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# Carbon Pricing: Discover Your Blind Spots on Risk and Opportunity

## EXECUTIVE SUMMARY

- Carbon pricing risk from a growing array of new policies and taxes spurred by the Paris Agreement could lead to significant losses on a company's financial statement.
- Carbon pricing risk could vary substantially among companies operating in the same business sectors.
- The financial risk from carbon pricing schemes depends on a company's carbon efficiency, location of operations, business model, and the market conditions of the sector.
- Company business models and broader market conditions will also dictate whether companies are able to absorb the increased costs or pass them on to their customers.
- At present, many companies measure their carbon footprint, which is an essential first step in understanding carbon efficiency of past operations, but it has a blind spot in regard to future carbon pricing risk exposure.
- Because a significant share of carbon pricing risk could come from supply chain activities and energy-intensive products, it is essential for companies to account for carbon risk beyond their direct operations.
- Meaningful data disclosure by companies on future carbon risk, as recommended by the Task Force on Climate-Related Financial Disclosures, will help inform the decision making of investors and accelerate mainstream green finance.

## THE GROWING RISKS FROM CARBON PRICING

Following commitments under the Paris Agreement to limit global warming to 2 degrees Celsius, governments are increasingly imposing a price on carbon, shifting the cost of greenhouse gas (GHG) emissions from society to the source of pollution. In 2013, Trucost estimated that the cost of GHG emissions from business activities that were linked to reduced crop yields, flooding, disease, acidification of oceans, and biodiversity loss was USD

2.7 trillion.<sup>1</sup> Pricing carbon provides an incentive to reduce GHG emissions and invest in low-carbon technologies. While current carbon prices average around USD 40/tCO<sub>2</sub>,<sup>2</sup> they are expected to increase in the near future, reaching up to USD 120/tCO<sub>2</sub> by 2030 in Organisation for Economic Co-operation and Development (OECD) countries under a 2 degrees Celsius-aligned scenario.<sup>3</sup>

The growing carbon price could affect companies directly with regulatory costs imposed on their operations through energy and fuel price increases, or indirectly through costs passed on by suppliers. These costs may be borne by companies or passed on to consumers in the form of higher prices. Rising prices, along with the increased cost of using carbon-intensive products such as motor vehicles, may depress consumer demand.

Understanding carbon pricing risk exposure is therefore essential to managing business risk and building resilience to intensifying global climate policies.

The growing carbon price could affect companies directly with regulatory costs imposed on their operations through energy and fuel price increases, or indirectly through costs passed on by suppliers.

At present, many companies measure their carbon footprint—a measure of carbon intensity and efficiency, and a vital first step in understanding exposure. However, across the global network of carbon policies, carbon pricing risk will vary over time according to the type of business activity and location. Relying on the carbon footprint as the only indicator of carbon pricing risk exposure could create a blind spot regarding the financial implications of carbon policies for companies and their investors. Companies should look at how carbon prices affect the cost of global value chain impacts, as well as the net impact on profitability across different scenarios and time horizons. This type of financial scenario analysis will be important in responding to climate risk disclosure initiatives, such as the Task Force on Climate-related Financial Disclosures (TCFD), which aims to help investors, lenders, and insurance underwriters appropriately assess and price climate-related risks and opportunities.

## MEASURING CARBON PRICING RISK EXPOSURE

While the number of carbon pricing schemes has grown rapidly over the last 10 years, prices in most jurisdictions are currently well below the level required to achieve the Paris Agreement's 2 degrees Celsius goal. To help companies and their investors assess exposure to future carbon pricing risk, Trucost developed the Corporate Carbon Pricing Tool. The tool features a carbon pricing risk premium, representing the gap between

<sup>1</sup> Trucost, 2013. Natural capital at risk: The top 100 externalities of business. TEEB, Geneva. [Online] Available: <https://www.trucost.com/wp-content/uploads/2016/04/TEEB-Final-Report-web-SPv2.pdf>.

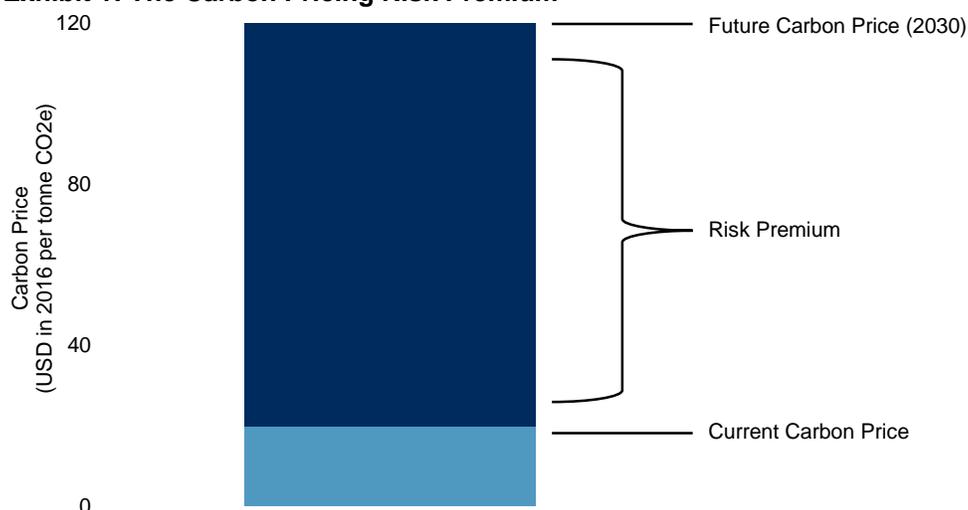
<sup>2</sup> Trucost, as of 2017.

<sup>3</sup> OECD/International Energy Agency (IEA). 2017. Chapter 2 of Perspectives for the energy transition – Investment needs for a low-carbon energy system. [Online] Available: [http://www.irena.org/DocumentDownloads/Publications/Perspectives\\_for\\_the\\_Energy\\_Transition\\_2017.pdf](http://www.irena.org/DocumentDownloads/Publications/Perspectives_for_the_Energy_Transition_2017.pdf).

current carbon prices and expected future prices under a 2 degrees Celsius scenario (see Exhibit 1). This gap varies depending on the current status of carbon pricing in each country, as well as the speed and degree to which prices are expected to rise in the future.<sup>4</sup>

By applying the carbon pricing risk premium to a company's regional GHG emissions, it is possible to quantify the additional future regulatory costs that could materialize in the transition to a low-carbon economy. This new approach to assessing carbon pricing risk allows a company to conduct asset-level scenario analysis of the impact of rising carbon prices on profitability and provides a more nuanced view of the competitive positioning and resilience to carbon transition risks.

### Exhibit 1: The Carbon Pricing Risk Premium



Source: Trucost. Data as of December 2017. Chart is provided for illustrative purposes.

By applying the carbon pricing risk premium to a company's regional GHG emissions, it is possible to quantify the additional future regulatory costs that could materialize in the transition to a low-carbon economy.

To illustrate the application of the carbon pricing risk premium, Trucost analyzed almost 100 companies across 16 countries, spanning three industry sectors: chemicals manufacturing, electric utilities, and automobile manufacturing. Drawing on publically disclosed GHG emissions and financial data, Trucost quantified the financial implications of increasing carbon prices consistent with a 2 degree Celsius scenario on corporate operating expenditures, revenues, and profitability.

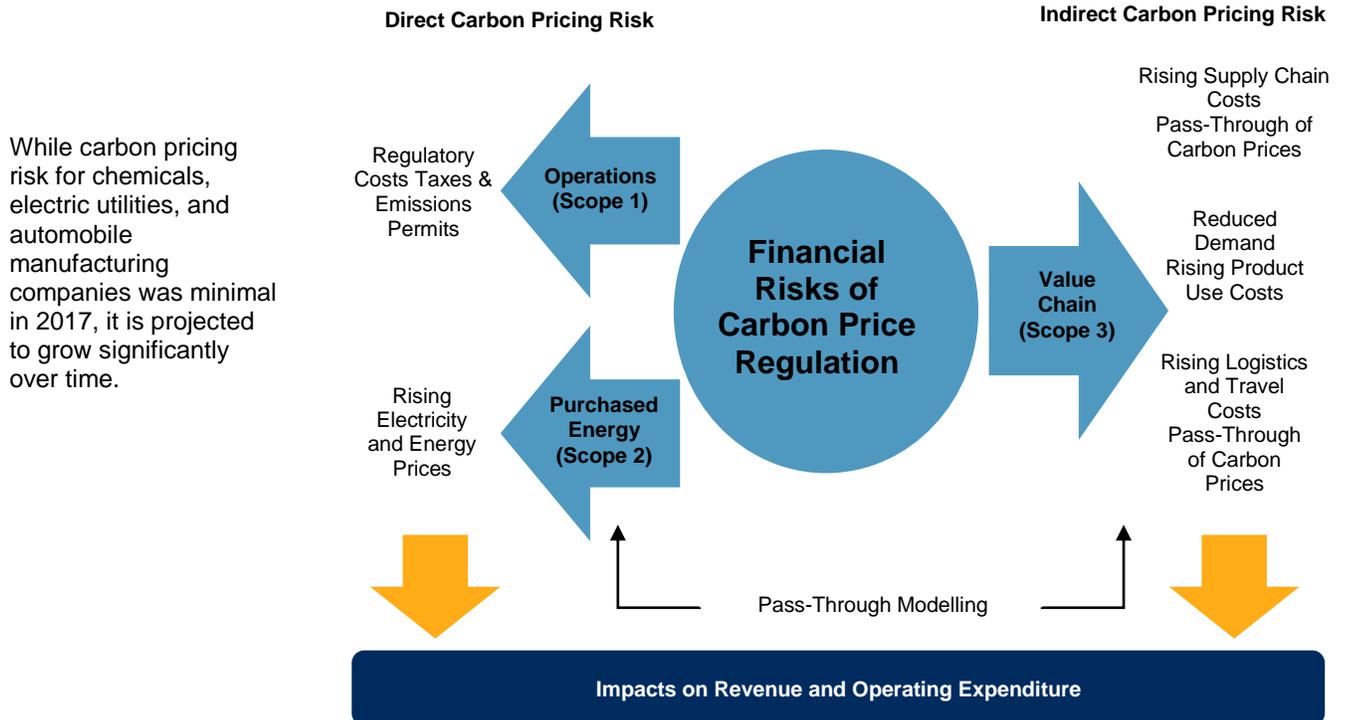
Trucost's analysis considers the following.

1. **The cost of rising carbon prices** on emissions from direct operations (also known as GHG Protocol scope 1 emissions), and the indirect cost of higher prices for carbon-intensive purchased electricity (scope 2) and purchased goods and services (scope 3, supply chain; see Exhibit 2).

<sup>4</sup> OECD/IEA. 2017. Chapter 2 of Perspectives for the energy transition – Investment needs for a low-carbon energy system. [Online] Available: [http://www.irena.org/DocumentDownloads/Publications/Perspectives\\_for\\_the\\_Energy\\_Transition\\_2017.pdf](http://www.irena.org/DocumentDownloads/Publications/Perspectives_for_the_Energy_Transition_2017.pdf).

2. **The degree to which companies can pass on higher regulatory costs** to their consumers and the implications of this on the demand for their products and services, based on sector-specific price elasticity assumptions. This analysis estimates the potential change in earnings before interest and taxes (EBIT) due to higher carbon prices aligned with meeting the 2 degree Celsius target<sup>5</sup>—referred to here as profit at risk. This analysis illustrates the potential carbon pricing risk if companies continue to operate with their current levels of profitability and carbon intensity.

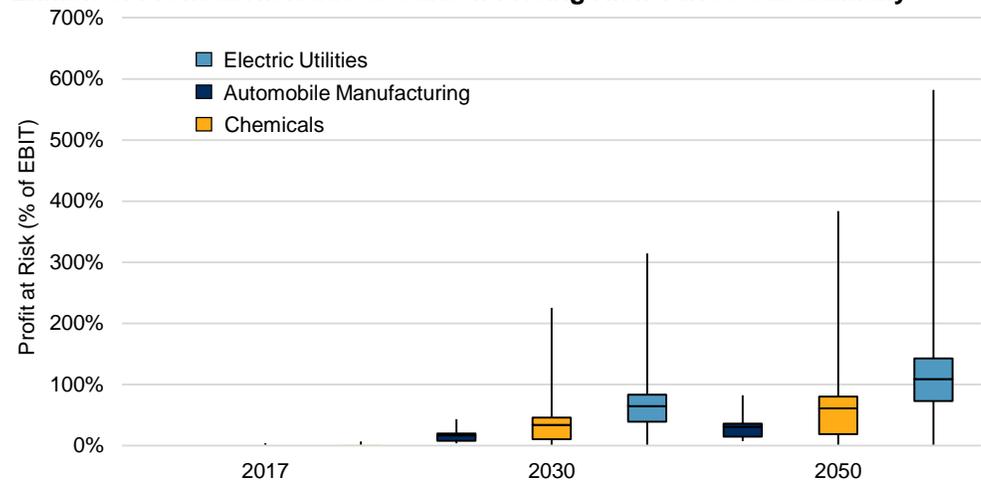
**Exhibit 2: Carbon Pricing Risk Could Affect Company Financial Performance Directly and Indirectly**



Source: Trucost. Data as of December 2017. Chart is provided for illustrative purposes.

While carbon pricing risk for chemicals, electric utilities, and automobile manufacturing companies was minimal in 2017, it is projected to grow significantly over time. Exhibit 3 shows the distribution of profit at risk across the three sectors. Not surprisingly, the electric utilities sector is likely to experience the most significant impacts from carbon pricing in the future; the average profit at risk could reach close to 90% by 2030 and exceed 150% by 2050. The chemicals sector could be exposed to slightly less severe risks, with average profit at risk expected at over 30% by 2030 and 60% by 2050, whereas automobile manufacturing could be subject to over 15% by 2030 and 30% profit at risk by 2050.

<sup>5</sup> This scenario represents the implementation of policies that are sufficient to reduce GHG emissions in line with the goal of limiting climate change to the 2 degree Celsius target by 2100 (the Paris Agreement). This scenario is based on research by OECD and IEA (2017).

**Exhibit 3: Profit at Risk due to Carbon Pricing Risk Varies Substantially**

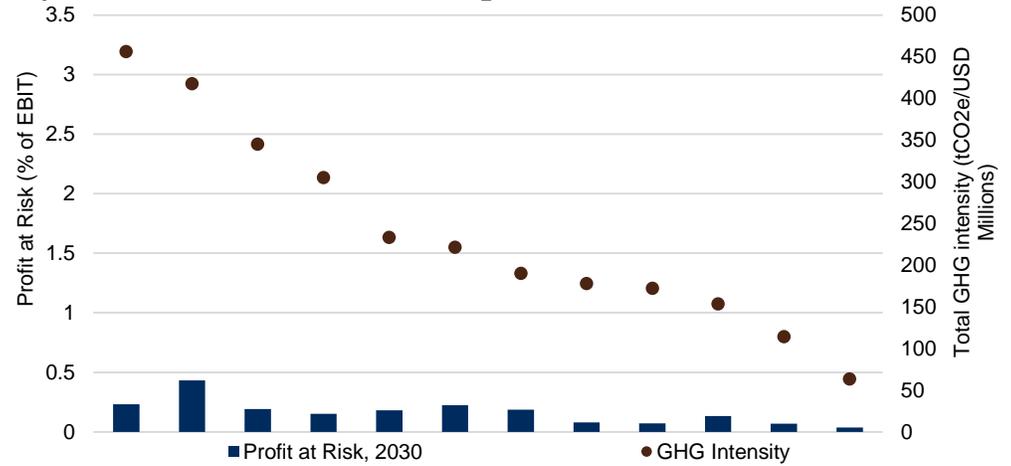
Source: Trucost. Data as of 2017. Chart is provided for illustrative purposes.

The difference in risk exposure among sectors is mainly a result of the GHG intensity of the business activity and the geographic distribution of the operations.

The difference in risk exposure among sectors is mainly a result of the GHG intensity of the business activity and the geographic distribution of the operations. Electric utilities have the highest operational carbon footprint, which leads to the highest operational carbon footprint per unit of revenue. The industry also tends to have physical assets concentrated in a few countries, which could mean they have limited flexibility to relocate their operations in response to rising costs. In contrast, the chemicals and automobile manufacturing sectors have lower GHG intensities and their operations and supply chains tend to be more widespread across regions, which means they are likely to have lower carbon pricing risk as well as greater flexibility in shifting operation and supply chain activities in response to rising carbon prices.

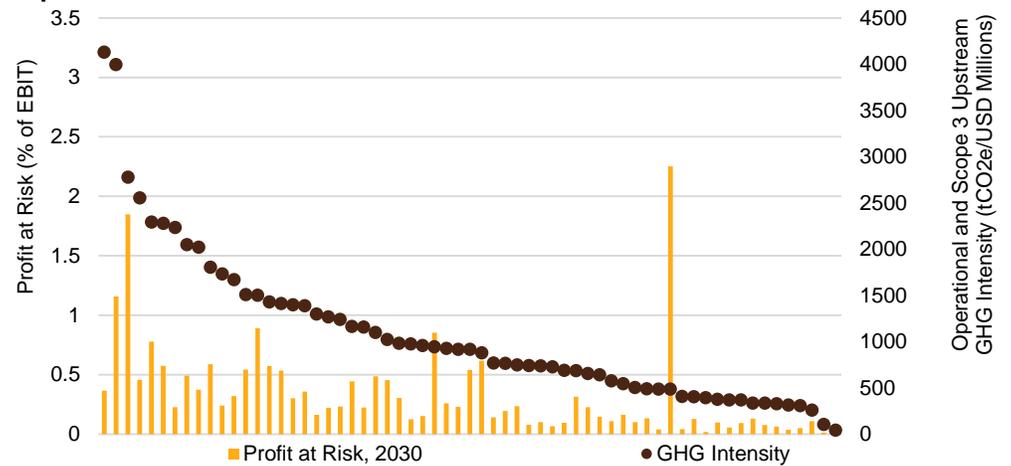
The variation in risk exposure within sectors is also significant and grows over time. By 2050, it is estimated that the profit at risk for chemicals companies will range from 1% to over 300%, electric utilities from 1% to nearly 600%, and automobile manufacturing from 7% to 82%. Exhibits 4-6 rank companies within each sector, from high to low GHG intensity. Profit at risk, shown by the bars, does not necessarily descend in the same order. For example, the companies with the highest profit at risk in both chemicals and electric utilities sectors have GHG intensity below or close to the sector average. Trucost's analysis suggests that there is a positive correlation between GHG intensity and profit at risk across sectors, but that this accounts for just 30% of the variation in risk between companies in the same sector. Thus GHG intensity represents only a partial indicator of a company's likely carbon pricing risk exposure.

**Exhibit 4: GHG Intensity Only a Partial Indicator of Carbon Pricing Risk Exposure – Automobile Manufacturing**



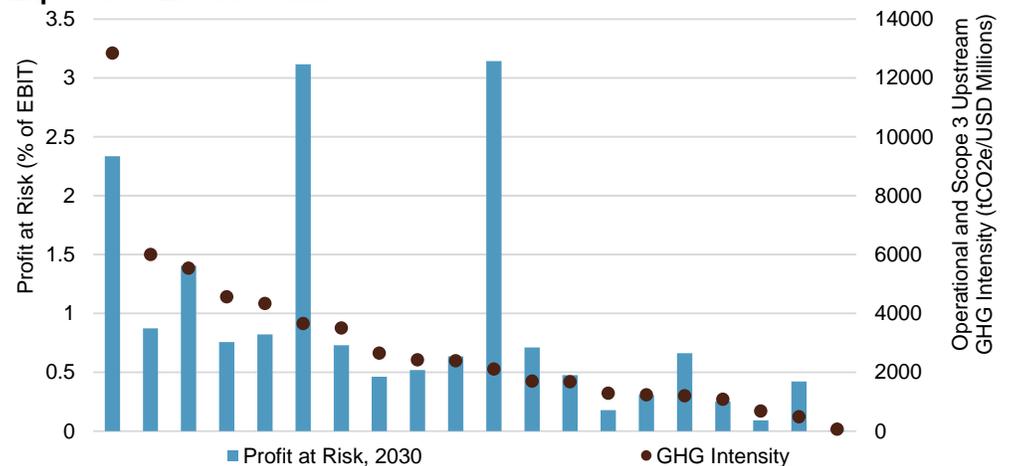
Source: Trucost. Data as of December 2017. Chart is provided for Illustrative purposes.

**Exhibit 5: GHG Intensity Only a Partial Indicator of Carbon Pricing Risk Exposure – Chemicals**



Source: Trucost. Data as of December 2017. Chart is provided for Illustrative purposes.

**Exhibit 6: GHG Intensity Only a Partial Indicator of Carbon Pricing Risk Exposure – Electric Utilities**



Source: Trucost. Data as of December 2017. Chart is provided for Illustrative purposes.

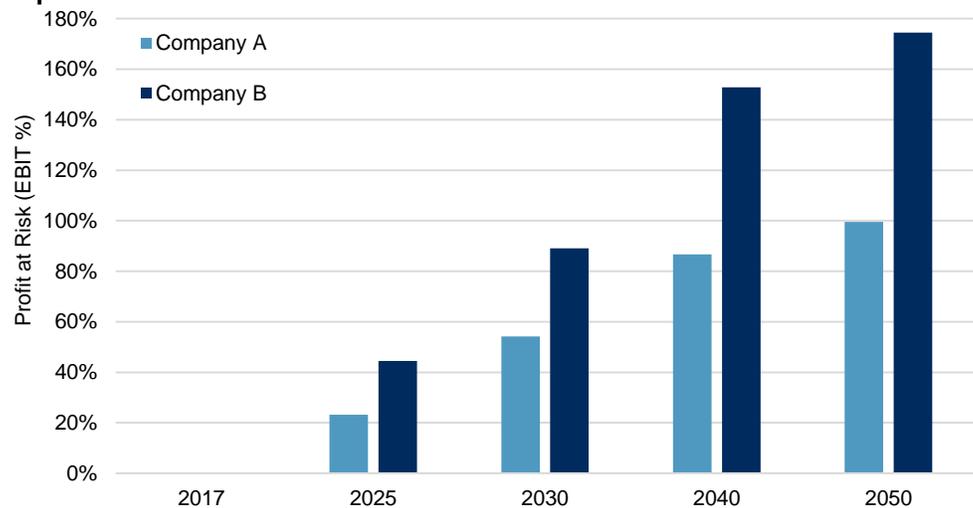
The variation in risk exposure within sectors is also significant and grows over time.

The financial risk from carbon pricing depends on a company’s carbon emissions, location of operations, business model, and the market conditions of the sector. The first two variables determine the total risk from carbon pricing schemes within its operations. Given the disparity of carbon price across regions, the total carbon pricing risk not only depends on how much a company emits, but also where these emissions occur.

For example, companies with similar carbon footprints could have different risk exposures due to differences in the location of their operations. Trucost analyzed two chemical companies, both with a total operational and supply chain GHG intensity of around 1,500 tCO<sub>2</sub>e/USD million in revenue, yet the profit at risk for company B was more than 30% higher on average between 2017 and 2050 than for company A (see Exhibit 7). The main reason is that company B’s GHG emissions were mostly concentrated in Europe, where the carbon price is expected to grow significantly in the future.

The financial risk from carbon pricing depends on a company’s carbon emissions, location of operations, business model, and the market conditions of the sector.

**Exhibit 7: Companies Can Have Similar GHG Emissions but Different Risk Exposure due to Location**



Source: Trucost. Data as of December 2017. Chart is provided for illustrative purposes.

Yet not all of this cost will be directly captured by a company’s financial statement—its specific business model and market conditions will dictate the portion of this cost likely to be absorbed by a company and therefore the impacts on its profitability. For example, companies with high resilience to increases in operational and supply chain costs may be able to minimize carbon pricing risk. This could occur in vertically integrated business models, where companies have greater control over emission efficiency in their supply chain, or non-integrated business models with flexible supply chains, where companies could easily switch to suppliers with lower carbon pricing risks. Market conditions also affect how much cost a company would have to absorb based on its ability to pass costs on to its customers, taking into account changes in demand for its products and services due to higher selling prices.

## THE VALUE CHAIN MATTERS FOR CARBON PRICING RISKS

Trucost profit at risk analysis combines scope 1 and 2 operational emissions and scope 3 supply chain emissions. In fact, supply chain activities often account for a larger share of a company's carbon pricing risk exposure than operational emissions—on average, 80% for automobile manufacturing, 53% for chemicals, and 29% for electric utilities. By analyzing supply chain impacts, a company could understand where risk exposure is concentrated and adjust its procurement strategy to minimize financial cost.

Risk exposure could be amplified if a company's products and services are carbon intensive. For sectors selling carbon-intensive products and services, increasing carbon prices could mean higher costs for consumers, in addition to any changes in price passed through by companies. The higher costs could reduce the demand for these products and services, lowering revenue for businesses.

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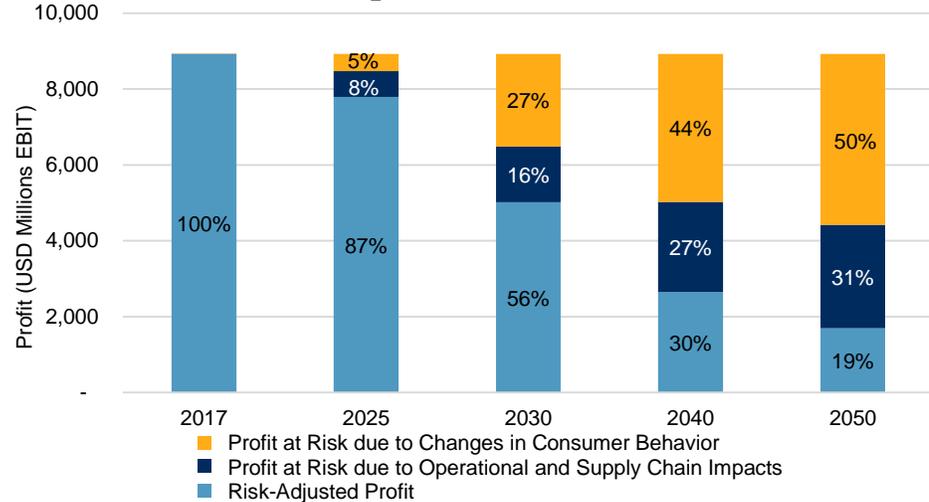
Automobile manufacturing is a good example. The previous analysis showed that 8-31% of the companies' profit at risk between 2025 and 2050 was linked to operational and supply chain emissions. Emissions from the products when they are used are highly material, because fossil-fuel-powered internal combustion engine vehicles are a large share of sales for most auto companies. If the price of fossil fuels rises under more stringent carbon regulation, the cost to consumers of operating a vehicle will increase and may influence purchasing decisions for new vehicles. Research has demonstrated that demand for motor vehicles has historically declined in response to higher fuel prices.<sup>6</sup> Carbon prices could be imposed directly on consumers through higher fuel prices. Trucost has estimated the increase in the cost of driving from carbon pricing for consumers and the effect it may have on the revenue of automobile manufacturing companies.

As shown in Exhibit 8, GHG emissions from the use of carbon-intensive products and services can be the most relevant financial impact for companies. For the automobile manufacturing sector, the profit at risk due to product emissions could reach 5-50% between 2025 and 2050, even exceeding operational and supply chain risks from 2030 onwards. This is based on the assumption that increasing costs of car ownership will have a negative impact on demand for cars in the long run, as consumers will have more time to adjust their purchasing strategy to adapt to higher running costs.<sup>7</sup>

<sup>6</sup> Goodwin, P., Dargay, J., and Hanly, M., 2004. Elasticities of Road Traffic and Fuel Consumption with Respect to Price and Income: A Review. *Transport Reviews*, 24(3), pp. 275-292.

<sup>7</sup> This is based on the assumption that the total number of vehicles owned will drop by 0.1% in the short term and 0.25% in the long term for every 1% increase in fuel price (Goodwin, et al., 2004).

**Exhibit 8: Impact of Carbon Price on Consumers Exacerbates Profit at Risk for Automobile Manufacturing**



Source: Trucost. Data as of December 2017. Chart is provided for illustrative purposes.

Companies need to understand carbon pricing risk exposure from the entire value chain, beyond just the risk from direct operations most commonly measured by carbon footprints.

Companies need to understand carbon pricing risk exposure from the entire value chain, beyond just the risk from direct operations most commonly measured by carbon footprints. While consumer demand could be affected by many other variables—such as market competition, consumer preference, and so on—this research highlights the importance of a company’s product portfolio, as well as the extent to which they are actively engaged in new product development and R&D activities to bring low-energy, low-emission products and services to their customers. Regulatory risks on carbon-intensive products may have further financial consequences. For example, many governments have committed to ban or phase out the sale of diesel and petrol cars—France by 2040, Norway by 2025, some German federal states in 2030, and the UK by 2040, with similar plans being developed in Netherland, India, and China.<sup>8</sup> Volvo, Renault-Nissan, BMW, and Volkswagen are aiming to mitigate these regulatory risks by planning to scale up electric vehicle production.

### BEYOND CARBON FOOTPRINTING

Climate policy around the world is creating financial uncertainties and opportunities for companies, in particular through carbon pricing. Trucost research shows that corporate exposure to carbon pricing risk is only partially measured by carbon footprinting. Enhancing the traditional carbon footprint with a carbon pricing risk premium provides a forward-looking lens on policy risk exposure at a regional level. Financial costs from operational, supply chain, and product-related emissions through different mechanisms,

<sup>8</sup> Chrisafis, A. and Adam V, 2017. France to ban sales of petrol and diesel cars by 2040: Guardian. [Online]. Available: <https://www.theguardian.com/business/2017/jul/06/france-ban-petrol-diesel-cars-2040-emmanuel-macron-volvo>. France-Presse, A., 2017. China to ban production of petrol and diesel cars 'in the near future': Guardian. [Online]. Available: <https://www.theguardian.com/world/2017/sep/11/china-to-ban-production-of-petrol-and-diesel-cars-in-the-near-future>.

such as tax, supplier cost pass through, and changes in market demand, can be estimated by applying carbon pricing scenarios.

Understanding carbon pricing risk exposure will better inform decision making on low-carbon investment, operation strategy, and procurement.

In addition to carbon emissions, carbon pricing risk exposure for companies depends significantly on the sector, region, and market of operation. To get a full picture of risk exposure, companies will need to go beyond using the carbon footprint of their direct operations as a proxy for risk and assess the impacts from supply chain and products in use. Scenario analyses that take into account the net impacts of carbon pricing on profitability are essential. Forward-looking scenario analysis is also key to this risk assessment, as shown in our findings that carbon pricing risk could grow significantly over time and in more stringent scenarios.

Understanding carbon pricing risk exposure will better inform decision making on low-carbon investment, operation strategy, and procurement. According to the recommendations by the TCFD, companies should stress test their business model against climate risks, understand carbon pricing risk and how it can be used to set internal carbon prices for cutting emissions, and identify hotspots of risk for abatement and investment priorities. The results will help companies to respond to the rising demand for climate risk disclosure, enhancing not only risk management but also resilience of sustainability stewardship.

Financial institutions are increasingly integrating climate data into their investment strategies to manage risk and capitalize on the transition to a low-carbon economy. A wealth of innovative green finance instruments are emerging, from carbon-efficient indices and funds to green bonds and lending tools. More meaningful data disclosure by companies on future carbon risk could inform the decision making of investors and accelerate mainstream green finance.

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