



CANADA'S **ECOFISCAL** COMMISSION
Practical solutions for growing prosperity

PROVINCIAL CARBON PRICING AND COMPETITIVENESS PRESSURES



Guidelines for Business
and Policymakers

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EXECUTIVE SUMMARY



Carbon pricing in individual Canadian provinces—if not matched by equivalent carbon prices in other jurisdictions—can potentially create competitiveness pressures on individual economic sectors. A sector’s “carbon costs,” as a share of its GDP, and its “trade exposure” are two key determinants of these pressures.

Data analysis for British Columbia, Alberta, Ontario, and Nova Scotia suggests that these pressures are significant for only a few sectors, representing only a small share of total provincial economic activity. Overall, the business community should not perceive carbon pricing as a significant economic threat.

The identification of competitiveness pressures also relies on firm-level data that is generally not publicly available. Differences in cost structures among firms within a sector, firms’ abilities to influence their selling

prices, the extent of firms’ responses to carbon pricing, and the stringency of policies in other jurisdictions all need to be examined to determine which firms are genuinely exposed to competitiveness pressures. Policymakers will need access to firm-level data to assess the credibility of firms’ claims of significant exposure.

For those firms and sectors facing genuine competitiveness pressures, governments can design the carbon pricing policy to address these challenges while still retaining the policy’s overall effectiveness at reducing greenhouse gas emissions in a cost-effective manner. Any measures designed to support specific firms or sectors should be targeted, transparent, and temporary.



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PROVINCIAL CARBON PRICING AND COMPETITIVENESS PRESSURES

Guidelines for Business and Policymakers

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Canada's Ecofiscal Commission

1. Introduction

Canada's Ecofiscal Commission has previously made the case that Canadian provinces stand to benefit from implementing broad-based carbon pricing policies.¹ By altering market incentives, carbon pricing drives reductions in greenhouse gas (GHG) emissions, contributing to global efforts to avoid costly impacts of climate change. Carbon pricing also creates incentives for innovation, helping to position Canadian firms to compete in increasingly carbon-constrained markets. Carbon pricing may also improve market access for Canadian resource products. Finally, carbon pricing achieves these outcomes more cost-effectively than alternative, regulatory policy approaches.

Broadly based carbon pricing, while essential for driving a cost-effective reduction in GHG emissions, would represent a very small share of the overall Canadian economy. For example, even if 85% of Canada's current annual GHG emissions (roughly 700 Mt) were priced at \$30 per tonne, the revenue raised would be less than 1% of Canada's national income, as measured by its gross domestic product. In aggregate terms, therefore, the direct economic impact of comprehensive carbon pricing would be very small. However, since different sectors vary considerably in their emissions profiles, the impact of carbon pricing policies will also vary significantly across sectors, and even across firms.

In particular, policy actions by provinces may have a short-term impact on the ability of some Canadian businesses to successfully compete in their market environments. In the run-up to the UNFCCC Conference of the Parties in Paris in December 2015, it is increasingly clear that the path toward global climate policy is complex. Even

though global emissions reductions are the ultimate policy goal, not all countries will implement carbon policies at the same pace or stringency. During this period of "uneven" policy adoption, Canadian provinces implementing carbon pricing may have more-stringent policies than other jurisdictions, and these policy differences may lead to pressures on a firm's competitiveness. This paper examines the extent to which such competitiveness pressures may arise from carbon pricing policies implemented by Canadian provinces.

Only a few regions have already implemented some form of carbon pricing—including British Columbia, Alberta, Quebec, California, and the European Union. Ontario has recently announced its intention to do so in the very near future. China has a number of cap-and-trade pilot programs, and India is in the process of implementing a carbon tax. While the United States is moving forward with national regulations for electricity generation and individual states are taking action, no national U.S. carbon price seems imminent. Thus far, with the exception of B.C.'s policy, carbon prices in Canadian provinces remain less than US\$20 per tonne. Significant differences in carbon prices across jurisdictions generate the possibility that some firms in some regions will experience a competitive disadvantage.

However, the presence of competitiveness pressures need not be an obstacle to implementing effective policy for Canadian provinces. While such pressures do pose real challenges, they apply only to a few industries. The smart design of carbon pricing policy can address these challenges by including targeted, transparent, and temporary measures of support.

1 See *The Way Forward: A Practical Approach to Reducing Canada's Greenhouse Gas Emissions*, Canada's Ecofiscal Commission, April 2015.



This paper uses Canadian provincial data to explore the extent of the pressures on competitiveness caused by carbon pricing policies. Our approach has two main benefits. First, it assesses the scale of these pressures, using a transparent, evidence-based framework.

We find that the pressures on competitiveness are quite small when expressed as a share of the country's total economic activity. Second, policymakers and emitters can use our framework to discuss cost-effective policy measures to address competitiveness.

2. What do we mean by “competitiveness pressures”?

Competitiveness is a concept that has different meanings, depending on the context and the audience. In considering competitiveness pressures created by carbon pricing policy, we must be explicit about what we mean by the term—as well as what we exclude from the relatively narrow definition used here.

Most generally, any individual firm's competitiveness reflects its ability to succeed in its business environment. Within any province, its firms' competitiveness depends on multiple factors. Corporate income-tax rates, foreign-exchange rates, the prices of locally supplied inputs, regulations of various kinds, wage rates, the proximity to key markets, the quality of supply chains, the creativity of management, and the ability to recruit and retain qualified workers are only a few of the many factors that determine whether firms in a given jurisdiction can successfully compete with firms elsewhere. Carbon pricing is only one factor in a larger and more complex story.

In the context of carbon pricing policy, competitiveness pressures can arise when there is a higher carbon price in one Canadian province than in other jurisdictions—either foreign or domestic. In these cases, provincial firms competing in national or international markets might experience a “carbon disadvantage” relative to firms outside the province. Given that Canadian firms have traditionally focused much of their trade within the North American market, it is the policy differences between the various Canadian provinces and between Canada and the United States that are particularly important for this discussion.

In short, carbon competitiveness pressures come from carbon-price *differentials* between trading partners, not the absolute level of the carbon price. Under a uniform global carbon price, for example, there would be no competitive disadvantage between Canadian and foreign firms.² On the other hand, using carbon pricing in any one province—while other jurisdictions have either no or lower carbon prices—can create challenges for firms and industries competing in international or interprovincial markets.

Differences between carbon prices at home and abroad can have both economic and environmental implications. When we

Is there also a “carbon advantage”?

This paper focuses on competitiveness pressures created by carbon pricing, but it is also important to recognize the opportunities for creating “carbon advantages” for Canadian firms.

As other jurisdictions implement their own ecofiscal policies, the global market for low-carbon innovations naturally grows. Implementing carbon pricing policies will make some domestic firms better positioned to compete in this emerging low-carbon global economy (NRTEE, 2012).

Advantages arise in several different ways. The most direct are from carbon-reducing sectors. Research by McKinsey & Company (2012), for example, suggests that Canadian firms could have increasingly valuable competitive advantages in sustainable resource development, carbon capture and storage, uranium mining and processing, and hydroelectricity expertise.

Competitive advantages could also come from those firms and industries better positioned to compete under carbon constraints as a result of their lower emissions intensity. One modelling analysis for Ontario, for example, finds that its electricity, pulp and paper, and food manufacturing sectors could have a carbon advantage relative to North American competitors in a carbon-constrained market (Sawyer, 2013).

talk about competitiveness pressures in this report, we refer only to competitive impacts on industries between jurisdictions with carbon prices of different stringency. Provinces with higher carbon prices might see some current or future production and investment move toward jurisdictions with weaker policies. The result is lost economic activity in the home jurisdiction. *Leakage* is the environmental side of the same coin: if economic activity simply relocates to other jurisdictions and produces carbon emissions identical to what

2 A uniform global carbon price would drive a global adjustment away from carbon-intensive activities and would involve important transitional costs. But these costs of structural adjustment to a low-carbon world are distinct from the competitiveness pressures we emphasize here.

existed in the home jurisdiction, Canadian provinces risk bearing the economic costs of lost production or investment with no net change in global GHG emissions.

The impacts on business competitiveness will change over time. Well-designed carbon pricing policies start with low prices that then increase steadily. In the short term, differences between carbon prices in Canadian provinces and other jurisdictions will tend to be small, and pressures on competitiveness will therefore also be small. In the very long term, since it is likely that jurisdictions will converge on similar carbon prices, these pressures will also tend to diminish. The important pressures on competitiveness are thus most likely to appear in the medium term, but only if policy in Canadian provinces gets far ahead of policy in other jurisdictions.

Finally, it is worth noting that most economic research has been unable to document a significant impact of carbon pricing on investment and production. Most studies of carbon competitiveness—for both proposed and historical policies in jurisdictions such as the European Union, the United States, and Canada—tend to find only small implications for the economy (e.g., Quirion & Hourcade, 2004; Aldy & Pizer, 2007; Reinaud, 2008, 2009; Barker et al., 2009; Morgenstern et al., 2007; National Round Table on

the Environment and the Economy [NRTEE], 2009). Recent empirical research for the United Kingdom, for example, finds no evidence that the competitiveness of firms has been negatively affected by that country's climate-change policies (Bassi & Zenghelis, 2014). Given the complexity of a firm's competitiveness, and how many factors come together to influence it, perhaps it is not surprising that empirical studies find no significant relationship between it and carbon pricing.

In sum, we define “competitiveness pressures” from carbon pricing more narrowly than the broader concept of business competitiveness commonly used in economic discussions. Yet using this narrow definition is critical to isolate factors that really matter for the good design of carbon pricing policies. Many competitiveness issues are entirely independent of carbon pricing and should not be conflated. And some outcomes from carbon pricing—such as structural changes within industry—are not really about carbon competitiveness at all, but instead are part of a cost-effective global transition toward an economy with lower overall GHG emissions. The complexity of these issues underlines the importance of using data and evidence-based analysis to assess the sector-by-sector competitiveness pressures from carbon pricing.

3. Which sectors are most exposed to competitiveness pressures?

Only a small subset of the Canadian economy is likely to experience competitiveness pressures from carbon pricing. Given that firm-level data is not publicly available, we use data at the sector level to consider how these pressures vary across the different sectors within selected provincial economies. We begin by using two key criteria to identify potentially vulnerable sectors: carbon cost and trade exposure.

Carbon cost measures the dollar value of a sector's carbon-price payments as a share of that sector's gross domestic product (GDP)—assuming a carbon price of \$30 per tonne of CO₂e, the value of British Columbia's current carbon tax. This value is also equal to the carbon price multiplied by the sector's *emissions intensity*.³ Sectors with higher carbon costs might use more energy, or rely on processes that produce substantial GHG emissions. The emissions intensity estimated for each sector includes both the *direct* GHG emissions produced by the sector as well as the *indirect* emissions embedded in the electricity used by the sector. The pressure on

competitiveness therefore reflects the carbon costs from both direct and indirect emissions.

A sector's *trade exposure* measures the extent to which firms in that sector compete with firms from outside their province.⁴ Trade exposure matters because it is one key factor in determining whether emitters can pass their carbon costs on to their consumers in the form of higher prices. If firms sell undifferentiated products and are price-takers—as is the case in many international commodities markets—they cannot pass province-specific carbon costs on to their customers. In this case, the decline in firms' profits reflects the decline in their competitiveness. On the other hand, if firms sell highly differentiated products and have some influence on their products' selling price, some fraction of carbon costs can be passed on to both domestic and foreign customers, thus dampening the impact of the carbon price on their bottom line.

3 Carbon cost is measured here as a share of each sector's GDP, assuming that firms' production methods are unchanged. Since most firms will adjust their production methods to a carbon price, especially over time, this measure will be an overstatement of the sector's true carbon cost. (In the economic model, real GDP for each sector is expressed in 2002 dollars; a carbon price of \$30 in 2015 is thus converted into approximately \$23 for the same base year.) Alternatively, a sector's carbon costs could be expressed as a share of the value of total sectoral revenues. Since revenues are necessarily larger than value added (GDP), this approach would result in lower estimates of carbon costs for all sectors.

4 Trade exposure for a sector is defined as the sum of the sector's imports and exports divided by the sum of the sector's production and imports (California Air Resources Board, 2012). A sector with a trade exposure of zero thus has neither imports nor exports. A sector with a trade exposure of 100% exports all the goods it produces (exports = production).

Provincial Carbon Pricing and Competitiveness Pressures

We examine these two characteristics for various sectors within selected Canadian provinces. For reasons of confidentiality, provincial-level data with the required sectoral detail is not available to the public. Instead, we use “model data,” which in this case means the data underpinning a regionally disaggregated computable general equilibrium (CGE) model. The model contains rich sector-level detail on employment, production, and GHG emissions. With model data, the sectoral details are a function of the model’s representation of provincial economies. While the model is closely calibrated to provincial data, it remains an approximation of provincial economic structure.⁵

Which specific sectors are most emissions intensive and trade-exposed in each province? Not surprisingly, it varies across the provinces. To highlight these differences, we examine four provinces to show the range of exposure to carbon pricing, but also to identify specific sectors most likely to be vulnerable. British Columbia shows the profile for an economy with a low-carbon, hydroelectric energy system. Alberta represents a resource-intensive economy, Ontario a manufacturing-intensive economy, and Nova Scotia a small economy with only a few specific emitters.

Below, we consider key details for each of the four provinces. These points highlight differences and similarities between provinces, but also draw out insights about vulnerable sectors in each case. Overall, a common theme emerges across all four provinces: the vast majority of economic activity—including services and other manufacturing—is not exposed to significant competitiveness pressures.

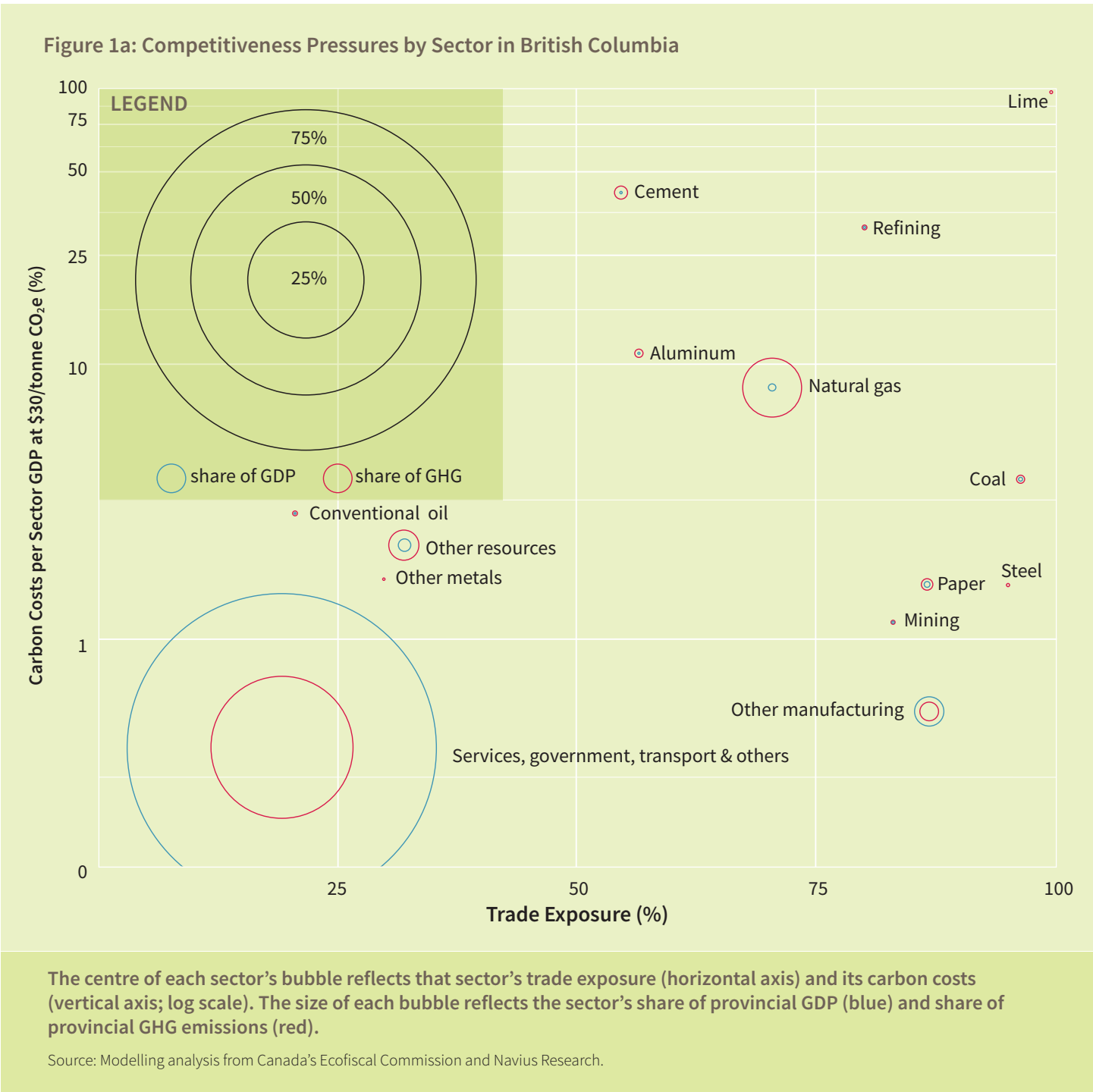
Figures 1a, 1b, 1c and 1d show how specific sectors in these four provinces are more or less exposed to pressures created by carbon pricing. Each sector is plotted showing its carbon costs on the vertical axis and its trade exposure on the horizontal axis. The farther a sector is positioned toward the upper right-hand corner of the figure, the more vulnerable it is to these two competitiveness pressures. The size of the bubble representing each sector shows its contribution to provincial GHG emissions (red) and GDP (blue). A larger bubble indicates a larger sector.⁶

5 Working with Navius Research, we developed provincial input-output tables (representing the flows of goods and services between different sectors and provinces) for 2015 based on a CGE simulation of current policy. The model is calibrated to historical provincial data.

6 Electricity generation does not appear in this analysis as a distinct sector, because the GHG emissions from electricity generation are allocated to the purchasers of the electricity in other sectors. These are each sector’s indirect emissions, as discussed earlier.



British Columbia



Provincial Carbon Pricing and Competitiveness Pressures

- The cement sector appears to be one of the most exposed to competitiveness pressures, with particularly emissions-intensive production. Note that much of the GHG emissions produced in cement manufacturing come from “process emissions”—those produced during the chemical processes involved in cement production—rather than from the combustion of fossil fuels. Such process emissions are not currently covered by the province’s carbon tax.
- Refining is the other particularly emissions-intensive sector in B.C., though it is quite small, contributing less than 0.1% of provincial GDP and less than 1% of provincial GHG emissions.
- The natural gas sector is also exposed to competitiveness pressures, and makes up about 2% of provincial GDP. Yet the sector is only one-fifth as emissions intensive as the cement sector on average.⁷ Though not shown in the figure, emissions intensity varies substantially across different natural gas projects, from conventional fields to shale and tight gas plays.
- Finally, liquid natural gas (LNG) facilities are not included in the analysis, as no projects are currently completed. Should the sector grow, however, it would likely be quite exposed to competitiveness pressures. Interactions with B.C.’s evolving tax treatment of LNG facilities would also play an important role in determining the sector’s overall competitiveness.

⁷ The vertical scale in Figure 1 is in log form, so the vertical distance between carbon costs gets compressed as the carbon cost increases. The vertical distance on the graph between 1% and 10% is the same as the distance between 10% and 100%.



Alberta



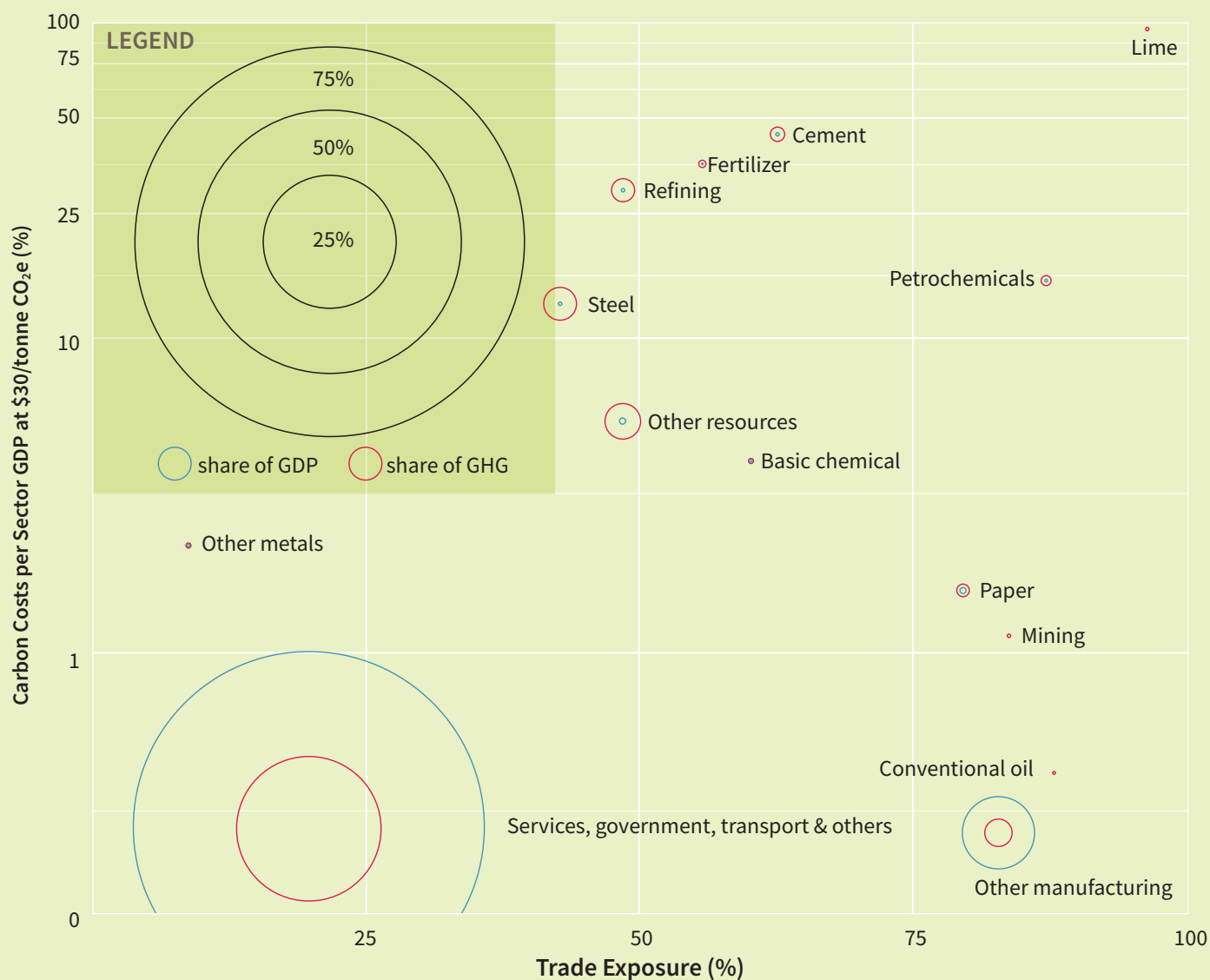
Provincial Carbon Pricing and Competitiveness Pressures

- A much larger share of Alberta's economy is exposed to competitiveness pressures, given the importance of resource extraction sectors. The oil and natural gas sectors collectively make up around 20% of provincial GDP. Still, interactions with other fiscal policies are a critical factor not considered here. In particular, royalties paid by oil sands companies are currently based on the difference between revenues and the sum of current and capital expenditures. As a result, these royalty payments would decrease as carbon prices rise, thereby offsetting some of the impact on competitiveness (Bošković & Leach, 2014).
- Indirect GHG emissions matter much more for provinces that rely on coal-fired electricity generation, such as Alberta and Saskatchewan. With a much more emissions-intensive electricity supply, a broad-based carbon price would lead to higher electricity costs. On the other hand, switching to gas-powered generation likely represents relatively low cost abatement; over time, indirect emissions are likely to decline in response to effective carbon pricing policies.
- Even though the oil and gas sectors are exposed to competitiveness pressures, they are not the most vulnerable sectors in Alberta. Fertilizer, chemical manufacturing, and petrochemical manufacturing are all considerably more emissions intensive and trade exposed—although they are much smaller as a share of the economy and thus may present less of a challenge for policy design.



Ontario

Figure 1c: Competitiveness Pressures by Sector in Ontario



The centre of each sector's bubble reflects that sector's trade exposure (horizontal axis) and its carbon costs (vertical axis; log scale). The size of each bubble reflects the sector's share of provincial GDP (blue) and share of provincial GHG emissions (red).

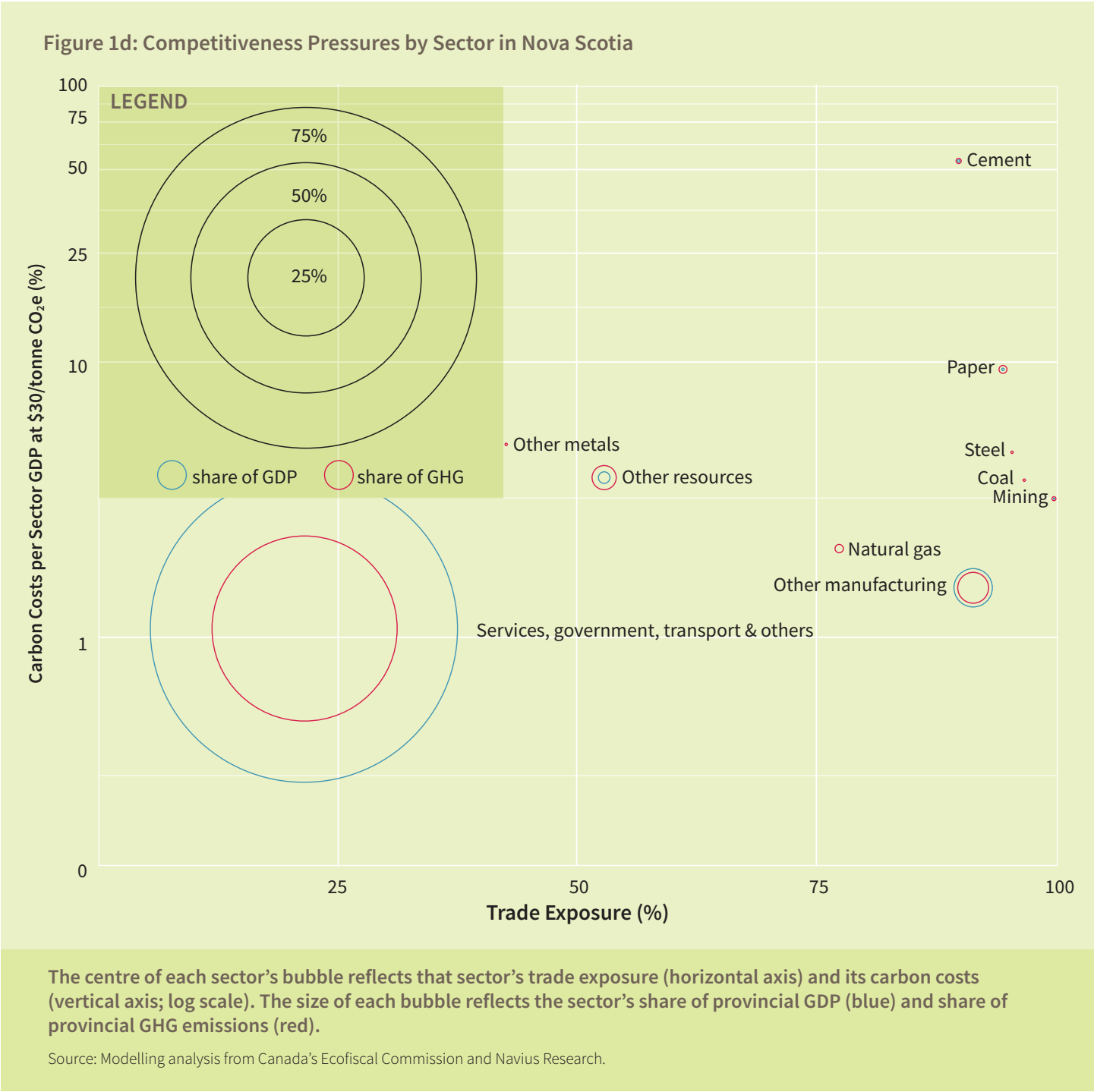
Source: Modelling analysis from Canada's Ecofiscal Commission and Navius Research.

Provincial Carbon Pricing and Competitiveness Pressures

- Ontario's manufacturing sector is mostly unexposed to competitiveness pressures from carbon pricing. Other manufacturing, including industries such as vehicle and aerospace manufacturing, is highly traded, but is generally not emissions intensive. Other manufacturing makes up around 15% of Ontario's GDP.
- Only a few specific manufacturing sectors—steel, chemicals, petrochemicals, fertilizer, and refining—display a notable exposure to competitiveness pressures. Though collectively these sectors make up less than 1% of provincial GDP, they are responsible for one-quarter of Ontario's industrial GHG emissions.
- Interestingly, some of Ontario's manufacturing sectors may be better positioned to compete relative to those in other provinces. Ontario's pulp and paper sector, for example, is less emissions intensive than the pulp and paper sectors in Alberta and Nova Scotia, largely because its electricity supply is less carbon intensive, and thus its indirect emissions are smaller. If carbon pricing policies were evenly implemented across all provinces, Ontario firms could face lower carbon costs and thus have an advantage relative to those in Alberta.



Nova Scotia



Provincial Carbon Pricing and Competitiveness Pressures

- Nova Scotia's small size has interesting implications for its exposure to competitiveness pressures. A large share of the goods it produces—coal, gold, cement, natural gas, pulp and paper, and other resources—are exported in competitive markets, leading to a very high measure of trade exposure.
- At the same time, vulnerable “sectors” are often single facilities. For example, Nova Scotia has a single cement facility and two pulp and paper plants. These are the individual emitters in the province likely to be most exposed to competitiveness pressures.
- About 10% of the provincial economy is based on other manufacturing that has low emissions intensity and carbon costs, although considerable trade exposure.
- Future developments in the province—such as additional natural gas projects and LNG plants—would likely also be both emissions intensive and trade exposed.

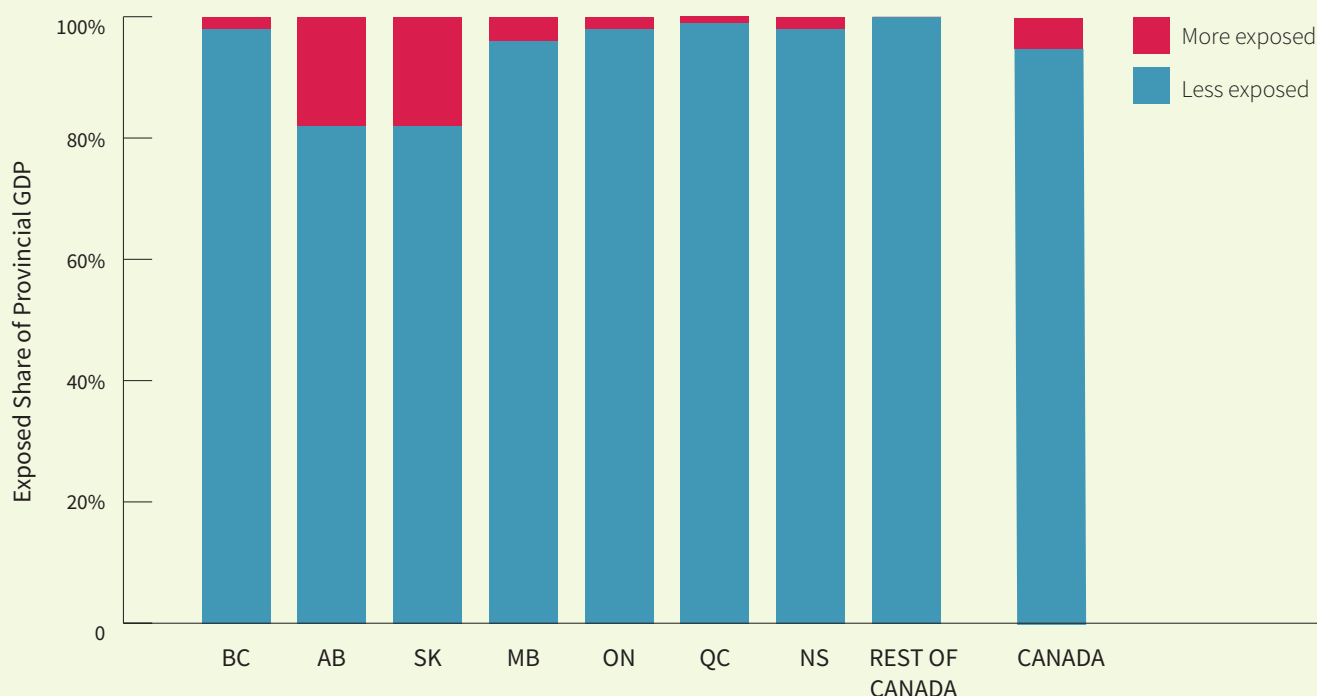


4. What is the overall scale of competitiveness pressures?

Figure 1 illustrates how different sectors are exposed to competitiveness pressures from carbon pricing. As discussed, the farther a sector is to the top right of the figure (i.e., is more emissions intensive and more trade exposed), the more vulnerable it is. But to quantify a share of the economy exposed to significant pressures, we

need to define a specific threshold. We categorize sectors as “more exposed” if they have both a carbon cost greater than 5% of GDP (measured at a \$30 carbon price) and a trade exposure greater than 15%.⁸ Figure 2 shows the share of provincial GDP coming from sectors deemed to be more exposed.

Figure 2: The Scale of Competitiveness Pressures for Canadian Provinces, 2015



The red bars show the share of GDP in each province coming from sectors with a carbon cost greater than 5% of GDP and a trade exposure greater than 15%.

Source: Canada's Ecofiscal Commission and Navius Research.

Four main observations emerge from Figure 2. First, the overall economic implications of competitiveness pressures are quite small. For Canada as a whole, only 5% of the economy is “more exposed.” With the exception of Saskatchewan and Alberta (to which we return below), considerably less than 5% of each province's economic activity is exposed to competitiveness pressures. The main reason for the large-scale absence of carbon exposure is that services and non-traded goods, both of which have very low *carbon intensities*,

represent a huge share of modern, developed economies. Canadian provinces are no exception. Consider, for example, the case of British Columbia. As indicated in Figure 2, that province's carbon tax, which applies directly to the use of most fossil fuels, does not have a key impact on overall business competitiveness. For non-traded goods and services, much of the carbon cost can be passed on to final consumers (households and drivers), thus significantly dampening the competitiveness pressures on that province's businesses.

⁸ These thresholds parallel the American Clean Energy and Security Act (H.R. 2454) proposed in the United States in 2009 (Western Climate Initiative, 2009). H.R. 2454 defines emissions intensity as emissions per dollar of sectoral production (revenues), rather than per dollar of value added (GDP). Using the 5% threshold in the context of carbon costs as a share of GDP is a more conservative approach since it leads to more sectors being classified as more exposed.

Provincial Carbon Pricing and Competitiveness Pressures

Second, while the shares of provincial GDP exposed to competitiveness pressures are generally small, the exposed sectors represent a disproportionate share of total provincial GHG emissions, as shown in Table 1. This finding is intuitive: since vulnerable sectors are *by definition* emissions intensive, their share of provincial GHGs must be larger than their share of provincial GDP. This difference has important implications and a potential tradeoff for policymakers. The general concern is that if carbon-intensive and trade-exposed firms relocate to regions with lower carbon prices, aggregate GHG emissions will not decline. This is the leakage problem discussed previously. Emissions in the carbon pricing province may decline, only to be replaced by increases in those jurisdictions with weaker carbon policies. The global effectiveness of carbon pricing policy is undermined if vulnerable sectors simply

relocate their activities to other jurisdictions but leave their GHG emissions unchanged.

If policymakers choose to exempt selected sectors from the carbon policy to avoid this competitiveness/leakage problem, they will create a second important problem. Given a desire to achieve a specific emissions-reduction target, the exemption of emissions-intensive sectors from carbon pricing would reduce the effectiveness of the policy in reducing emissions and would also impose a greater burden on the remaining sectors. As is generally the case in issues of public finance, the smaller the tax base, the higher the tax rate needs to be to generate a targeted outcome. Policy can, however, be designed to address this tradeoff while maintaining incentives to improve emissions performance. We return to policy approaches below.

Table 1: Share of Provincial GDP and GHGs Exposed to Competitiveness Pressures From Carbon Pricing

	Percentage of GDP from sectors:		Percentage of GHGs from sectors:	
	less exposed	more exposed	less exposed	more exposed
British Columbia	98	2	78	22
Alberta	82	18	48	52
Saskatchewan	82	18	21	79
Manitoba	96	4	57	43
Ontario	98	2	74	26
Quebec	99	1	83	17
Nova Scotia	98	2	64	36
Rest of Canada	100	0	91	9
Canada (overall)	95	5	60	40

Third, the magnitude of the competitiveness pressures varies widely across provinces. Part of this story is differences in electricity mixes: provinces with low-carbon electricity generation—including hydro provinces such as British Columbia, Manitoba and Quebec, but also Ontario (which phased out coal-powered electricity)—have much lower indirect emissions. Part of the story is structural: emissions-intensive industries make up a larger share of some provincial economies. Alberta and Saskatchewan, in particular, with strong oil and gas sectors, emissions-intensive electricity generation, and significant chemical manufacturing sectors, will have greater vulnerability. And part of the story is policy: some provinces have already implemented policies to reduce emissions intensity, including

B.C.'s carbon tax, Alberta's Specified Gas Emitters Regulation, and Ontario's coal phase-out.

Fourth, the scale of the overall competitiveness pressures is relatively insensitive to changes in the price of carbon, as seen in Table 2. We have used a price of \$30 per tonne of CO₂e to define carbon costs, but the share of the economy "more exposed" increases only modestly as this price increases considerably. At \$60 per tonne, 7% of the economy is more exposed; at \$90 per tonne, 8% is more exposed; at \$120 per tonne, the number is around 10%. Individual emissions-intensive sectors, of course, face higher carbon costs and competitiveness pressures at higher carbon prices. But the number of sectors that are more exposed does not change significantly.



This finding reinforces the idea that competitiveness pressures are much more important for some specific industries than for the economy overall.⁹

Finally, note that the thresholds used to construct Figure 2 are somewhat arbitrary. Indeed, different carbon pricing policies and policy proposals have used different benchmarks for determining vulnerability (for a summary, see Western Climate Initiative, 2009). California, for example, categorizes sectors as facing low, medium,

or high competitiveness “risks” based on specific thresholds for emissions intensity and trade exposure (California Air Resources Board, 2012). California’s criteria appear to be less strict than the ones used here, and allow for a very large number of sectors to be considered “at risk,” even those with very limited trade exposure. California uses these categories to determine which sectors are allocated free permits under its cap-and-trade system and, as a result, has provided a large number of free permits.

Table 2: Shares of Provincial GDP More Exposed Under Different Carbon Prices

	\$30 per tonne CO ₂ e (% of GDP more exposed)	\$60 per tonne CO ₂ e (% of GDP more exposed)	\$90 per tonne CO ₂ e (% of GDP more exposed)	\$120 per tonne CO ₂ e (% of GDP more exposed)
British Columbia	2	3	7	9
Alberta	18	28	28	28
Saskatchewan	18	20	20	20
Manitoba	4	5	5	5
Ontario	2	2	2	5
Quebec	1	3	3	5
Nova Scotia	2	5	7	17
Rest of Canada	0	6	10	10
Canada (overall)	4	7	8	10

5. What’s missing from this analysis?

We have now examined two of the many factors affecting the competitiveness of firms in the context of carbon pricing. And though our analysis is useful at identifying potential pressures from the policy, it also has some clear limitations, mostly arising from a lack of adequate data. There are five reasons why our analysis should not be considered a definitive assessment of the competitiveness pressures created by carbon pricing. The examination of (confidential) firm-level data is required for a more thorough analysis of these pressures.

1. Firms Respond to Carbon Prices. Our analysis cannot address how firms respond to carbon pricing. Rather, it looks only at the carbon costs as if firms made no adjustment in their production

methods. In response to any significant carbon price, however, a profit-maximizing firm can be expected to reduce its GHG emissions and change its use of emissions-intensive inputs. Of course, this is exactly the point of carbon pricing: it induces substitution and innovation. Especially over time, these responses can be very significant. That these responses are not built into Figure 1 suggests that the carbon costs shown therein, as well as the percentages of GDP “more exposed” in Figure 2, should be viewed as upper bounds of the actual competitiveness pressures.

2. Firms Differ Within Sectors. Owing to data limitations, we have examined only sectoral averages for carbon costs and trade

⁹ The estimated shares of provincial GDP “more exposed” are also relatively insensitive to changes in the trade exposure threshold (15% in Figure 2). Almost all the sectors are identified as trade exposed, given that our measure is based on out-of-province trade. Considering only *international trade*, on the other hand, would reduce the number of sectors classified as trade exposed.

exposures. Yet different firms within any one sector vary significantly in both dimensions. Smaller firms, for example, tend to be less involved in exporting to foreign markets than are larger and more established firms, although smaller firms may be more vulnerable to loss of market share to imported products. In industries characterized by ongoing technological change, it is normal to see older production facilities operating alongside newer ones. And though both vintages of firms may satisfy the requirements of profitability, the older facilities typically use older and more emissions-intensive technologies than do the newer ones, which embody the latest and cleanest technologies. These important differences among firms within any sector underline the importance of examining firm-level data to determine the genuine competitiveness pressures associated with carbon pricing. Sector-level data can be a very useful starting point, but it is not sufficient for those designing policy.

3. Carbon Policy Elsewhere Matters. Our measure of trade exposure has an important limitation. We estimate trade exposure based on *all* out-of-province trade, and do not differentiate based on specific trading partners. As a result, the metric could overstate risks if firms in specific sectors primarily compete with firms in jurisdictions that have already implemented carbon pricing policies. Given that several provinces and U.S. states have implemented carbon pricing policy, or are in the process of doing so, competitiveness pressures could be lower than suggested in the previous section. Similarly, with the United States moving forward with electricity regulations through the Environmental Protection Agency, indirect emissions from electricity will begin to see increasing carbon costs that will be passed on to manufacturers throughout the United States, thus reducing the competitiveness pressures faced by Canadian firms. This points again to the need for more detailed data. Policymakers need to know which foreign markets Canadian firms are exporting to, and also receiving imports from, and the extent of carbon pricing policies in all those jurisdictions. Genuine competitiveness pressures on Canadian businesses cannot be ascertained without such data.

4. Market Details Matter. Another limitation of our analysis is that we do not examine the nature of each sector's product and market structure. Yet both factors affect the extent to which firms are able to pass carbon costs on to their consumers in the form of higher prices. If firms sell differentiated products, as is often the case in manufacturing industries, they generally have some ability to set their own prices. In such settings, firms will be able to pass some part of their carbon costs on to consumers. The more firms can pass on these costs, the less they are exposed to carbon competitiveness pressures.

5. Other Policies Affect Competitiveness. Finally, the broader policy context is critical. Carbon pricing policy is far from the only policy that affects business competitiveness. Other fiscal policies—such as corporate taxes and resource royalty regimes—play a major role. These various policies could also interact, depending on policy details. For example, if carbon costs are tax deductible for firms, the total amount paid in corporate income taxes could decrease under carbon pricing policy. It is also worth noting that revenues raised from a carbon pricing policy could be recycled back to the economy in a way that enhances business competitiveness. An example is in British Columbia, where part of the revenues raised by the carbon tax finance the reduction in the corporate income-tax rate, which is now the lowest in Canada. The combination of higher carbon taxes and reduced corporate income taxes could well lead to an improvement in the competitiveness of some businesses, and this is one option that policymakers in all Canadian provinces have at their disposal. Another option is to use carbon pricing revenues in more targeted ways to support vulnerable industries, as we discuss below.

In short, when attempting to identify the genuine competitiveness pressures on Canadian businesses created by the introduction of carbon pricing, it is not sufficient to rely only on an examination of each sector's emissions intensity and trade exposure. These two metrics have clear limitations and must be used carefully, and several other factors must also be examined. Figure 1 may be a useful starting point for policymakers, but by itself, it is not an adequate basis for the design of good policy.

6. What are the implications for policy?

Based on the analysis presented here, six principal lessons emerge for Canadian provinces considering how best to implement carbon pricing policies while also recognizing the importance of potential pressures on business competitiveness.

1. Competitiveness pressures from carbon pricing should not be overstated.

Competitiveness pressures do pose real economic and environmental challenges—but only for a small number of industries and a very small share of total economic activity. Most provincial economies are not both emissions intensive and trade exposed, and so are not highly vulnerable to competitiveness pressures. Moreover, as more Canadian provinces and U.S. states move forward with carbon pricing policies, these pressures are further diminished, suggesting that even the competitiveness pressures identified in this paper may overstate the actual impact on business. Also, as emitters respond to the carbon price over time, by reducing emissions and improving energy efficiency, their carbon costs will fall. Overall, the business community should not perceive carbon pricing as a significant economic threat.

2. Competitiveness pressures should neither preclude nor delay policy action.

It is possible to move forward on policy using targeted support. This support does not require the blanket exemption of vulnerable sectors, which would undermine the policy and increase the burden on the remaining sectors. Instead, cap-and-trade systems—such as those in California and Quebec—can provide limited emissions permits for free based on production or emissions intensity. Experience and economic research suggests that such “output-based allocations” can offset competitiveness pressures (Fischer & Fox, 2004, 2009a; Rivers, 2010). In the case of a carbon tax, the equivalent policy is a rebate to firms based on their production levels (Fischer & Fox, 2009b). In both cases, emitters still have incentives to reduce their GHG emissions but have dampened incentives to reduce their production.¹⁰

3. Support for vulnerable sectors should be targeted.

Providing any free permits generates two challenges for policymakers. First, by treating some firms or sectors differently from others, free permits can be divisive and can undermine the political acceptance of the policy. Second, the more permits are provided for free, the less carbon pricing revenue is generated. Forgoing revenue means

having less opportunity for revenue recycling through, for example, reducing existing taxes. These challenges point to the importance of policymakers identifying the *genuine* competitiveness pressures created by the policy, and altering the policy design only to deal with these situations. At the same time, they will need to resist the claims from those entities that might exaggerate their own exposure to such pressures.

4. The process and mechanisms for providing support should be transparent.

While only some sectors and firms will face significant competitiveness pressures, *all* firms have incentives to seek additional support from government. A transparent, data-driven approach to identifying competitiveness pressures can help ensure that support is provided only where it is needed to address legitimate competitiveness concerns, rather than relying on the stated needs from firms, whose objectivity may be questioned. This approach can help ensure the credibility of carbon pricing overall, but it can also ensure that the policy is effective in reducing GHG emissions and does so at the lowest possible economic cost.

5. Support to specific sectors should be temporary.

Providing transitional support gives emitters time to adjust to policy. But competitiveness pressures are likely to decline over time, as more jurisdictions implement carbon pricing, and as the market works by producing carbon-reducing innovation that emitters can adopt to reduce emissions at lower costs. Providing temporary support for vulnerable firms produces additional incentives for them to develop innovative solutions, but also limits the cost of providing this support. British Columbia, for example, recently provided transitional support to the cement sector in the form of \$22 million over three years to address that sector’s competitiveness challenges.

6. Any support should be justified by data and analysis.

The analysis in this paper offers a first look at the competitiveness pressures created by carbon pricing in Canadian provinces. Other factors also matter. What is the market structure of the industry, and to what extent can carbon costs be passed on to consumers? How do other policies, such as corporate taxes and resource royalties, affect the carbon costs borne by emitters? How important are the differences in technologies and emissions intensities among the

¹⁰ Emitters are still included under the cap—i.e., they are not *exempted*—and so reducing one tonne of CO₂e means they can sell (or avoid purchasing) an additional permit. The *marginal* price of carbon maintains the firms’ incentive for reducing emissions. But by increasing a firm’s overall profits, providing rebates or free permits based on its output creates an additional incentive for production. Together, the two incentives mean that emitters can benefit by reducing emissions through improved performance rather than by reducing production.

various firms within any given sector? How stringent is the carbon policy in the jurisdictions that represent the relevant external markets for Canadian firms? The detailed data necessary to answer these questions is generally not publicly available and may only be available from businesses themselves.

Implementing an effective and cost-effective carbon pricing policy can generate significant economic and environmental benefits to each province, if the policy is designed well. But some firms and industries will be exposed to genuine competitiveness pressures created by the policy. The provision of special support to specific firms or sectors should not be the default position for policymakers, but rather the exception. In the end, firms and governments need to demonstrate genuine competitiveness pressures to justify creating targeted, transparent, and temporary support measures.

7. Next steps

This report establishes a framework for assessing competitiveness pressures under provincial carbon pricing policies. It finds that competitiveness need not be an obstacle to moving forward with carbon pricing policy, as the policies can be designed to address these challenges. Our next report considers these design solutions in detail. It considers different approaches to recycling carbon pricing revenue back to the provincial economy, including approaches to address competitiveness concerns.

References

- Aldy, J., & Pizer, W. (2009). *The competitiveness impacts of climate change mitigation policies*. Center for Climate and Energy Solutions. Retrieved from <http://www.c2es.org/docUploads/competitiveness-impacts-report.pdf>
- Barker, T., Junankar, S., Pollitt, H., & Summerton, P. (2009). The effects of environmental tax reform on international competitiveness in the European Union: Modelling with E3ME. In M. S. Andersen & P. Ekins (Eds.), *Carbon-energy taxation: Lessons from Europe* (pp. 147-214). Oxford, UK: Oxford University Press.
- Bassi, S., & Zenghelis, D. (2014). *Burden or opportunity? How UK emissions reductions policies affect the competitiveness of business*. Centre for Climate Change Economics and Policy and the Grantham Research Institute on Climate Change and the Environment. Retrieved from <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/07/Burden-or-opportunity.pdf>
- Bošković, B., & Leach, A. (2014). *Leave it in the ground? Oil sands extraction in the carbon bubble*. [Working paper]. Retrieved from <http://www.uwinnipeg.ca/economics/docs/leach-oil-sands.pdf>
- California Air Resources Board. (2012). *Cap-and-trade program: Emissions leakage research and monitoring*. Public Workshop. Retrieved from <http://www.arb.ca.gov/cc/capandtrade/meetings/073012/emissionsleakage.pdf>
- Fischer, C., & Fox, A. (2004). *Output-based allocations of emissions permits: Efficiency and distributional effects in a general equilibrium setting with taxes and trades*. [Discussion Paper 04-37]. Resources for the Future. Retrieved from <http://rff.org/rff/Documents/RFF-DP-04-37.pdf>
- Fischer, C., & Fox, A. (2009a). *Comparing policies to combat emissions leakage: Border tax adjustments versus rebates*. [Discussion Paper 09-02]. Resources for the Future. Retrieved from <http://www.rff.org/documents/RFF-DP-09-02.pdf>
- Fischer, C., & Fox, A. (2009b). *Combining rebates with carbon taxes: Optimal strategies for coping with emissions leakage and tax interactions*. [Discussion Paper 09-12]. Resources for the Future. Retrieved from <http://www.rff.org/RFF/Documents/RFF-DP-09-12.pdf>
- McKinsey & Company. (2012). *Opportunities for Canadian energy technologies in global markets*. Commissioned by Natural Resources Canada. Retrieved from <http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/files/pdf/2013/McK-Report-eng.pdf>
- Morgenstern, R., Aldy, J. E., Herrnsstadt, E. M., Ho, M., & Pizer, W. A. (2007). Competitiveness impacts of carbon dioxide pricing policies on manufacturing. *Assessing U.S. Climate Policy Options*. Resources for the Future. Retrieved from http://www.rff.org/files/sharepoint/WorkImages/Download/CPF_9_IssueBrief_7.pdf
- National Round Table on the Environment and the Economy (NRTEE). (2009). *Achieving 2050: A carbon pricing policy for Canada*. [NRTEE Technical Report]. Retrieved from http://www.naviusresearch.com/data/resources/Technical_Report_Achieving_2050.pdf
- National Round Table on the Environment and the Economy (NRTEE). (2012). *Framing the future: Embracing the low-carbon economy*. Retrieved from <http://collectionsCanada.gc.ca/webarchives2/20130322185857/http://nrtee-trnee.ca/wp-content/uploads/2012/10/framing-the-future-report-eng.pdf>
- Quirion, P., & Hourcade, J.-C. (2004). *Does the CO₂ emission trading directive threaten the competitiveness of European industry? Quantification and comparison to exchange rates fluctuations*. EAERE, Annual Conference, Budapest. Retrieved from <http://halshs.archives-ouvertes.fr/hal-00643411/>

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- Reinaud, J. (2008). *Issues behind competitiveness and carbon leakage: Focus on heavy industry*. [IEA Information Paper]. Paris: Organisation for Economic Cooperation and Development / International Energy Agency. Retrieved from http://www.iea.org/publications/freepublications/publication/Competitiveness_and_Carbon_Leakage.pdf
- Reinaud, J. (2009). *Trade, competitiveness and carbon leakage: Challenges and opportunities*. Energy, Environment and Development Programme Paper 09/01. London, UK: Chatham House. Retrieved from <http://www.chathamhouse.org/sites/files/chathamhouse/public/Meetings/Meeting%20Transcripts/0109reinaud.pdf>
- Rivers, N. (2010). Impacts of climate policy on competitiveness of Canadian industry: How big and how to mitigate? *Energy Economics*, 32(5), 1092-1104. Retrieved from <https://ideas.repec.org/a/eee/eneeco/v32y2010i5p1092-1104.html>
- Sawyer, D. (2013). *Carbon exposed or carbon advantaged? Thinking about competitiveness in carbon-constrained markets*. Sustainable Prosperity Policy Brief. Retrieved from <http://www.sustainableprosperity.ca/content/carbon-exposed-or-carbon-advantaged-thinking-about-competitiveness-carbon-constrained>
- Western Climate Initiative. (2009). *Draft statement of principles on competitiveness and review of options*. Retrieved from <http://www.westernclimateinitiative.org/document-archives/Cap-Setting--and--Allowance-Distribution-Committee-Documents/Draft-Statement-of-Principles-on-Competitiveness-and-Review-of-Options/>





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