

### FOR A LOW CARBON ECONOMY



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#### **Sustainable Prosperity**

c/o University of Ottawa 555 King Edward Avenue Ottawa, ON K1N 6N5 613-562-5800 x3342 www.sustainableprosperity.ca

# The Hidden Factor in Climate Policy: Implicit Carbon Taxes

#### By Erick Lachapelle<sup>1</sup> and Sustainable Prosperity<sup>2</sup>

### **Key Messages**

- Existing taxes on fossil fuels, though originally imposed for other purposes, can be conceptualized as implicit carbon taxes.
- Current implicit carbon tax rates in most countries in the Organization for Economic Co-operation and Development (OECD) are for the most part inversely related to the carbon content of fuels. The most obvious example is coal, which is often taxed at markedly lower, sometimes non-existent, rates despite having the highest carbon content.
- The lack of link between the current tax rate and the carbon content of the fuel implicitly encourages the consumption of carbon-intensive fuels, which is not aligned with stated government environmental, fairness and efficiency objectives.
- Large differences in implicit carbon tax rates across fuels and countries, and over time, suggest there is considerable scope for Canadian governments to increase rates on carbon-intensive fuels with little disruption to the economy, in order to bring tax policy in line with broader policy objectives (e.g. reducing emissions and stimulating the green economy).

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<sup>1</sup> Assistant Professor, Université de Montréal

# The issue

Given that energy generation and fossil fuel combustion account for the majority of greenhouse gas (GHG) emissions in Canada, any effort to significantly reduce emissions must target the consumption of fossil fuels. One policy option gaining support that could spur substantial emissions reductions is a carbon tax (Andersen and Ekins, 2009).<sup>3</sup> A carbon tax, when applied to the energy sector, creates the incentive to both conserve energy and gradually shift away from carbon-intensive energy sources. While a comprehensive, national carbon tax is not a reality at present, the existing energy tax structure already puts an implicit price on carbon emissions through fuel taxes.<sup>4</sup> The implicit carbon tax can be defined as the sum total of all non-refundable<sup>5</sup> taxes (i.e. excise + Value Added Tax [VAT] + specialized taxes) levied on a particular fossil fuel, expressed in terms of the dollar equivalent per unit of carbon dioxide.<sup>6,7</sup>

However, the current implicit carbon tax rates were not imposed to change energy consumption patterns<sup>8</sup>, and as such are not aligned with government policies to reduce carbon emissions. If the tax rates are the same, an implicit carbon tax can have the same effect on reducing GHG emissions as an explicitly labelled carbon tax.<sup>9</sup> However, that is precisely the issue in Canada: current implicit carbon tax rates are too low to incentivize a widespread shift away from fossil fuels. In fact, the low tax rates, especially on coal, the most carbon-intensive fuel, create the perverse incentive to consume *more* carbon-intensive energy.<sup>10</sup>

The current tax rates on fossil fuels encourage continued reliance and investment in non-renewable energy resources. Canadian policy makers need to examine existing implicit carbon tax rates and strive to increase the overall coherence between the tax system and other environmental, economic and fiscal policy objectives (OECD, 2001).

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3 A carbon tax is already in place in British Columbia and Quebec. A carbon price, in the form of a \$15/t CO<sub>2</sub> contribution to a technology fund, exists in Alberta.

<sup>4</sup> Conceptually, an implicit carbon tax is any tax that increases the price of carbon-based energy.

<sup>5</sup> It is important to include only *non-refundable* taxes in order to better estimate the *effective* tax rate on various forms of carbon-based energy. For this reason, it is common to exclude VAT from estimates of the implicit carbon tax levied on industrial use of fossil fuels, where VAT is refunded to industry.

<sup>6</sup> Other taxes and subsidies on inputs to production are excluded from this analysis, but are also significant. For example, subsidies for labour in coal extraction keep the price of coal lower than in a free-market equilibrium. In general equilibrium, taxes on labour/capital can act as implicit taxes on energy, depending on substitutability between these factors and energy.

<sup>7</sup> Note that Canadian and U.S. data include federal excise taxes plus VAT (where it is non-refundable), in addition to average state and provincial tax rates, as calculated by the IEA.

<sup>8</sup> Reasons they were imposed at certain rates include: to increase revenue or to fund infrastructure improvements.

<sup>9</sup> Moreover, as the OECD (2001: 56) points out, fiscal taxes imposed upon carbon-based energy (i.e. implicit carbon taxes) will have the same economic and environmental impact as an explicitly labelled "carbon tax," provided that the tax rates on the different tax bases are the same

<sup>10</sup> It is important here to distinguish between tax APPLICATION and tax INCIDENCE. Coal, for example, is an input to things like electricity generation, and a tax applied to coal would be passed onto consumers (so, the tax incidence). This might raise equity concerns that are distinct from equity issues related to how coal is taxed in relation to other fossil fuels (the tax application issue).

# The knowledge base

### The international knowledge base

One of the earliest studies on the implicit carbon tax examined its role in determining cross-national variation in energy prices across OECD countries, the economic costs of superimposing carbon taxes on top of existing energy taxes, and the prospects for restructuring taxes on energy to achieve a reduction in carbon dioxide (CO<sub>2</sub>) emissions (Hoeller and Coppel 1992). This important study was one of the first to develop concrete estimates of implicit carbon taxes, which clearly documented the tendency for OECD countries to tax mineral oils and oil products at a higher rate than coal and natural gas. This tendency is explained as the result of the high demand inelasticity for gasoline, and the stable and predictable flow of revenues that a high excise tax provides to governments (Baranzini et al. 2000: 397).11

Though limited to considering implicit carbon taxes for a single year (1988) and by its grouping together of oil and oil products, the study broke new ground by emphasizing the importance of existing energy taxes for broader climate policy objectives, and for advancing the argument that the introduction of new and explicitly labelled "carbon taxes" should be accompanied by a reform of the existing energy tax structure (Baranzini et al. 2000).

Building on this work, recent studies have proposed a conversion of implicit carbon taxes to a common carbon price, thereby "rationalizing" the energy tax system for consistency with environmental and climate policy objectives (e.g. Albrecht, 2006; Yokoyama et al. 2000).

The existing studies on implicit carbon taxes share in common the view that considerable progress can be made, in terms of pricing carbon and reducing emissions, by adjusting existing energy taxes.<sup>12</sup> Existing studies are limited, however, in terms of their inability to differentiate between tax rates applied to similar fossil fuels with different carbon content - like diesel and gasoline - as well as changes in the implicit carbon tax rate over time.

Considerable progress can be made, in terms of pricing carbon and reducing emissions, by adjusting existing energy taxes.



<sup>11</sup> It is often more difficult for governments to impose concentrated costs on small groups (Olsen, 1965), e.g. industry use of coal and heavy fuel oil. Moreover, to the extent that coal and heavy fuel oil are used primarily by heavy industry, lower tax rates on these products reflect an attempt by governments to maintain the international competitiveness of its energy-intensive industries (Andersen and Ekins, 2009).

<sup>12</sup> President Obama was not successful in passing a comprehensive climate bill, and the Canadian government is unlikely to unilaterally impose a domestic carbon price. Yet short of an explicit carbon tax or emissions cap and permit trading system, governments in both countries could go some way in jointly undertaking a more straightforward rationalization of their respective energy tax systems.

#### Current implicit tax rates

Looking at the OECD as a whole, implicit carbon tax rates vary widely across fuels. In order to garner a better sense of the relative magnitude of implicit carbon taxes across fossil fuels, one approach is to convert tax data to a common metric – for instance, carbon dioxide (CO<sub>2</sub>). Such a conversion allows for a more straightforward comparison of how energy tax rates differ across fuels, based on corresponding levels of emissions. Figure 1 presents implicit carbon tax rates averaged over the OECD in 2006 for six fossil fuels, arranged from highest carbon content (Coal, 26 Teragrams [Tg] of carbon [C] per quadrillion Btu or Tg C) to lowest (Nat. Gas, 14.5 Tg C).<sup>13</sup> Data refer to the equivalent tax in current Canadian dollars per tonne of CO<sub>2</sub>.<sup>14</sup>

Existing implicit carbon taxes are in fact inversely related to the carbon content of fossil fuels.



Figure 1: OECD Average Implicit Carbon Taxes, by fuel in CAD\$/tCO<sub>2</sub>

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Note: The numbers in brackets represent the carbon content of the fuel, as Teragrams (Tg) of carbon (C) per quadrillion BTU (or TgC). Source: IEA (2009)

Figure 1 clearly shows that existing implicit carbon taxes are in fact inversely related to the carbon content of fossil fuels.<sup>15</sup> Energy used in transportation is taxed at a much higher rate than other fuels like coal and heavy fuel oil, despite being less carbon-intensive. From

15 This is true except for natural gas, which is taxed at a lower rate than transport fuels.

<sup>13</sup> Tax data in figure 1 refer to the sector-specific implicit tax on steam coal (industry), heavy fuel oil (industry), light fuel oil (households), diesel (non-commercial use), gasoline (non-commercial use) and natural gas (household use).

<sup>14</sup> For this series, exchange rates from the Penn World Tables 6.3 are used to convert from USD to Canadian dollars (Heston et al. 2009). To convert to the equivalent tax rate per tonne of CO<sub>2</sub>, the following emission factors were used: coal (2.77), heavy fuel oil (3.078), light fuel oil (2.642), diesel (0.00269), gasoline (0.00232), and natural gas (2.34). All figures are in tonnes of CO<sub>2</sub> per base unit corresponding to the original International Energy Agency (IEA) data, and were developed consistently with the 1996 IPCC Guidelines for estimating emissions from the combustion of fossil fuels.

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the perspective of climate change policy, Canada's existing energy tax structure is disconcerting as more heavily polluting fuels such as coal are systematically taxed at a lower rate, on a per tonne of  $CO_2$  basis. In fact, the use of coal is hardly taxed at all in many OECD countries, including Canada, even though it is the most carbon-intensive fuel with relatively large remaining reserves (Harvey, 2010).<sup>16</sup>

In addition to the transportation sector being more heavily burdened than the energy sector, households also tend to pay higher tax rates on energy products than industry. Figure 2 documents the mean tax rate on three fuels for which IEA data provide distinct tax rates across the industrial (ind) and household (hh) sectors. The data represent the implicit carbon tax rate by fuel, and by sector, averaged across all OECD countries for which data are available, and converted to Canadian dollars using 2006 market exchange rates.



Figure 2: OECD Average Implicit Carbon Tax Rate across sectors, in 2006 CAD\$/tCO<sub>2</sub>

Source: IEA (2009)

As can be seen in Figure 2, households in the OECD tend to pay much higher taxes than industry for use of the same fuels. For light fuel oil, households tend to pay an average of nearly \$30 more in taxes than industry. For diesel, the sector difference is nearly \$50, while the average difference between household and industrial tax rates on the use of natural gas is close to \$30 per tonne of  $CO_2$ .

Though distressing for climate policy and from the perspective of social equity,<sup>17</sup> these cross-sector and cross-fuel differences in implicit carbon tax rates are not entirely surprising.

16 The zero tax rate policy on coal effectively constitutes an indirect subsidy, as users pay nothing for the large amount of carbon emitted into

17 Footnote 10 provides a broader context for this issue

the atmosphere



From an economic perspective, and as Baranzini et al. (2000:397) point out, motor fuels are taxed at relatively higher rates because demand for these energy products is relatively inelastic, making it easier for governments to extract revenues from their consumption. In addition, higher gasoline taxes are sometimes justified on the basis that revenues are used for road maintenance and infrastructure. On the other hand, public choice theories also help to account for higher tax rates on households, given that this sector constitutes a large group with diffuse interests, and thus has less incentive to mobilize against higher taxes, relative to small groups (such as a specific industrial sector) who bear concentrated costs (Svendsen et al. 2001). From the perspective of climate change and social equity, however, the existing energy tax structure may be seen to fall short of democratic ideals in terms of fairness. The challenge for governments is to level the playing field and bring the implicit tax rate on other fuels and for other sectors closer to what ordinary citizens already pay per tonne of  $CO_2$  when heating their homes or fueling at the pump. Such tax increases can help make the tax system more compatible with broader policy goals of reducing emissions from heavily polluting activities, while also promoting fairness in the tax system.<sup>18</sup>

Many policy makers are concerned about the competitiveness impacts of carbon taxes on domestic energy-intensive, trade-exposed (EITE) industries. The concern is that the additional costs imposed by carbon taxes places these industries at a competitive disadvantage compared to companies outside of the tax jurisdiction. Beyond the alternative perspective that stricter environmental regulation can actually be good for the economy (Martin and Kemper, 2010; Porter, 1998), and the positive link found between environmental tax reform and rising GDP (Andersen and Ekins, 2009), large cross-national differences in implicit carbon taxes suggest there is considerable room for countries to increase levies on carbon-based fuels. Indeed, as can be seen in Figure 3, implicit carbon taxes for the same fossil fuels already vary widely across countries.<sup>19</sup> These differences suggest there is substantial scope for a reform of energy taxes without imposing extraordinary costs, especially among countries with comparatively lower rates.

Large cross-national differences in implicit carbon taxes suggest there is considerable room for countries to increase levies on carbon-based fuels.

<sup>18</sup> A key policy challenge in this regard is to ensure that carbon energy tax increases in other sectors does not result in higher prices for products purchased by households.

<sup>19</sup> Compared to Mintz and Olewiler (2008), estimates of the implicit carbon tax on gasoline in Canada are comparatively higher, since they include average provincial taxes, in addition to the \$0.10/litre federal excise.



#### Figure 3: Implicit carbon tax rate for selected OECD countries, 2008

#### Light fuel oil (household use)



Steam coal (industrial use) \$34.30 Norway \$28.45 Finland \$27,71 Sweden \$9.14 Denmark \$3.22 UK USA \$0.00 Germany \$0.00 France \$0.00 Canada \$0.00 0 5 10 15 20 25 30 35



#### Heavy fuel oil (industrial use)





Notes: data is for 2008 (or most recent available) and is converted from national currency to Canadian dollars using the Bank of Canada average annual exchange rate for 2008. Source: IEA (2009)

C\$/tCO

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As shown in figure 3, the implicit carbon tax applied to fossil fuels in Canada is consistently on the lower end of the spectrum. Relative to Canada, European countries tax fossil energy at much higher rates; it would take a carbon tax equivalent to nearly \$270 Canadian dollars per tonne of  $CO_2$  to bring the average Canadian tax on diesel to the level currently paid in the U.K. In contrast to motor fuels, coal is taxed in relatively few OECD countries, though here too differences exist. For instance, the UK Climate Change Levy, implemented in 2001, has resulted in a modest implicit carbon tax on coal of about \$3 Canadian per tonne of  $CO_2$ . These cross-national differences suggest there is some scope for Canada to increase the implicit carbon tax rate on several fossil fuels, like coal, without necessarily harming the economy, if done incrementally and concurrently with other policy decisions (as was done in the UK and other countries with experience in environmental tax reform).

### The knowledge base in Canada

Several studies have looked at implicit carbon taxes in the Canadian context. In one particularly interesting study, Jack Mintz and Nancy Olewiler (2008) develop a strong case for replacing the Canadian federal gasoline excise tax with a broad-based carbon tax to cover other fuels. Using the existing federal excise tax on gasoline consumption in Canada as a basis, the proposed tax amounts to roughly \$42 Canadian dollars per tonne of  $CO_2$ . Importantly, the proposed tax would not impact the price of gasoline – it would rather bring other, more heavily polluting fuels, like coal, under the same level of tax that consumers already pay each time they fuel up at the pump – thus alleviating one potential source of political opposition.

Energy prices are largely determined by energy market fluctuations and tax rates. In Canada, the taxation of fossil fuels has evolved over the last decade, though changes to nominal tax rates are more pronounced, and more frequent, for some fuels than others. Figure 4 plots the evolution of implicit carbon tax rates on fossil fuels for which Canadian data are available, over the period 1999 to 2008. To facilitate over-time comparison, the data are adjusted for inflation using a Canada-specific consumer price index for energy (OECD, 2009). The implicit carbon tax rate on heavy fuel oil, and light fuel oils (used by industry and households), has kept up with inflation, and has actually increased, in real terms, over the period 1999 to 2008 (Figure 4). On the other hand, smaller and less frequent adjustments to tax rates on gasoline, diesel, and household use of natural gas, have resulted in a fall in the real implicit carbon tax for these fuels (Figure 4). Meanwhile, the non-existing tax on coal has been a constant feature of the Canadian energy tax system.

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opportunities to raise implicit carbon taxes. From a public finance perspective, the comparatively larger tax increases on some fuels suggest that governments have both the scope and the capacity to adjust tax rates on all fossil fuels to better reflect the environmental costs associated with their use. Moreover, in the context of rising budget deficits and the need to mitigate carbon emissions, changes to existing energy taxes can create some "fiscal room" for governments, while generating incentives for Canadians to adopt new technologies and reduce carbon emissions.



Source(s): IEA (2009)



# Implications for policy makers:

This policy brief describes how existing taxes on fossil fuels act as implicit carbon taxes. Like an explicit carbon tax, existing implicit taxes on carbon-based energy can create incentives to reduce emissions and substitute for less carbon-intensive forms of energy, when high enough. From this analysis, the following conclusions for Canadian policy makers can be drawn:

- Faced with increasing budget deficits and a need for flexible policies to reduce CO<sub>2</sub> 1. emissions, Canadian governments should consider adjusting existing fossil fuel taxes. A thorough "carbon audit" of Canada's fiscal and tax policies, in conjunction with an analysis of the scope for their reform, can help policy makers decide on the changes required to ensure the tax system is aligned with broader environmental, economic, social and fiscal objectives.
- 2. Given the large cross-national differences that exist in energy taxes across countries, Canada should begin discussions with its NAFTA partners, and other governments around the world, on the need for better international alignment of energy tax policies.
- The current low (or non-existent) implicit carbon tax rate on coal encourages its use 3. for purposes such as electricity generation, despite its large contribution to aggregate CO<sub>2</sub> emissions. From the perspective of climate change, raising the price of coal through the tax system is most urgently needed, given the relatively large estimates of recoverable coal reserves, and its carbon intensity.



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