensity and energy efficiency investments, and Section 3.7 discusses policy implications of the findings.

3.2. Taking stock

3.2.1. Carbon emissions

The adoption of the Paris Agreement at the United Nations Climate Change Conference of the Parties in 2015 (COP 21) was one of the biggest climate change milestones in history. The overarching aim of the Paris Agreement is to reduce greenhouse gas emissions and ensure that global temperature increases this century remain well below 2°C relative to pre-industrial levels, while ideally pursuing a scenario where the temperature increase remains below 1.5°C. As such, the Paris Agreement calls for very aggressive reductions in emissions – particularly carbon emissions, which account for more than three-quarters of all greenhouse gas emissions worldwide.

Since the early 1990s, the region has experienced substantial reductions in carbon emissions, but there is room for further improvement. Carbon emissions decreased in absolute terms, on a per capita basis as

1 This chapter uses low-carbon economy, carbon-neutral economy and green carbon economy interchangeably.

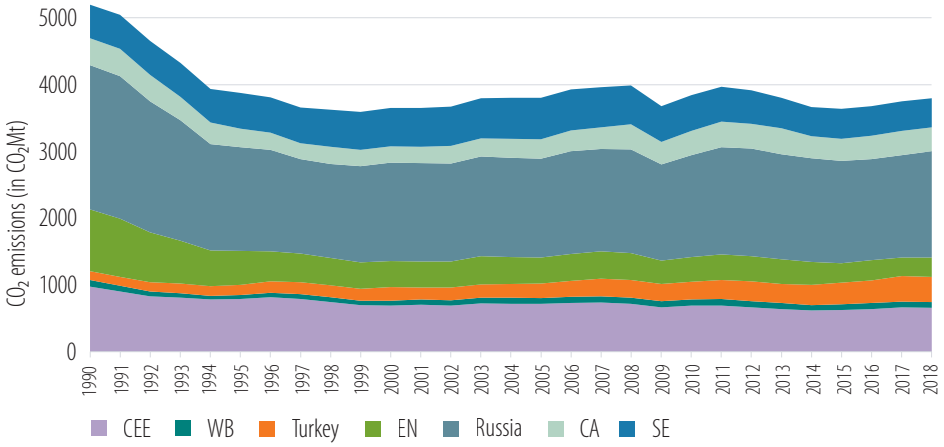
well as per US dollar of GDP (Figure 1).[2] While this is encouraging, much more remains to be done for alignment with the Paris Agreement. The region's emissions per capita declined in the 1990s, reaching their lowest point around 2000, but since then, they partially bounced back to higher levels. Moreover, carbon emissions have increased continuously in Turkey and several other sub-regions since the late 1990s; Russia remains the largest emitter (panel A). While they have halved compared with 1990, carbon emissions per US dollar of GDP are still about 50% higher in the region than in the Southern Europe sub-region of the European Union (Panel C). But an important difference is that countries in Southern Europe did not have to overcome the distortions of the low energy prices and chronic environmental neglect of the central planning era in the region.

Figure 1

Carbon emissions – absolute, per capita and per unit of GDP

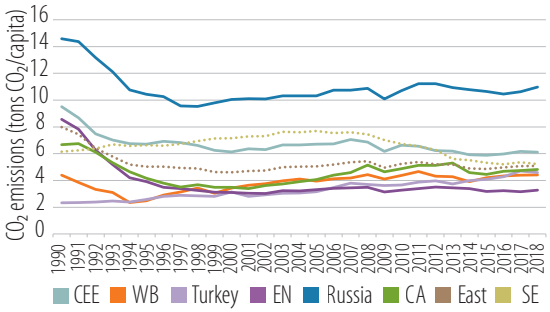
Panel A

Absolute carbon emissions



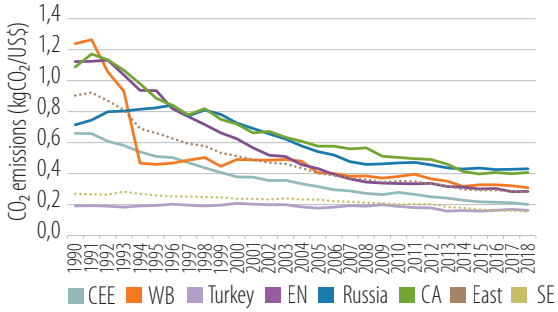
Panel B

Carbon emissions per capita



Panel C

Carbon emissions per unit of GDP



Source: *IEA and authors' calculations.*

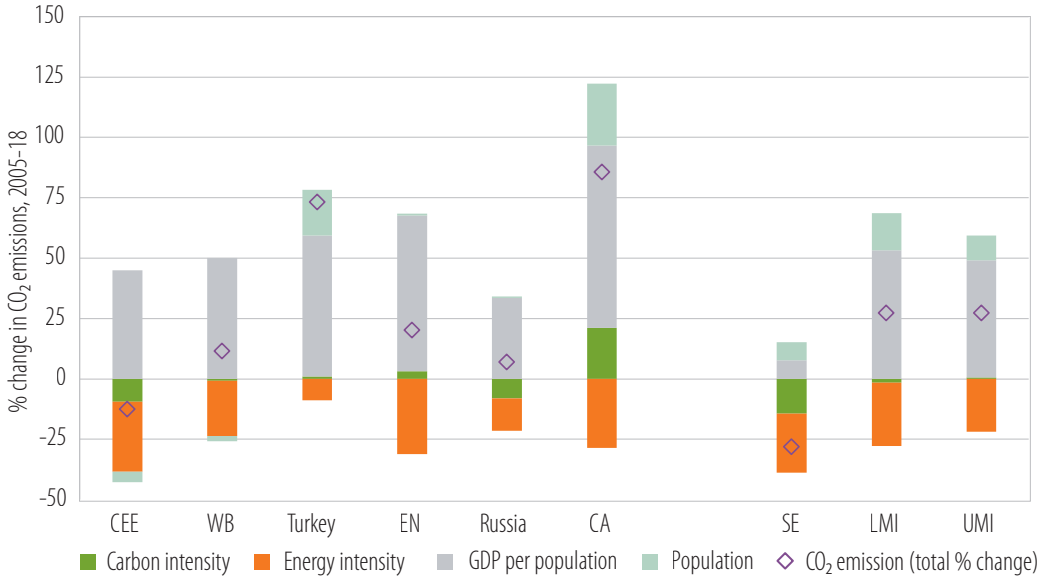
Note: *Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; East – Eastern Europe and Central Asia; SE – Southern Europe.*

2 A significant drop in carbon emissions per capita and per unit of GDP in the Western Balkans in 1994 was driven by the significant drop in carbon emissions in Bosnia and Herzegovina.

In the more recent period between 2005 and 2018, carbon emissions increased in most of the sub-regions. The only sub-region where absolute carbon emissions decreased was Central and Eastern Europe: by 11.9%, which is less than the decrease in carbon emissions in Southern Europe during the same period (28.0%). The decrease was driven primarily by reductions in energy intensity (the amount of energy that is used to produce a unit of value added; Figure 2), motivated by EU policies and regulations, as countries in both Southern Europe and Central and Eastern Europe are EU members. In other sub-regions of Eastern Europe and Central Asia, energy intensity decreased too, but overall carbon emissions nevertheless increased during the same period, driven primarily by growth in GDP per capita and, in Central Asia and Turkey, by population growth.

Figure 2

Drivers of changes in carbon emissions between 2005 and 2018



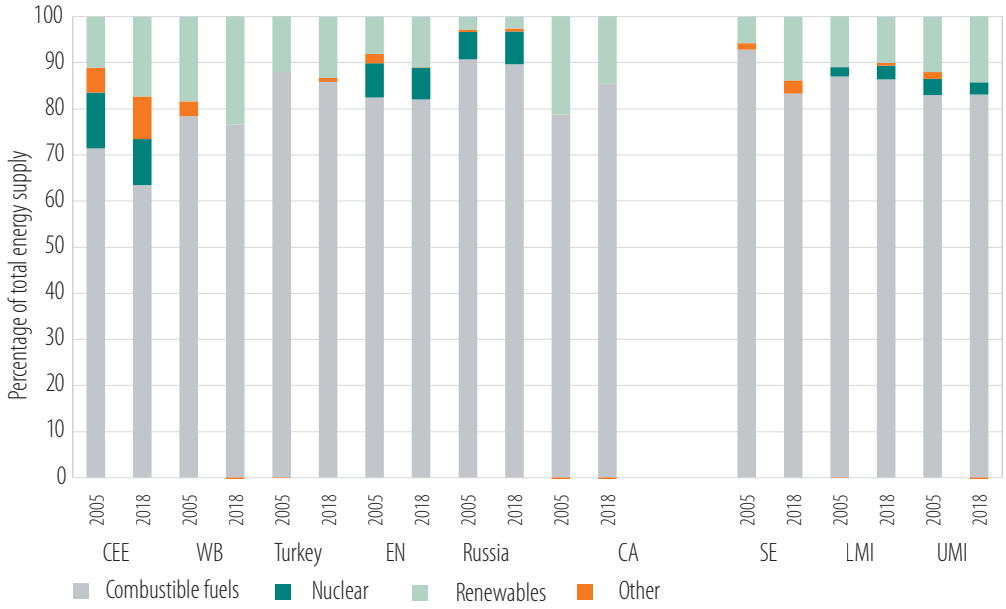
Source: *IEA and authors' calculations.*

Note: *Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies. Carbon intensity refers to carbon emissions per unit of energy. Energy intensity refers to energy use per unit of GDP.*

3.2.2. Primary energy supply

Despite a shift away from coal and oil towards nuclear power and renewables, the region is still highly reliant on fossil fuels. Combustible fuels (which include coal, oil and gas) remain the region's primary energy source, and accounted for 75.1% of its electricity in 2018 (Figure 3). Russia – a resource-rich country with substantial fossil fuel subsidies – had the highest share (89.7%), followed by Turkey (85.8%) and Central Asia (85.5%). In Central Asia, the share of combustible fuels as a source of energy increased by 6.7 percentage points between 2005 and 2018, primarily because of a substantial rise in the use of oil. In Central and Eastern Europe, by contrast, that share fell by 8 percentage points over the same period, primarily owing to a decline in the use of coal and peat. The share of renewable energy remained relatively small, though still higher than in Southern Europe as well as lower- and upper-middle-income economies.

Figure 3
Breakdown of primary energy supply by fuel type



Source: *IEA data from World Energy Balances.*
Note: *Data represent unweighted averages across countries. Combustible fuels include coal and peat, crude, natural gas liquids (NGL) and feedstocks, oil and natural gas. Renewables include hydro, geothermal, solar, tide, wind, biofuels and waste. Other includes heat and electricity. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

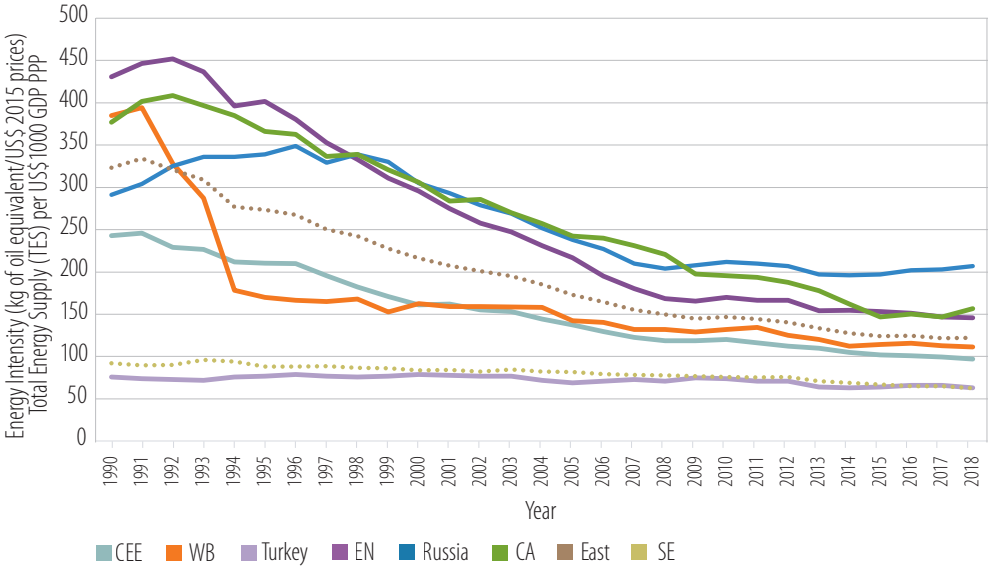
3.2.3. Energy intensity of GDP

Central planning led to distortions in the sectoral structure of economies and intrinsic inefficiencies in the use of energy. The sectoral structure of each economy and the amount of energy that is used to produce a unit of value added in each industry (which reflects the energy efficiency[3] of the various industries), alongside other factors such as weather conditions and the standard of living, determines the energy intensity of GDP.

The average energy intensity of GDP in the region has more than halved since 1990. This has been driven primarily by improvements in energy efficiency within individual sectors (EBRD, 2011). Nevertheless, the energy intensity of GDP remains almost twice that in Southern Europe (Figure 4), indicating that there is still much room for improvement.

3 The reverse of energy intensity is used as a proxy for energy efficiency.

Figure 4
Energy intensity of GDP



Source: *IEA and authors' calculations.*
Note: *Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; East – Eastern Europe and Central Asia; SE – Southern Europe.*

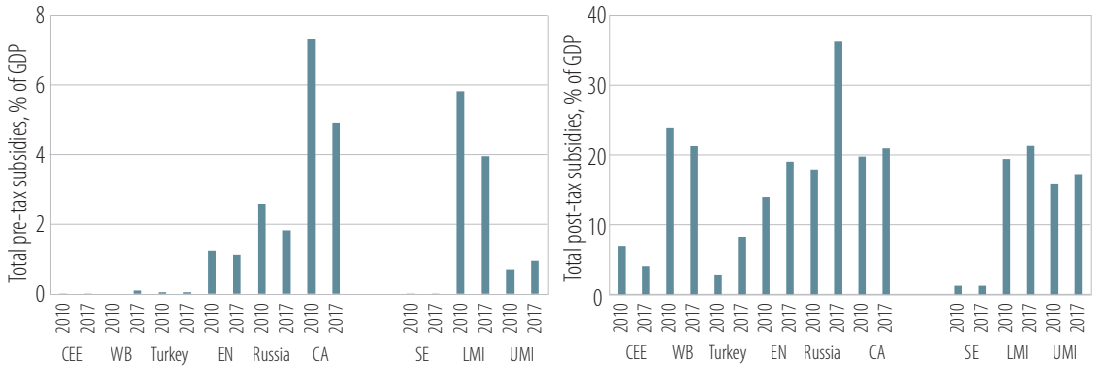
A more nuanced picture emerges when looking at energy intensity by country. Ukraine, for example, reduced its energy intensity by 42% between 1990 and 2018, but remains the country with the highest energy intensity of GDP in the region, more than twice the regional average. In contrast, Armenia, which had the second highest energy intensity of GDP among countries in the region in 1990 (after Uzbekistan), managed to reduce it by 80% in the same period, coming below the average for the region in 2018. In 2018, the most energy-intensive countries in the region besides Ukraine were Russia, the Kyrgyz Republic, Uzbekistan, Moldova, and Bosnia and Herzegovina (in declining order of energy intensity). On the plus side, each of those countries had reduced its energy intensity relative to the early 1990s, primarily thanks to a decrease in industry's share in GDP.

3.2.4. Fossil fuel subsidies

When it comes to energy-efficient business models, firms' choices are strongly influenced by their countries' energy policies, including fossil fuel subsidies. Several countries in the region that are heavily reliant on fossil fuels for their energy supply – such as Russia and several countries in Central Asia – subsidise fossil fuels and electricity generated from fossil fuels. Most countries do not take account of the costs associated with global warming, local externalities or forgone consumption tax revenues when setting energy prices. This is a key policy distortion that makes fossil fuels (and electricity generated from them) cheaper for both households and firms, in turn affecting behaviour in terms of energy usage. According to the IMF, the region's fossil fuel subsidies had a total value (excluding tax treatment) of $43 billion in 2017 (equivalent to 1.2% of the region's GDP), while subsidies including tax treatment totalled $885 billion (15.3% of GDP) (see Coady et al, 2019).

Fossil fuel subsidies are not negligible as a percentage of GDP. While the pre-tax fossil fuel subsidies as a percentage of GDP decreased in all regions between 2010 and 2017 (Figure 5), they still amounted to almost 5% of GDP in Central Asia and 1.8% of GDP in Russia. Once tax treatment is included, all countries – including those in Southern Europe – had some level of fossil fuel subsidies. Moreover, their share in GDP almost tripled in Turkey, doubled in Russia and increased in all other sub-regions except Central and Eastern Europe (where it decreased by more than 40%) and the Western Balkans.

Figure 5
Fossil fuel subsidies as a percentage of GDP



Source: *Coady et al (2019) and authors' calculations.*
Note: *Estimates represent unweighted averages across countries and include both consumption and production-related subsidies. Post-tax subsidies include the costs associated with global warming, local externalities or foregone consumption tax revenues when setting energy prices. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; East – Eastern Europe and Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

Fossil fuel subsidies affect firms' behaviour: better-managed firms respond to incentives and reduce their energy intensity less if the fossil fuel subsidy is relatively large. The magnitude is substantial: an improvement in the quality of general management practices (firms' general approach to operations, monitoring, targets and incentives) from the 25th to the 75th percentile of the distribution is associated with a 21% fuel intensity reduction when fossil fuel subsidies are low (or negative), but only with a 3% fuel intensity reduction when fossil fuel subsidies are high (Schweiger and Stepanov, 2021).

Firms' environmental footprints are influenced by factors other than energy policies. Besides general management practices, firms' environmental footprints depend on the way in which they address environmental issues and monitor energy usage and pollution, on ESG practices more broadly, as well as investments they make with or without explicit consideration for the environment. The next sections look at each of these in turn, using unique Enterprise Survey data.

3.3. Green management

3.3.1. Measuring green management practices

Nowadays, effective management includes not only the ability to manage operations and human resources, but also the ability to minimise the firm's impact on the environment. The Green Economy module of the EBRD-EIB-WBG Enterprise Survey systematically collected information on the four main pillars of firms' green management practices.[4] The first pillar concerns the question of whether firms have strategic objectives pertaining to the environment and climate change. The second pillar looks at whether firms employ a manager with an explicit mandate to deal with green issues. It is also important to see who the 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 (see Martin et al, 2012; and Yong et al, 2018). The third green management practices pillar concerns the question of whether firms have clear and attainable environmental targets. The fourth pillar looks at whether firms actively and

4 In most economies, the response rate for the Green Economy module was in excess of 95%.

frequently monitor their energy and water usage, as well as carbon emissions and other pollutants, in order to reduce their environmental footprint.[5, 6]

The quality of firms' green management can be quantified on the basis of their answers to several specific Enterprise Survey questions related to these four pillars. A measure of the quality of green management practices was constructed based on the answers. The scores for each question were normalised so 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. This exercise shows that the quality of firms' green management, averaged at the country level, is positively correlated with the average quality of *general* management practices (firms' general approach to operations, monitoring, targets and incentives). But this positive raw correlation is relatively modest, with a coefficient of 0.2.[7]

3.3.2. Green management patterns across the region

The average quality of green management practices differs across sub-regions. Firms in Central and Eastern Europe have, on average, the best green management practices in the region, followed by firms in the Western Balkans (Figure 6). But they lag firms in Southern Europe. Turkish firms score worst in terms of the average quality of green management, below the average for firms in lower- and upper-middle-income economies (LMI and UMI, respectively).

There are also marked differences across the sub-regions in the four pillars underlying the overall green management practices measure. For example, many firms in the Eastern Neighbourhood and the Western Balkans excel when it comes to monitoring – they frequently collect data on energy and water usage, and emissions of pollutants (Figure 7). But they are less adept at translating that monitoring into specific targets. Economies in Southern Europe do not perform so well when it comes to monitoring, but when they do, they are much better at translating that into specific targets. Firms in Central and Eastern Europe excel at having a manager with explicit responsibilities in the area of climate change and development, but again they do not deliver that much – comparatively – in terms of green monitoring.

5 The first pillar is based on one question about strategic objectives relating to environmental or climate change issues. The second pillar includes three questions about managers responsible for environmental and climate change issues and their reporting lines, as well as criteria for their performance evaluation. The third pillar covers 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. The fourth pillar includes 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).

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

7 Controlling for country, sector and firm size, the correlation coefficient between general and green management scores is 0.15.

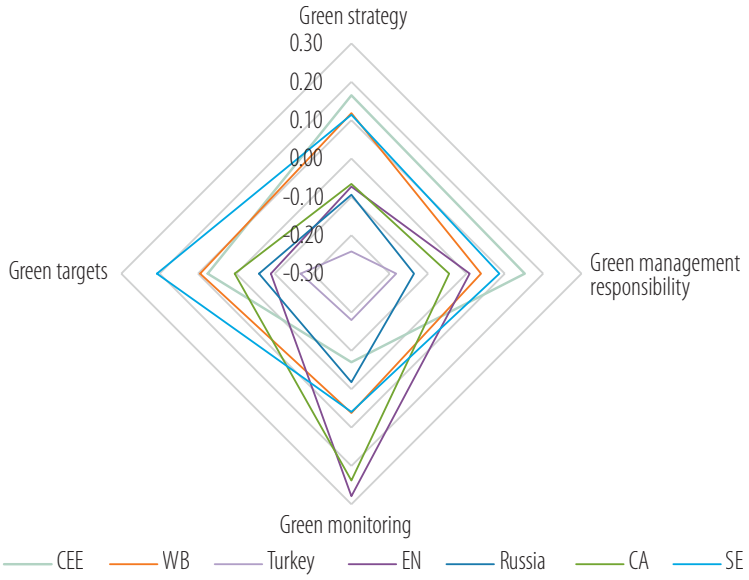
Figure 6

The average quality of green management differs across regions

Source: *Enterprise Surveys and authors' calculations.*
Note: *Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

Figure 7

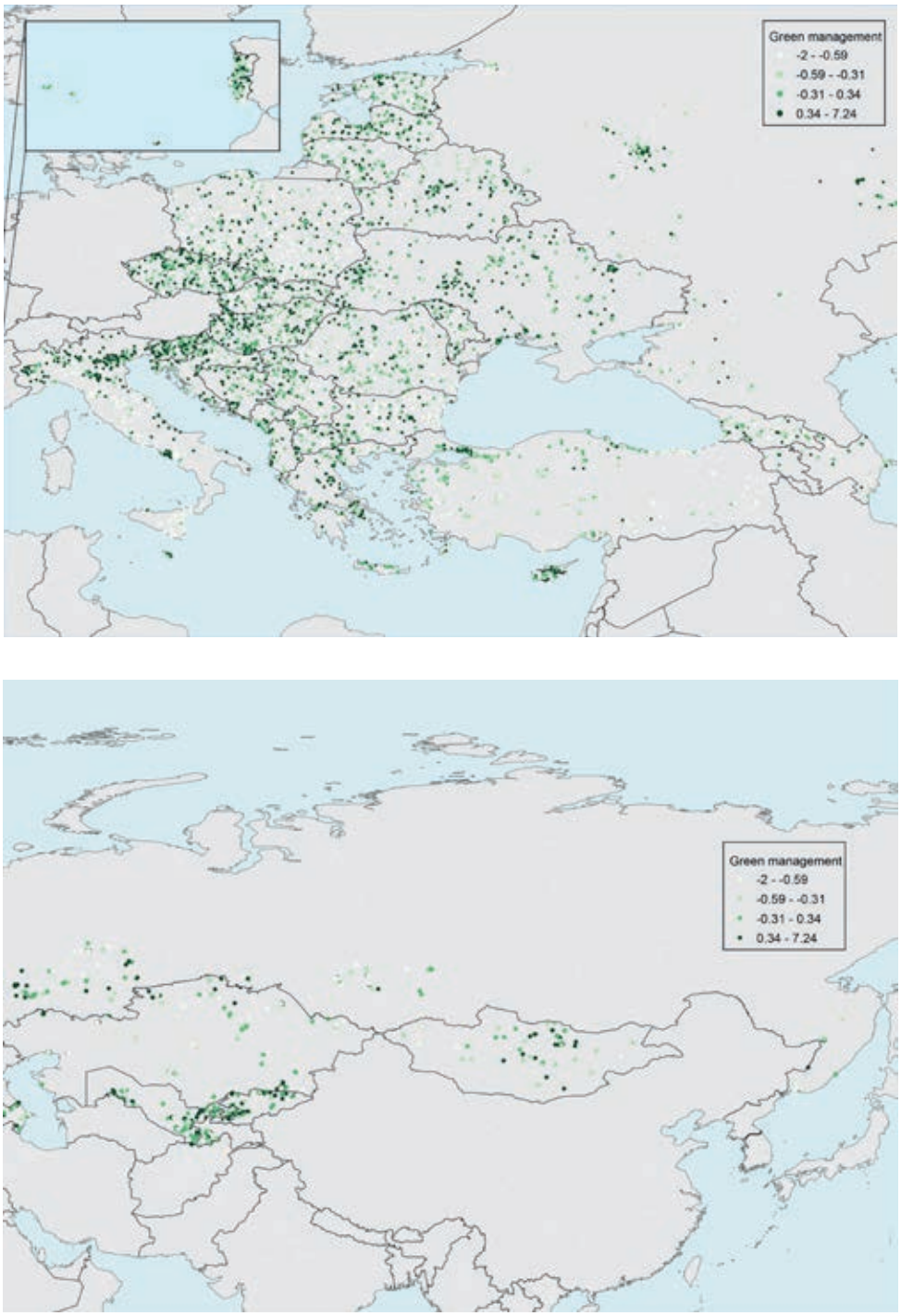
The four pillars of green management



Source: *Enterprise Surveys and authors' calculations.*
Note: *Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe.*

Figure 8

Geographical distribution of firms and the quality of their green management



Source: *Enterprise Surveys and authors' calculations.*

Note: *This map shows the geographical distribution of the firms in the region and Southern Europe. Each dot represents one or several firms in a locality. Darker green colours indicate higher-quality green management. Green management is measured as a z-score based on four areas of green management practices: strategic objectives related to the environment and climate change; whether the firm has a manager with an explicit mandate to deal with green issues, who this manager reports to and whether their performance is evaluated against the establishment's environmental performance; environmental targets; and monitoring of energy and water usage, carbon and other pollutant emissions.*

3.3.3. Determinants of green management practices

Although there are substantial differences across countries in terms of the average quality of green management, most of the variation is found within countries. This is true even after accounting for cross-country differences in sectoral composition. Figure 8 shows that firms with good and bad green management practices can be found in each country, with neither concentrated in specific locations within the country. There are several factors that may explain the large differences in green management scores across firms within a given country. Besides the firm's sector, these include other firm characteristics, such as size, age and ownership, as well as external factors, such as customer or regulatory pressure, and whether the firm is experiencing environmental and climate change-related problems. These are discussed further below.

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 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, or participate in an emissions trading system. Using data on average carbon emissions per unit of value added (see De Haas and Popov, 2019),[8] emissions-intensive sectors can be identified; they are defined here as industries covered by the Enterprise Surveys that have above-median emissions. The following sectors are emissions-intensive based on that definition: paper products, printing and publishing, coke, petroleum, chemical products, rubber and plastic products, non-metallic mineral products, basic metals, land transport, water transport and air transport.

Another factor is whether a firm is required to be more transparent about its overall performance. Listed firms tend to be subject to greater scrutiny and under more pressure (from institutional investors, for example) to report on ESG issues, and are thus more likely to have good green management practices. Other external factors requiring more transparency – such as customer pressure and environmental regulations (proxied by energy taxes or levies) – can also prompt firms to reduce their environmental impact. 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.

Experiencing environmental and climate change-related problems may affect green management practices, too. Firms with direct, first-hand experience of such problems – for example, firms that have suffered monetary losses due to extreme weather events or which have been negatively affected by pollution produced by nearby firms – may be more inclined to enhance their green credentials. Enterprise Survey data reveal that 9.1% of firms in the region and 13.5% of firms in Southern Europe have experienced monetary losses due to extreme weather events in the three years prior to the survey. For example, 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, there have been severe hailstorms in Croatia, Poland, Romania and Slovenia.

Firm size and age are likely to matter as well. 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 example, 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.

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.[9]

8 Alternative classifications yield a similar set of industries. See, for example, Broner et al (2016).

9 See, for example, Dean et al (2009) and Brucal et al (2019).

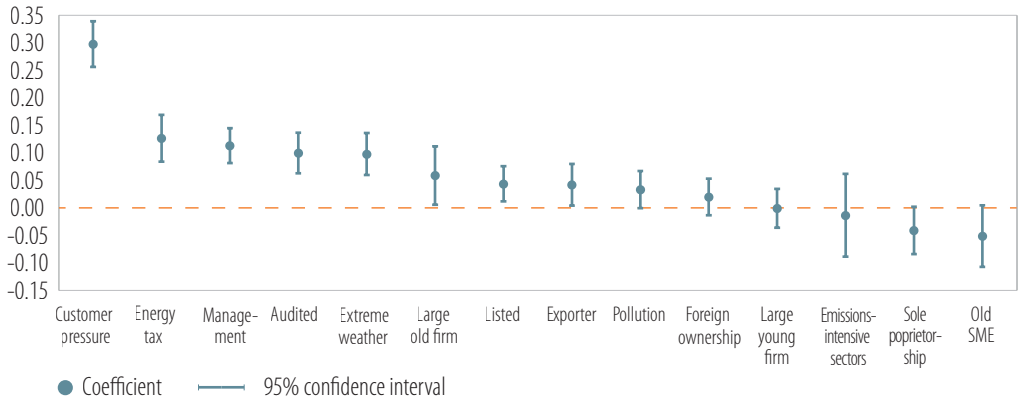
This has sometimes been referred to as the "pollution halo effect". But at the same time, firms in polluting industries may also relocate to countries with less stringent environmental regulations (termed "pollution havens") in response to costly regulations in their home countries, increasing pollution levels both in their host countries and globally (see, for example, Cai et al, 2016).

Customer pressure is the most important determinant of the quality of green management practices. Estimates from a firm-level regression (Figure 9) indicate that in the region, firms whose customers require environmental certifications or adherence to certain environmental standards as a condition of doing business with them on average have better green management practices than firms whose customers do not require this. This is closely followed by whether a firm is subject to an energy tax and the quality of its general management practices. Several other determinants also play a role, such as having audited financial statements or having experienced monetary losses due to extreme weather events. With other controls included, being active in emissions-intensive sectors is not an important determinant of green management practices – but it is likely that this is covered, to a large extent, by customer pressure and energy tax.

Overall, external factors play a more important role in determining the quality of green management practices than firm characteristics. This suggests that there is a role for government guidance and stricter regulation.

Figure 9

Determinants of green management



Source: *Enterprise Surveys and authors' calculations.*

Note: *This figure shows the standardised coefficients from a regression estimated using weighted ordinary least squares. The dots represent standardised coefficient estimates, and the lines represent the 95% confidence intervals. Regression includes the variables shown in the figure and controls for locality size; it also includes country, sector, accuracy and truthfulness fixed effects, and uses robust standard errors. Young firms are defined as those less than 5 years old. SMEs have fewer than 100 employees. Foreign-owned firms are those with at least 25% foreign ownership. Sectors are based on ISIC Rev. 3.1. Emissions-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).*

3.4. Corporate ESG responsibility practices

3.4.1. Measuring corporate ESG responsibility practices

The ability to handle environmental issues in a proactive manner is just one aspect of effective firm management; the ability to handle social and governance issues is also part and parcel of it. But information on firms' ESG practices is often only available for listed companies. Relatively few firms in the region are listed, with many stock markets remaining underdeveloped. Even in the region's most developed stock markets, ESG disclosure is in its infancy: for example, the Warsaw Stock Exchange published its first ESG reporting guidelines for listed companies only in May 2021, in partnership with the EBRD. Consequently, few listed firms disclose ESG information.

Moreover, even if listed companies had perfect ESG disclosure, there would still be no information on ESG practices of the vast majority of firms: unlisted firms and SMEs. While the Green Economy module and Enterprise Surveys were not developed specifically to collect information on ESG practices, they included a number of questions that can shed light on ESG-related practices of the unlisted firms and SMEs. This information has been used to build a firm-level "Corporate ESG Responsibility" composite indicator (see Box 1 for more details). Thanks to the Enterprise Survey coverage, the information and thus the composite indicator cover more than 28 000 firms, mainly SMEs, in more than 40 economies.

There is no global agreement on what ESG entails. This Corporate ESG Responsibility composite indicator does not follow the standards of any of the four leading ESG organisations[10] in their entirety, nor does it match any of the variegated approaches of ESG rating agencies (such as Vigeo Eiris, ISS-oekom, MSCI ESG Rating or Sustainalytics). Indeed, ESG rating agencies are using significantly different approaches (Berg et al, 2020; Chatterji et al, 2016; Gibson, 2019) and the correlation of ESG scores provided by different agencies is very low (Berg et al, 2020). This lack of an "industry standard", a "surprising lack of agreement" among agencies (Chatterji et al, 2016) or even an "aggregation of confusion" (Berg et al, 2020) in the realm of ESG ratings make building an indicator relying only on one of the agencies' methodologies problematic.

The aim of this firm-level Corporate ESG Responsibility composite indicator is to shed light on whether smaller firms in emerging markets pay attention to ESG practices. Its aim is not to produce ESG scores for listed large companies to serve investors' needs or to "certify" the ESG standards of any specific firm. This would require interaction with companies, verification on the ground and additional face-to-face interviews.

3.4.2. Patterns of corporate ESG responsibility practices across the region

Firms in Southern Europe have on average better corporate ESG responsibility than all of the sub-regions in Eastern Europe and Central Asia, with Central and Eastern Europe performing best and Russia and Turkey the worst. Figure 10 illustrates the resulting average Corporate ESG Responsibility composite indicator in the region and Southern Europe, as well as lower- and upper-middle-income economies covered in the Enterprise Surveys. At the country level, firms in the Baltic states have on average the best Corporate ESG Responsibility composite indicator, while firms in Montenegro and Tajikistan are at the other end of the spectrum.

10 These are the Global Reporting Initiative (GRI), the Sustainability Accounting Standards Board (SASB); CDP (formerly the Carbon Disclosure Project); the Carbon Disclosure Standards Board (CDSB); and the International Integrated Reporting Council (IIRC).

Figure 10

Average quality of Corporate ESG Responsibility composite indicator (z-score)

Source: *Enterprise Surveys and authors' calculations.*
Note: *Z-score calculation is based on the Enterprise Survey sample of 41 economies. Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

Box 1

Corporate ESG Responsibility composite indicator

The Corporate ESG Responsibility composite indicator is based on ESG-related questions in the Enterprise Surveys. It is inspired by the Sustainability Accounting Standards Board (SASB) standards. Selected ESG-related questions – 45 in total out of more than 200 in the Enterprise Surveys – have been aggregated to match the main ESG pillars and sub-pillars, and generate a synthetic index (see Table 1.1 for the schematic representation). The Corporate ESG Responsibility composite indicator has been built taking the following steps:

1. Identify and select the building blocks (E, S, G, and their sub-pillars) and respective variables, based on relevant frameworks such as the SASB and on their relevance in the assessments of the main ESG rating agencies.
2. Match the main building blocks and the variables used by SASB and ESG rating agencies with the topics (set of questions) covered by the Enterprise Surveys.
3. Align the sub-pillars with SASB standards to the maximum possible extent. Three sub-pillars are included for E (environmental awareness, green management practices, green measures), three for S (gender, education and skills, training) and six for G (corporate governance, management practices, internal controls and audit, business ethics, compensation, innovation).
4. When data are missing due to skipping patterns that ensure the firms answer only questions relevant to them rather than non-response, answers are imputed when logically straightforward (in line with OECD-JRC, 2008). Answers can include "refusal" or "don't know"; this is typically treated as missing in the analysis, but can on a case-by-case basis be used as valid information.
5. Calculate pillars and the overall composite indicator as z-scores with mean 0 and standard deviation 1 over the sample, including all 41 economies and companies covered in the Enterprise Surveys.
6. Weight the main building blocks (E, S, G) and the sub-pillars taking into account their relevance; the components within each sub-pillar, on the contrary, are equally weighted. The weight for E has been set at 40%, the one for S at 25%, the one for G at 35%.

7. Perform various other robustness checks, such as looking at correlation matrices and benchmarking different versions of scores built using different definitions in terms of (i) inclusion or not of specific building blocks; and (ii) different weights.
8. Generate the final output, represented by firm-level Corporate ESG Responsibility scores.

Table 1.1

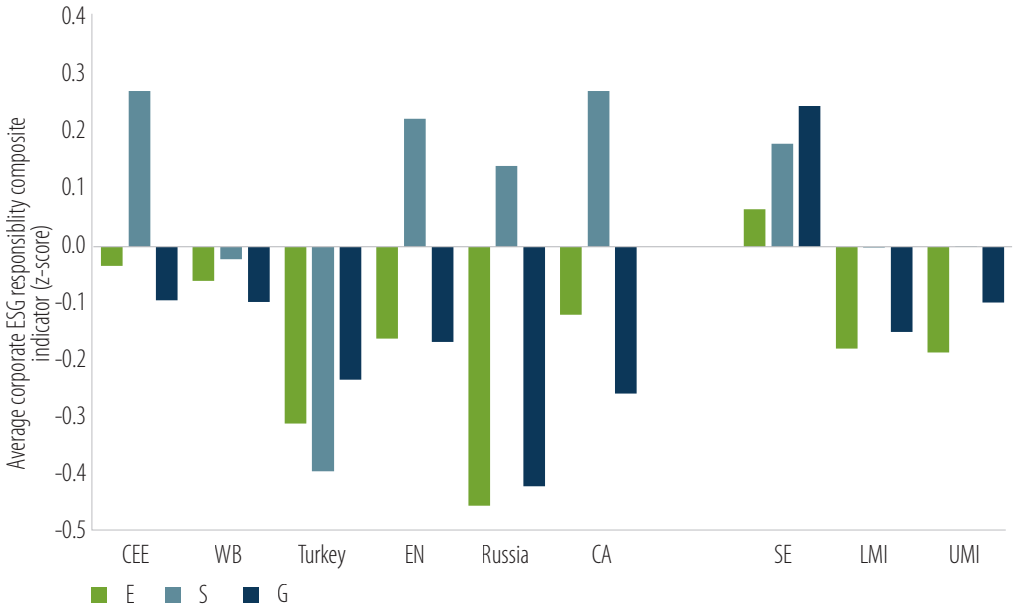
Corporate ESG Responsibility composite indicator: building blocks and Enterprise Survey questions

E	Environmental awareness	Monitor/ external audit/ targets of energy consumption, CO_2, water, pollution
	Green Management	Strategic objectives mentioning environment, manager responsible, certifications
	Green Measures	Heating and cooling improvements, upgrade of machines and of vehicles, etc.
S	Gender	Female owners, female top managers, female employees
	Education and skills	Secondary school completion
	Training	Formal training programmes
G	Corporate governance	Written business strategy with KPIs, board of directors, meeting with suppliers
	Management Practices	Monitor performance indicators, production targets, promotion of non-managers
	Internal controls & audit	Certified fiscal statement, internationally-recognized quality certification
	Business Ethics	Obstacles from crime, losses from robberies, gifts or informal payments
	Compensation	Performance bonuses for managers
	Innovation	R&D, purchase of fixed assets, use of technology from foreign company

Source: Authors' classification based on Sustainability Accounting Standards Board (SASB) standards and Enterprise Surveys.

There are differences in the average performance on the three components of the Corporate ESG Responsibility indicator across the sub-regions. On average, firms in Central and Eastern Europe perform best on the social component (Figure 11). The same is true for firms in Central Asia and the Eastern Neighbourhood, although these are on average weaker on environmental and governance components. The differences in average performance on the three components are smaller for firms in the Western Balkans than for those in Central and Eastern Europe, Central Asia and the Eastern Neighbourhood, but they are below the overall Enterprise Survey performance.

Figure 11
Average quality of Corporate ESG Responsibility pillars (composite indicator, z-score)

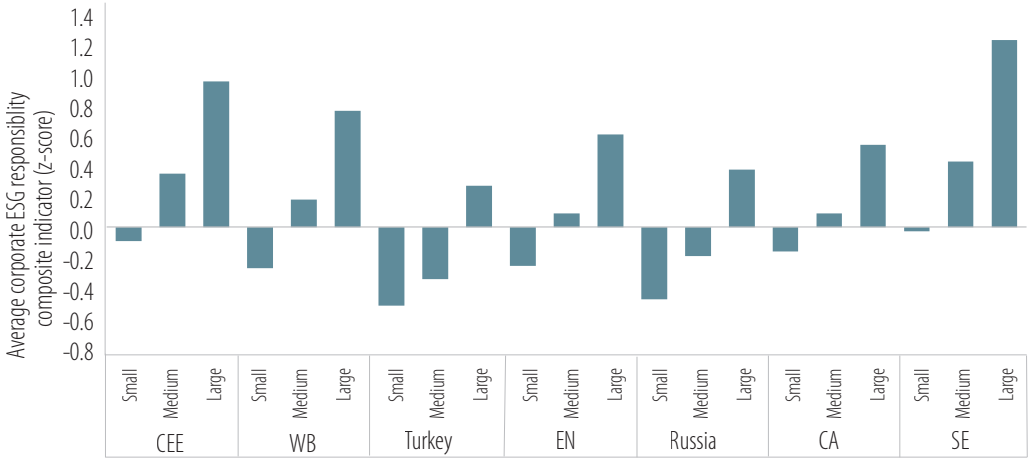


Source: *Enterprise Surveys and authors' calculations.*
Note: *Z-score calculation is based on the Enterprise Survey sample of 41 economies. Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

The Corporate ESG Responsibility composite indicator confirms that firm size[11] matters for ESG practices; it provides an indication of the relevance of the gaps across size and regions. Small companies (those with fewer than 20 employees) are on average the weakest in terms of ESG performance in each sub-region, including Central and Eastern Europe, Central Asia, the Eastern Neighbourhood and the Western Balkans, followed by medium-sized firms (Figure 12). Large firms (those with at least 100 employees, most of them not listed) on average perform best and score better than small firms in all sub-regions.

11 The Enterprise Survey thresholds are: small – fewer than 20 employees; medium-sized – 20-99 employees; large: at least 100 employees.

Figure 12
Determinants of Corporate ESG Responsibility

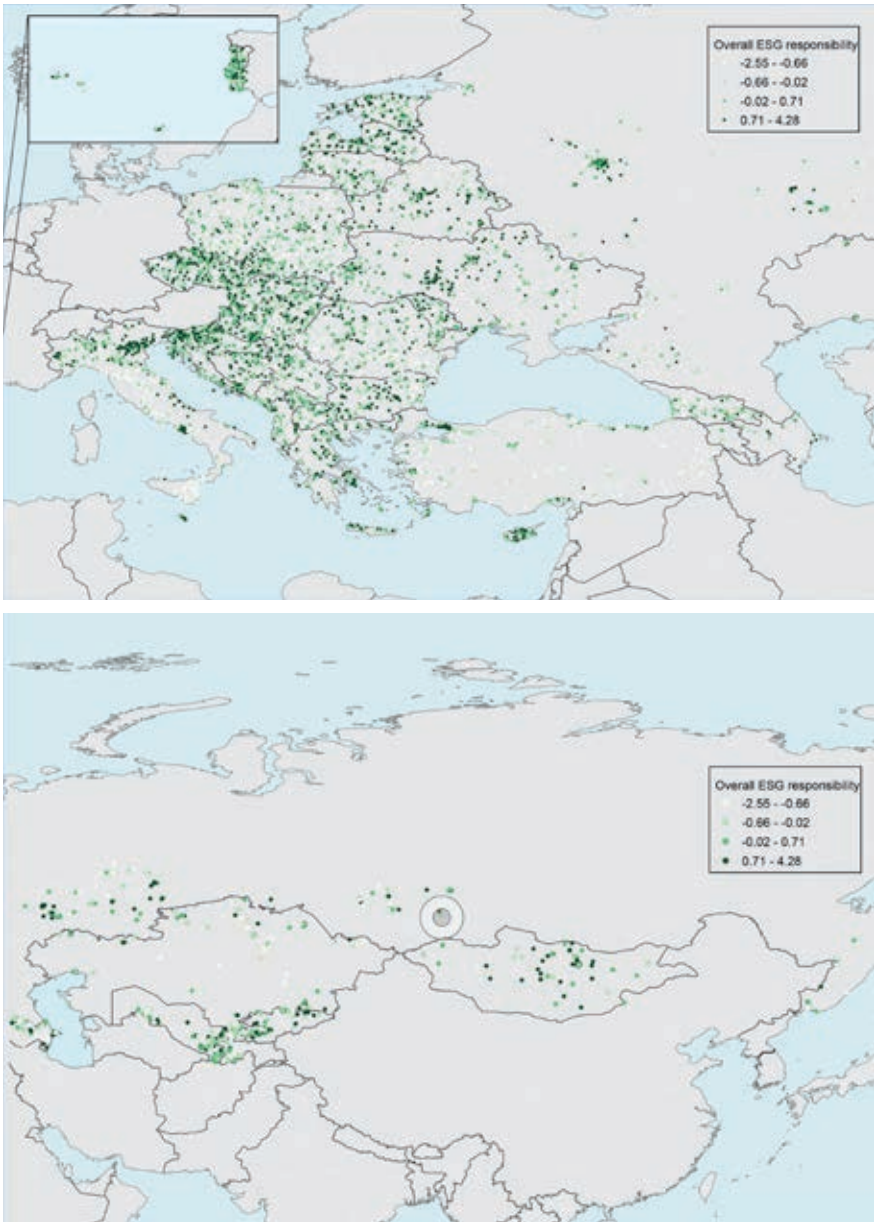


Source: *Enterprise Surveys and authors' calculations.*
Note: *Z-score calculation is based on the Enterprise Survey sample of 41 economies. Data represent unweighted averages across countries. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe. Small firms have fewer than 20 employees, medium-sized firms have 20-99 employees and large firms have 100 or more employees.*

3.4.3. Determinants of corporate ESG responsibility practices

There are substantial differences across countries in terms of the average value of the Corporate ESG Responsibility composite indicator. But firms with high and low values can be found in every country (Figure 13). In a few countries, such as Italy and Turkey, firms with high values and firms with low values of the Corporate ESG Responsibility composite indicator appear to be concentrated in specific locations, but such a pattern is not evident elsewhere.

Figure 13
Geographical distribution of ES firms and their Corporate ESG Responsibility composite indicator



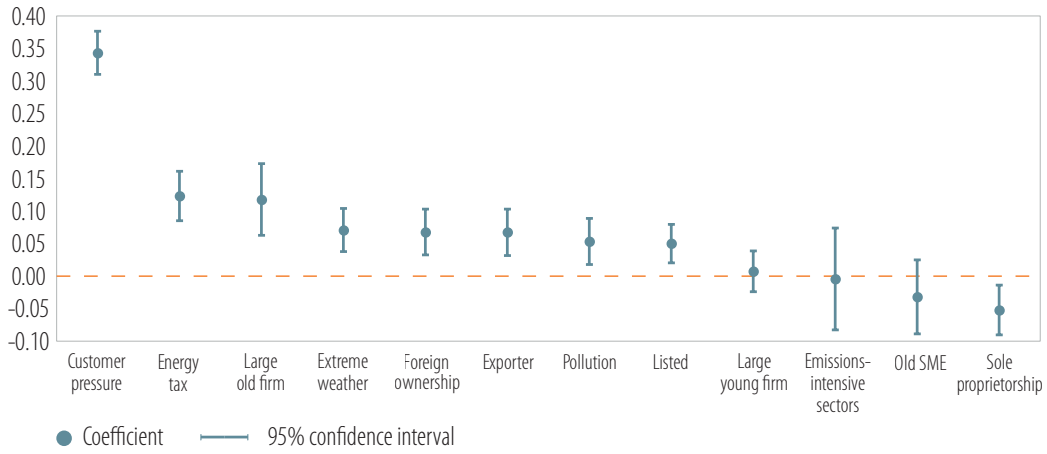
Source: *Enterprise Surveys and authors' calculations.*
Note: *Z-score calculation is based on the Enterprise Survey sample of 41 countries. See Box 1 for more details.*

There are several factors that may explain the large differences in Corporate ESG Responsibility composite indicator scores across firms within a given country. Besides the firm's sector, these include other firm characteristics, such as size, age and ownership, as well as external factors, such as customer or regulatory pressure, and whether the firm is experiencing environmental and climate change-related problems.

Customer pressure is the most important determinant of the quality of Corporate ESG Responsibility practices. Estimates from a firm-level regression (Figure 14) indicate that across

the region, firms whose customers require environmental certifications or adherence to certain environmental standards as a condition of doing business with them on average have better corporate ESG responsibility practices than firms whose customers do not require this. This is closely followed by whether a firm is subject to an energy tax. Several other determinants also play a role, such as being a large old firm, having experienced monetary losses due to extreme weather events or pollution by others, having at least 25% foreign ownership, being an exporter or being a listed firm.

Figure 14
Determinants of Corporate ESG responsibility composite indicator



Source: *Enterprise Surveys and authors' calculations.*
Note: *This figure shows the standardised coefficients from a regression estimated using weighted ordinary least squares. The dots represent standardised coefficient estimates, and the lines represent the 95% confidence intervals. Regression includes the variables shown in the figure and controls for locality size; it also includes country, sector, accuracy and truthfulness fixed effects, and uses robust standard errors. Young firms are defined as those less than five years old. SMEs have fewer than 100 employees. Foreign-owned firms are those with at least 25% foreign ownership. Sectors are based on ISIC Rev. 3.1. Emissions-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).*

These findings suggest that while ESG standards and guidelines are prepared for and adopted by listed firms, policymakers and other relevant stakeholders should think about ESG guidelines for unlisted firms and SMEs. The latter groups represent the majority of firms in emerging markets, as well as the region as a whole. Moreover, ESG risks should not be left solely in the realm of financial investors: they should be evaluated by commercial banks, insurance companies and public authorities too. Furthermore, ESG disclosure should be on par with financial disclosure as quickly as possible, with the same rigour, level of implementation and enforcement, quality control and information and communication technology (ICT) infrastructure.

3.5. Green investment

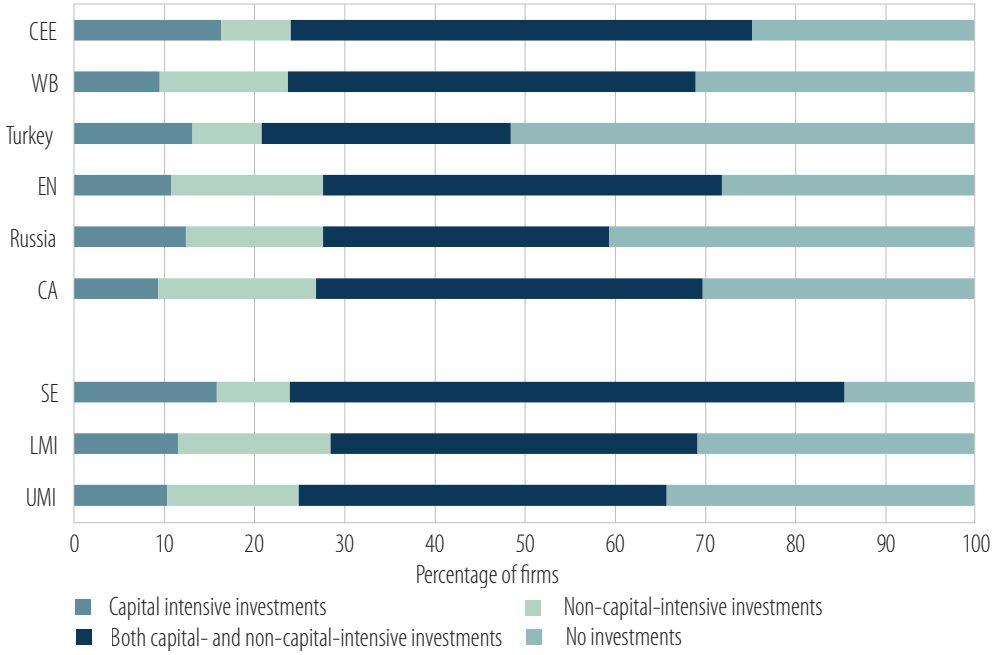
3.5.1. Evidence on green investment

Green investments are necessary to reduce firms' carbon footprints. In addition to improving their green management and, more broadly, their ESG practices, firms can also invest in measures that result in an increase in energy efficiency and/or a reduction in pollution or other negative environmental effects, even if this is achieved as a by-product of other objectives. In the Enterprise Survey, firms were asked about various types of investment, ranging from typical fixed asset investments, such as machinery and

equipment upgrades, to measures that might not require any fixed asset investments, without specifying the (green or non-green) reason for making a particular investment. Some of these investments, such as machinery and equipment upgrades, vehicle upgrades, on-site generation of green energy and waste minimisation, recycling and waste management, are capital-intensive – in other words, they require large amounts of investment. Others, such as heating and cooling improvements, energy management, measures to control air pollution, water management, lighting improvements and measures to control other pollution, are – in comparison – less capital-intensive.

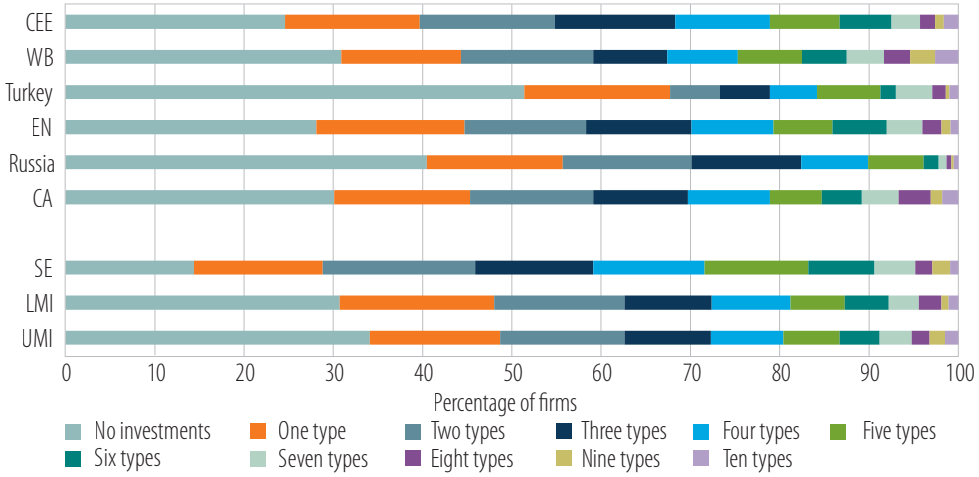
More than 70% of firms in the region have made at least one type of green investment, compared with more than 85% of firms in Southern Europe. Enterprise Survey evidence indicates that more than a quarter of respondent firms in the region have not engaged in any type of green investment, whether capital-intensive or not, over the three years prior to the survey, while 46% have engaged in both capital-intensive and non-capital-intensive green investment (Figure 15). Most firms have made one type of investment (Figure 16). These patterns vary across sub-regions. In Central and Eastern Europe and Central Asia, most firms have made two types of green investment, while in the Western Balkans, 2.6% of firms have made all the different types of green investment.

Figure 15
Breakdown of firms' green investment by capital intensity



Source: *Enterprise Surveys and authors' calculations.*
Note: *Capital-intensive green investments are investment in more climate-friendly energy generation on site, machinery and equipment upgrades, vehicle upgrades and investment in waste minimisation, recycling and waste management. CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

Figure 16
Breakdown of the number of different green investments by firms



Source: *Enterprise Surveys and authors' calculations.*
Note: *CEE – Central and Eastern Europe; WB – Western Balkans; EN – Eastern Neighbourhood; CA – Central Asia; SE – Southern Europe; LMI – lower-middle-income economies; UMI – upper-middle-income economies.*

3.5.2. Green investment: financial and managerial constraints

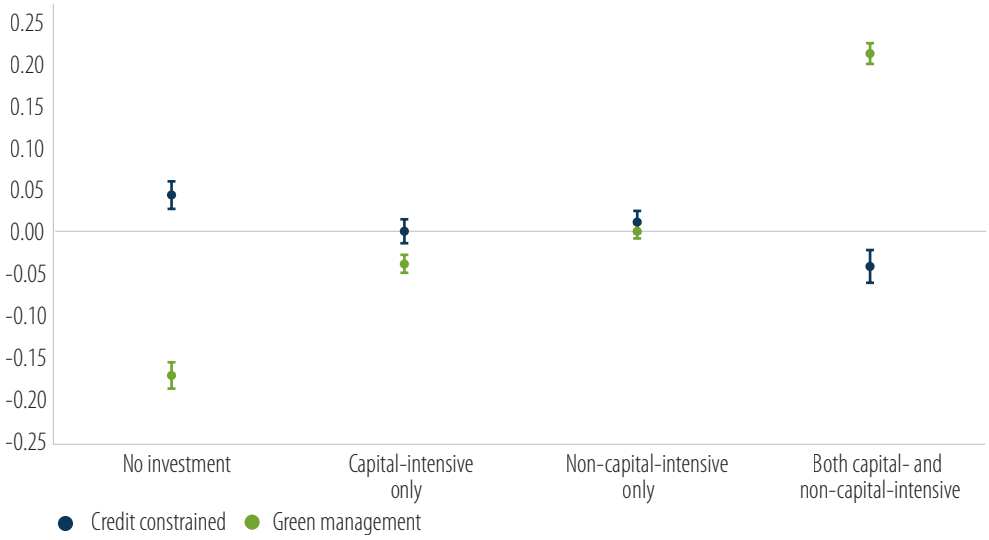
What influences a firm's decision to make a particular type of green investment, and a particular number of green investments? De Haas et al (2021) have shown that financial frictions and managerial constraints slow down firm investment in more energy efficient and less polluting technologies, with environmental consequences in the form of higher emissions down the line. This section tackles this phenomenon from an alternative perspective: it asks whether the impact of financial frictions and management constraints differs by the type of green investment (capital-intensive versus less capital-intensive) and the number of different green investments in which a firm engages. 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.

Credit constraints and green management quality affect the type of green investment a firm makes. Figure 17 illustrates the average marginal effects of credit constraints and green management on different types of green investments, based on multinomial logit regression with the type of green investment as a dependent variable (see the notes under the figure for more details). Being credit-constrained is associated with a 4.3 percentage points higher probability of making no green investments and a 4.2 percentage points lower probability of making both capital- and non-capital-intensive green investments. A unit increase in the quality of green management practices, equivalent to moving from the 10th to the 50th percentile of the distribution of the quality of green management practices, is associated with a 17.2 percentage points lower probability of making no green investments, a 3.9 percentage points lower probability of making only capital-intensive green investments and a 21.2 percentage points higher probability of making both types of green investments.[12]

12 These average marginal effect estimates are statistically significant at 1% level of significance or lower.

Figure 17

Average marginal effects of credit constraints and green management on different types of green investments



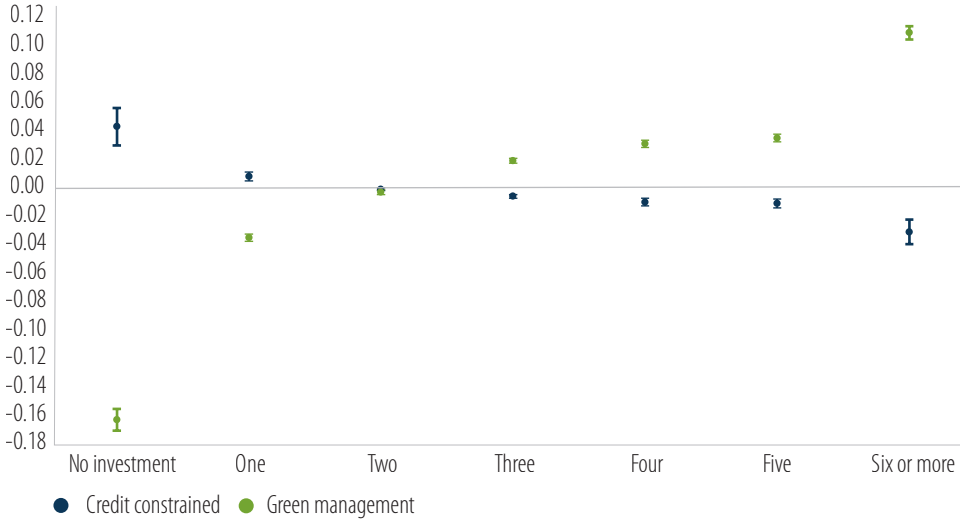
Source: *Enterprise Surveys and authors' calculations.*

Note: *This figure summarises the average marginal effect estimates of credit constraints and green management on the type of green investment, based on a multinomial logit regression with the type of green investment as a dependent variable. The dots represent average marginal effect estimates, and the lines represent the 95% confidence intervals. Regression controls for the firm-level covariates (log firm age and its square, percentage of employees with a completed university degree, indicators for exporter status, listed firm, sole proprietorship, and audited financial accounts); locality-level credit market controls (log average amount of assets of banks in a 15km radius and the number of bank branches in a 15km radius) and population size class; and country and sector fixed effects.*

Moreover, the quality of green management practices plays a part in a firm's decision on how many different green investments to undertake. A unit increase in the quality of green management practices is associated with a 16.2, 3.4 and 0.2 percentage points lower probability of making no, one or two different green investments, respectively, and with a 2.0, 3.2, 3.6 and 11.0 percentage points higher probability of making three, four, five or six or more different green investments, respectively (Figure 18). Being credit-constrained, in contrast, is associated with 4.4 percentage points higher probability of making no green investments, and a 1.0 and 3.0 percentage points lower probability of making five or six or more different green investments, respectively, than not being credit-constrained.

Figure 18

Average marginal effects of credit constraints and green management on the number of different green investments



Source: *Enterprise Surveys and authors' calculations.*

Note: *This figure summarises the average marginal effect estimates of credit constraints and green management on the number of green investments, based on an ordered logit regression with the number of green investments as a dependent variable. The dots represent average marginal effect estimates, and the lines represent the 95% confidence intervals. Regression controls for the firm-level covariates (log firm age and its square, percentage of employees with a completed university degree, indicators for exporter status, listed firm, sole proprietorship, and audited financial accounts); locality-level credit market controls (log average amount of assets of banks in a 15km radius and the number of bank branches in a 15km radius) and population size class; and country and sector fixed effects.*

Green management practices play an important role in a firm's decisions about green investment. The estimates of the average marginal effects of credit constraints and quality of green management depicted in Figures 17 and 18 are not directly comparable, and they are also not causal – 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. But they suggest that the quality of green management practices might play a very important role – potentially a bigger one than credit constraints – in a firm's decision whether or not to make green investments at all, but also which type of green investments as well as how many different green investments to make.

Policy measures that ease access to bank credit specifically for green investment might be just one element of a broader policy mix to stimulate green investment. Governments and development banks should also consider measures that could strengthen green management practices. This may include dissemination of information on best green management practices, requirements to measure and report environmental impact, or credit lines contingent on the implementation of investment in the best technologies in environmental terms or contingent on the adoption of better green management practices by firms.

3.6. Energy efficiency investments

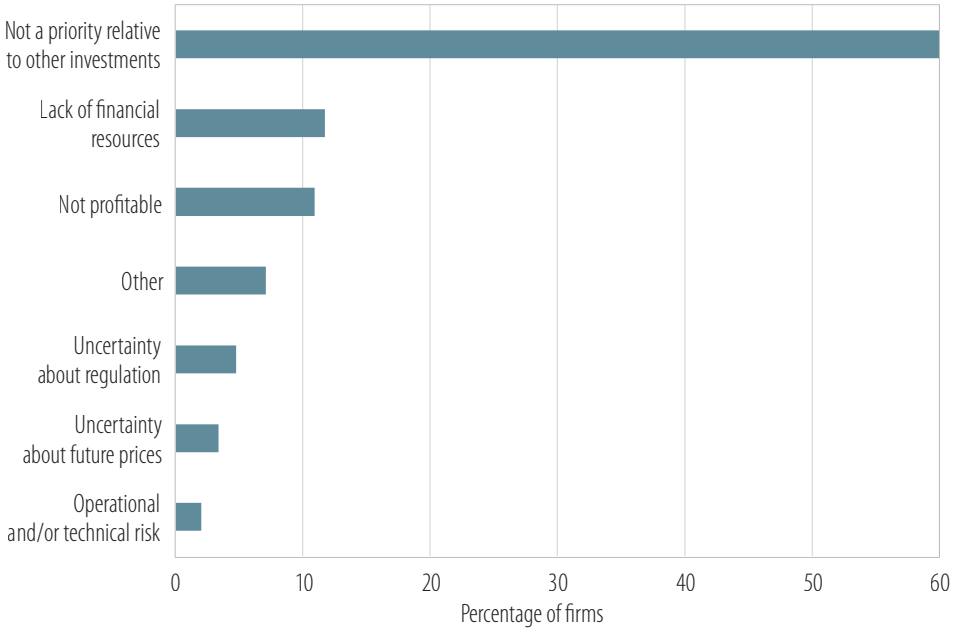
Investments in energy efficiency are essential for the transition to a carbon-neutral economy. Many of the green investments discussed in the previous section, such as improvements to heating, lighting and cooling, green energy generation on site, or machinery and equipment upgrades, are likely to result in lower energy usage and can thus be classified as investments in energy efficiency. IEA (2017) assessed that as much as 44% of all emissions reductions by 2040 could come from energy efficiency gains. But

despite the potential environmental and efficiency benefits of such investments, the share of firms implementing them is limited – in the region, over a quarter of firms adopted energy efficiency measures in the three years prior to the interview, ranging from 22.1% in the Western Balkans to 34% in Turkey.

3.6.1. Reasons for not investing in energy efficiency

The majority of firms do not view investment in energy efficiency measures as a priority relative to other investments. To understand the rationale behind these decisions, the Enterprise Survey asks firms that have decided not to adopt energy efficiency measures about their reasons for forgoing them. Overall, 60% of respondent firms in the region that have not implemented energy efficiency measures report that this is not a priority relative to other types of investment (Figure 19); in Southern Europe, this is even higher, at close to 70%.

Figure 19
Reasons for not investing in energy efficiency measures



Source: *Enterprise Surveys and authors' calculations.*

A lack of financial resources is the second most common reason for not investing in energy efficiency measures, followed by the perception that such investment is not profitable. The second and third most cited reasons are a lack of financial resources (11.7%) and the perceived unprofitability of such investment (10.9%). In Turkey and Central Asia, the perceived lack of profitability was the second most common reason for both SMEs and large firms. Financial constraints are more of an obstacle for SMEs than they are for large firms in all regions except Central and Eastern Europe, Central Asia and the Western Balkans, where the percentages of SMEs and large firms complaining about financial constraints do not differ substantially by firm size. In contrast, this difference is particularly large in Turkey, the Eastern Neighbourhood and Russia. Large firms, in contrast, are more likely to worry about the uncertainty surrounding future prices.

3.6.2. Do firms that invest in energy efficiency have lower energy intensity?

Investments in energy efficiency have potential environmental and efficiency benefits, but do the firms that make them actually have lower energy intensity than firms that do not? Panel A of

Table 1 shows that there is no significant correlation between energy efficiency investments and energy intensity. This is not necessarily surprising given the differences among the countries in the region on a number of dimensions, such as the availability of fossil fuel subsidies, energy supply sources, the structure of the industry at the beginning of the 1990s and so on. While sector and country fixed effects are included in the regressions, they cannot control for all subsidies support that might be firm-specific.

A firm's decision to invest in energy efficiency is likely to be influenced by its level of energy intensity. Highly energy-intensive firms may be more likely to invest in energy efficiency than firms with lower energy intensity. To alleviate such concerns when assessing the link between energy efficiency investments and energy efficiency, the following analysis estimates the impact that energy efficiency investments have on energy intensity in two stages. The first stage isolates the share of energy efficiency investments that is purely due to exogenous factors ("instrumental variables") and therefore unlikely to be affected by energy intensity. That predicted share of energy efficiency investments is then used in the second stage to estimate the causal impact on energy intensity. More details on this approach are in the notes accompanying Table 1.

Table 1

Energy efficiency investments and energy intensity

	(1)	(2)
Dependent variable	Electricity cost/sales	Energy cost/sales
Panel A: OLS		
Energy efficiency investment	0.001	0.002
	(0.001)	(0.001)
Panel B: IV First stage; dependent variable: energy efficiency investment		
Extreme precipitation 2000-2009, 100km radius	0.005**	0.006**
	(0.002)	(0.003)
Energy efficiency investment instrument	0.814***	0.814***
	(0.027)	(0.028)
Panel C: IV (Second stage)		
Energy efficiency investment	-0.009***	-0.024***
	(0.003)	(0.005)
LM test for underidentification	909.26	810.78
Stock-Wright LM S statistic	15.10	22.35
Anderson-Rubin Wald test	7.53	11.14
Anderson-Rubin chi2 test	15.12	22.39
F statistic for weak identification	486.07	432.53
Hansen J statistic p-value	0.174	0.808
Observations	13190	12026

Source: *Enterprise Surveys, Banking Environment and Performance Survey II (BEPS II), World Clim 2.1 database and authors' calculations.*

Note: *This table shows the results of OLS and instrumental variables regressions explaining the impact that energy efficiency investments have on firm energy intensity. Panel A shows the OLS estimates, Panel C shows the IV estimates and Panel B shows the first-stage regressions, where the dependent variable is energy efficiency investment. The dependent variables in Panels A and C are electricity cost over sales (column 1) and energy cost over sales (column 2), both winsorised at 5%. The first-stage instruments are extreme precipitation 2000-2009, 100km radius, defined as the number of times the average monthly precipitation within 100km of the firm was more than 2 standard deviations above the long-term (1970-2000) average monthly precipitation within 100 km of the firm in the period 2000-09, and average energy efficiency investment indicator of firms in other sectors in the region. All regressions include firm-level controls (log of the number of permanent, full-time employees and its square, log firm age and its square, percentage of employees with a completed university degree, indicators for exporter status, listed firm, sole proprietorship and audited financial reports, locality size class), as well as country*sector fixed effects. * Standard errors in parentheses. * p < 0.1, ** p < 0.05, *** p< 0.01.*

The first stage exploits exogenous variation in energy efficiency investments across different localities. Awareness of the importance of energy efficiency investment is, at least in part, a form of intangible capital (Bloom et al, 2016), and local access to this form of capital is determined by knowledge diffusion, which varies from area to area. One important factor that can raise firms' awareness is the experience of extreme weather events. The increasing severity and frequency of such events are one of the consequences of global warming.[13] Firms that themselves experience extreme weather events, or are informed about such events in their area, are more likely to be concerned about climate change and the environment and therefore be more aware of the need for energy efficiency investments. To measure variation in firms' exposure to extreme weather, this analysis uses granular historical monthly climate data for average precipitation between 1970 and 2000 (Fick and Hijmans, 2017) and historical monthly average precipitation data between 1970 and 2009 (Harris et al, 2014, and Fick and Hijmans, 2017) from the World Clim 2.1 database. The resulting instrumental variable is the number of times that the monthly average precipitation within 100km around the firm between 2000 and 2009 was above the long-term (1970-2000) average precipitation within the same area by more than two standard deviations.

Investment in energy efficiency is determined by the local diffusion of awareness of the importance of such investment. Thus, an additional instrument is the average energy efficiency investment indicator of all other firms in the same region. To be of use as an instrument, an individual firm should have only negligible influence on this regional average. To ensure that this is likely, regional averages exclude observations from a firm's own (two-digit) sector. This is similar to the "leave-one-out" strategy pursued, for example, in "jackknife" approaches (Angrist et al, 1999). Table 1, Panel B, confirms that firms were more likely to make energy efficiency investments if they are located in an area that experienced a higher number of extreme weather events (in this case, precipitation) or an area where firms from other sectors were more likely to make energy efficiency investments, all other things being equal.

Investment in energy efficiency measures is beneficial for a firm's bottom line. With the first-stage result in hand, Panel C looks at how exogenous variation in energy efficiency investments influences firms' energy intensity. It shows that firms that make such investments have on average a 0.9 percentage points lower share of electricity costs in sales (column 1) and a 2.4 percentage points lower share of energy costs (including electricity and fuel) in sales (column 2). This is quite substantial, given that the average share of electricity and energy costs in sales in the sample are 2.5% and 5.2%, respectively.

3.7. Conclusions and policy implications

At the start of the transition process, the region was an outlier relative to countries with similar levels of development, not only in terms of its industrial structure, but also in terms of the amount of carbon emissions that resulted from it. Encouragingly, carbon emissions from fuel combustion have decreased substantially in absolute terms since 1990. But absolute carbon emissions have been on an increasing trend in several sub-regions since the late 1990s, and they have increased in Turkey compared with 1990, driven by economic growth. If the region's economies are to fulfil their commitments under the Paris Agreement, those improvements will need to continue.

In Central and Eastern Europe, which are EU members, the decrease in carbon emissions between 2005 and 2018 was driven by improvements in energy efficiency. In other regions, GDP per capita and population growth outweighed any energy intensity improvements (and led to overall increases in carbon emissions). This indicates that there is further room for reductions in energy intensity; indeed, energy intensity of GDP in the region remained almost twice that in Southern Europe, indicating that there is still a long way to go.

Despite a shift away from coal and oil towards nuclear power and renewables, the region still relied on fossil fuels to generate 75.1% of its electricity in 2018. Moreover, several countries still have

13 Weather-related variables have been used as instruments in existing literature; see, for example, Cachon et al (2019) and Mellon (2020).

generous fossil fuel subsidies. This makes the transition to a low-carbon future harder, as energy prices are not reflecting the economic and environmental costs, and they hinder investment in green measures.

The transition to sustainable growth and a green economy will only be a success if the private sector applies its ingenuity, investment and entrepreneurship to that endeavour. Firms can improve their environmental performance through the adoption of good green management practices. There is significant variation in the quality of green management practices across the region's economies. External factors, such as customer pressure, being subject to an energy tax or having experienced losses due to extreme weather events play a more important role in determining the green management quality than firm characteristics. This suggests that there is a role for government guidance and stricter regulation.

Moreover, the ability to handle environmental issues in a proactive manner is just one aspect of effective firm management; the ability to handle social and governance issues is also part and parcel of it. Firms in the region lag those in Southern Europe on those too, as ESG disclosure is limited even by large listed firms, let alone large unlisted firms and SMEs. As with green management practices, external factors, such as customer pressure or being subject to an energy tax play an important role in determining the quality of corporate ESG responsibility practices.

Another way in which firms can reduce their environmental footprint is by making green investments. They are more likely to invest in a higher number of green measures if they do not experience credit constraints and have better green management practices. Credit constraints do not matter for non-capital-intensive green investments and their impact does not vary much with the number of green investments. But green management practices are important for all types of green investments and matter more for firms' profits, as well as their environmental footprints.

Many green investments can be classified as energy efficiency investments. These are essential for the transition to a green economy, but many do not materialise. By far the most important reason why firms did not make any energy efficiency investments is that they do not view them as a priority. But energy efficiency investments pay off for firms. Empirical findings indicate that such investments result in lower electricity and energy costs as a share of sales. Adopting energy efficiency measures is thus beneficial for firms' profits, as well as their environmental footprints.

Taken together, the chapter's findings suggest that despite the progress made since 1990, countries in the region face several challenges in the transition to a green economy, particularly among private sector firms. Policy measures that ease access to bank credit specifically for green investment might be just one element of a broader policy mix to stimulate green investment. Policymakers will need to provide a business environment that is conducive to green investment and which encourages all firms to improve their management practices and, more broadly, their corporate ESG responsibility.

3.8. References

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