

Studying the Effects of Carbon Prices on Sustainable Development in British Columbia

by

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Abstract

As the years have advanced, politicians have increasingly discussed the effectiveness and rightness of putting prices on greenhouse gas emissions to discourage people from contributing more to the problem of climate change. British Columbia (B.C.), Canada's westernmost province, introduced one such price in mid-2008 in the form of a carbon tax shift, which offset revenue that accrued to the provincial government from the sale of many carbon-based fuels with consequent cuts in personal and corporate income taxes. The provincial government argued that this would achieve greater economic growth while reducing greenhouse gas emissions and any resulting damage to the environment; however, many British Columbians have opposed the policy since it was introduced, especially in rural B.C. In this thesis, I examine the efficacy of B.C.'s carbon tax by comparing its performance on indicators associated with Sustainable Development Goals 8 (to achieve decent work and economic growth), 10 (to reduce inequality), 12 (to make production and consumption sustainable), and 13 (to reduce the damages of climate change), before and after the carbon tax was introduced, from the years 2001 to 2015, using a simple linear model to estimate the direction, magnitude, and statistical significance of changes associated with introducing the carbon tax in 2008 and raising it each year until 2012. I also conducted remote telephone interviews with randomly selected British Columbians (10 December 2020 – 18 March 2021, n=24), eight each in the communities of Coquitlam, Elkford, and Smithers, to ask them what they thought about the carbon tax's effect on their lives, especially their ability to act more sustainably. While I found mainly mixed to positive effects associated with the carbon tax on B.C.'s aggregate-level performance with the Sustainable Development Goal indicators, most of the individuals I interviewed said the tax had not met with such success since then and, in fact, said it was responsible for making their lives worse. I find that many of the people I interviewed felt excluded from the process of

making a policy that affected and continues to affect them, and that this alienation was strongest in the rural coal-mining community of Elkford. I suggest that the B.C. government should redesign its carbon tax with extensive public participation and focus on reducing greenhouse gas emissions.

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Chapter 1: Introduction

1.1: Background

Climate change caused by human emissions of greenhouse gasses (GHGs) is one of today's most pressing environmental issues. GHGs warm Earth through the greenhouse effect, whereby they trap solar radiation, typically 5 to 50 micrometres (μm) in wavelength, on Earth (Jacob, 1999). The Intergovernmental Panel on Climate Change's (IPCC) 2018 special report recommends limiting the average increase in global temperature to 1.5 degrees Celsius ($^{\circ}\text{C}$) over the 1850–1900 'base' period and says that as of the time of publication, it was "likely" that this average warming had reached 1.0°C over the base period (IPCC, 2018: pp. 4, 31, 59). In a scheduled report from 2021, the IPCC says, "It is unequivocal that human influence has warmed the atmosphere, ocean and land" and that the "best estimate" of the mean warming from 1850–1900 to 2010–2019 was 1.07°C (IPCC, 2021: pp. 5, 6). Risk to especially vulnerable and unique ecosystems becomes much higher when average global warming exceeds 1.5°C , as do the expected impacts in aggregate and upon the regions that are already the most adversely affected (IPCC, 2018: pp. 5, 7–11, 40). Consequently, it will lead to damage to economies, human health, and other vital aspects of modern life (Ibid.: pp. 35–40).

Due to climate change's negative effects, some governments have implemented policies discouraging actions that contribute to it. One of the most theoretically persuasive policies is placing a monetary price on GHG or carbon emissions. Boyce (2018: p. 53) explains, "In the short run, a carbon price provides an incentive for households, firms, and governments to reduce emissions cost-effectively. In the long run, the prospect of continuing and rising carbon prices also provides an incentive for innovations to lower the cost of cutting emissions." Furthermore, prices encourage such parties to perform GHG-cutting actions that cost less than the set price, create new tools and

techniques that will emit less GHG, and meet emissions reduction targets (Ibid.).

Policies that implement carbon pricing and are presented as taxes are an archetypal policy of discouragement. A carbon ‘tax’ (price) is a levy “on the carbon content of fossil fuels” (Hoeller and Wallin, 1991: p. 7) whose proceeds would go directly to government. They are classified as Pigouvian taxes due to their attachment to a negative externality of fossil fuel-related activity (Helm, 2005). While taxes themselves do not mandate any degree of emissions reductions, they do require some compensatory action for emitting. This may be a reason why scholars including Stavins (1997), Tietenberg (2003), and Helm (2005) describe them as a ‘command-and-control’ way for government to impose an action or non-action.

Since they are probably the best-known economic disincentive for reducing GHG emissions in Canada, I have focussed my research on direct taxes on carbon. For example, British Columbia’s (B.C.) provincial government was the second one in Canada (after Quebec’s) to introduce a carbon tax and was the first one in North America to introduce a revenue-neutral one: it planned to return an estimated \$1,849 million (Canadian, or CAD) in revenue generated from 2008 to 2011 to people and businesses (BC Ministry of Finance, 2008). The tax was also designed to be implemented by degrees, rising from \$10 per tonne of carbon dioxide equivalent (tCO₂e^{*}) in 2008 to \$30 per tCO₂e in 2012, rising \$5 per tCO₂e in each intervening year; and “apply to virtually all fossil fuels, including gasoline, diesel, natural gas, coal, propane, and home heating fuel” (Ibid.).

1.2: Research Purpose and Objectives

This study’s purpose was to explore whether a carbon tax has been correlated with sustainable development benefits in B.C. Here I interpret benefits as movement towards any one or more

*Tietenberg (2013) explains that this is a sum of total carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) emissions. CH₄ and N₂O levels are converted to CO₂e based on the global warming potential each molecule of these two gases bears relative to CO₂ over 100 years.

indicators of sustainable development. This term was introduced in 1987 when the World Commission on Environment and Development released its report, *Our Common Future*. Environmental conservation, social equity, and economic growth are the three pillars of sustainable development. Sustainable development has had a recent resurgence in prominence with the United Nations publishing its Sustainable Development Goals (SDGs), which Canada agreed to try to meet, in 2015.

The study has four major objectives and related research questions:

1. Identify appropriate indicators to evaluate how B.C.'s carbon tax has affected progress towards sustainable development, with focus on SDGs that have indicators reflected in literature about this tax.

a. Do these indicators represent all the elements of sustainable development?

2. Find out and record changes in chosen sustainable development indicators in the context of the B.C. carbon tax shift.

a. How did per-year GHG emissions change during the portion of the study period with the carbon tax shift relative to the portion before it?

b. How did per-year, per-capita GDP change during the portion of the study period with the carbon tax shift relative to the portion before it?

i. How did economic inequality as measured by market, post-tax, and net income change during the study period?

c. How did employment rates change during the portion of the study period with the carbon tax shift relative to the portion before it?

i. Did employment rates change more in some categories of work than others over the study period?

ii. Did employment rates change more for some groups of British Columbians than others

over the study period?

d. How much responsibility do the available studies believe the carbon tax shift can claim for any of the changes in the indicators?

3. Learn how people believe the carbon tax shift has affected them in relation to the key sustainable development factors.

a. Do British Columbians support the carbon tax shift?

b. Do British Columbians believe their government is acting in their best interests?

c. Do British Columbians feel less dependent on fossil fuels with the carbon tax shift?

d. Do British Columbians believe the carbon tax shift is improving, or could improve, the quality of their jobs?

4. Consider the policy implications of my work in relation to improving the performance of B.C.'s carbon tax shift on sustainable development indicators.

1.3: Study Area

The study examined carbon issues in B.C. from 2001 to 2015. In July 2008, B.C. introduced the first carbon tax in North America that was intended to be revenue-neutral. My study timeframe predates B.C.'s introduction of carbon pricing, so I could compare selected indicators as they appeared after carbon pricing's inception in B.C. with them as they appeared before it. The number of years before and after the tax's inception is intended to be the same to compare quantitatively similar time periods. The governance of the politically centre-right B.C. Liberal Party throughout the timeframe under study provides some control for the potential influence of the governing party's ideology.

1.4: Study Methods

There are many indicators that fall under the three pillars of sustainable development and that

a researcher curious about the effects of a carbon price might choose to examine on grounds of sustainable development. Much of the available literature about the effects of carbon taxes produced regarding countries outside Canada focusses on the changes in socioeconomic indicators associated with their introduction, perhaps even more so than their environmental indicators. Because the B.C. carbon tax is a political policy with environmental, economic, and social ramifications, I had to consider how it affected the province's performance on select indicators from all three of those categories. Chapter Two establishes the indicators I have chosen, based upon the literature and SDGs as noted previously, and explains why I chose them.

I employed a mixed-methods research approach. I undertook quantitative research (gathering and analyzing statistical values) to measure data associated with the presence or absence of a variable (Creswell and Creswell, 2018). My quantitative research was non-experimental and descriptive, examining "variables that are ... studied as they exist" (Belli, 2009: p. 60). Where they were available, I used records of changes in political and environmental indicators kept by the federal and B.C. governments over the study period and printed in literature. I used quantitative research to measure data that might be associated with the presence or absence of a variable (Creswell and Creswell, 2018), in this case a carbon price.

Quantitative research did not provide all the evidence I need about how the B.C. tax shift has affected progress on the established indicators, however. An in-depth understanding of public opinion about the policy and the government that introduced it would likely only come out through qualitative research (gathering and analyzing narrative, that is, what people think subjectively). Learning what people think had the added value of comparing popular opinion to the facts to find out how the government can respond to concerns. Chapter Three describes the methods in detail.

1.5: Significance of the Study

As few Canadian jurisdictions had implemented carbon prices until the federal government introduced one in 2019, there is commensurately little academic literature on their effects from within Canada. Most discussion of carbon taxes with which the public and politicians are familiar consists of advocacy. My research contributes to that debate by discovering the implications of carbon taxation. Therefore, having numerical data is especially helpful in showing what discernible effect the application of ‘this much’ measurable pressure in a known direction has had on the measure of the chosen indicators.

1.6: Study Limitations

There are several study limitations, foremost among them the impossibility of comparing B.C. from 2008 onwards as it is with a carbon tax to a counterfactual situation without one during the same period without using econometric models; I have only looked for correlation between the carbon tax and changes in indicators of sustainable development but have not tried to establish causation. Another limitation is that the uniqueness and recentness of B.C.’s carbon price within Canada are ‘double-edged swords’: I could not compare or contrast it with many other provinces, notwithstanding the practical limitation of time, at the time I conceived and planned this project, nor was there a long study period from which to choose. The B.C. government that introduced the carbon tax did not do so with the express intention of having proceeds therefrom pay for GHG emission reduction, limiting its ability to reduce emissions on its own (I understand that B.C. has many more climate programs, but the focus of my work was on the carbon tax shift).

I successfully interviewed twenty-four people about what they thought of B.C.’s carbon tax in the past and present, though selection bias made them a nonrepresentative sample of the population. Therefore, I could not extrapolate what all ‘the people’ of B.C. thought of the carbon tax from

my participants. I could not know how much they remembered about B.C.'s carbon tax, or their feelings about it, when it was introduced in 2008, but I was sure they did not remember everything they thought about it in that year. Indeed, I had to ask people's opinion about the carbon tax in the winter of 2020–2021, after it had risen to \$40/tCO₂e from \$30/tCO₂e in 2013 following the expiry of a five-year freeze and the appointment of a new government.

1.7: Organization

This thesis contains six chapters. Following Chapter One, Chapter Two reviews the literature regarding what a carbon tax is and how this technique is distinct from other ways of carbon pricing, like emissions trading systems. The review also elaborates upon the theoretical economic rationale for introducing a carbon tax and examine arguments for and against doing so. I also identify what sustainable development means and establish the indicators for consideration in this study. Lastly, I turn to B.C. and summarize the events that led to the carbon tax's inception as provincial policy and list the effects that other researchers have found to be associated with the early period of carbon tax as provincial policy. In this, I also explain why it is important to study the B.C. carbon tax shift under the sustainable development framework.

Chapter Three elucidates the research methods. Chapter Four begins by presenting the results gleaned about how the tax shift has affected progress towards the sustainable development indicators (established in Chapter Two from a review of the SDGs and the academic literature surveyed). It will subsequently present surveyed citizens' opinions about the carbon tax in relation to the selected indicators and explore citizens' responses to correspondence about the carbon tax with them. Chapter Five offers observations about whether the results of my quantitative research suggests the carbon tax has been positively or negatively correlated with movement towards the SDGs. After discussing the quantitative research, it will discuss what the qualitative research tells me

about my participants' thoughts on the carbon tax. Chapter Six will conclude and offer reflections on the policy implications of the carbon tax.

Chapter 2: Carbon Prices and Sustainable Development

2.1: Introduction

Most of the world's climate scientists, their national governments, and the United Nations consider global climate change a widespread and pressing existential threat to life (IPCC, 2018; Ripple et al., 2020). Humans have caused most present climate change through their mass GHG emissions, thanks largely to fossil fuel combustions, some industrial fertilizers, and changes in land use. Therefore, economists have proposed to abate this problem by implementing carbon taxes. They raise prices for fossil fuels in positive and direct correlation with their carbon intensity, i.e., how much CO₂e they will release when burned (Hoeller and Wallin, 1991). Raising fuel prices has been positively correlated with lower GHG emissions intensity (that is, fewer units of GHGs are emitted per unit of economic output like GDP) in cross-national comparisons (Ibid.). This causal action may encourage consumers to use less energy or less carbon-intensive energy; either will reduce emissions, according to Hoeller and Wallin (Ibid.). While taxes are the most discussed form of carbon price, in many jurisdictions, people talk of emissions-trading systems (ETSs)—where they are popular because policymakers believe them to be more purely market-based (see Newell and Paterson, 2010; MacNeil, 2016)—and outright regulations are still used.

Sustainable development is an early attempt to deal simultaneously with the integrated concerns of society, environment, and economy. It calls attention to perceived problems in these domains and proposes reforms to deal with them. In this telling, economies must grow as per usual, but wealth must be distributed more equally and growth must not rely on resource overuse (Brundtland et al., 1987). Limits to the environment's ability to absorb human pollution must also guide how much growth takes place (Ibid.). Societies must become more democratic, reflecting every person and group's interest in benefitting from 'green growth'.

This chapter will begin by explaining differences between carbon taxes and their advantages and disadvantages relative to other forms of emissions reduction tools. The chapter will go on to explain two major reasons to price carbon such that economic performance might improve. The third, fourth, and fifth sections of the chapter will review what sustainable development means, what indicators might suggest progress towards or regress from that condition in British Columbia since it debuted its carbon tax shift, and how that tax shift came about. The chapter will conclude by posing key research questions and summarizing its key findings.

2.2: A Brief Overview of a Direct Carbon Price Tax

Taxes affect the price of doing some action directly by raising the price of doing the action. This is, theoretically, a self-evident disincentive to do less of the action. A tax rate is usually easier to change and less costly to enforce than a regulation (Pearce, 1991).^{*} When it applies to every person and entity doing business where it is effective (Goulder, 1995; Litman, 2009), it can get money from more sources, reducing the per-capita cost. Taxes encourage emissions cuts at the margins of greatest ease (Perman, 1994). Potentially, they can also be applied to more sources of emissions depending on which actors in the chain must pay them (Hanley, Shogren, and White, 2013). More generally, taxes are also easier to implement and become active sooner than an ETS (see e.g., Andrew, 2008; Hanley, Shogren, and White, 2013; Harrison, 2013). They are also less prone to subversion (Smith, 1998): not needing information about all forms of pollution that all firms generate, as it does when introducing an ETS, the government need not solicit said information from each firm. Firms can and often do negotiate more favourable political treatment when the government solicits information from them (Ibid.).

^{*}Because the political right is popularly associated with a desire to maximize private interests' role in determining the economy, this also makes taxes (and ETSs) more popular with that faction in many societies than direct regulations (Harrison, 2010).

A GHG emitter can minimize its burden from this tax if it minimizes its GHG emissions, whereas regulations run the risk of burdening light and heavy emitters alike, so a tax can encourage actors to cut emissions through increased efficiency and simply decreased use (Pearce, 1991), which is closely related to the advantage of the ease of modification previously noted. Revenue recycling can also contribute to reductions in wealth inequality (Dissou and Siddiqui, 2014). Lastly, a universally applied tax does not favour certain firms or sectors at others' expense (Helm, 2005). Government neutrality is especially vital the more sectors are similarly carbon intensive: ensuring that the economy is diverse enhances the chances that growth will continue at respectable rates. It does, however, make low-carbon aspects of doing business proportionately more efficient, offsetting the efficiency cost to the high-carbon aspects at least somewhat (Carl and Fedor, 2016).

Conversely, if it is not held revenue-neutral, a carbon tax can merely impose yet greater efficiency costs on the economy, though there is a positive causal relationship between its size and how distortionary it is (Pearce, 1991). A strict Pigouvian model also assumes that every actor knows how much damage each added unit of GHG will do to the environment, which almost never occurs (Helm, 2005).^{*} Whenever policymakers “rely on non-economic arguments” to cut GHG emissions, as they usually do (Ibid.: p. 210), they “set [emissions-reduction] targets and instruments at sub-optimal levels” (Loc. cit.). Environmental taxes also impose “concentrated costs and [lead to] diffuse benefits” (Harrison, 2012: p. 384), making them “politically difficult policy instruments to accept”[†] (Loc. cit.; see also Antweiler and Gulati, 2012). Carbon taxes risk reducing poorer people's economic standing and/or bolstering that of wealthier people disproportionately (Hamilton and

^{*}This, however, is not to say that people cannot know or even estimate how much GHG, whether converted to CO₂e or not, is being emitted: many types of fossil fuels have known carbon intensities and the amounts of each type burned make it easy to estimate the amount of GHGs emitted (Harrison, 2010).

[†]Guzman and Clapp (2017) aver, saying that they simply raise the price of high-carbon goods like gas, thereby not generating much political opposition. This is only true where people use comparatively little fuel per capita—and B.C., as we shall see, has high concentrations of such people.

Cameron, 1994; Lee and Sanger, 2008; Chalifour, 2010). The tax shift may not even obtain the expected environmental improvements if recycling the revenue does not encourage people to change their behaviour (Harrison, 2010) or if too little revenue is recycled for this purpose, it is misallocated, or both, as Duff (2008) posits. If improved environmental outcomes do result, a flat per-CO₂e-unit tax rate may not account for the different degrees of marginal damage each unit causes across the jurisdiction, which could cause inefficiency (Smith, 1998); and if emissions intensity is already low, achieving marginal gains in efficiency can be comparatively costly (Komanoff and Gordon, 2015). A person could apply a transitive property and describe raw emissions reductions in the same terms as well.

Emissions trading systems (ETSs) and direct regulations may supplement taxes. Respectively, these are market- and non-market-based economic instruments. ETSs allow polluting parties to bid for the ‘right’ to do so. They are superficially more purely market-based than carbon taxes because the government does not automatically get the money—indeed, it often begins by issuing permits freely (see, e.g., Helm, 2005; Newell and Paterson, 2010). This is advantageous because it is more intuitively acceptable to businesses, many of which believe they can profit by reducing their emissions pre-emptively and then calling for a higher price (Bumpus, 2015). Free permits also attract businesses (Harrison, 2012; Bumpus, 2015) and do not repel individuals as taxes do because taxes show a clear, obvious loss (Harrison, 2012). Likewise, politicians who commit themselves to free-market economics and tend to promulgate anti-tax rhetoric (Newell and Paterson, 2010; MacNeil, 2016) might champion an ETS. ETSs themselves do not preclude taxes. For example, B.C. is part of the Western Climate Initiative (WCI) alongside Quebec and California, which invited it to join the ETS regime in which they co-operated as well; however, after a review in 2014, the B.C. government opted to retain its own tax alone (Bumpus, 2015).

2.3: Two Leading Reasons to Have a Carbon Price

2.3.1: Correcting Externalities

Externalities are effects upon some party's welfare caused by an action that that party did not undertake (Buchanan and Stubblebine, 1962). Externalities take the form of physical, not price-related, costs and are always unintended by-products of the producer's actions (Owen, 2004; Graves, 2014). Parties incur externalities outside the market (Endres, 2011) and receive no compensation for them (Owen, 2004; Fairbrother, 2016). Indeed, people will 'pay', in money or use of a resource, in exchange for no benefit (Fairbrother, 2016), even though they may be no less satisfied than before (Buchanan and Stubblebine, 1962). In Pigou (1938), bearers of externalities cannot be compensated at all. Environmental economics, however, attempts to bring externalities into calculations of the price of any environmentally destructive activity by calculating the cost to society of the problem (a sum of private and external costs) and applying it to the producer's cost of producing the pollution (Endres, 2011).

While externalities can be positive or negative (see Pigou, 1938; Field, 2001; Graves, 2014), environmental externalities are overwhelmingly negative. Externalities occur whenever social and private marginal net products as calculated in gross domestic product (GDP) differ (Pigou, 1938). They are a prime example of market failure, which is a result of markets not applying the proper price to one or more effects of individual, government, and business actions (Hanley, Shogren, and White, 2013). In the environmental context, one reason fossil fuel producers have overproduced is because they have not had to bear the full cost of their production, leading to overexploitation and over-selling (Andrew, 2008). Historically, consumers have not had to pay a price for the effects of their consumption of fossil fuels, either, which has inspired overconsumption.

Pigou suggests that having the state levy fees is all that can correct for externalities whenever

there are at least “two contracting parties” (1938: p. 192). For example, when a government and power company sign a contract for the latter to burn coal and supply electricity to a community, the citizens bear the external effects of visible air, water, and land pollution and, eventually, of climate change. A government that introduced a Pigouvian tax to correct an externality would calculate the marginal abatement cost of pollution (MAC)—how much money it would cost to remove a given unit of pollution from the environment—to the affected people and set the tax equal to that (see Endres, 2011; Hanley, Shogren, and White, 2013). Theoretically, adding the MAC to the base market price firms charge for polluting goods reduces demand for them (see, e.g., Goulder, 1995).

2.3.2: Shifting the Tax Burden

Taxes distort the economy almost everywhere they are levied: Goulder (1995: p. 157) names “income, payroll, and sales taxes”, and Pearce (1991: p. 940) adds “corporation taxes”, which are all associated with ways to make money. Distortions manifest usually as lost GDP (Ibid.; see also Smith, 1998). The double dividend theory (Goulder, 1995) posits that shifting the tax burden onto activities with specifically negative effects on the environment can help reduce the distortions associated with these taxes on ‘productive’ activities while making the new tax less costly. Distortionary taxes themselves tend to make the environmental taxes costlier in the first place (Ibid.).

The double dividend proposition requires several necessary conditions to hold true. Reducing a pre-existing inefficient non-environmental tax via an environmental tax (Goulder, 2013) is only the tip of the iceberg. It will only work this way if the inefficiencies burden the accepted, well-regulated sources of capital and labour income too much and resource ownership and informal labour too little (Ibid.). Lastly, the workforce must add high value both to produced goods and to the environment (Ibid.). In Goulder’s (Ibid.) simplified model of a closed economy where only labour generates wealth, the revenue recycled does not equal the negative of the tax interaction.

When the economy becomes more open and complex, however, using environmental tax revenues to reduce marginal taxes on capital, labour, or both makes taxation less inefficient (Ibid.).

The double dividend proposal may be weak (that reductions in distortionary taxes are more efficient than lump-sum returns to taxpayers), intermediate (that substituting a distortionary tax with an environmental one can confer negative or no gross cost), or strong (that “[t]he revenue-neutral substitution of the environmental tax for *typical* or *representative* distortionary taxes involves a zero or negative gross cost”) (Goulder, 1995: p. 159; emphasis original)—that is, the intermediate proposal allows for the possibility that a tax shift can lead to any change in the net size of the economy, while the strong proposal presumes a tax shift cannot lead to net economic contraction. A representative distortionary tax could refer to one with a gross cost close to the median or mean out of all the distortionary taxes applied. There is more evidence for a weak double dividend proposal than for an intermediate or strong one (Ibid.). Importantly, however, reducing tax rates is more efficient than return via lump-sum payments (Parry and Williams, 2011, cited in Goulder, 2013). This is intuitively obvious because lower tax rates last longer than a temporary return and are harder to undo.

The stronger forms of the double dividend hypothesis are less clear theoretically and less well-supported practically. A tax on an environmentally unfriendly good reduces post-tax wages, distorting the labour market at least as strongly as a tax that generates as much revenue, assuming only labour and not capital is taxed (Goulder, 1995). It also ‘distorts’ consumers’ choice of what they can buy by encouraging them to buy goods not subject to the tax, so the tax generates less gross revenue, so a government cannot reduce a labour or capital tax by as much as it would like to and the environmental tax’s gross cost will be higher (Ibid.). If, however, capital is taxed at a higher marginal level than labour, then applying a broad-based environmental tax and recycling

revenues by reducing the marginal tax burden on capital makes the tax system more efficient overall (Ibid.). Furthermore, the gains could be greater if the tax is applied to the proximate source of the externality (Ibid.).

A ‘well-designed’ tax works to reduce pollution to a nonzero level deemed socially and/or economically ‘optimal’ (Field, 2001). The system achieves the economic optimum when aggregate marginal benefits equal aggregate MAC (Goulder, 2013). (Notably, the IPCC [2018] calls for a 45 per cent net cut of 2010’s CO₂e levels by 2030, and net zero emissions by 2050, to limit climate change to 1.5°C, which will also limit the attendant economic damage. This paper, however, is solely concerned with one policy in one jurisdiction.) It is also difficult to return lump sums of money to households that pay no net taxes (Goulder, 2013). Goulder (Ibid.) also finds that if the government does not take in too much revenue, environmental taxes raise revenue more efficiently than non-environmental ones. Also, if there are marginal environmental benefits to be gained or costs to be avoided, the environmental tax is a net gain (Ibid.).* Because carbon taxes attempt to discourage people from using fossil fuels, and a tax shift reduces the burden on labour and capital—which interested parties could invest in cleaner goods to help make them profitable—a government could unite environmental protection and economic growth. These are two of the three ‘super-objectives’ of sustainable development, as we will see soon.

There are several ways in which a government could achieve the third super-objective, social inclusion, with the revenues from a well-designed tax shift. Firstly, it could fund public services. Secondly, it could raise wages for people working in the lowest-paying jobs. Thirdly, it could invest in endeavours that make people more independent from the government, businesses, or both. An

*All the foregoing presumes that the economy is in equilibrium. Ayres and Walter (1991), however, posit that the economy is almost always in some form of disequilibrium and that abatement offers initial cost savings. Such an issue is interesting but is beyond this paper’s scope.

opponent might argue that ‘economistic’ focus on growth precludes environmental protection significantly, to which one could respond that part of the point is to reward low- and zero-emissions activities at the expense of high-emissions ones. As noted above, a carbon tax shift itself can do this, but it is different from decreeing that ‘climate-unfriendly actions shall not be rewarded, while climate-friendly actions shall be rewarded’. Nor is it enough to make the economy more efficient if people lose their jobs or are denied jobs in the name of efficiency, an injustice compounded if these forms of unemployment hit people who are already worse off harder than others.

2.4: Sustainable Development

Sustainable development has been a popular term since 1987, when the World Commission on Environment and Development (often cited as the Brundtland Commission after its chair, G.H. Brundtland) introduced it in its published report, *Our Common Future*. Sustainable development calls for meeting people’s material needs and correcting or overcoming “limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs” (Brundtland et al.: 1987, p. 43). The report outlines three pillars to sustainable development: economy, environment, and society. The concept of sustainable development became more prominent again when the United Nations General Assembly’s member states ratified the seventeen Sustainable Development Goals (SDGs) to attempt to reach by 2030. I will discuss the SDGs, explain what each pillar means, then denote my chosen indicators and the super-pillars and SDGs to which they correspond most closely.

2.4.1: The SDGs and Their Relevance

In 2015, the United Nations Development Programme (UNDP) drafted seventeen umbrella SDGs for United Nations member states to try to achieve by 2030 or earlier. These fall under the sustainable development pillars outlined below (which, as Sachs [2012] notes, most countries today

purport to want to achieve) and themselves comprise 169 more specific targets. In turn, the UNDP proposes many indicators by which to measure progress towards meeting the targets and SDGs in general (303 according to Costanza et al., 2016, and Hák et al., 2016; 232 according to the UN, 2019). The SDGs replaced and built upon the Millennium Development Goals (MDGs) as objectives for governments to fulfil (Costanza et al., 2016; Biermann et al., 2017). Canada agreed to the SDGs when they were presented in the 2015 session of the United Nations General Assembly and developed a sustainable development strategy that purports to reflect national need better than full adoption (Environment and Climate Change Canada, 2019a; Rosen, 2017).

Government commitment to the SDGs is at least as important as nominal adoption; while Sachs (2012) also discusses the SDGs in international terms, he names nation-state-level “good governance” (p. 2208) as a necessary condition for achieving the economic, environmental, and social pillars of sustainable development. It is most closely related to the social element, if any of these, in which case there may be a positive feedback loop between government transparency or ‘public-mindedness’ and attainment of something close to universal inclusion. In this context, democracy becomes imperative where it exists: without public support for its measures, a democratic government may find its attempts to achieve more sustainable development thwarted by public protest up to and including loss of office. Conversely, if it gets people on board, which it may do if they believe it is creating the conditions for them to be meaningfully independent, they will more probably support its sustainable development endeavours.

2.4.2: Economy

The World Commission is concerned mainly with international and national economies (1987: see especially Chapter 3, pp. 67–91), but it also argues generally that economies should continue to grow. It describes the extremes of both poverty and wealth—general inequality—as deleterious

to the environment (Ibid.). Growth must therefore be equitable and inclusive. The Commission also notes that development based on extraction of non-renewable natural resources has helped to deplete the environment (Ibid.). Many observers have critiqued the narrow focus upon total or per-person GDP growth as the optimal indicator of economic progress (see, e.g., Costanza et al., 2016), but growth does reflect increased ability to develop projects with life-improving potential.*

The SDG most closely related to this principle is number 8, to “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”† (United Nations, 2019). SDG number 8’s first target is for every jurisdiction to create the most per capita growth that it can over the long term, expressed in real terms (Ibid.). Real GDP growth is more important than nominal GDP growth because inflation, i.e., higher prices, offsets nominal GDP growth. Thus, I have learned how much money British Columbians made per year during the 2001–2015 study period in terms of Canadian dollars chained to 2012. Since climate change should be addressed more urgently than it is, it is more important to stimulate economic growth and employment in sectors that do not exacerbate the problems of climate change than to stimulate growth and employment for their own sake. Growth in sectors with high environmental impact, such as GHG emissions and air pollution, would count as progress towards SDG 8 were it not for the presence of the target to “improve progressively ... global resource efficiency in consumption and production and work to decouple economic growth from environmental degradation” (Ibid.). The indicator of total, per-head, and per-GDP domestic material consumption evaluates progress towards this target.‡

*Furthermore, state, international, and business actors could choose to ascribe greater monetary value to more ‘environmentally friendly’ goods and services if they chose, but this topic is beyond the scope of this paper.

†It is also called “Decent work and economic growth” for short.

‡This is also an indicator under the target to “achieve the sustainable management and efficient use of natural resources” under SDG number 12, to “ensure sustainable consumption and production patterns,” also “Responsible consumption and production” (Ibid.). I will judge the carbon tax’s success on this indicator to be inverse to the amount of carbon-based fuel British Columbians consumed, as well in total and per unit of GDP (conveniently, I have figures in

2.4.3: Environment

Environmental protection and enhancement are integral to sustainable development. Brundtland et al. name energy generation as the source of “the ultimate limits to ... development” (p. 58), with acidification and GHG accumulation straining “the biosphere’s capacity to absorb the by-products of energy use” (Loc. cit.). Climate change itself, when it happens, affects the social and economic status quo (Ibid.), in ways including life becoming significantly harder, once-profitable enterprises and even sectors falling, and the people affected adversely calling for redress. Thus, SDG number 13, “Take urgent action on climate change and its impacts by regulating emissions and promoting developments in renewable energy”,* includes a target of “integrat[ing] climate change policies into national [and subnational] policies, strategies, and planning” (United Nations, 2019). Appropriate climate change policies are those enacted with the intention to mitigate damage, adapt to it, and forestall it by reducing the amounts of GHGs emitted, and that have the effect of doing these things, which is an unstated necessary premise of the target under SDG 13. The carbon tax shift was one of several climate policies the B.C. government introduced around the same time (Jaccard, 2012), so it fulfilled the target at least partly. I might look at how well B.C. co-ordinated its climate policy with other Canadian provinces, the federal government, and even U.S. states. It is also important to evaluate how much emissions[†] the tax shift helped reduce to measure how effectively it contributed to meeting the target, to which end it is imperative to learn the volume of GHGs that have been emitted in B.C. each year with and without the tax shift.

millions of dollars’ worth of GDP and millions of tonnes’ worth of CO₂e, so I can represent this as a tonne-per-dollar value), during the 2008–2015 period.

*It is also called “Climate action” for short.

[†]These will be converted into and measured in CO₂e because CO₂ is the most common and ‘baseline’ GHG in the atmosphere. Notably, B.C.’s carbon tax has covered well over half of emissions generated in the province throughout the study period when it has been operative, but it has also had some significant exemptions, which may have limited its efficacy in the past and present and reduced its similarity to the ‘ideal’ form.

2.4.4: Society

Lastly, the Commission recommends giving people equal access to the process of determining how society is arranged (1987), often broadly called democracy. Democracy trades in rhetoric about liberty, equality, and empowering ‘the people’. A government that introduces a carbon tax, therefore, must make its case to the people about what it is doing and how everybody is expected to contribute and receive benefits in return if it is democratic. It must also distribute the benefits and burdens in a way that enhances equality between people: as noted above, existing inequality has contributed to environmental degradation since at least 1987. Besides this, the common concern remains that some people are worse off than others unnecessarily.

SDG 8 is relevant here too, thanks to the target “by 2030 [to] achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value” (UN, 2019). SDG number 10, which calls for reduction of intra- and international inequalities (Ibid.), may also be social or economic. The target to grow household incomes for the poorest 40 per cent of the population more quickly than for the jurisdiction’s average has a self-explanatory indicator (Ibid.). It is a good social indicator because the point of the social pillar of sustainable development is to make sure the most people prosper and to extend prosperity to those who are not—a goal not achieved if the most gains go to the best off. Also, while the SDGs do not attempt to track the calibre of democracy per se, as noted above, Sachs (2012) points out that it remains important, and I wonder how well British Columbians feel their government responds to them.

2.4.5: Rationale for My Choice of Goals and Indicators to Track

In addition to attempting to cover all three pillars of sustainable development with the SDGs and indicators I have chosen, I have chosen mainly high-profile indicators for which the federal

and B.C. governments have kept quantitative data (intergovernmental co-operation being the exception) for which both supporters and opponents claim there is evidence to support their positions. As discussed in the introduction, I track greenhouse gas emissions because they drive climate change, which drives changes in many more fields, whether they are natural, economic, or social (SDG 13). I track fuel use, with sales being a prima facie sensible proxy, because sources related directly to fossil fuels are responsible for the bulk of B.C.'s GHG emissions; transportation, fossil-fuel production, and buildings have been the province's three highest-emitting sectors since at least 1990 (British Columbia, 2021). Total and per-capita GDP offer a high-level general indication of how well the economy is performing in terms of producing goods and services that are 'rewarded' with money (SDG 8). Because work is (at least in theory) the main activity for which people get money, it is worth paying attention to labour market indicators at the high level. The share of GDP and employment from natural resources and agricultural—or, as I adapt the B.C. government's categorization of them, from agriculture, forestry, fishing, and hunting; and mining, quarrying, oil, and gas—production offers an indication, especially in the second subcategory, of how much B.C.'s economy relies on the production of commodities whose use exacerbates the climate crisis directly (SDGs 8 and 12). Any tax is a tool of economic policy, and governments often use revenues generated by taxes to redistribute or 'equalize' means to some extent; B.C.'s carbon tax shift has included multiple programs that have purported to do precisely this based on one criterion or another, and seeing some continue to be apparently favoured with fortune and others not favoured might be detrimental to the sense that 'everyone is in this together' as reducing climate change goes (SDG 10). Lastly, because climate change does not and cannot respect political boundaries, it is worth knowing how well governments may have collaborated to stop it (SDG 13).

2.5: A Brief History of British Columbia's Carbon Price

While the right-of-centre B.C. Liberal Party was the governing party to introduce the carbon tax shift, the idea originated with its left-leaning competitor, the New Democratic Party (NDP), when it was in government in 1999. That year, Joan Sawicki, who had just become Environment Minister for B.C., commissioned a report on carbon taxes. It proposed a carbon tax shift, hoping to exploit the economic double dividend effect and make environmental gains (Sodero, 2011). The Liberals won government in the 2001 B.C. election, however, and shelved the report; while they cut personal income taxes during their first mandate, they did so in isolation from environmental concerns,^{*} and they had this as a policy goal from the outset (Ibid.).

The Liberal government, re-elected in 2005, became more environmentally active in its second term, however. It responded somewhat to popular (and Premier Gordon Campbell's own) growing concern about environmental issues and negative effects attributable to climate change on B.C.'s weather and forests (Sodero, 2011; Harrison, 2012; Heinmiller and Sharpe, 2012; Sodero, 2015). The climate policy entrepreneurship of American state governors Arnold Schwarzenegger and Christine Gregoire also encouraged Campbell to act (Sodero, 2011; Rabe and Borick, 2012). Following consultation with business, public, and environmental representatives, his government introduced the carbon tax shift in its 2008 budget. From 1 July 2008, eligible fuels were charged \$10/tCO₂e based on their carbon content, with the fee rising by \$5/tCO₂e per year until 2012. This was an 'economist's ideal' tax because it began modestly, rose predictably, applied uniformly to all fuel sources under consideration, and aimed for the double dividend (Jaccard, 2012).

Practically speaking, Campbell had extensive policy latitude to act, being the leader of a

^{*}Indeed, they were highly unpopular in the B.C. environmental community through 2006, thanks largely to their cuts to the provincial Ministry of the Environment, construction of B.C.'s first ever coal-fired power plant, and expansion of mining and offshore fossil fuel exploration (Harrison, 2012; Heinmiller and Sharpe, 2012).

parliamentary government with the next provincial election due in 2009 (Jaccard, 2012). Kingdon's (1984; cited in Heinmiller and Sharpe, 2012) multiple-stream framework posits that policy entrepreneurship—that is, creating a new and lasting consensus around how a government acts to solve one or more problems—necessitates the union of three usually independent concerns (also called streams). In a problem stream, people notice a problem and call on policymakers to solve it (Heinmiller and Sharpe, 2012). A politics stream revolves around government officials and their desire to remain in office (Ibid.). In a policy stream, advocates (who may be inside or outside government) diagnose problems and propose their preferred solutions (Ibid.). Heinmiller and Sharpe (2012) credit Campbell with being a climate policy entrepreneur for B.C.*

The tax was relatively popular just before it was introduced but then became unpopular, thanks in part to being introduced just after gas prices rose past the 'symbolic' threshold of \$1.50/litre (Harrison, 2012; Peet and Harrison, 2012). B.C. media aired vocal opposition from northern and rural B.C., where local politicians framed their discontent as reaction to an unjust move by an out-of-touch provincial government more responsive to the large cities of Vancouver and Victoria than the small towns[†] (Peet and Harrison, 2012). Northern British Columbians said that using fuel was a necessity for them, not a lifestyle choice (Ibid.). The NDP launched a campaign to reverse the tax shift, increasing their popularity with a provincial election approaching (Harrison, 2012; Harrison, 2013). Thanks to the 2008 global financial crisis, however, the Liberals could frame the election mainly around economic management, an issue that British Columbians regarded as weak for

*The problem that needed solving was environmental destruction and the simultaneous decline in the economy and society. The politics, or the medium or milieu in which the problem would be addressed, was that a popularly elected parliamentary legislature and especially the party elected to form government is responsible for leading the problem-solving process and in theory, may address the problem by whatever means it chooses. The policy is any one or more instruments that people involved at the top of the political structure introduced. Campbell was a policy entrepreneur, to Heinmiller and Sharpe (2012), for introducing pro-environment measures when enough people began to demand his government do so.

[†]I call this phenomenon hinterland alienation.

the NDP and strong for the Liberals (Ibid.). Furthermore, many prominent environmentalists lauded the Liberals' tax shift plan and castigated the NDP (Sodero, 2011; Harrison, 2012; Heinmiller and Sharpe, 2012). After the Liberals won the election, the tax shift proceeded according to the plan they had set out (Sodero, 2011).

The new fee was designed to apply to most sources of combustion-based GHGs because authorities could measure them (Rhodes and Horne, 2014; Mascher, 2018), but by 2012, the fraction of GHG emissions under its influence were only 70 (Harrison, 2012) to 75 per cent; it was feasible for the government to apply it to up to 89 per cent of emissions by then (Rhodes and Horne, 2014). Over the carbon tax's lifetime—while it was still being increased—B.C. also lifted it on fuels “exported; used for inter-jurisdictional travel; purchased by eligible First Nations individuals or bands; used in industrial processes and not combusted; [and] used for agricultural purpose” (Mascher, 2018: Table 2, p. 1016). From the outset, it missed “non-combustion emissions from industrial processes; landfills; forestry; agriculture; vented and fugitive CO₂ and CH₄ [methane] emissions from production/transmission of fossil fuels” (Loc. cit.). Coverage, therefore, fell to about 70 per cent by 2017 (Mascher, 2018). The ETS that Ontario and Quebec joined in 2014 and 2013 respectively, by contrast, applied to about 85 per cent of their GHGs (Ibid.).

2.6: Chapter Summary

Human-generated GHGs cause climate changes when they are released into the environment en masse. This is one of the most environmentally damaging activities that people do, but until recently governments did not tend to charge for it. Some governments have recently raised carbon prices directly by taxing GHG emissions, which may not only correct this historical oversight but help reform taxation systems to make them more efficient, a goal reflected in the slogan ‘tax bads, not goods’. The attempt to reduce pollution and restrictions on the economy simultaneously

concur with two of the three aims of sustainable development; however, the relation to the third aim, to improve everybody's social standing from the bottom up, is murkier. In practice, if the net tax cuts come disproportionately from the taxes the richest people pay, a carbon tax shift like B.C.'s could cut taxes for rich people the most, for middle-class people next, and for poor people least.

I have discussed how the B.C. carbon tax shift was conceived, designed, made law, and endured to become the subject of this thesis. The proposed research will evaluate it based on how well it met the criteria of 'classic' sustainable development during the study period of 2008 to 2015 relative to that of 2001 to 2008, inclusive. It chooses the environmental indicator of changes in CO₂e emissions and two indicators that straddle the line between social and economic. Changes in employment, per-capita and total GDP, GHG emissions (and consumption of the products that cause them), and belief that people are independent and have good service from their government are important indicators with the carbon tax shift in place relative to those without it are the key indicators I will study.

Chapter 3: Research Design and Methods

3.1: Introduction

My research followed a mixed-method case study strategy of inquiry, which provided me with some insight into British Columbians' individual, experience-based understanding of their province's carbon tax shift and how it may have worked towards improving sustainable development in B.C. (Creswell and Creswell, 2018). I achieved my objectives by reviewing literature, documents, and datasets, and obtaining data firsthand through such methods as semi-structured interviews and questionnaires. Data analysis using both qualitative and quantitative data analysis software—NVivo and RStudio—has helped interpret and convey the research findings. This chapter explores the approach to the research more comprehensively.

3.2: 'Go with What Works': The Pragmatic Paradigm

A paradigm is a panoply of concepts that affect how a person understands the world and guide them on what to study and how to study it (Kuhn, 1970, cited in McNeill and Chapman, 2005; Morgan, 2007; Blackburn, 2008). Pragmatic researchers blend aspects of 'classical' paradigms like social constructivism, transformationalism, and post-positivism based on what they want to know (Creswell, 2009; Robson and McCartan, 2016). Pragmatism recognizes that everybody has values and holds that it is good for researchers to base studies upon their values (Morgan, 2007; Robson and McCartan, 2016), and like sustainable development, it emphasizes the equal importance of the natural and social worlds (Robson and McCartan, 2016). A combination of facts, opinions, and inferences composes a person's knowledge (Ibid.).

I came to review carbon taxes after I learned that climate change threatened economic and social arrangements as well as ecosystems and that political indifference and hostility impeded progress to making societies more sustainable and thus better. Therefore, I want to find a policy

that has helped, or can help, move the host polity towards greater sustainable development (Feilzer, 2010). Because I want policies that avoid harming people who have been disadvantaged historically, I want to think the carbon tax shift policy has had positive, or at least neutral, social and economic effects for rural and poor people (evaluating it on the social metric of advancing the interests of those worst off), but I must try to evaluate the evidence objectively and confirm or refute whether it has done so.

The revenue-neutral B.C. carbon tax shift has had advocates and detractors since it was announced. I do not presume that one side ‘owns’ the truth, preferring to form theories based on what I learn and then testing them in practice (Morgan, 2007). The proposed research also draws from the pragmatic tenet that even opposed parties can come to collaborate on issues (Ibid.). Like post-positivists, I think a whole affects an individual or group more than the other way around (McNeill and Chapman, 2005). My simultaneous recognition that the carbon tax shift’s benefits and burdens may not be distributed uniformly or based on greatest ability or need, meanwhile, lends itself to transformationalism’s focus on power between groups and people (Mertens, 2007). Transformationalism assumes that people’s values, based at least partly on the many identity-based subcategorizations they fit, affect the reality they occupy (Ibid.). * While I designed the framework of my proposed research before testing it in the field with little alteration from my research participants, I sought as much information as I could from the sort of people whom literature has posited as suffering from the introduction of a carbon tax to learn whether they think it has harmed them. I compared it with the literature reviewed in Chapters Two and Four to evaluate their perceptions for truth.

*The latter aspect appears in common in Robson and McCartan’s (2016) description of post-positivist knowledge construction. I agree that people’s traits affect ‘reality’ insofar as this refers only to their perception thereof. I do agree with post-positivists that people can strive towards objectivity, even if they rarely achieve it, and reach progressively closer understandings of reality by interpreting the facts.

3.3: Mixed-Method Research Approach

A mixed-method research approach derives data from qualitative and quantitative research methods. Qualitative and quantitative forms of data, it is hoped, will supplement, complement, and reinforce each other. Quantitative data can correct the biases in qualitative research, address a new set of related issues, acquire information that confirms or disproves the qualitative information gathered, and offer context that suggests why this is so; the inverse can also happen (Greene et al., 1989; Leech and Onwuegbuzie, 2009; Creswell and Creswell, 2018). Mixed-method research may favour qualitative or quantitative methods or use them equally (Johnson et al., 2010; Creswell and Creswell, 2018). Quantitative research evaluates theories by showing that, based on the available evidence, an independent variable does or does not cause, or is correlated or not correlated with, a dependent variable, all else being equal (Creswell and Creswell, 2018). Qualitative research entails learning what people think is happening based on their needs, values, and experiences (Ibid.). My research topic affects people in myriad circumstances in B.C. and has implications for people elsewhere, so I must understand the ‘big picture’ of how it affects sustainable development in B.C. By learning what settings some people occupy that may have helped make them think how and what they do, meanwhile, I have come to understand and perhaps empathize more strongly with people who disagree with me about the end of sustainable development, the means used to try to reach it, or both.

Both qualitative and quantitative researchers can ask questions to learn their outcomes. Through deductive, quantitative research, I have determined whether the carbon tax shift has been good or bad for advancing sustainable development in B.C. as measured by my indicators, and through inductive, qualitative research, I have determined whether participants agree (Creswell and Creswell, 2018). My data gathering began as temporally sequential but became concurrent, my

emphasis was close to equal, and my methods were unmixed; in Leech and Onwuegbuzie's "typology of mixed methods research designs" (2009), this was a cross between types P1 and P3. The design is partially mixed because I have collected and analysed forms of both quantitative and qualitative data to answer my research objective but have not applied processes of both quantitative and qualitative analysis to all my data (Ibid.). The gathering process was divided by time in that I began looking for information about the broad sweep of the carbon tax shift and figured out what some trends were before soliciting details about how it affected individuals, and concurrent in that I did statistical analysis, checking, and rechecking thereof while doing interviews and coding the themes and responses therein. The emphasis is equal because I looked for quantitative (descriptive and numerical) data about the tax shift's impacts on B.C.'s economy as well as qualitative (normative and narrative) data about whether individual people believed it had done more good or harm to them.

3.4: Case Study Strategy

A case study strategy of inquiry is a strategic research plan that adopts "multiple perspectives" to delve into all facets "of the complexity and uniqueness of a particular project, policy, institution or system in a 'real-life' context" (Simons, 2009: p. 21; quoted in Simons, 2010: p. 457). A case can refer to a person or political jurisdiction as well (Simons, 2010). Simons (2010) says quantitative and mixed-method researchers can use case studies as effectively as the qualitative researchers who are traditionally associated with the strategy. Generalizing from any case study is difficult because of its context dependency (the importance of background circumstances in determining the outcome) (Ibid.), the equal and opposite inverse of its strength in describing one case (Stake, 1995; cited in Simons, 2010). This poses a problem for those who hope "to inform policy" outside one province (Simons, 2010: p. 458). That said, it can be performed over as much time as needed

and written in accessible language, the latter being an advantage that could empower the people who provide the qualitative data to make their voices heard (Ibid.). My proximity to the subjects while gathering data and subjective opinions (like those of research participants) are also potential pitfalls; however, Simons (2010) also cites the latter as “an intelligence that is essential to understanding and interpreting the[ir] experience[s]” (p. 459).

3.4.1: Why B.C. Works as a Case Study

B.C., Canada’s westernmost province, offers an ideal case to study a carbon tax shift because, as I have noted in both preceding chapters, it was the first province in Canada to introduce one. B.C. is Canada’s third most populous province, with the most recent Canadian census counting 4,648,055 residents (Statistics Canada, 2016a), so it brings about greater impact on Canada’s GHG emissions than a less populous province would (as noted by, e.g., Mascher, 2018). The carbon tax has also survived sustained political opposition to become a feature of the province’s politics. The distributional issues around any policy are integral to sustainable development and I have chosen only a few of the many relevant indicators. B.C.’s geographically, ethnically, and socioeconomically diverse population, whose people have many and sometimes conflicting values, lends itself well to studying any number of sustainable development indicators in conjunction with the carbon tax shift. From my pragmatic paradigm, I believe the social milieu affects individual opinion and that high levels of natural resources-related employment will likely bring about the most. Considering this, I surveyed three communities—one each with high, medium, and low levels of natural resources-related employment. The 2016 Canadian Census counts employed persons by sector according to both the North American Industry Classification System (NAICS) and the National Occupation Classification (NOC). For this thesis, I have counted the number of people published in the census as working in natural resources and agriculture according to NAICS.

I originally considered conducting three case studies, comparing sustainable development indicators and public opinion in B.C. to the same factors in Quebec, which has had a \$3/tCO₂e carbon levy since 2007 and whose government joined an ETS with Ontario and California in 2013, as well as Saskatchewan, where no carbon price applied until the one the federal government legislated in 2018 took effect in 2019. This would have made it possible for me to compare GHG-governing regimes directly, but I will deal with the best-known case due to my limited material resources, time, and capacity. However, I have also drawn at least some data from relevant academic reports where appropriate to compare with B.C.

3.5: Data Collection and Sampling Procedures

I have reviewed literature on sustainable development, the forms of carbon pricing, and exposition of why both are necessary. I have also analyzed other secondary sources of data such as government statutes, including the *Carbon Tax Act 2008*. Below, I list and exposit the data collection and data analysis methods I have used. I collected data through several methods, thereby triangulating it to ensure reliability and validity, a discussion of which follows the later section “Data Analysis”.

3.5.1: Document Review

Document review plays an important role in the research. Government documents have provided invaluable information about the design and execution of the B.C. carbon tax shift. Non-governmental analysts have also raised valid concerns about the shift that I have chosen to incorporate among my sustainable development indicators; the literature I reviewed has been invaluable in showing B.C.’s movement in relation to these indicators. Documentation is a vital and accessible source of secondary information that will continue to supplement and offer points of comparison and contrast with my field data. The most useful information I gleaned from document review

concerns indicator changes, especially GHG emissions, GDP, employment, and taxation rates.

3.5.2: Dataset Review

Quantitative research is about testing for, then evaluating the direction and power of, a relationship between independent (causal) and dependent (effect) variables. It may be experimental or non-experimental. In experimental research, the researcher manipulates an independent variable directly to find out how it affects dependent variable(s), while in non-experimental research, the researcher studies a purported cause and effect (Cook and Cook, 2008; Belli, 2009). Non-experimental quantitative research can only prove correlation between variables and cannot quite prove causation, but these are important nonetheless (Cook and Cook, 2008).

I chosen my sustainable development indicators based upon concerns presented in the literature on B.C.'s carbon tax shift. The results of my quantitative research show data presented numerically, which I analyzed "*using mathematically based methods*" (Muijs, 2004: pp. 1–2; emphasis original). The presence or absence of a mathematical trend towards or away from progress on sustainable development indicators can support an alternative or null hypothesis that the carbon tax shift has (or has not) succeeded and is suited to quantitative research (Muijs, 2004). Because I could not easily muster a control group of British Columbians who are not subject to the carbon tax, I could not perform an experiment to show its economic, environmental, or social effects in their households or communities (Ibid.). I did, however, gather datasets that show how emissions (Environment and Climate Change Canada, 2019b; Statistics Canada, 2020a), GDP (Statistics Canada, 2020b), and population (Statistics Canada, 2016a) have changed year over year. Though the data may not be fully reliable and were gathered for non-research purposes, factors which reduce their utility (Muijs, 2004), they still provided helpful information. Datasets from censuses and budgets helped me evaluate changes in the social and economic indicators of GDP and employment.

3.5.3: *Semi-Structured Interviews (SSIs)*

SSIs are common ways to collect data in both qualitative and mixed-method research (Adams, 2015; McIntosh and Morse, 2015). SSIs help explore research participants' unique opinions deeply (Adams, 2015) by motivating and empowering them to talk one on one with researchers (Oppenheim, 1992; Adams, 2015). They also offer the interviewer a hint of what the interviewee's everyday life is like (Madill, 2011) and obtain data beyond the reach of more 'hands-off' methods (McIntosh and Morse, 2015). While interviews are especially helpful in getting information about an "unknown ... issue" (Adams, 2015: p. 494), a description that is not true of B.C.'s carbon tax shift, interviews help gather knowledge of people's opinions and experiences of the same (McIntosh and Morse, 2015). SSIs can also suggest whether I need more open-ended questions (Adams, 2015).

SSIs can combine closed- and open-ended questions, which the interviewer often supplements with questions about how or why the participant thinks or knows something (Adams, 2015). This SSI format enabled my respondents and me to expand on questions and responses where necessary. Each question owed something to my understanding of sustainable development and tried to answer, especially, my third and fourth research objectives. In SSIs, researchers speak with one interviewee at a time for up to an hour per sitting, which I strove to keep shorter to avoid giving myself or participants fatigue and to respect their prior commitments (Adams, 2015). SSIs describe what people think, but they may serve a confirmative or corrective narrative; that is, I might use them to justify or dismiss participants' sentiments about the original tax shift and especially changes to it (McIntosh and Morse, 2015).

I conducted twenty-four telephone interviews with key informants in each community from which I chose to sample. I attempted to achieve systematic random sampling, the selection of participants based on their place in a pre-existing list (Oppenheim, 1992; Bloor and Wood, 2006)—

in this case, from the online telephone directory Canada411—when I solicited participants. I knew nothing about my prospective participants besides their names, telephone numbers, and, if they consented to be interviewed, mailing and email addresses before I spoke with them. Appendix A lists my proposed interview questions, which are based on themes and facts I found in the literature I reviewed and which I used to seek information about the sustainable development indicators I selected.

3.6: Data Analysis

Today, both quantitative and qualitative analysis require use of specialized computer programs. I have used RStudio, an open-source quantitative data analysis program, to compare statistics on my SDG indicators in B.C. year by year using simple linear models; the base version I used was released on 12 December 2019 (R Core Team, 2019). I used the following packages in this version of RStudio: tidyverse (see Wickham et al., 2019), DescTools (Signorell, 2020), janitor (Firke, 2019), MASS (see Venables and Ripley, 2002), and ldsr (Nguyen, 2020). My sample size was fifteen years for the full background study period and eight years for the with-tax period, counting 2008 as a with-tax year by default because the tax was introduced on 1 July that year. I tested the response variables of CO₂e emissions; gasoline and diesel oil sales; total and per-capita GDP in dollars chained to 2012 values; market-rate, post-tax, and total Gini coefficient; number of employed people as well as employment, workforce participation, and unemployment rates; number of people employed in agricultural and natural-resource production jobs, amount of GDP in 2012-chained dollars generated by agricultural and natural-resource production, the percentages of employment and GDP owing to agricultural and natural-resource production, and the amount of GDP in 2012-chained dollars generated per tCO₂e—against the independent variables of whether the carbon tax was present (for the years 2001 to 2015 inclusive) and how much it was per tonne of CO₂e (for the

years 2008 to 2015 inclusive). I used diagnostic graphs to evaluate whether the data were homoscedastic, normally distributed, and that no data points were overly influential. I had to transform the following response variables to make the data more normally distributed, and I did so in the following ways:

- Estimated impact of another dollar's worth of carbon tax in the with-tax period on CO₂e emissions in mtCO₂e: Box-Cox transformation
- Estimated impact of another dollar's worth of carbon tax in the with-tax period on total GDP in millions of CAD: double-natural-logarithm transformation
- Estimated impact of the introduction of the carbon tax on post-tax Gini coefficient: Box-Cox transformation
- Estimated impact of another dollar's worth of carbon tax in the with-tax period on economic efficiency measured by dollars per tCO₂e: Box-Cox transformation

I have used NVivo, a qualitative data analysis program, to code for themes based on constant comparison, the most discussed content, keywords, word count, symbols and what they represent, taxonomies, and points of contrast (Leech and Onwuegbuzie, 2011). The indicators and themes that have emerged from the literature, such as progressive economic redistribution, fuel use from activities like driving and heating, governments' need for action, and hinterland alienation, helped to guide analysis of the themes that came from the data. Many of the reports on practical effects of the B.C. carbon tax shift that I have studied have focussed upon GHGs, with economic factors taking a secondary role and social effects, in turn, a tertiary one. By contrast, the theoretical literature has focussed on economic and, to a lesser extent, social effects. The literature that discusses how the tax shift was conceived and implemented indicates the continuing power of a government under parliamentary rules, especially in Canada. Entrenchment of pre-existing power asymmetries

and disregard for the needs of those ‘below’ has been common to practical literature on facts and opinions alike. Differing forms of opposition of the public will about carbon taxes and the reality of the same would be a fascinating social issue unto itself—but this is a story for a separate topic.

My research findings will go to communities concerned, academics who study carbon taxes, environmental advocates, and government officials interested in the results. I will state my results in commonplace language for the benefit of non-experts and reformulate them as fact sheets, blogs, reports, photographic essays, or in any format in which they wish to receive them.

3.7: Ensuring Reliability and Validity

If the thesis is to guide decision-makers and future researchers, it must offer valid and reliable data. Therefore, I have regularly evaluated my findings’ validity, replicability, and credibility at every stage of research. Authors including Sandelowski (2000), Muijs (2004), Onwuegbuzie and Johnson (2006), Dellinger and Leech (2007), Ihantola and Kihn (2011), and Zohrabi (2013) list forms of reliability and validity, and highlight dangers to the same, for quantitative, qualitative, and mixed-method researchers. I averted these pitfalls through methods including:

Triangulation: Collecting data from multiple sources bolsters the data’s reliability and validity, as well as their interpretation and depiction. This research has employed document and dataset review and semi-structured interviews, amassing data from many participants with varied perspectives; this can make data more valid. In a mixed-method study, the strengths of the quantitative methods I used should compensate for the weaknesses of the qualitative methods and vice versa (Onwuegbuzie and Johnson, 2006; Ihantola and Kihn, 2011).

Addressing time and population displacement: Time validity, especially as related to the opinions of British Columbians on the carbon tax, was low due to changes in the tax (Onwuegbuzie and Johnson, 2006; Ihantola and Kihn, 2011). Population validity (Ibid.) was also threatened (also

vis-à-vis public opinion) because I did not know whom Horne (2011), Jaccard (2012), and/or Rhodes and Jaccard (2014) polled or interviewed. I compensated for this in part by reminding myself and readers that my own series of interviews was a comparison as much as a follow-up.

Member checking: To confirm the correctness of my interview records, I will write to my interviewees to show them the initial research results, themes I have gleaned from them, and learn whether they consider my findings true and interpretations valid (and thus, my argument sound). After I may travel to B.C., I hope also to present at up to three locations that have communities with participants in their catchment areas; they will be geographically dispersed to open them to more people. I will facilitate the presentations, optionally with help from local contacts, to allow all participants who wish to express their thoughts and recommendations to do so. I will write comments given in person myself and provide mailing addresses and postage for other participants to write back to me if they wish.

Comprehensive descriptions: Case studies do not lend themselves well to generalization, as noted. Giving detailed descriptions of the historical and geographical context of B.C.'s carbon tax shift, however, may allow readers to decide if results may apply in other contexts.

Peer scrutiny: My thesis committee and advisor will have many, strong opportunities to read my research, providing insights and corrections as needed. Qualitative researchers often use peer scrutiny to bolster the validity of the results. My committee and advisor can also confirm the content and criterion validity of my variables and measures.

Consideration of bias: As noted, mixed-method research stands on the idea of researchers having values, but values skew how one analyzes and evaluates data. By evaluating my data, especially qualitative data, considering my assumptions, I recognized my biases, how they might have changed, and how the research developed from them. This is designed to “giv[e] as full and honest

an account of the research process as possible, in particular explicating the position of the researcher in relation to the research” (Reay, 2012: p. 638; cited in Palaganas et al., 2017: p. 430), which will facilitate readers’ evaluation of research results. I thought my personal and epistemological biases would be especially tested (Palaganas et al., 2017). I have written a short retrospective about my reflections on circumstances and assumptions and understand better how they and the research affect each other. Also, rereading my retrospective refreshed my memories of field research.

Chapter 4: Results of Quantitative Analysis of Sustainable Development Goal Indicators and Qualitative Analysis of Interviews with British Columbians

4.1: Introduction

In this chapter, I show the correlations among B.C.'s carbon tax on the SDG indicators I have chosen. Analyzing the tax and sustainable development in B.C. at the provincewide level, I have found that in most cases, the correlations between the presence or absence of the carbon tax—or its per-unit price, when it was in force—and what I regard as progress towards sustainable development are small, statistically insignificant, or both. I begin by considering SDGs numbers 8 (decent work and economic growth), 10 (reducing inequality), 12 (responsible consumption and production), and 13 (climate action), with indicators I have chosen to evaluate: reduced CO₂e emissions which contribute to climate change, increased intergovernmental co-operation to combat climate change, increased economic growth as measured by total and per-capita GDP, lower economic inequality as measured by the Gini coefficient,^{*} higher employment and workforce participation and lower unemployment rates,[†] and less reliance on polluting sectors for GDP and employment. After this, I present the data gleaned from my interviews of participants to find out their opinions about the carbon tax. I conclude this chapter with a summary of the data.

4.2: Sustainable Development Goal Indicators

4.2.1: Carbon Dioxide Equivalent Emissions

Annual CO₂e emissions in B.C. since it installed the carbon tax have been flatter than those in Canada at large, as Table 1 shows. B.C.'s emissions as a percentage of Canada's also declined

^{*}The Gini coefficient, a measurement of distribution of wealth between people and groups from perfect equality at 0 to perfect inequality at 1, is named after the mathematician who created it in 1912.

[†]The workforce participation rate is the quotient of every person who is working or seeking work divided by the working-age population; the employment and unemployment rates are the quotients of every person with and without a full- or part-time job divided by the participation rate.

gradually over the study period. Interestingly, while Harrison (2013) and Komanoff and Gordon (2015) attribute depressed GHG emissions in 2009 to the worldwide ‘Great Recession’, B.C. cut its emissions slightly from 2009 to 2010 even though this recession officially ended in 2009.

Table 1: GHG emissions in Canada and British Columbia per year, in million tonnes of CO₂e (mtCO₂e), 2000–2015. Based on Environment Canada (2019).

Year	Canada	Per cent change from year before	B.C.	Per cent change from year before
2000	733.511	—	64.991	—
2001	722.935	-1.4%	66.323	+2.0%
2002	726.555	+0.5%	63.312	-4.5%
2003	744.832	+2.5%	63.191	-0.2%
2004	745.920	+0.1%	64.916	+2.7%
2005	738.717	-1.0%	62.973	-2.9%
2006	735.693	-0.4%	62.494	-0.8%
2007	730.099	-0.8%	62.719	+0.4%
2008	751.661	+3.0%	63.390	+1.1%
2009	693.598	-7.7%	60.220	-5.0%
2010	702.803	+1.3%	59.023	-2.0%
2011	714.078	+1.6%	59.589	+1.0%
2012	717.171	+0.4%	59.184	-0.7%
2013	725.372	+1.1%	60.541	+2.3%
2014	722.558	-0.4%	60.351	-0.3%
2015	723.094	+0.1%	59.247	-1.9%

Over my study period, B.C.’s average annual emissions are 60.193 mtCO₂e in the with-tax period 2008–2015 versus 63.704 mtCO₂e in the pre-tax period 2001–2007 (based on Environment Canada, 2019), so annual averages declined by about 3.511 million tCO₂e—5.5 per cent. Removing the ‘half-year’, 2008,* from consideration makes the tax seem more effective: annual emissions average 59.737 mtCO₂e in with-tax period 2009–2015 versus 63.704 mtCO₂e in the pre-tax period 2001–2007 (based on Environment Canada, 2019), so annual averages declined by 3.968 mtCO₂e—6.3 per cent. Notably, B.C. emitted less CO₂e in every year of study that fell fully in the with-tax period than in every year that preceded the tax’s introduction fully (see Table 1 above). The introduction of and gradual rise in B.C.’s carbon tax are correlated with small declines in the amounts

*I call 2008 the ‘half-year’ because for the first half, no GHG emissions were taxed in B.C.; for the second half, most were. Rayne and Forest (2013) make a good point that comparing B.C.’s GHG emissions in 2008 with those in any other year is a complicated endeavour.

of CO₂e emitted, both between without- and with-tax periods and during the 2009–2015 period in the with-tax period, as shown in Table 2. Figures 1 and 2 below show the changes in emissions from 2001 (including pre-tax years) and 2008 (in July of which the tax was introduced).

Table 2: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s CO₂e emissions in mtCO₂e (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s CO₂e emissions in mtCO₂e.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-3.511	-5.084, -1.938	0.0003	0.614
Additional dollar of carbon tax	-0.095	-0.211, +0.022	0.095	0.295

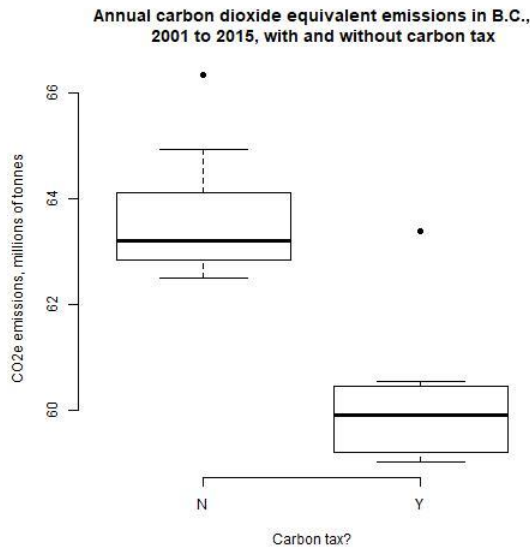


Figure 1

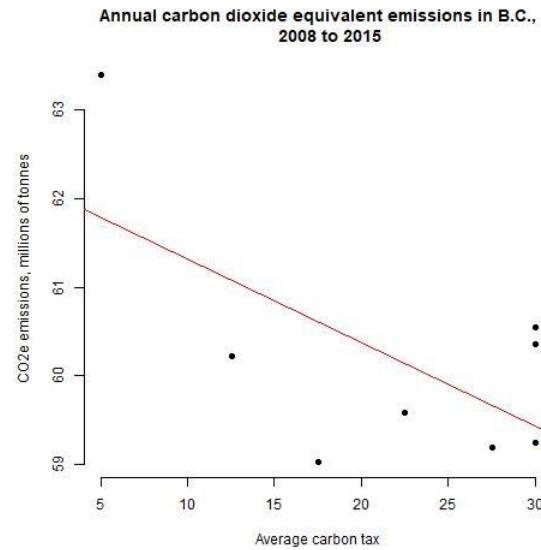


Figure 2

Residential natural gas consumption also fell in B.C. during the with-tax period. Xiang and Lawley (2019) credit the tax for reducing it 6.9 to 10.1 per cent over the 2008–2014 period with the tax versus the 1990–2007 pre-tax period. B.C.’s per-capita vehicular-fuel consumption also declined from 91 litres in 2001 to 79.5 litres in 2014, a fall that began after the carbon tax was introduced in mid-2008 (Antweiler and Gulati, 2016: p. 8). A combination of B.C.’s lower vehicle ownership per head (Ibid.) and higher gasoline taxes, especially after the carbon tax came in (Ibid., p. 9; see also Antweiler and Gulati, 2012), helped offset lesser fuel efficiency than in the rest of Canada. Antweiler and Gulati (2016) also perform a counterfactual model showing that without a

carbon tax, gasoline demand from July 2012 to December 2014 inclusive could have been 0.73 to 1.82 per cent higher.

The increased price did not affect all British Columbians' gasoline purchases equally each year, however: there has in fact been considerable regional variation. Lawley and Thivierge (2018) estimate that a five-cent-per-litre rise in tax reduced demand for gasoline by 5 to 6.5 per cent from 2008 to 2012, all else equal, with smaller communities recording near-zero responses and Vancouver (7 to 10.5 per cent) and Victoria, Kelowna, and Abbotsford (10 to 10.5 per cent) registering higher declines (p. 166). Likewise, Rivers and Schaufele (2015a) find that the carbon tax reduced total demand for gasoline in B.C. by 1.8 million tonnes between 2008 and 2012; however, gasoline purchases rebounded after the tax was 'locked' at \$30/tCO₂e (Table 4). Erutku and Hildebrand (2018), examining the tax's statistical effect on gasoline purchases between 1991 and 2015, find that it had statistically insignificant effects (see p. 130).^{*} Bernard and Kichian (2019) estimate that by December 2016, the \$30/tCO₂e tax was reducing emissions from diesel by 1.3 per cent of their equivalents for diesel and 0.2 per cent overall from June 2008.[†] Variance in diesel purchases was roughly consistent throughout my study period as indicated by Figures 3 and 4, which track month-by-month purchases of refined petroleum products from January 2001 to December 2015 inclusive (Table 3 shows the same trends, averaged to an annual level for simplicity's sake). Table 4 shows the estimated statistical effects of the introduction and increase of the carbon tax on fuel sales.

^{*}From 1991 to 2011, the non-significant effect of the introduction of the tax itself was -0.0347, which decreased in magnitude to -0.0331 when the end date is extended to 2015. From 1991 to 2011, the tax's impacts on behaviour in B.C. cause an estimated 2.46 to 2.62 per cent per-capita fall in gasoline consumption, which are statistically significant; the estimated impact falls to 1.19 to 1.23 per cent per-capita decline, and statistically non-significant, when the time frame is extended to 2015.

[†]Diesel emissions fell by 1.13 million tons by the end of 2016 thanks to the tax, having been 10.04 million tons in mid-2008 versus 68.71 million tons of overall CO₂e emissions at the same time.

Table 3: Annual net sales of gasoline and diesel oil in B.C., in litres, 2000–2015. From Statistics Canada Table 23-10-0066-01 and author’s calculations.

Year	Gasoline		Diesel oil	
	Sales	Sales change from year before	Sales	Sales change from year before
2000	4,406,399	—	1,370,074	—
2001	4,460,565	+1.2%	1,329,901	-2.9%
2002	4,532,446	+1.6%	1,418,915	+6.7%
2003	4,512,548	-0.4%	1,515,135	+6.8%
2004	4,543,450	+0.7%	1,647,352	+8.7%
2005	4,507,834	-0.8%	1,681,135	+2.1%
2006	4,524,469	+0.4%	1,721,635	+2.4%
2007	4,554,406	+0.7%	1,796,611	+4.4%
2008	4,467,255	-1.9%	1,714,031	-4.6%
2009	4,536,112	+1.5%	1,647,876	-3.9%
2010	4,560,666	+0.5%	1,838,578	+11.6%
2011	4,537,496	-0.5%	2,221,338	+20.8%
2012	4,348,707	-4.2%	1,761,637	-20.7%
2013	4,336,807	-0.3%	2,145,516	+21.8%
2014	4,422,297	+2.0%	1,922,523	-10.4%
2015	4,656,988	+5.3%	1,852,896	-3.6%

Table 4: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s fuel sales in millions of litres (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s CO₂e fuel sales in millions of litres.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-38,366	-65,410.46, -11,322.21	0.006	0.042
Additional dollar of carbon tax	-1,276	-4,021.467, 1,470.449	0.359	0.01

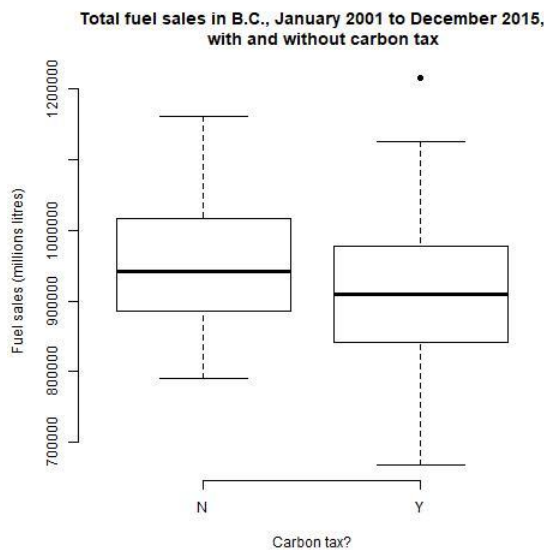


Figure 3

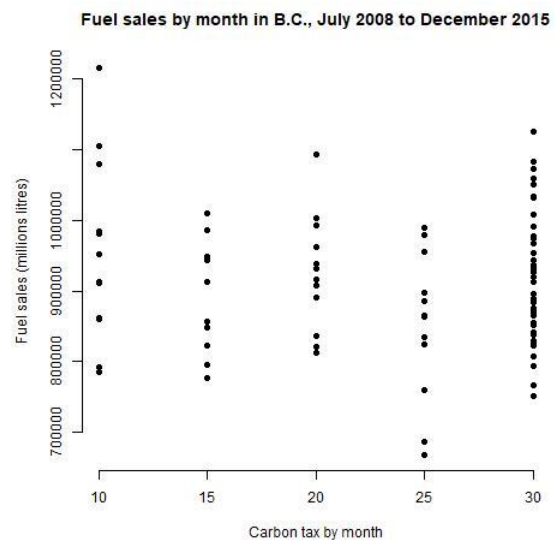


Figure 4

4.2.2: Climate Co-operation

In 2007, just before it introduced its carbon tax, B.C. joined the Western Climate Initiative (WCI), an initiative that began among several American states. B.C.'s carbon tax was accepted as an alternative disincentive measure to the WCI's cap-and-trade program (WCI Partners, 2010). The province's lieutenant governor touted B.C.'s participation in the WCI in three throne speeches (British Columbia, 2008a; 2009a; 2010a). The WCI, however, is a voluntary entity, a fact that B.C.'s own withdrawal, effective on 12 January 2018, underlined (WCI, 2017).*

During the time B.C. was a member of the WCI, Canada had no nationwide carbon tax, and its own provincial tax was "the most comprehensive and ambitious in North America" (Hsu et al., 2017: p. 426). B.C. and its former partner, California, were both subnational jurisdictions with leaders who were trying to enact climate-friendly policies independently of apathetic national governments (Ibid.: pp. 426–7). They made their unique policies and took the opportunity to frame the issue and open potential economic opportunities (Ibid.). Hsu et al. (Ibid.: see Figure 5 below), however, describe B.C.'s tax as inadequate to fulfilling the Paris Agreement. Regardless, B.C. and California did set their own agendas, though they attempted only horizontal co-operation (i.e., between like levels of government) and did so after they came up with their climate policies (Ibid.). Within B.C., there was more vertical co-operation (higher and lower orders of government working together) between the provincial and municipal governments (Ibid.).

*Houle, Lachapelle, and Purdon (2015) acknowledge that the tax and ETS were meant to complement each other at first "to extend the coverage of British Columbia's climate policy" (p. 59). They also reaffirm that parliamentary regimes concentrate the power to set agendas and conversations in the government of the day (p. 49) and note that this was therefore the reason the discussion revolved around taxation (p. 59).

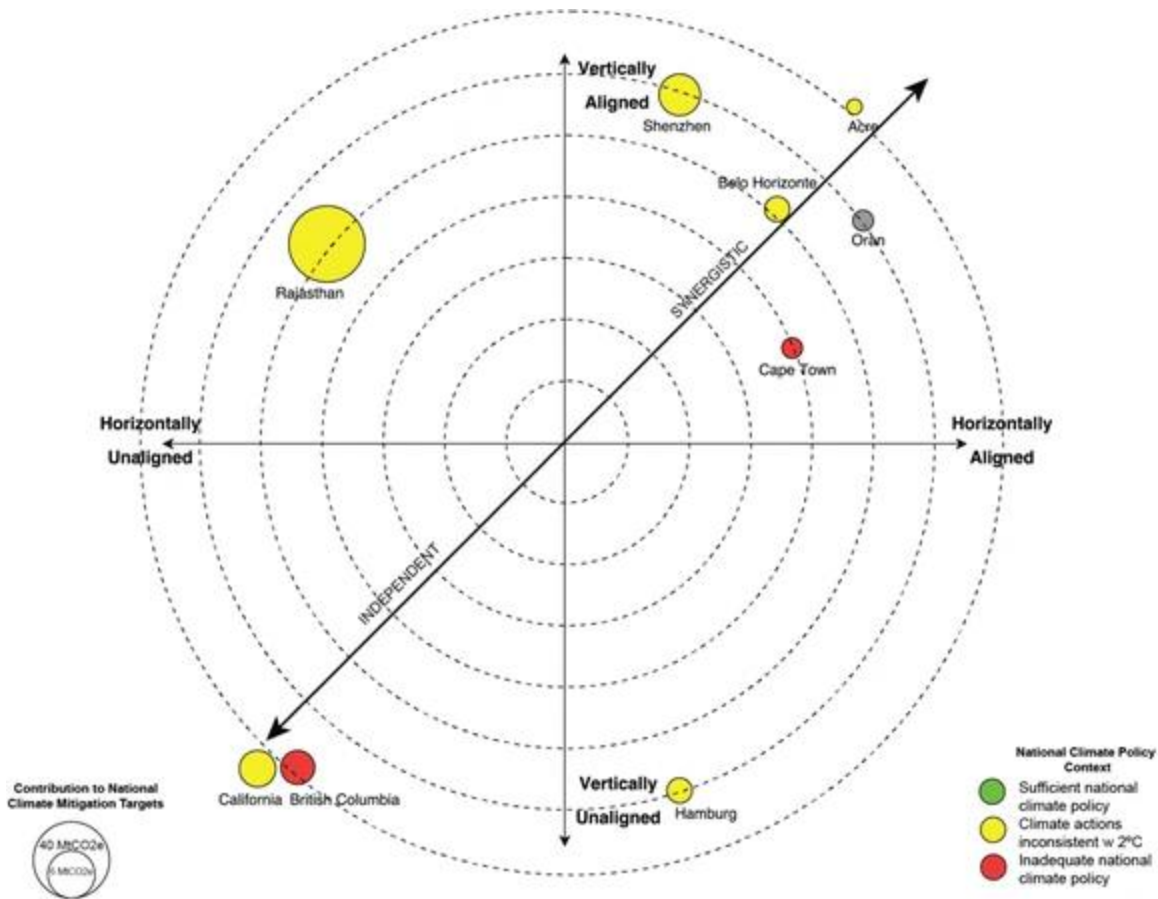


Figure 5: B.C.'s carbon tax shift and its alignment of subnational climate policies with national climate policies (originally from Hsu et al., 2017).

4.2.3: GDP and Gini Coefficient

Tables 5 and 6 below show the total and per-capita expenditure-based GDP of Canada and B.C. in dollars chained to 2012, from 2000 (to calculate over-year economic growth rates in 2001) to 2015. Unlike when measuring CO₂e emissions, it is important to consider total and per-capita GDP because they reflect the macro- and microsocial effects of economic growth. If an economy grows because the population grows but average incomes decline or stay level, it indicates that the society is wealthier but (certain) people are not, which has distributive implications and touches on the social equality element to which I will return in the next subsections.

Table 5: Expenditure-based annual GDP in Canada and B.C. (in millions of Canadian dollars, chained to 2012) and year-by-year growth rates, 2000–2015 (as of 1 July each year). From Statistics Canada Table 36-10-0222-01 and author's calculations.

Year	Canada		B.C.	
	GDP	GDP change from year before	GDP	GDP change from year before
2000	1,447,508	—	166,405	—
2001	1,473,418	+1.8%	167,541	+0.7%
2002	1,517,887	+3.0%	174,214	+4.0%
2003	1,545,232	+1.8%	178,240	+2.3%
2004	1,592,933	+3.1%	185,250	+3.9%
2005	1,643,973	+3.2%	194,460	+5.0%
2006	1,687,281	+2.6%	203,053	+4.4%
2007	1,722,238	+2.1%	209,419	+3.1%
2008	1,739,534	+1.0%	210,903	+0.7%
2009	1,688,636	-2.9%	205,878	-2.4%
2010	1,740,814	+3.1%	211,749	+2.9%
2011	1,795,582	+3.1%	218,203	+3.0%
2012	1,827,201	+1.8%	223,329	+2.3%
2013	1,869,759	+2.3%	228,310	+2.2%
2014	1,923,422	+2.9%	236,696	+3.7%
2015	1,936,100	+0.7%	241,509	+2.0%

Table 6: Expenditure-based annual GDP per capita in Canada and B.C. (in Canadian dollars, chained to 2012) and year-by-year growth rates, 2000–2015 (as of 1 July each year). From Statistics Canada Tables 36-10-0222-01, 17-10-0009-01, and author's calculations.

Year	Canada		B.C.	
	GDP per capita	GDP per capita change from year before	GDP per capita	GDP per capita change from year before
2000	\$47,172.02	—	\$41,197.21	—
2001	\$47,497.59	+0.7%	\$41,094.69	-0.2%
2002	\$48,402.89	+1.9%	\$42,485.38	+3.4%
2003	\$48,831.71	+0.6%	\$43,215.12	+1.7%
2004	\$49,871.64	+2.4%	\$44,577.85	+3.2%
2005	\$50,985.78	+2.2%	\$46,343.45	+4.0%
2006	\$51,802.89	+1.6%	\$47,869.60	+3.3%
2007	\$52,365.13	+1.1%	\$48,804.42	+2.0%
2008	\$52,321.35	-0.1%	\$48,490.86	-0.6%
2009	\$50,213.84	-4.0%	\$46,679.00	-3.7%
2010	\$51,193.05	+2.0%	\$47,418.39	+1.6%
2011	\$52,289.38	+2.1%	\$48,466.84	+2.2%
2012	\$52,635.52	+0.7%	\$48,903.06	+0.9%
2013	\$53,295.37	+1.3%	\$49,310.20	+0.8%
2014	\$54,276.56	+1.8%	\$50,284.86	+2.0%
2015	\$54,228.08	-0.1%	\$50,563.10	+0.6%

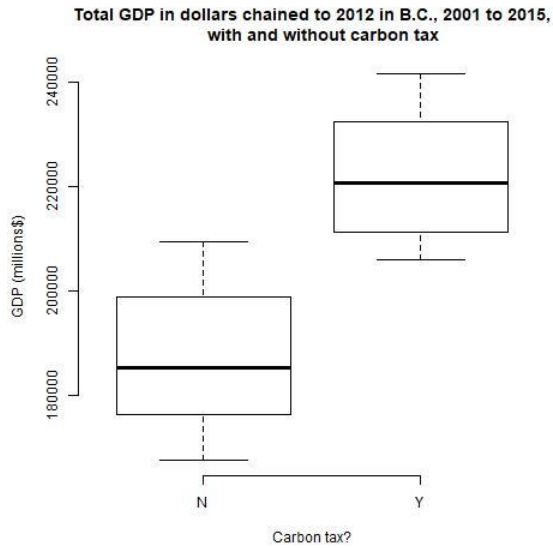


Figure 6

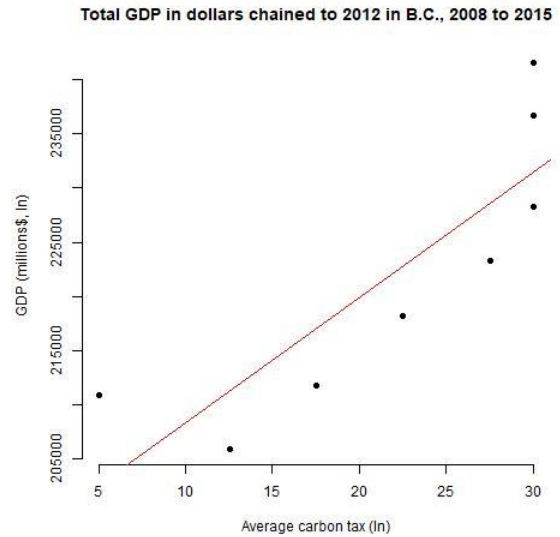


Figure 7

B.C. and Canada grew their respective economies to varying degrees in each fully pre-tax year under consideration, with B.C.'s growth outpacing Canada's in the last six. B.C.'s real GDP growth outpaced Canada's in three of the remaining six years, and B.C.'s economy also grew in real terms during most of the years of the carbon tax shift. B.C.'s economy grew by 14.5 per cent from 2008 to 2015, at an average rate of 2.1 per cent per year, during the with-tax period; during the same time, Canada's economy grew by 11.3 per cent from 2008 to 2015, at an average rate of 1.6 per cent per year. Figures 6 through 9 show the total and per-capita GDP by year, first from 2001 and second

Figure 8

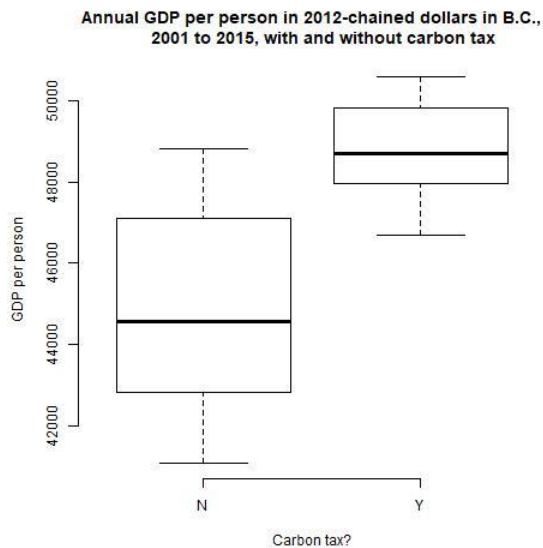
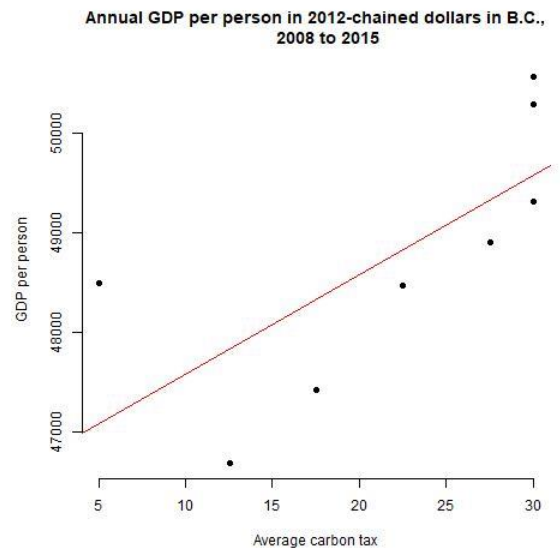


Figure 9



from 2008, and Tables 7 and 8 show the estimated statistical correlations between the carbon tax's introduction and increase and changes in total and per-capita GDP in B.C.

Table 7: Estimated correlations of the introduction of B.C.'s carbon tax on B.C.'s total GDP in millions of CAD chained to 2012 values (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.'s total GDP in millions of CAD chained to 2012 values.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+34,618	+18,875.68, +50,360.85	0.0004	0.606
Additional dollar of carbon tax	+1,155	+445.212, +1,864.376	0.007	0.680

Table 8: Estimated correlations of the introduction of B.C.'s carbon tax on B.C.'s per-capita GDP in CAD chained to 2012 values (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.'s per-capita GDP in CAD chained to 2012 values.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+3,851.6	+1,417.227, +6,285.227	0.005	0.433
Additional dollar of carbon tax	+99.86	+1.635, +195.085	0.005	0.426

Elgie and McClay (2013) produce (Figure 10) an image from Ekins (2007) tracking changes in the GDPs of seven European countries after they introduced carbon tax shifts, with projections some years into the then-future. There are relatively small fluctuations over each year, though the economic changes are mostly net positive. B.C.'s annual average economic growth with its carbon tax shift over the study period outpaced all seven of the countries Ekins studied. Notably, however, B.C.'s economic growth with the carbon tax was considerably less than before the carbon tax. In the pre-tax period 2001–2008, its real GDP chained to 2012 grew by 25.88 per cent at an annual average of 3.697 per cent. These figures are considerably higher than their with-tax counterparts; even if only counting B.C.'s real GDP in with-tax years wherein it expanded, it did so by 17.307 per cent overall between 2009 and 2015 and 2.884 per cent per year on average. B.C.'s per-capita real GDP change is broadly comparable to the pan-Canadian average over both parts of the study period (with and without the carbon tax shift).

The Effect of Environmental Tax Shifts on GDP in European Countries

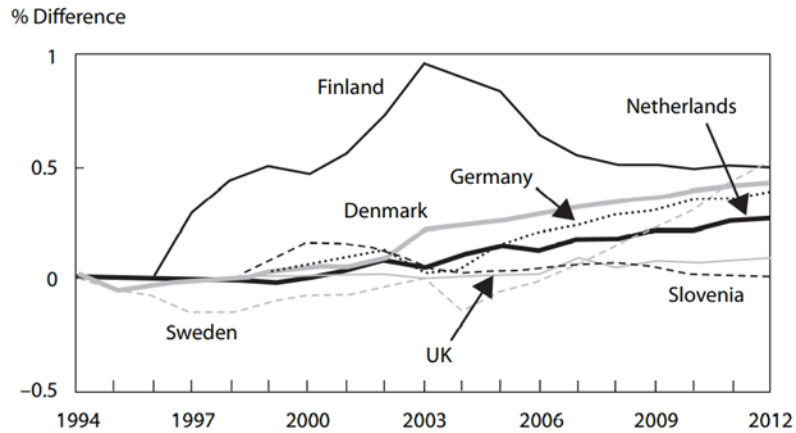


Figure 10: Graph comparing the effects of environmental tax shifts in seven European countries on GDP (smaller than B.C.'s). Originally from Ekins (2007: p. 41), reprinted in Elgie and McClay (2013: p. S7), used with permission.

Figure 11, from Beck et al. (2015), shows that the richest British Columbians paid the most money to the carbon tax before the government recycled the revenue. Furthermore (Figure 12, from Ibid.), they find a weak double dividend from carbon-tax revenue recycling: the aggregate welfare of British Columbians (corresponding roughly to GDP) declines less in two simulations where revenue recycling is assumed than where it is not. Revenue recycling also makes the carbon tax more progressive, leading to minor welfare gains for the four lowest-income deciles of British Columbians and smaller decreases for the top six* (Figure 13, from Ibid.). Lastly, the carbon tax shift was often revenue-negative, not revenue-neutral—that is, income tax cuts exceeded carbon tax intakes (Table 9).

*Households in Decile 1 had incomes of \$17,000 or less; Decile 2, \$17,000–26,000; Decile 3, \$26,000–35,000; Decile 4, \$35,000–45,000; Decile 5, \$45,000–55,000; Decile 6, \$55,000–68,000; Decile 7, \$68,000–82,000; Decile 8, \$82,000–100,000; Decile 9, \$100,000–130,000; Decile 10, over \$130,000 (Beck et al., 2015: Table 4, p. 51).

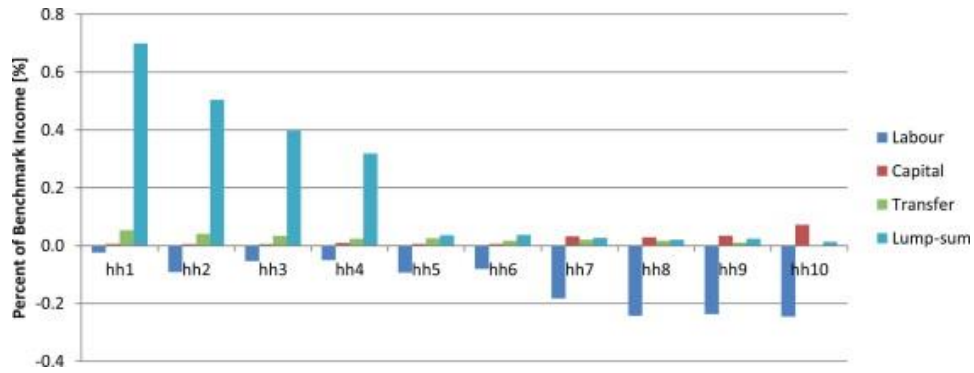


Figure 11: Welfare impacts from labour, capital, transfer, and lump-sum income of the carbon tax shift on households in B.C., by income decile, with revenue recycling, 2008–2014. Originally from Beck et al. (2015: p. 57).

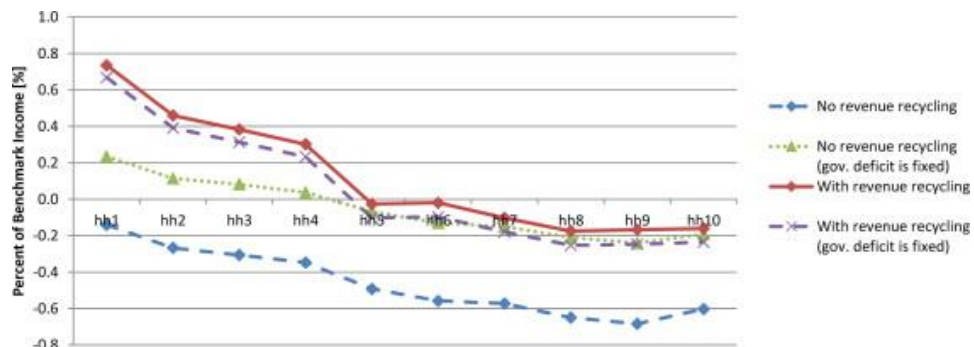


Figure 12: Aggregate welfare impacts of the carbon tax shift on households in B.C., by income decile, with versus without revenue recycling, 2008–2014. Originally from Beck et al. (2015: p. 58).

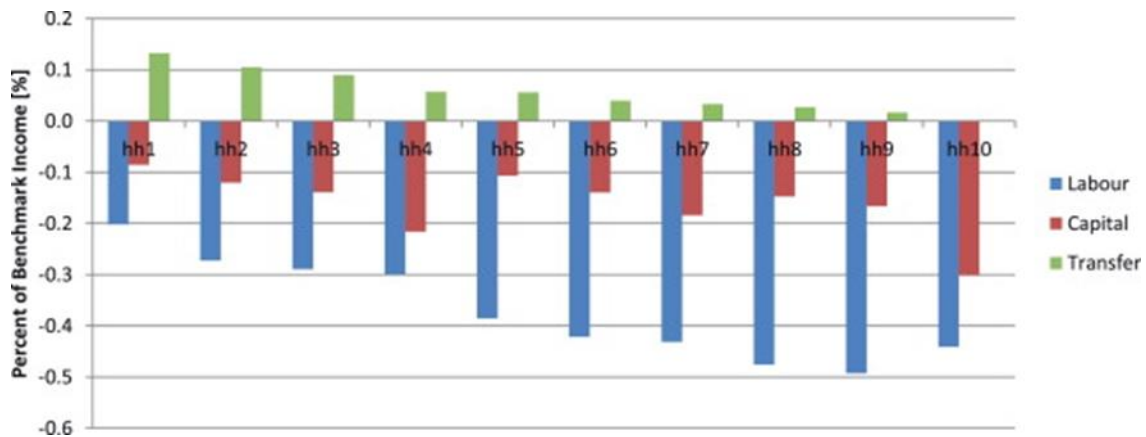


Figure 13: Welfare impacts from labour, capital, transfer, and lump-sum income of the carbon tax shift on households in B.C., by income decile, without revenue recycling, 2008–2014. Originally from Beck et al. (2015: p. 56).

Table 9: Actual and projected gains in revenues (from carbon taxes) and forgone revenues (from corporate and income tax cuts and transfer payments) in B.C., and net changes to revenues, in millions of dollars, 2008/09–2015/16 fiscal years. From British Columbia (2008b, 2008c, 2009b, 2009c, 2010b, 2010c, 2011a, 2011b, 2012a, 2012b, 2013a, 2013b, 2014a, 2014b, 2015a, 2015b, 2016a) and author’s calculations. (Note: The projections for each fiscal year are taken from the financial-and-economic review and three-year budget plan produced in the previous year.)

Year	Carbon, actual (projected)	Income, actual (projected)	Net change, actual (projected)
2008/09	306 (338)	-313 (-338)	-7 (0)
2009/10	541 (557)	-729 (-757)	-188 (-200)
2010/11	741 (727)	-865 (-862)	-124 (-135)
2011/12	959 (950)	-1,141 (-1,152)	-182 (-202)
2012/13	1,120 (1,172)	-1,380 (-1,380)	-260 (-208)
2013/14	1,222 (1,187)	-1,232 (-1,232)	-10 (-45)
2014/15	1,198 (1,228)	-1,524 (-1,445)	-326 (-217)
2015/16	1,190 (1,261)	-1,729 (-1,730)	-539 (-469)

Table 10: Gini coefficients of British Columbians’ adjusted market, total, and post-tax incomes and year-over-year percentage changes, 2000–2015. From Statistics Canada Table II-10-1034-01 and author’s calculations.

Year	Market	Change from year before	Total	Change from year before	Post-tax	Change from year before
2000	0.427	—	0.353	—	0.312	—
2001	0.439	+2.8%	0.366	+3.7%	0.328	+5.1%
2002	0.454	+3.4%	0.378	+3.3%	0.341	+4.0%
2003	0.437	-3.7%	0.360	-4.8%	0.324	-5.0%
2004	0.437	0	0.363	+0.8%	0.328	-1.2%
2005	0.432	-1.1%	0.364	+0.3%	0.325	-0.9%
2006	0.420	-2.8%	0.355	-2.5%	0.320	-1.5%
2007	0.410	-2.4%	0.349	-1.7%	0.314	-1.9%
2008	0.409	-0.2%	0.346	-0.9%	0.311	-1.0%
2009	0.424	+3.7%	0.355	+2.6%	0.321	+3.2%
2010	0.429	+1.2%	0.357	+0.6%	0.322	+0.3%
2011	0.420	-2.1%	0.346	-3.1%	0.312	-3.1%
2012	0.418	-0.5%	0.347	+0.3%	0.313	-0.3%
2013	0.419	+0.2%	0.352	+1.4%	0.318	+1.6%
2014	0.414	-1.2%	0.346	-1.7%	0.308	-3.1%
2015	0.416	+0.5%	0.343	-0.9%	0.312	+1.3%

The data also show that income inequality did not move much with time. All three of the categories in Table 10 above saw more years in the pre-tax period than the with-tax period where income inequality declined, as well as vice versa when it rose. Conversely, however, the average Gini coefficients for market, total, and post-tax income in the fully pre-tax period from 2001 to

2007 are, respectively, 0.433, 0.362, and 0.326 versus with-tax-period figures from 2009 to 2015 of 0.420, 0.349, and 0.315. By all three measurements, income inequality therefore declined during the with-tax period relative to the pre-tax period, including 3.002 per cent, 3.591 per cent, and 3.374 per cent declines in inequalities of market, total, and post-tax income. Figures 14 through 19 show market, post-tax, and total Gini coefficients in B.C., first from 2001, second from 2008 by each measurement; Tables II through 13 show the estimated statistical correlations of the introduction and increase in the tax on the Gini coefficient, measured by market, post-tax, and total income, in percentage points.

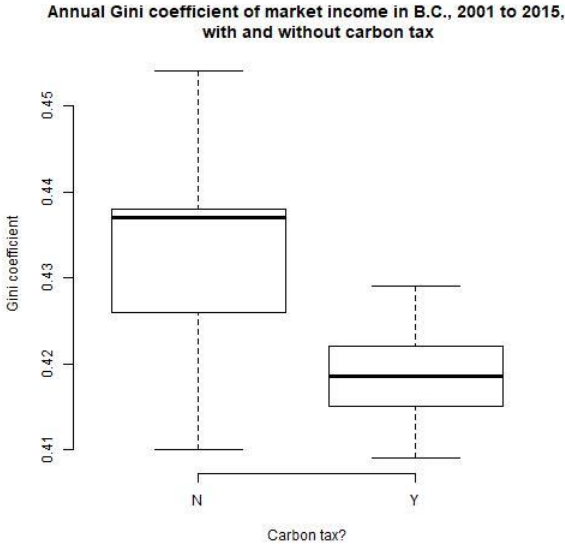


Figure 14

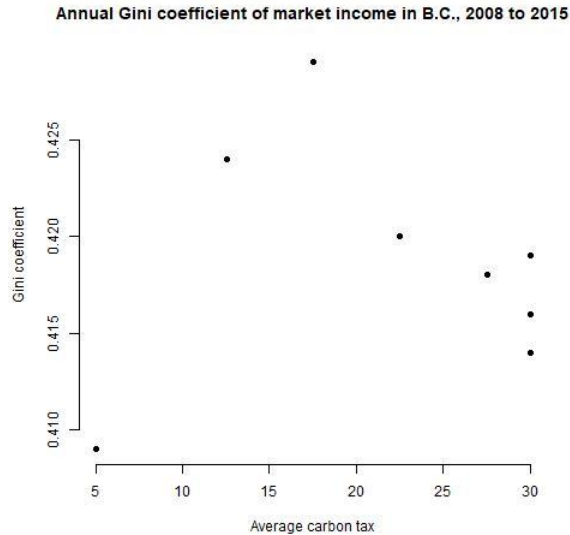


Figure 15

Table II: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s Gini coefficient of market-level income inequality in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s Gini coefficient of market-level income inequality in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.014	-0.026, -0.002	0.024	0.285
Additional dollar of carbon tax	+1.322*10 ⁻⁵	-0.0006, +0.0007	0.962	-0.166

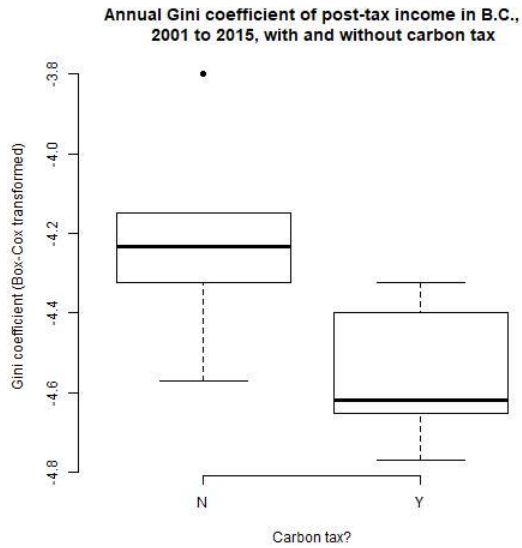


Figure 16

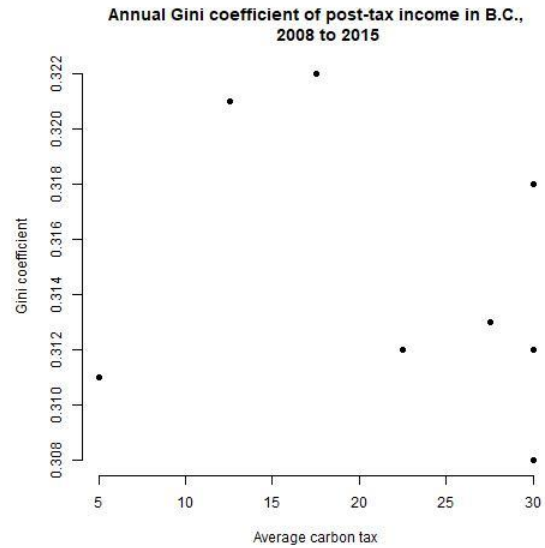


Figure 17

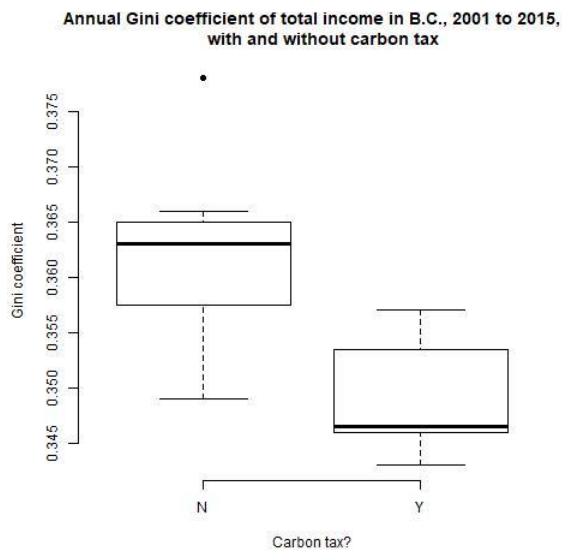


Figure 18

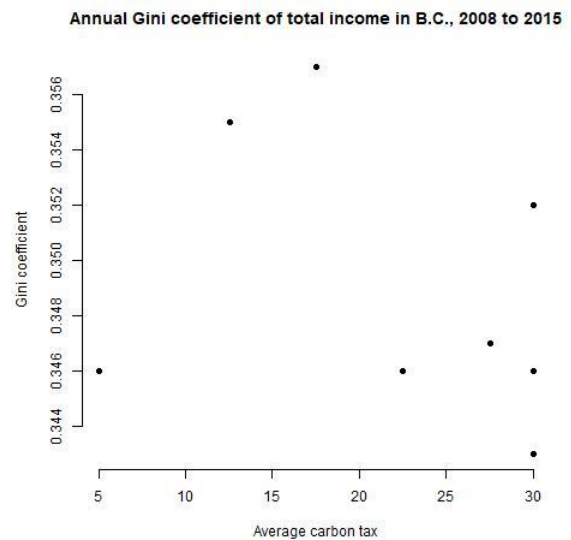


Figure 19

Table 12: Estimated correlations of the introduction of B.C.'s carbon tax on B.C.'s Gini coefficient of post-tax income inequality in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.'s Gini coefficient of post-tax income inequality in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.011	-0.019, -0.004	0.008	0.391
Additional dollar of carbon tax	-0.0001	-0.0007, +0.0004	0.522	-0.083

Table 13: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s Gini coefficient of total income inequality in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s Gini coefficient of total income inequality in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.013	-0.212, -0.005	0.004	0.449
Additional dollar of carbon tax	-0.0002	-0.0007, +0.0003	0.455	-0.055

4.2.4: Employment

Employment crosses boundaries between economic and social spheres. Yamazaki’s (2017) study of B.C. from 2001 to 2013 finds that aggregate net employment rose by 75,000 jobs between 2007 and 2013, whereas a counterfactual plot of the same without the tax saw it rise by only 12,000, shown in Figure 6; however, my calculations indicate that he misstates the numbers from Statistics Canada’s Table 14-13-0327-01. In this regard, Table 14 suggests that net raw employment in B.C. in fact evinced only 59,600 more net jobs in 2013 than in 2007, over the whole with-tax period under study, while B.C.’s net number of employed people rose by about 115,000. Yamazaki (Ibid.) suggests the net employment effect of the tax is positive over this period: increased supply and demand for labour across non-EITE sectors outweigh cuts to same across EITE sectors. In non-EITE sectors, the redistribution effect caused by the lowering of taxes on labour and capital, increasing both supply and demand for labour, exceeds the output effect caused by the fall in production, which cuts demand for employment. On the other hand, Yamazaki (Ibid.) also finds small falls in wages.

Table 14: Employment (M), labour force participation (P), and unemployment (U) rates and numbers of employed persons 15 years of age or older in thousands (kJ) in B.C. by year, 2000–2015. From Statistics Canada Table 14-10-0327-01, British Columbia (2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008b, 2009b, 2010b, 2011a, 2012a, 2013a, 2014a, 2015a, 2016, 2017, 2018, 2019, 2020), and author’s calculations. Note: Where the B.C. government’s percentages differ slightly from the federal government’s, I defer to the latter.

Year	M rate	Change from year before	P rate	Change from year before	U rate	Change from year before	kJ	Change from year before
2000	0.602	—	0.648	—	0.072	—	1,930.8	—
2001	0.591	-1.1pp	0.640	-0.8pp	0.077	+0.5pp	1,920.9	-9.9
2002	0.595	+0.4pp	0.650	+1.0pp	0.085	+0.8pp	1,952.4	+31.5
2003	0.603	+0.8pp	0.655	+0.5pp	0.080	-0.5pp	1,998.1	+45.7
2004	0.605	+0.2pp	0.653	-0.2pp	0.072	-0.8pp	2,028.3	+30.2
2005	0.616	+1.1pp	0.654	+0.1pp	0.059	-1.3pp	2,089.7	+66.4
2006	0.622	+0.6pp	0.653	-0.1pp	0.048	-1.1pp	2,140.8	+51.1
2007	0.632	+1.0pp	0.660	+0.7pp	0.043	-0.5pp	2,206.0	+65.2
2008	0.632	0	0.662	+0.2pp	0.046	+0.3pp	2,241.9	+35.9
2009	0.607	-2.5pp	0.658	-0.4pp	0.077	+3.1pp	2,191.9	-50.0
2010	0.607	0	0.657	-0.1pp	0.076	-0.1pp	2,223.0	+31.1
2011	0.602	-0.5pp	0.651	-0.6pp	0.075	-0.1pp	2,227.8	+4.8
2012	0.604	+0.2pp	0.648	-0.3pp	0.068	-0.7pp	2,262.5	+34.7
2013	0.598	-0.6pp	0.640	-0.8pp	0.066	-0.2pp	2,265.6	+3.1
2014	0.595	-0.3pp	0.633	-0.7pp	0.061	-0.5pp	2,278.4	+12.8
2015	0.595	0	0.634	+0.1pp	0.062	+0.1pp	2,306.2	+27.8

In considering this, Yip (2018) focusses on changes in unemployment rates. The average number of weekly working hours per person and the labour force participation rate incurred no statistically significant changes at the aggregate level, but the unemployment rate did: Yip contends that the tax itself caused unemployment rates to rise 1.2 to 1.3 per cent, and each additional dollar of the tax contributed to an unemployment rate 4.3 to 4.6 percentage points higher (Yip, 2018: his Table 2, p. 141). Yip (2018) finds that after the tax was introduced in July 2008, the unemployment rate rose the most, and very significantly, for low- and moderately educated men of working age (2.4 and 1.4 percentage points respectively—his Table 3, p. 142). He measures the period from July 2005 to July 2015, so his control period is limited to no more than an equivalent timespan to the tax’s presence at \$30/tCO₂e. Figures 20 through 27 show in contrast to this the thousands of employed people, labour-force participation, employment, and unemployment rates in B.C., first from

2001, second from 2008. My analysis of the unemployment rate specifically is that it did not change by a large or statistically significant amount in the with-tax period relative to the pre-tax period from 2001 across the whole population (see Tables 15 through 18 for estimated statistical effects on numbers of employed people and employment, participation, and unemployment rates). I have not measured effects on labour market indicators beyond B.C.'s whole population.

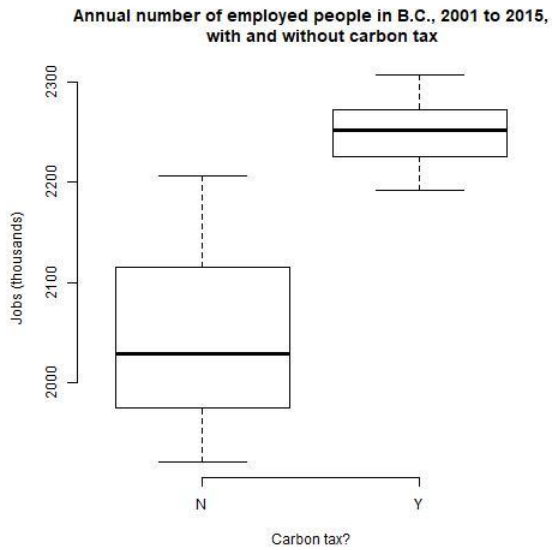


Figure 20

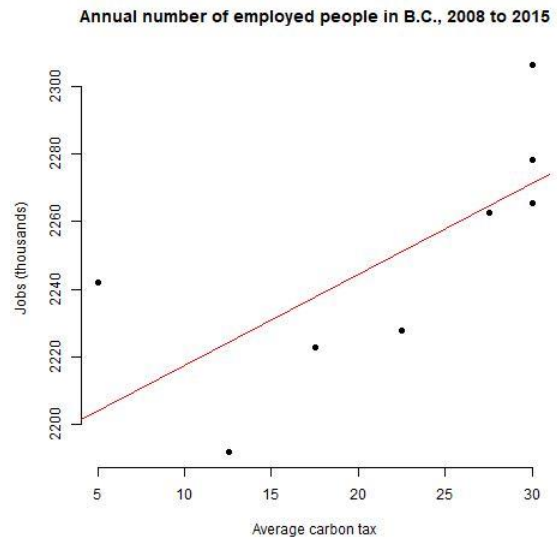


Figure 21

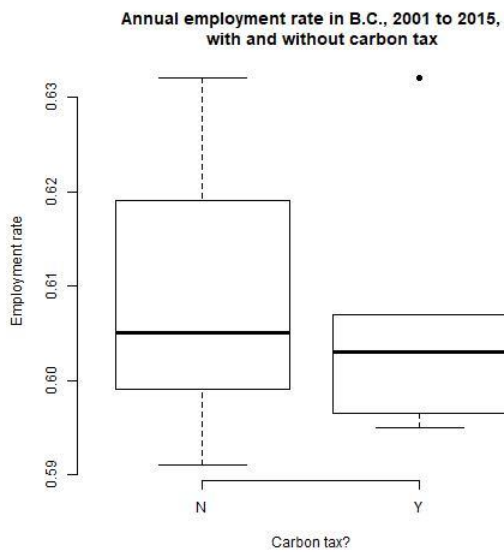


Figure 22

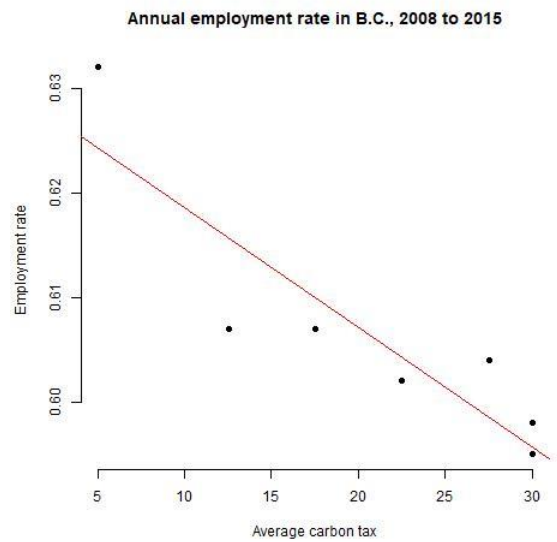


Figure 23

Annual workforce participation rate in B.C., 2001 to 2015, with and without carbon tax

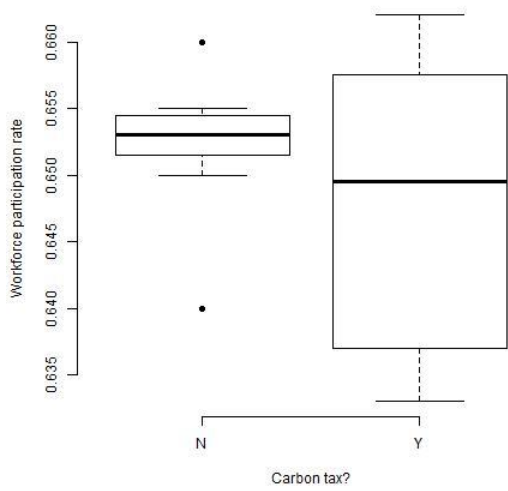


Figure 24

Annual workforce participation rate in B.C., 2008 to 2015

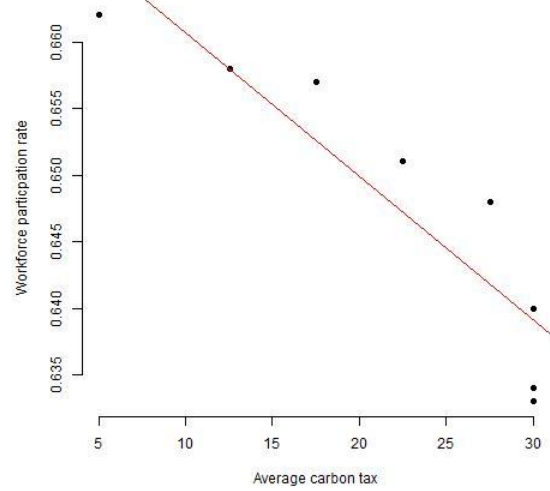


Figure 25

Annual unemployment rate in B.C., 2001 to 2015, with and without carbon tax

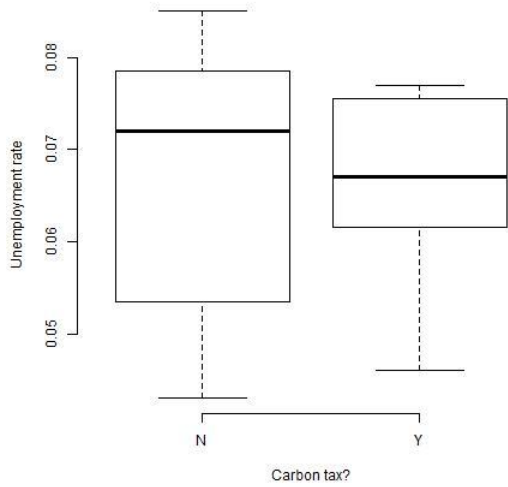


Figure 26

Annual unemployment rate in B.C., 2008 to 2015

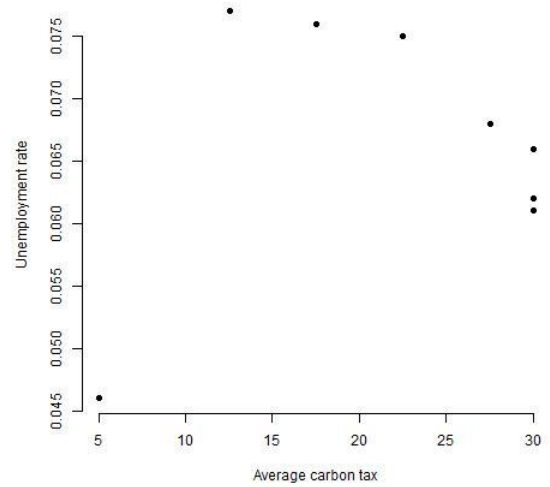


Figure 27

Table 15: Estimated correlations of the introduction of B.C.’s carbon tax on the number of jobs in B.C. in thousands (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the number of jobs in B.C. in thousands.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+201.630	+118.128, +285.140	0.0002	0.652
Additional dollar of carbon tax	+2.688	-0.016, +5.391	0.051	0.413

Table 16: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s employment rate in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s employment rate in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.004	-0.019, +0.011	0.559	-0.048
Additional dollar of carbon tax	-0.001	-0.002, -0.0006	0.0002	0.783

Table 17: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s labour force participation rate in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on B.C.’s labour force participation rate in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.004	-0.015, 0.006	0.386	-0.014
Additional dollar of carbon tax	-0.001	-0.0016, -0.0006	0.002	0.795

Table 18: Estimated correlations of the introduction of B.C.’s carbon tax on B.C.’s unemployment rate in percentage points (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on unemployment rate in percentage.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+8.929*10 ⁻⁵	-0.015, +0.015	0.99	-0.077
Additional dollar of carbon tax	+0.0002	-0.0009, +0.001	0.639	-0.121

4.2.5: Economic ‘Greening’

The agricultural and natural resources-related sectors are relatively emissions-intensive. Economic greening could mean that B.C.’s economy became less dependent on these sectors or that they reduced their emissions. By the first definition, which is the one I use, B.C. made a small amount of progress again towards ‘greening’ its economy. Tables 19 and 20 show the differences in GDP and employment owed to these sectors, which produce primary goods, year over year.

There is mixed evidence on the tax’s effect on the agricultural economy. Rivers and Schaufele (2015b) find that the tax’s effect on B.C.’s agricultural trade was “statistically indistinguishable from zero” (p. 247). Eleven of twelve crops considered during the with-tax period had no major drop in export or import volumes during the study period, except oats, of which B.C. imported

48.2 per cent less by volume and which it did not even produce en masse (p. 249). Because agriculture is emissions-intensive and trade-exposed (EITE), or at least uses large amounts of fuel, this suggests that the relatively small tax did not reduce its contributions to GDP much. Conversely, Olele et al. (2019) find that the tax reduced net farm incomes in B.C. by 8.3 to 11.6 cents per dollar of farm receipts, relative to the rest of Canada, between the 2001–07 and 2009–15 periods and raised net costs for farms in B.C. relative to the rest of Canada by 11.6 cents per dollar of farm receipts over the same periods (pp. 613, 614).

Table 19: Annual amounts (in millions of dollars) and percentages of British Columbia’s industry-based GDP related to natural resources (agriculture, forestry, fishing, hunting [AFFH]; mining, quarrying, and oil and gas extraction [MQOG]), fiscal years 2000–2015. Based on Statistics Canada Table 36-10-0402-01 (adaptations of which appear in British Columbia [2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008b; 2009b; 2010b; 2011a; 2012a; 2013a; 2014a; 2015a; 2016; 2017; 2018; 2019; 2020]). N.B.: I calculate lower shares of GDP from resources than the provincial government sources, perhaps because the provincial government counts “support activities for agriculture and forestry” twice, and I follow the provincial government in grouping MQOG but group AFFH on the grounds that these can be renewable activities, while MQOG extraction is not.

Year	AFFH GDP	MQOG GDP	Resources GDP	GDP	Resources share of GDP	Change from year before
2000	4693.0	7897.0	12590.0	154965.9	0.081	—
2001	4891.6	8856.2	13747.8	155830.5	0.088	+8.6%
2002	4884.8	8158.1	13042.9	161762.2	0.081	-8.6%
2003	5039.0	8014.8	13053.8	165799.6	0.079	-2.4%
2004	5431.5	8392.0	13823.5	172580.4	0.080	+1.0%
2005	5502.9	9381.5	14884.4	180855.0	0.082	+2.7%
2006	5488.7	9409.6	14898.3	189185.8	0.079	-4.3%
2007	5463.1	8195.5	13658.6	194682.7	0.070	-11.1%
2008	4996.5	8429.0	13425.5	195789.1	0.069	-2.3%
2009	4525.1	7547.7	12072.8	190709.2	0.063	-7.7%
2010	4917.3	8586.5	13503.8	195819.3	0.069	+8.9%
2011	5335.4	9217.5	14552.9	201413.0	0.072	+4.8%
2012	5343.3	8941.8	14285.1	206590.7	0.069	-4.3%
2013	5656.4	9187.9	14844.3	211555.3	0.070	+1.5%
2014	5660.7	9728.5	15389.2	219060.9	0.070	+0.0%
2015	5891.2	9422.7	15313.9	224153.4	0.068	-2.8%

Table 20: Numbers of jobs in thousands, total and in AFFH and MQOG sectors, and AFFH and MQOG percentages of employment in B.C., fiscal years 2000–2015. Based on Statistics Canada Table 14-10-0202-01 (also found in British Columbia [2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008b; 2009b; 2010b; 2011a; 2012a; 2013a; 2014a; 2015a; 2016; 2017; 2018; 2019; 2020]).

Year	AFFH jobs	MQOG jobs	Resources jobs	Jobs	Resources share of jobs	Change from year before
2000	69.5	12.8	82.3	1,930.8	0.043	—
2001	55.4	11.4	66.8	1,920.9	0.035	-18.4%
2002	58.0	9.2	67.2	1,952.4	0.034	-1.0%
2003	64.6	13.1	77.7	1,998.1	0.039	+13.0%
2004	60.4	11.3	71.7	2,028.3	0.035	-9.1%
2005	62.0	13.8	75.8	2,089.7	0.036	+2.6%
2006	59.3	19.1	78.4	2,140.8	0.037	+0.1%
2007	61.9	19.7	81.6	2,206.0	0.037	+0.1%
2008	53.1	24.5	77.6	2,241.9	0.035	-6.4%
2009	47.6	23.6	71.2	2,191.9	0.032	-6.2%
2010	48.0	23.4	71.4	2,223.0	0.032	-0.1%
2011	41.6	24.8	66.4	2,227.8	0.030	-7.2%
2012	41.8	25.1	66.9	2,262.5	0.030	-0.1%
2013	47.2	27.6	74.8	2,265.6	0.033	+11.7%
2014	45.5	28.7	74.3	2,278.4	0.033	-1.2%
2015	43.2	27.4	70.6	2,306.2	0.031	-6.1%

In the pre-tax period, the economic baskets under examination, which produce agricultural goods and natural resources, collectively contributed their highest shares of B.C.'s GDP in 2001 and employment in 2003, and their lowest share of GDP in 2007 and employment in 2003. In the with-tax period, they contributed their highest shares in 2011 (GDP) and 2013 (employment); their lowest in 2009 (GDP) and 2012 (employment). The 2007 percentage of GDP owing to these high-emitting resource sectors was lower than its counterparts in only three with-tax years: 2011, 2013 and 2014. The second-lowest year for resources' percentage share of GDP in the pre-tax period, 2003, was higher than in all years in the fully-with-tax period, while all the annual employment percentages for resources in the with-tax period are lower than those in the fully pre-tax period. Its percentages in 2008, when the tax was introduced, are seventh lowest for employment but third lowest for GDP. The immediate production of natural resources and agriculture contributes averages of 8.0 per cent of B.C.'s GDP and 3.6 per cent of all employment in the pre-tax period and

6.9 per cent of GDP and 3.1 per cent of employment in the with-tax period. This suggests that the economy of B.C. became less dependent as a percentage on natural resources and agriculture after the carbon tax was introduced, though not necessarily due to it. Figures 28 through 35 show the numbers and proportions of GDP in dollars and jobs in B.C. derived from natural resources and agriculture, first from 2001, second from 2008, and Tables 21 through 24 show the expected statistical correlations between the introduction and increase of the carbon tax and changes in the numbers and proportions of GDP in dollars and jobs in B.C. derived from natural resources and agriculture.

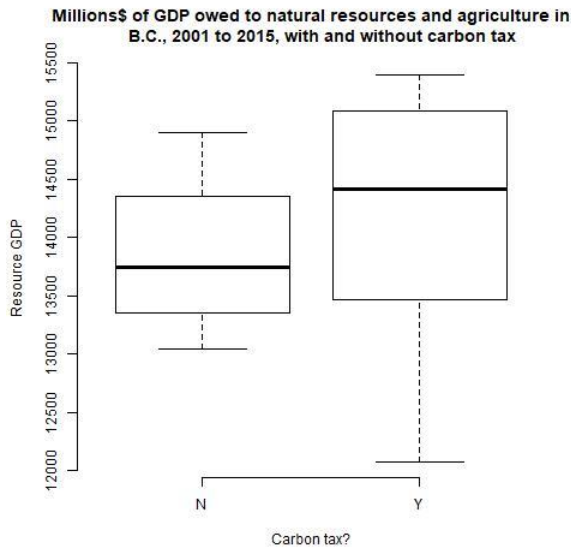


Figure 28

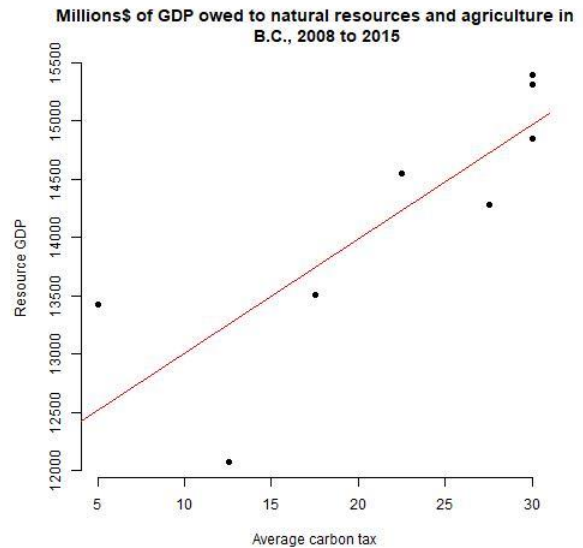


Figure 29

Table 21: Estimated correlations of the introduction of B.C.’s carbon tax on the amount of GDP from natural resources and agricultural production in B.C. in millions of CAD chained to 2012 values (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the amount of GDP from natural resources and agricultural production in B.C. in millions of CAD chained to 2012 values.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+300.7	-787.082, +1,388.443	0.561	-0.048
Additional dollar of carbon tax	+97.71	+29.650, +165.774	0.013	0.618

Percentage of GDP owed to natural resources and agriculture in B.C., 2001 to 2015, with and without carbon tax

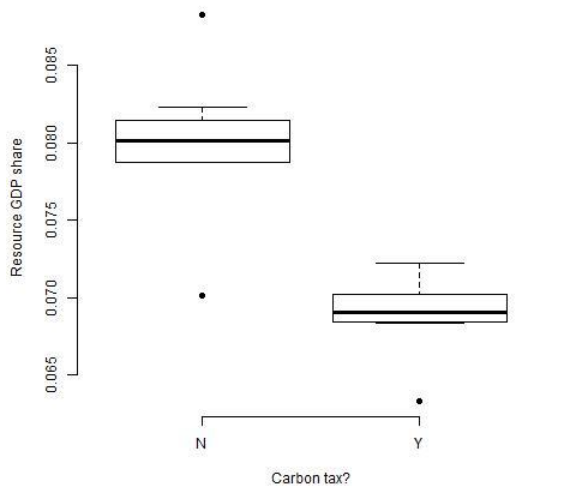


Figure 30

Percentage of GDP owed to natural resources and agriculture in B.C., 2008 to 2015

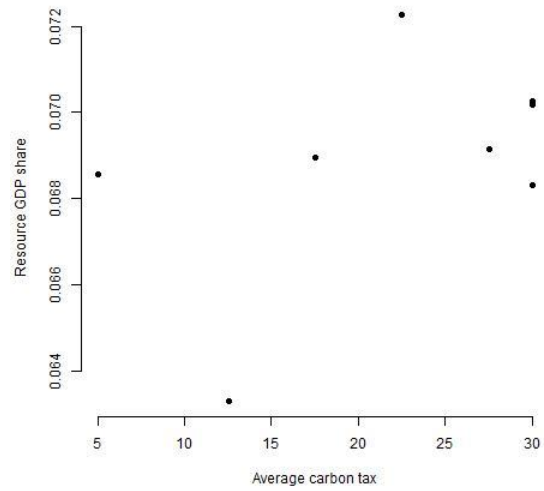


Figure 31

Annual number of people employed in natural resources and agriculture in B.C., 2001 to 2015, with and without carbon tax

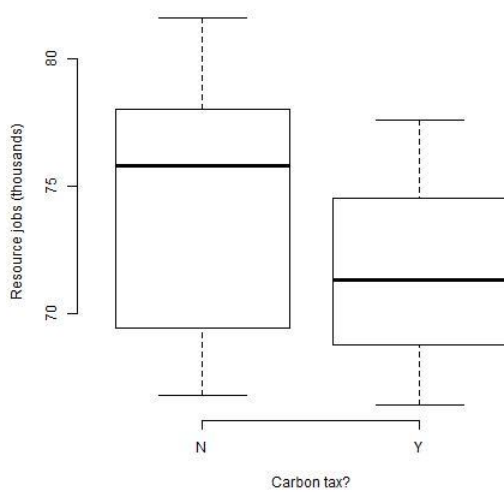


Figure 32

Annual number of people employed in natural resources and agriculture in B.C., 2008 to 2015

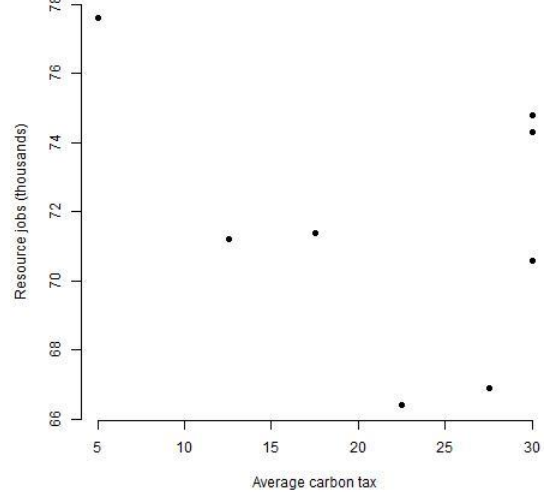


Figure 33

Table 22: Estimated correlations of the introduction of B.C.'s carbon tax on the percentage of GDP from natural resources and agricultural production in B.C. by year (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the percentage of GDP from natural resources and agricultural production in B.C. by year.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.011	-0.016, -0.006	0.0002	0.646
Additional dollar of carbon tax	+0.0001	-0.0001, +0.0004	0.254	0.078

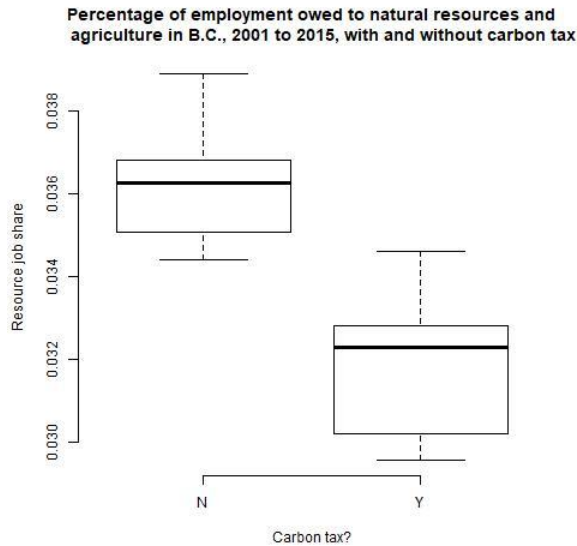


Figure 34

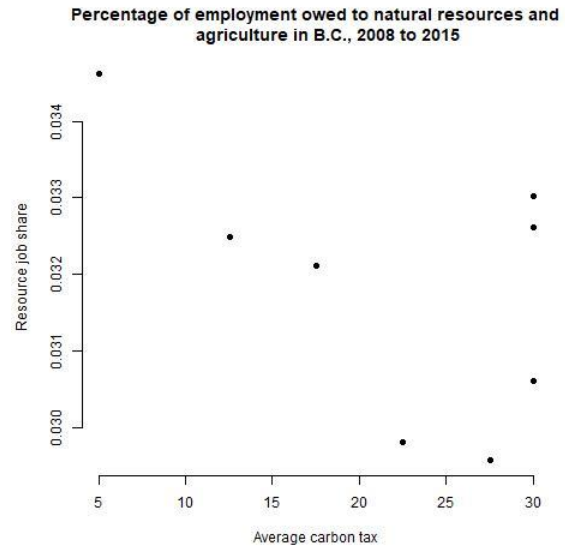


Figure 35

Table 23: Estimated correlations of the introduction of B.C.’s carbon tax on the numbers of jobs from natural resources and agricultural production in B.C. in thousands (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the numbers of jobs from natural resources and agricultural production in B.C. in thousands.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-2.521	-7.902, +2.859	0.330	0.0002
Additional dollar of carbon tax	-0.139	-0.524, +0.245	0.409	-0.031

Table 24: Estimated correlations of the introduction of B.C.’s carbon tax on the percentage of employment from natural resources and agricultural production in B.C. by year (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the percentage of employment from natural resources and agricultural production in B.C. by year.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	-0.004	-0.006, -0.002	0.0002	0.642
Additional dollar of carbon tax	-0.0001	-0.0002, +5.356*10 ⁻⁵	0.162	0.181

Both Canada and B.C. also decoupled their economic growth from their emissions to a degree. Table 25 below shows that during the years studied when B.C. had a carbon tax, the national and provincial averages of dollars added to GDP per tonne of CO₂e emitted rose. During the with-tax portion of the study period, counting 2008, B.C.’s economy generated an average of 3,692.255CAD

per tonne of CO₂e, while not counting 2008, its economy generated an average of 3,744.427CAD per tonne of CO₂e. Given its 2001–2007 average of 3,312.671CAD per tonne of CO₂e, its economic CO₂e efficiency rose by 11.5 per cent including 2008 and 13.0 per cent not including 2008. Additionally, B.C.’s economic CO₂e efficiency exceeded Canada’s in all years of the study period as well as 2000. Figures 36 and 37 and Table 26 show the estimated statistical changes in B.C.’s economic CO₂e efficiency in dollars per tonne of CO₂e from the inception of and increase in the carbon tax.

Table 25: Economic GHG efficiency in Canada and British Columbia per year, in dollars per tonne of CO₂e, 2000–2015. Based on Environment Canada (2019), Statistics Canada Table 36-10-0222-01, and author’s calculations.

Year	Canada	Per cent change from year before	B.C.	Per cent change from year before
2000	1973.396	—	2560.427	—
2001	2038.106	+3.3%	2526.149	-1.4%
2002	2089.156	+2.5%	2751.654	+8.9%
2003	2074.605	-0.7%	2820.643	+2.5%
2004	2135.529	+2.9%	2853.694	+1.2%
2005	2225.443	+4.2%	3087.966	+8.0%
2006	2293.458	+3.1%	3249.157	+5.2%
2007	2358.910	+2.9%	3339.010	+2.8%
2008	2314.253	-1.9%	3327.049	-0.4%
2009	2434.604	+5.2%	3418.762	+2.8%
2010	2476.960	+1.7%	3587.548	+4.9%
2011	2514.547	+1.5%	3661.828	+2.1%
2012	2547.789	+1.3%	3773.452	+3.0%
2013	2577.656	+1.2%	3771.134	-0.1%
2014	2661.963	+3.3%	3921.987	+4.0%
2015	2677.521	+0.6%	4076.281	+3.9%

Table 26: Estimated correlations of the introduction of B.C.’s carbon tax on the economic efficiency of B.C. in dollars of GDP (chained to 2012 values) per tonne of CO₂e over the background study period (2008–2015 versus 2001–2007) and the per-dollar increase in with-tax period 2008–2015 on the economic efficiency of B.C. in dollars of GDP (chained to 2012 values) per tonne of CO₂e.

Variable	Estimated effect size	Confidence interval (95%)	P-value	R ²
New carbon tax	+745.4	+445.034, +1,045.684	0.0001	0.665
Additional dollar of carbon tax	+24.547	+14.790, +34.304	0.0008	0.841

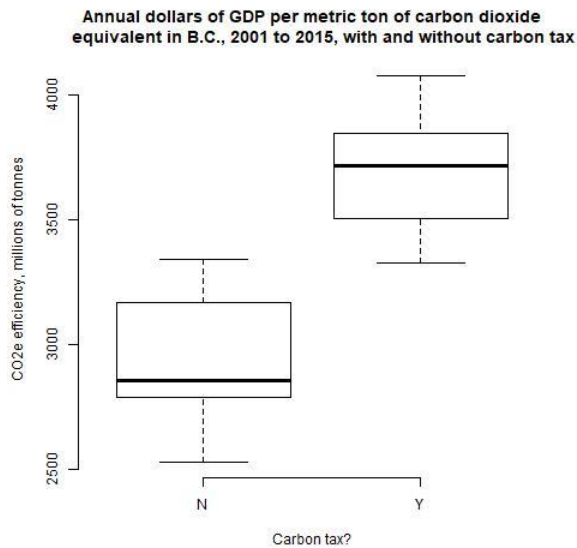


Figure 36

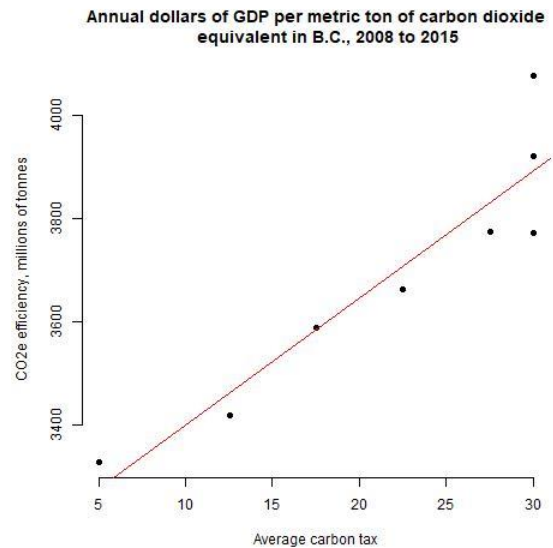


Figure 37

4.3: Popular Opinion about the Carbon Tax

4.3.1: Early Days

While most reviewers have found the B.C. carbon tax to be somewhat successful, people in B.C.'s rural and northern communities have long criticized it (Peet and Harrison, 2012; Harrison, 2013). Observers noticed their opposition more strongly because “the governments of Vancouver and surrounding cities in the Lower Mainland [Vancouver’s suburbs and bedroom communities] were largely silent” (Peet and Harrison, 2012: p. 97). This was despite the expectation that Lower Mainland residents would end up paying more than northern and rural dwellers and would therefore have more incentive to oppose the policy change (Ibid.). Lower Mainlanders drove personal vehicles more than twice as far per person per trip as northerners (Ibid.). Indeed, voters in southwestern B.C. disapproved of the tax only slightly less than voters in the north did (Beck, Rivers, and Yonezawa, 2016). Citizens of Maple Ridge and Delta in the Lower Mainland did complain, albeit because they thought their hometowns would not get their ‘fair share’ of the tax monies back (Peet and Harrison, 2012).

As Peet and Harrison (2012) posit, people's views on the tax are based on factors including the desire to do what they thought was right and to follow their worldview, factors that may be common to people within and outside the provincial government. Politicians take stances mainly because they must be elected to act (Ibid.). Similarly, a highly engaged minority of citizens and the government advocate policies, while the disengaged majority assume they will reap rewards from the policies (Ibid.). Because voters would see the carbon tax shift's harms but not its benefits clearly, however, they were liable to oppose it no matter where they lived (Ibid.).

Peet and Harrison (2012) argue that politicians from B.C.'s northern interior interpreted the shift as a continuation of the provincial government's habit of favouring the major cities, Vancouver and Victoria. Many northern politicians followed their constituents, who were disproportionately rural, working-class, and politically conservative, in opposing the carbon tax (Ibid.). Northerners framed their opposition in economic terms, explaining their greater need for fuel to heat buildings and drive larger vehicles longer distances (Ibid.),* which Beck, Rivers, and Yonezawa (2016) and Lawley and Thivierge (2018) confirm. They also claimed, however, that the provincial government had not consulted them extensively about it (Peet and Harrison, 2012). Ideology, the social milieu, and pre-existing ideas overrode expert knowledge (Beck, Rivers, and Yonezawa, 2016; Rhodes, Axsen, and Jaccard, 2014). While many associate anti-government sentiments mainly with the political right, the opposition NDP led an "Axe the Tax" campaign in the 2009 provincial election (Harrison, 2012). Peet and Harrison (2012) quote Bob Simpson, the then NDP member of the Legislative Assembly (MLA) for the electoral district of Cariboo North in B.C.'s

*This is likely because population is more dispersed in the north. Farrell (2017) shows that in the Republic of Ireland, whose population centres roughly on the capital, Dublin, there is a general inverse correlation between proximity to the capital and fuel use. On average, people in the southern, mid-western, and mid-eastern environs of Dublin use 37.5 per cent more motor fuel than in the city proper, while those further outside the city use 62.6 per cent more motor fuel on average (Ibid.: Table 2, p. 36). Farrell suggests that a more scattered population and the higher driving rates to which that leads may be responsible for this phenomenon (Ibid.).

north-central interior, saying: “[Using fuel] is not a lifestyle choice” (p. 104). In this telling, northern and rural British Columbians, that is, used fuel with the strictly utilitarian goal of making the microclimate more livable and while driving for necessities.

4.3.2: After the Growing Pains

Shortly before the carbon tax was scheduled to reach the Liberals’ self-imposed ceiling, it became more popular, though polled British Columbians’ responses were mixed and often revealed the prevalence of ignorance. Horne (2011) found that 70 per cent of respondents wanted B.C. to help politically lead the fight against climate change to some degree. Thirty-six and 44 per cent of respondents said that reducing GHG emissions would be beneficial and neutral, respectively, for B.C.’s economy (Ibid.). Sixty-nine per cent of respondents wanted a uniform application of carbon tax to all sources of GHGs (Ibid.). Seventy-one per cent of respondents ranked the carbon tax among their top three choices for how the B.C. government should raise revenue (Ibid.). More respondents said they would like additional carbon tax revenue to fund other government services (56 per cent) or pollution-reduction initiatives (49 per cent) than do anything that was associated with the shift policy (individual income tax cuts, 40 per cent; low-income-resident relief, 36 per cent; corporate income tax cuts, 4 per cent—Ibid.).

Rhodes and Horne (2014) interviewed 39 British Columbians about the tax shift. Seven respondents thought it had had very positive effects, while 18 thought it had had somewhat positive effects. More interviewees could name potential positive economic than environmental impacts—32 versus 26 (Ibid.).* An even larger percentage majority than in Horne (2011) said they would like

*These included expanding the green technology and energy sectors, a ‘virtue signal’ to green-minded professionals, and the double dividend. However, 30 interviewees also named potential negative impacts, including declining output from “cement, forest products, greenhouse growers and mining” (Ibid., p. 163), the “competitive disadvantage” (Ibid., p. 164), added costs imposed on B.C. producers as well as GHG-intensive and unprofitable businesses, and personal bills exceeding rebates (Loc. cit.).

to see carbon-tax revenue used to fund direct carbon-cutting programs—32 out of 39 participants, or 82 per cent (Rhodes and Horne, 2014). While the tax became more popular with British Columbians overall, however, it remained unpopular in rural communities.* At least as late as 2014 (Beck, Rivers, and Yonezawa, 2016), majorities of northern citizens surveyed echoed their representatives' opposition to the carbon tax.

4.3.3: Today

Over the period from December 2020 to March 2021, I called people in three B.C. communities, Coquitlam, Smithers, and Elkford, asking for telephone interviews about the carbon tax, as outlined in Chapter 3. I asked each participant their age range, gender identity, education level, where they or other members of their household worked, and several questions about their opinions regarding B.C.'s carbon tax (see Appendices A and B for a full list of questions and responses to question 14, which deals with their opinions about the concept of sustainable development).

Five of 24 participants (21 per cent) said they would prefer a higher carbon tax to what they had, while another five said they would prefer an equivalent tax; ten participants (42 per cent) said they would prefer a lower tax, and the remaining four (17 per cent) were unsure. Smithers, participant 8 (2021, 12 February, personal communication—pers. comm.) said, “I don’t think I should be paying it at all, because I don’t think it makes a [expletive deleted] of a lot of difference, except gives them—grabs the tax, more money, and gets the government more money.” Some participants from Smithers and Elkford hinted at hinterland, and in the former case also northern, alienation in response to this question when explaining why they wanted a lower carbon tax: for example, Smithers, participant 3 (2021, 13 January, pers. comm.) noted, “the provincial and federal government, they all live in cities, they all live in the south, they don’t really address our issues up here.”

*Beck, Rivers, and Yonezawa (2016) define rural communities in B.C. as those having “[fewer] than 100,000 residents” (p. 133).

Elkford, participant 2 (2021, 8 January, pers. comm.) said, “[The tax] makes it very difficult for the rural areas. ... We’re being discriminated against. [...] It’s centralized government; they want to do what they want to do in Vancouver, Victoria, and we really have no say.”

All eight participants from Elkford cited coal mining as the dominant industry in their town, while the participants from Smithers collectively (not all) named forestry, agriculture, mining, tourism, and transportation. Four participants from Coquitlam could not name a dominant industry; the other four said the service sector was important, and Participant 8 (2021, 18 March, pers. comm.) specified tourism. Relatedly, though ten of 24 participants (42 per cent) were retired, all eight participants from Elkford said they or someone else in their household worked in one of the nearby coal mines at the time of interviewing, including four who were retired therefrom; one participant each from Smithers said they had worked around forestry, mining, and fishing; and two participants from Coquitlam were retired from the oil-and-gas industry, specifying having worked in the Northwest Territories exploring for it (Participant 1: 2021, 4 January, pers. comm.) and selling it (Participant 5: 2021, 30 January, pers. comm.). Nine participants (38 per cent) claimed the carbon tax’s effect on their community’s dominant industry was net-negative, another nine claimed it was net-neutral, two (8 per cent) said it had net positive effects, and four (17 per cent) were unsure. One of the two participants who cited positive effects of the carbon tax on industry was Elkford, participant 1 (2020, 10 December, pers. comm.); they said that they believed it helped encourage changes in behaviour among large and heavily emitting enterprises.

Eighteen participants (75 per cent) said they were using more fuel than twelve years prior; three each (13 per cent) said they were using about as much fuel as before or were unsure. Coquitlam, participant 3 (2021, 21 January, pers. comm.) was the only participant who claimed the carbon tax had played a causal role in their driving reduction, and cited concern about the fuel costs associated

with their previous vehicle and need for a new vehicle at the same time as having also played a role. Nineteen participants said they had driven less than in previous years, but except for Coquitlam, participant 3, no participants cited the carbon tax as the reason for this; they all cited other factors, most often retirement and the COVID-19 pandemic. In Elkford and Smithers, participants cited the low density of services and remoteness from other communities as reasons why driving was necessary:

Elkford is an extremely small community, and we live at, literally, the end of the road. (Elkford, participant 8, 2021, 21 February, pers. comm.)

If I have to go to the hospital, I have to drive; I have to drive for forty-five minutes. (Elkford, participant 2, 2021, 8 January, pers. comm.)

[E]verything is on the outskirts [of town], too, so you might go to visit somebody out there, like five miles out of town. (Smithers, participant 4, 2021, 17 January, pers. comm.)

Lack of mass or active transportation was a common factor that often made driving necessary in all three communities: Coquitlam, participant 1 (2021, 4 January, pers. comm.) said that “if you want to go to New Westminster and back, it takes you half a day [just to] take the bus ... there’s no service.” Coquitlam, participant 4 (2021, 28 January, pers. comm.) added that Greater Vancouver’s SkyTrain only reached the edges of Coquitlam. Elkford, participant 8 (2021, 21 February, pers. comm.) noted, “in the city, you have a lot more options [about how to transport people].” Smithers, participant 2 (2020, 23 December, pers. comm.) said, “In our town, there is not public transit”, nor “a lot of sidewalks”. Twenty-three of 24 participants (97 per cent) reported needing to drive to visit friends and relatives or to go to work, including four (17 per cent) who had to drive for both purposes; the exception was Smithers, participant 1, who said (2020, 14 December, pers.

comm.) that in 2015, their family had “moved into town so we could walk almost everywhere”, having previously lived more remotely. Coquitlam, participant 7 (2021, 11 March, pers. comm.) said, “[T]he kind of work that I do is really specialized, so ... I don’t really have a lot of choice in location [of employment]”; noting they had “probably ended up driving more” recently because of changing jobs to a location further from their residence. A fact I had not expected to learn in Elkford was that Teck Industries, which operates most of the nearby coal mines, operates buses thereto which transports employees to work, and that many of the buses were electric. Elkford, participant 3 (2021, 11 January, pers. comm.) estimated that “the majority ... seventy-five, eighty per cent of them are riding the bus”, including themselves.

Every participant had at least one motor vehicle, and participant 3 from Coquitlam (2021, 21 January, pers. comm.) was the only one who mentioned having an electric car. Thirteen participants (54 per cent), including seven from Coquitlam, were from households with multiple vehicles. Twenty-three participants answered directly whether they had switched to more fuel-efficient vehicles in the previous twelve years; Elkford, participant 4 (2021, 15 January, pers. comm.) had switched to a more efficient vehicle in 2006, before the tax was introduced. In all, nineteen participants (77 per cent) had switched vehicles.

When asked how they would prefer to transport themselves, seven participants (29 per cent) said they preferred to drive. Coquitlam, participant 6 (2021, 17 February, pers. comm.) framed it as a matter of personal convenience, while Elkford, participant 2 (2021, 8 January, pers. comm.) and Coquitlam, participant 8 (2021, 18 March, pers. comm.) said driving was the most convenient way to cross B.C.’s mountainous terrain. Smithers, participant 7 (2021, 8 February, pers. comm.) said they supported the building of a bicycle path in Smithers to reduce non-winter driving but said it would be near useless in winter. The response of Smithers, participant 3 (2021, 13 January, pers.

comm.) alluded to another practical barrier to driving less that they faced: “[I]f I didn’t have to move stuff around [for my job], and it wasn’t pouring rain, or minus thirty [degrees Celsius], then I would walk or cycle more”. Elkford, participant 5 (2021, 23 January, pers. comm.) said that even if a bus network between communities in the eastern Kootenays attracted a sizable ridership, it would be too expensive. Elkford, participant 7 (2021, 4 February, pers. comm.) said, “For long-distance travel, I would prefer anything to driving, but there’s not a lot of options here. ... I would take public transit of some sort if it was available, but there is nothing.” Eight participants (33 per cent) said it was too costly to switch to hybrid, electric, or even more efficient ‘traditional’ gas-powered vehicles. Also, nine participants (38 per cent) said hybrid and electric vehicles were technically unsuitable for travel on cold days, in the mountains, going long distances, or some combination thereof, and eight (33 per cent) said they needed certain vehicles to accommodate their personal or business activities.

Self-reported purchase of car fuel outside B.C. among my participants was not common; only five out of 24 participants (21 per cent) said they had travelled out of B.C. specifically to buy gas or would do so. Among those who did, Coquitlam, participant 8 (2021, 18 March, pers. comm.) said, “Without COVID, weekly, we would go to the States to buy our gas” because it was cheaper there. Participants 2 and 6 from Elkford (2021, 8 January and 3 February, pers. comm.) said they actively bought gas in Alberta because it was cheaper; the former specified that savings were “ten cents a litre” in Alberta relative to B.C. Many participants in Coquitlam and Elkford (almost all those in Smithers noted its remoteness from Alberta and the United States) said that they did get fuel when they travelled across borders, but they did not travel specifically to get fuel.

Twenty-three participants used natural gas at least in part to heat their home; the remaining participant used a combination of electricity and wood. Five participants (21 per cent) used a

combination of natural gas- and electricity-powered appliances to regulate their homes' temperatures; two (8 per cent), both from Coquitlam, used a combination of gas and geothermal; two (8 per cent), one each from Elkford and Smithers, used a combination of gas and wood. Sixteen participants (67 per cent) heated with natural gas only. Cost was the most common barrier cited against switching from gas, with fifteen participants (63 per cent) citing it jointly or solely; ten (41 per cent) cited the lack of available alternatives as a barrier, jointly or solely. In Elkford and Smithers, five participants (31 per cent of those from two communities) said they would not burn firewood due to health issues.

Fourteen participants (58 per cent) could name things they had personally done to reduce heating or cooling fuel consumption from at least one source, including five (21 per cent) who cited measures both they and others they knew had taken;* however, eight participants (33 per cent) said neither they nor anybody they knew had done any such thing. Reported involvement in municipal politics was low, with only two out of 23 participants who responded directly to this question (8 per cent) saying that they or others had spoken to the municipal government about becoming more environmentally friendly in any way, including Smithers, participant 6 (2021, 26 January, pers. comm.), who had talked about improving the town's recycling program, which is adjacent but not directly connected to my study.

All 24 participants answered at least three of my five questions about a hypothetical 'perfect' sustainable-development policy in the affirmative, at least conditionally (see Appendices A and B). Elkford, participant 2 (2021, 8 January, pers. comm.) outright rejected the elements of job quality and reducing fuel use, saying any attempt to do either of these would only make things worse.

*For example, Coquitlam, participant 1 (2021, 4 January, pers. comm.) said they and some of their neighbours had installed heat pumps; Elkford, participant 6 (2021, 3 February, pers. comm.) mentioned keeping firewood as "secondary heat" as well as delivering it to some of their neighbours.

Elkford, participant 4 (2021, 15 January, pers. comm.) rejected the element of encouraging inter-governmental co-operation to fight climate change, citing fears that it would lead to the B.C. and Canadian governments being dictated by other governments and unelected figures therein. Elkford, participant 3 (2021, 11 January, pers. comm.) appeared to connect the actual B.C. carbon tax shift implicitly with the Campbell government's participation in regional accords with other governments, though they "[didn't] see how they're spending money on stuff that gets more efficient and better for the environment" in B.C., which they would have preferred. Coquitlam, participant 8 (2021, 18 March, pers. comm.) said they had "no opinion" about whether a sustainable-development policy should be used to encourage intergovernmental co-operation to fight climate change (see Appendix B).

4.4: Summary

B.C.'s carbon tax shift was correlated with changes in the SDG indicators I have evaluated of varying sizes and degrees of statistical significance. Furthermore, because it was only the most prominent program introduced as part of the provincial government's environmental strategy in 2008, it could not have been responsible for all the changes in all the indicators, regardless of in which direction they trended and how statistically significant the correlation was. The existence of reversals of trends in SDG indicators whether I evaluate the whole study period 2001–2015, or only the with-tax period beginning in 2008, is another complicating factor, suggesting there is no optimum level of carbon tax to balance progress in the indicators I have studied. Because I could find no statistics to evaluate the level of intergovernmental co-operation, I have not evaluated it quantitatively. I find that, overall, B.C. has made little progress towards the SDGs I have chosen to evaluate.

From my qualitative data, meanwhile, I find that most of the people I have interviewed do not

know much about how the carbon tax has affected them, though most of the effects they could name were negative. Nearly all of them supported sustainable development in the abstract, based on their mostly affirmative responses to my questions about a hypothetical sustainable-development policy. Analyzing the tax and sustainable development at the individual level, I have found that most of the British Columbians with whom I have corresponded do not think it has helped them move towards more sustainable livelihoods. I discuss these findings in Chapter 5.

Chapter 5: Reflecting on the B.C. Carbon Tax

5.1: Introduction

I discuss my findings from my analysis of the data I have found and collected. I argue in the following that the small changes in the SDG indicators I have analyzed reflect little progress towards sustainable development on their own. Furthermore, because there were many more policies in addition to the carbon tax, it probably could not have achieved the entirety of all the effects. I discuss the changes in my SDG indicators—CO₂e emissions, intergovernmental co-operation on fighting climate change, GDP, Gini coefficient, employment, and economic reliance on polluting sectors—with and without the tax shift and as the tax increased, and find some changes to be positive, others to be negative, and changes of both types to vary considerably in magnitude and statistical significance. I then discuss what I have learned from my interview participants about what they think the effects of the tax shift. I conclude with a summary and a consideration of some of the policy implications going forward.

5.2: Sustainable Development Goal Indicators

5.2.1: Carbon Dioxide Equivalent Emissions

If the tax was a driving factor in limiting the rate at which GHG emissions rose, it may have applied to household fuels consistently while business fuels were more exempted. Tietenberg (2013) judges even this as at least a modest success because under ‘business as usual’, emissions may have risen to even higher levels. Attempts to evaluate the success of a carbon tax relative to outcomes from a set base year are, therefore, questionable in this telling (Ibid.). It is crucial, however, for a government to decide by what volume, fraction, or both of GHG emissions it wants each emissions-reducing policy, including a carbon tax, to reduce GHG emissions, for which an historical baseline is imperative. Furthermore, when the government sets an emissions-reduction

target relative to some baseline, and especially when it makes the target law, evaluations of each policy enacted in service of reaching that goal must determine each policy's contribution, positive or negative, to emissions reduction.

B.C.'s original version of the Carbon Tax Act, passed in 2007, included a requirement that it reduce its GHG emissions by 33 per cent relative to that year by 2020 and by 80 per cent by 2050 (Beck et al., 2015; Guzman and Clapp, 2017). The carbon tax was not supposed to be B.C.'s only emissions-reduction tool, though it was predicted to help save up to 3 million tCO₂e per year by 2020 assuming a consistent \$30/tCO₂e levy (Sawyer, 2011; Rhodes and Jaccard, 2013; Rhodes, Axsen, and Jaccard, 2014). This is only 4.78 per cent of the over 62 million tCO₂e ascribed to B.C. in 2007 (see Table 1). Even if the tax has reduced this much CO₂e, it is clearly only a small fraction of the baseline equivalent. Moreover, because this reduction is relatively inexpensive, costing \$0 to \$5 per tCO₂e forgone, and the tax rate could have been up to \$50/tCO₂e without sacrificing economic efficiency meaningfully (Rhodes and Jaccard, 2013), it is surprising, if examined as an academic purporting neutrality who has only read third-party sources, that the government did not progress with making the tax higher. After conducting interviews with several people who espoused opposition to the tax in concept, execution, or both, however, it is less surprising.

Additionally, total emissions matter more than per-capita emissions because all GHGs emitted contribute in part to the problem of climate change and averages can conceal a great deal of variation based on any number of factors. Rayne and Forest (2013), who advocate using per-capita emissions as a metric of carbon tax efficacy, note that population numbers change, but they are incorrect to say that changes in per-capita emissions reflect the policy's efficacy better. In Tables 1 through 3, I refer to total GHG emissions because all GHGs released in the past persist in the atmosphere for years, or even millennia, to cause climatic changes in the present and future (Bot-

zen et al., 2008). More surprisingly, Rayne and Forest (2013) assert that reductions in GHG emissions in B.C. from 1990 to 2010 owe almost exclusively to reductions achieved early in that period than to the carbon tax, as of then. Skepticism of the tax's efficacy was warranted (Ibid.), but with time it has proved to be correlated with slight but statistically significant decreases in CO₂e emissions (see Tables 2 and 3; introducing the tax itself was correlated with per-year emissions reductions being both larger and more statistically significant).

The decline in emissions, however, was not consistent with the necessity to slash emissions more dramatically. In the last year of the with-tax period I have studied as background, 2015, B.C.'s CO₂e emissions were only 5.535 per cent lower than in 2007 (see Table 1)—well behind the goal established in the Carbon Tax Act of a 33 per cent reduction of 2007 emissions by 2020, let alone the IPCC's urgent recommendations. Furthermore, though I do not study the record of B.C.'s government after 2015 on any SDG indicators, it is relevant going forward that the NDP government elected in 2017 repealed sections 2 through 7 of the Carbon Tax Act requiring the government to set reports in which it anticipates how much money it will collect in carbon taxes;* this is relevant because the government could reverse engineer the anticipated amount of CO₂e emitted therefrom. Without knowing this vital statistic, the government cannot track its progress towards its emissions-reduction goal, even to present itself as doing better than it is, thereby also removing a mechanism of accountability.

5.2.2: Climate Co-operation

I found no data in federal or provincial databases to assess the B.C. carbon tax's efficacy in making, or encouraging, the provincial government co-operate with other jurisdictions on fighting climate change. The provincial government left the WCI in 2017, after the initial study period

*See British Columbia (2008c). Sections 2 through 7 were repealed on 10 December 2017.

ended, but it joined after introducing the carbon tax, so a direct comparison is impossible. As noted, the WCI was meant to encourage co-operation between similarly powerful levels of government; co-operation between provinces and municipalities is not comparable to that between provinces and states, or even provinces and the federal government. The constitution of Canada gives status and, with it, the ability to tax, spend, and regulate en masse (see Schwartz, 2019) to only federal and provincial governments.

Peet and Harrison (2012) find that municipal governments in the north objected more to the carbon tax than those around Vancouver, and that a feeling of regional alienation played a role. This fits two hypotheses proposed by Schwartz (2019): that provincial governments effectively set the agenda and that municipal governments are motivated to act independently before they are forced to act. Schwartz (*Ibid.*, at pp. 54 and 55–56) shows the logic of these theories: to the first, the provincial government passes a law which applies in every community in the province; the municipal governments learn about the new law and must enforce and conform with it; and they are expected to conform, though they may fight. To the second, municipal governments decide to act in ways that suit them, perhaps by listening to other actors in advance; they relearn the province's policies governing municipalities; and then they tailor their plans to maximize the liberty afforded them under the extant policies.

Schwartz discusses Vancouver, a celebrated case of a city acting independently to enact 'green' policies. Vancouver is the only city in B.C. with a unique charter giving it expansive rights and responsibilities (Schwartz, 2019), and it is the only municipality in B.C. that she discusses extensively as having undertaken major environmental initiatives. Schwartz argues (2019, pp. 59–66) that Vancouver's pursuit of three major sustainable-development initiatives calls both theories she proposes into question; however, no other municipality in B.C. has this much leeway, so comparing

Vancouver to any of the communities where I interviewed residents is apples to oranges. Schwartz discusses (Ibid., p. 60) the government of Vancouver making deals with its counterpart in nearby Delta and with the greater Metro Vancouver board to allocate carbon credits. Peet and Harrison's (2012) concept of regional alienation, however, suggests that rural and especially northern communities' governments may not have wanted to participate in the first place, which weakened another level of vertical co-operation. And as Schwartz (2019) notes, the carbon tax was applied to all fuels that municipal governments purchased, which was an attempt to enforce vertical co-operation. Many of the participants from Elkford and Smithers whom I interviewed dismissed the provincial government, but they did not comment on this requirement that the province made of municipalities. Ironically, while Elkford, participant 4 (2021, 15 January, pers. comm.) was most skeptical of sustainable development, they praised Elkford's council for installing solar panels and enacting measures to conserve energy. They may appreciate this as a way to avoid the carbon tax, but they did not say whether they did in my interview with them.

Co-operation with the federal government on achieving any carbon price during the study period was nil. Compounding the problem was a general lack of federal investment and strategy towards developing renewable energy during this period (Madiraju, 2014). In 2011, the Harper government committed \$80 billion over ten years to facilitate hydroelectric expansion in B.C., Manitoba, Quebec, and Newfoundland and Labrador; it did not have a national strategy for developing renewable energy at this time, and what would be added in B.C. was 3.3 out of twelve gigawatts' worth of power (Ibid.). The federal government did contribute \$186.4 million from the gas tax so Greater Vancouver could buy more and newer vehicles for the SkyTrain and TransLink, its bus service, in 2009 (Infrastructure Canada, 2009). The provincial government also helped municipal governments apply successfully for federal funding to expand their transit fleets in both 2009 and

2010 (BC Transit, 2010, 2011). The federal and provincial governments also co-administered the ecoENERGY and EnerGuide for Homes programs from 2007 to 2012 and 2013 respectively, encouraging people to buy more efficient appliances; in Vancouver alone, with municipal-government promotion, “these incentives ... led to over 10,000 home energy efficiency renovations in the city and over 13,000 tonnes of GHG emission reductions” (Vancouver, 2014: p. 12). These federal grants and programs were more than nothing, but they were not a concerted large-scale strategy for reducing emissions.

5.2.3: GDP and Gini Coefficient

Both B.C.’s total and per-capita GDP grew consistently for most of the with-tax period I have analyzed in the background. The slowed GDP growth of 2008 may be more attributable to that year’s financial crisis, as well as the economic contraction of 2009, which was itself smaller in B.C. than nationwide (Tables 5 and 6). Average growth during the with-tax period in B.C. remained slower than that in the pre-tax period, suggesting that if the carbon tax had brought a dividend in efficiency, it led to gains that were smaller than the losses from the recession. The carbon tax did not, however, cause the recession in B.C.; from the *British Columbia Financial & Economic Review 2010*:

The annual decline [in 2009] was largely attributable to a drop in the goods-producing industries, most notably manufacturing. Weakness in the US housing market (combined with low lumber prices) hampered demand for BC forest products, which resulted in large declines in the forestry industries. Further, job losses throughout the forestry sector contributed to a decrease in labour income and retail trade. (British Columbia, 2010b: p. 3)

Thus, B.C.’s dependence on a trade-reliant sector which flagged due to exogenic factors

harm ed its economy in one year in the context of a global recession that was worse in many other jurisdictions. More surprisingly, the carbon tax was correlated with higher real total and per-capita GDP in B.C., though the relationship was not statistically significant in the latter case (Tables 7 and 8). I judge that the carbon tax was correlated positively with the SDG to improve economic growth.

The carbon tax was also correlated positively with the attempt to achieve greater economic equality, though it did not correlate with a significant reduction in any of three measures of the Gini coefficient (see Tables 11, 12, and 13; introducing the tax itself was correlated with per-year inequality reductions being both larger and more statistically significant). Although I did not always remind my interview participants of this, the central policy was meant to be a tax shift, not a new standalone tax. Market, post-tax, and total income inequality all rose in 2011 and 2012 relative to 2010, once the tax was established after Campbell's B.C. Liberals were re-elected. Lee (2013: p. 14) attributes this to successive cuts in B.C.'s corporate tax rate from 12 to 11 (effective on 1 July 2008), 10.5 (from 1 July 2010), and 10 per cent (from 1 July 2011). From fiscal years 2008/09 to 2014/15, the corporate tax cuts cost \$100 million, \$370 million, \$474 million, \$671 million, \$834 million, \$710 million, and \$959 million (Lee, 2013; British Columbia, 2009c, 2010c, 2011b, 2012b, 2013b, 2014b, 2015b, 2016b).^{*} Had the government reduced low-income individuals' income tax rates more or reduced the corporate tax rate by less, it would have been more progressive and the post-tax Gini coefficient would have dropped, hence B.C. would have greater equality and made more progress towards this goal.

5.2.4: Employment

After I read Yamazaki (2017), finding that jobs in manufacturing, which are more carbon-in-

^{*}Correspondingly, business' share of tax relief rose from 31.95 per cent in fiscal year 2008/09 to 50.75, 54.80, 58.81, 60.43, 58.10, and 62.93 per cent over the next six fiscal years.

tensive than simple resource production, declined more during the with-tax period than did jobs in resource production, I wondered if I had been pursuing the wrong question. If a carbon tax were going to ‘target’ jobs for elimination based on their contribution to climate change, it would make more sense to ask about its effects in communities arranged by their percentage of residents employed in manufacturing. Deriving natural-resource inputs from the same jurisdiction would ease regulatory oversight and usually limit the costs of transport, however, so a policy that hit more upstream would have more total effects. A carbon tax, though applied at the point of combustion, could have such an effect if it reduced demand for the resources being used for manufacturing.

The number of jobs was correlated with a statistically significant increase of about 201,630 during the with-tax period over the pre-tax period, though a larger population is more likely to have more people working than a smaller one. Also, during the with-tax period, B.C. saw a net gain of about 2,688 jobs per year, though the same caveat about population applies and the statistical significance is much smaller. Introducing the carbon tax had very small and statistically insignificant effects on the employment, participation, and unemployment rates at large. (See Tables 15 through 18.)

If the tax shift had any causal effect on workforce participation rates, it may have been because the reduced emphasis on taxation of earned income encouraged more people to seek jobs who might not have otherwise. Depending on whether employing entities were seeking employees at higher rates than the extant employment rate in society (for example, if they want four more employees when there are five more applicants, they are ‘seeking employees’ at an 80 per cent rate), this could facilitate a rise or fall in the employment and unemployment rates, inverse to each other. Cutting businesses’ tax rate can encourage either increasing employment, by giving businesses more money to put towards wages for new employees, or not, for various reasons. For example,

presuming equal revenues, businesses would be permitted to keep more money and could save it, invest it, or draw from it to raise the wages of current employees. A business would have to use its increased profits to hire more employees if government demanded it, which did not happen in B.C. This is a way in which the tax shift could have been used to increase employment.

5.2.5: *Economic 'Greening'*

The carbon tax shift was mostly not associated with statistically significant differences in amounts or percentages of GDP or employment that came from natural resources and agriculture. There were three statistically significant differences: the shares of employment and GDP related to the tax's introduction, and the amount of GDP by year in with-tax years. During the with-tax period, however, the B.C. government invested in liquefied natural gas (LNG), a fossil fuel. LNG is associated with heavy volumes of emissions by methane leakage, and the tax was applied only to combustion emissions as discussed earlier, so the tax could not have been a disincentive to this activity. Wisen et al. (2020) estimate that B.C.'s wells alone leak at least 75,000 mtCO₂e. Because the tax was applied more heavily downstream and businesses could claim various exemptions, the tax was not based broadly enough to change behaviour. The intention may have been to reduce demand for fuel first and take supply with it. Extending the tax to emissions from land-use changes, including drainage of carbon sinks like forests, would likely spur more economic 'greening' by shifting investment from certain activities such that the less they emit, the more they receive.

Among emissions-intensive sectors, agriculture is necessary to keep because it produces food. On the premise that people who do something necessary should be well compensated, the carbon tax was unjust in that it was correlated with declines in farmers' incomes as Olele et al. (2019) say. It may have been just for the provincial government to exempt farmers from fuel and carbon taxes on coloured fuel effective on 1 January 2014 (British Columbia, 2014c); exemption from the carbon

tax alone would have saved the province's farmers up to \$16.53 million in 2014 and \$21.7 million in 2015.* From mid-2008 to the end of 2013, farmers might have been internalizing fuel costs while trade volumes did not change by statistically significant volumes over the pre-tax portion of the period as identified by Rivers and Schaufele (2015b).

Overall, B.C.'s GDP became progressively lighter on per-dollar embedded emissions as the study period advanced. Its lead over Canada tended to climb more quickly in the with-tax part of the study period. One indication of this de-emphasis comes from the fact that during the study period, B.C.'s small oilpatch (compared to Alberta's) peaked in 2008, producing \$9,264 million worth of sales before falling more than 55 per cent to \$4,120 million in 2009 and, except for 2014 when it was back up to \$7,011 million, not crossing the \$5-billion threshold again (as seen, for example, in British Columbia, 2018: Table A1.1D on p. 70). Coal production was also mostly level during the with-tax period and lumber production was below what it was in the pre-tax period (Ibid.). Coal and oil, as fossil fuels, must be consumed in increasingly smaller quantities, reaching zero as soon as possible, to avert as much climate change as possible, and production must be terminated to discourage consumption. The overall decline in emissions-heavy natural resources and agriculture production as a percentage of GDP—from about 8 per cent at the beginning of the study period to about 7 per cent at the end of it—and the rise in dollars per tonne of CO₂e (see Tables 19, 20, and 25) is a good top-line indicator of this. Adding to the carbon tax was positively correlated, counterintuitively, with a statistically significant degree of increased net revenue from natural resources and agricultural production (though this almost certainly did not cause it), and the estimated net increase of 97.71 million CAD is large in human terms but small as a fraction of

*In B.C., on-farm fuel use was responsible for 0.551 mtCO₂e in 2014 and 0.720 mtCO₂e in 2015 (Environment Canada, n.d.). The figures above are from authorial calculations assuming this was all coloured farm fuel. It is noteworthy, however, that emissions from animal production, a non-combustion source and thus not subject to the carbon tax, exceeded those from on-farm fuel use by ratios of between 3.5 and eight to one in the 2001–2015 study period (Ibid.).

a major subnational economy like that of B.C. (see Table 21). Furthermore, introducing the tax was correlated with small but statistically significant drops in the percentages of jobs and dollars attributable to natural resources and agricultural production, but not their raw counts (see Tables 22 through 24).

5.3: Discussion of Popular Opinion

More than a decade after the carbon tax was introduced, several of the residents I interviewed said that they did not know much about it; they knew it existed but were unsure how it had affected them. Most of the rest described it as having affected their local industries primarily negatively; in Elkford, which was not only the most resource-reliant community surveyed but one reliant on the heavily polluting coal-mining sector,* this was a supermajority opinion. In a context where work is the most common way of getting money, this is a reasonable proxy for how they feel it to be affecting them personally, and it is a rational expression of people's self-interest to worry about how they will live if they lose their jobs. B.C.'s carbon tax was applied at the point of consumption and most of the participants said it had raised fuel prices for them, though some said they felt significant financial pinches from it and others said they did not.

The change of government in 2017, after the main study period, and the NDP's increase in the carbon tax rate after the Liberals kept it level (in nominal dollars) in their last years in office may have played a role in the belief that the tax was bad. The apparent causal link between citizens seeing no improvement after a government raises taxes and calling for their taxes to be lowered is intuitive. Likewise, if people do not see themselves getting tangible benefits in exchange for the taxes they pay, the democratic legitimacy of a tax will be compromised. Relatedly, if they vote for

*Though one participant clarified it was "not thermal" but "steel-making coal" (Elkford, participant 2: 2021, 8 January, pers. comm.). Coal production's contributions to B.C.'s emissions also varied somewhat during the study period, between about 1.5 and 2.2 mtCO₂e per year (see Environment Canada, n.d.).

candidates who are not elected, who serve in opposition rather than government,^{*} or who do not represent what they see as their interests, or more generally, if they do not see elected officials even having dialogue with them, they will feel alienated from the government's decision-making. The respondents from the two rural communities showed different degrees of alienation from the process in their responses, with more from Elkford expressing outright opposition to the tax. Participant 2 from Elkford (2021, 8 January, pers. comm.) offered a concrete demand in exchange for supporting the tax: a living allowance for rural British Columbians.

Many also regarded the incentives to change patterns and levels of fuel use as lacking or inadequate. Nearly all the participants said they still used at least some natural gas and drove large vehicles because alternatives were unsuitable, unavailable, or too expensive. Participants 3 and 8 from Smithers (2021, 13 January and 12 February, pers. comm.), for example, explained that they had to drive trucks for the specific businesses they were involved in running. General sentiment among participants that the tax had not encouraged them to use less fossil fuels, and so the small number of stories recounted about their attempts to use less fuel and those of their acquaintances is unsurprising. Several participants from Smithers and Elkford, both low-population communities, said that mass transit for everyone was not viable there,[†] while several of those in Coquitlam said the mass transit system of nearby Vancouver was planned too poorly to reach their community. Low population and service densities were also frequently cited both as limiting the uptake of active transportation and necessitating driving. Self-reported rates of leakage of gas purchases, however, were also low.

^{*}Elkford, for example, is in the provincial electoral district of Kootenay East, represented by BC Liberal MLA Tom Shypitka at the time of writing. Elkford, participant 4 (2021, 15 January, pers. comm.) said they thought Shypitka was a good MLA “even though he doesn’t get any say in [the Legislative Assembly]”.

[†]In Elkford, the company-provided buses to and from the coal mines could be scaled into a more comprehensive transit system. Otherwise, the town only has a bus for people with disabilities (Elkford, participant 6: 2021, 3 February, pers. comm.). This participant also said that due to COVID-19, “now, there’s lots of guys driving. You know, they can’t be on the bus”, and that most were driving individually (Ibid.).

Many participants also considered it unviable to try to switch home heating sources for reasons of cost and effectiveness. Smithers, participant 3 (2021, 13 January, pers. comm.) said, “If solar panels would be economically viable, and they would heat our house efficiently, then that would be good. [...] And here, even in the summer, you may not get enough solar for that to be effective.” Elkford, participant 4 (2021, 15 January, pers. comm.), said, “unless there was some other option locally available, I will stay with natural gas.” Participants 1 and 3 from Coquitlam (2021, 4 and 21 January, pers. comm.) both mentioned that they had actively reduced their natural gas consumption by installing heat pumps and had done so without getting any financial aid from the provincial government. This suggests that the present government is offering little such assistance to majorities of the population, or else that it is offering money that people are not accepting. There have been programs targeted at low-income and rural British Columbians as part of the tax shift, ostensibly to ease this transition, but they did not offer enough money to be much use to many people.*

Under the present economic paradigm, the twin goals of achieving an ecological-environmental double dividend of lower emissions and higher GDP, after Goulder (1995)—if B.C. did indeed obtain one from the carbon tax shift—may be mutually exclusive. These are competing values, neither superficially ‘superior’ to the other, which people may hold for any reason. As a pragmatic researcher, I recognize the temptation to judge other persons’ morality favourably if their opinions

*Harrison (2013), citing Lee (2013), notes that the carbon tax’s rise from \$10 to \$30/tCO₂e from 2008 to 2012 was twenty times larger as a percentage than the low-income tax credit. Lee (2013: Table 2, p. 17) shows that the corporate and personal income tax cuts paid out to households higher up the income distribution ladder well exceeded the low-income tax credit as well, per household, a measure that would “disproportionately benefit wealthy investors” (Harrison, 2013: p. 19). Beck et al. (2015: Table 1, p. 43) point out that of the \$1,141 million in taxes the B.C. government cut for the 2011/2012 fiscal year, \$671 million—or 58.81 per cent—was cut from corporate taxes, redounding disproportionately to the benefit of richer people. Meanwhile, only \$66 million worth of tax expenditures were allocated to directly helping people in northern B.C., with the Northern and Rural Homeowner Benefit available to up to \$200 per person; the province spent \$184 million on a general provincewide tax credit for low-income British Columbians labelled as part of ‘climate action’, and the remaining \$220 million to reduce the two bottommost income tax brackets by five percentage points each (Ibid.). Nor was it even a given that every recipient would spend their additional money to fund the purchase of, for example, an electric car or a geothermal heating system.

align with mine and unfavourably if they do not, but I can understand that they think a certain way because they see one value as more beneficial. Somebody may value comprehensive social services more than lower taxes, such as participant 5 from Smithers (2021, 18 January, pers. comm.), or vice versa. Therefore, different semantics are necessary to convince different people that a policy aim is worthwhile and that the proposed mechanism will achieve it.

For most people, GHG reduction should be framed as a social service that will help everyone in the long term due to the rising social cost of carbon (see Bagamery, 2021). It may sacrifice the double dividend for B.C. to change its carbon tax's purpose to invest in technical infrastructure and social and economic programs that can facilitate the quicker, deeper reductions in emissions that are necessary. The benefits will not be zero, however, and may exceed the double dividend; the only way to be certain is to attempt a different way to use tax monies. The tax itself should also be extended to cover non-combustion-induced emissions as well as combustion-induced ones. If a tax is indeed meant as a disincentive to take or not take an action, then it should be applied to the passive emissions from methane and land use changes to apply consistently and reduce damages. Since most of the people I interviewed did not go out of their way to buy gas outside B.C. with the tax, they would continue to contribute to the fund to help phase out gas while they were buying it. Given what most participants cited as poor mass and active transportation systems in their communities, it is important to invest in mass and active transportation, and to avoid hinterland alienation, those in rural communities should be designed collaboratively with users. In urban communities, this expansion should also be developed democratically, though it does not have the risk of hinterland alienation.

5.4: Summary

In examining several indicators of sustainable development, I find that introducing the carbon

tax was correlated most often with what I considered to be positive movements towards them, but the changes were frequently small, insignificant, or both. Some indicators showed opposite trends as the tax raised from 2009 to 2012 and beyond into 2015. Because I have only evaluated the carbon tax and largely ignored all the other environmental policies in the Campbell government's comparative flurry of activism of 2007–2008, and because I have not performed or evaluated any experiments, I cannot say the effect is causal. Furthermore, I agree with an observation that one of my past professors made to me, that social scientists rarely prove causality. I can say, however, that because the small changes in my chosen indicators before and after the tax was introduced are a collective function of all the B.C. government's environmental policies (whether their outcomes were positive, negative, or neutral), the tax's responsibility for them was no more than a fraction of a fraction of what B.C. needed to do to achieve sustainable development.

A carbon tax may increase the price of a good or service beyond what would-be buyers are willing to pay for it; a society can also stigmatize emissions and demand increased payment from offenders. Even if the increase in market-calculated price is small, knowledge that a tax is responsible for the change in price may encourage people to change their actions to avoid paying it. The availability and workability of alternative sources of transportation and heating that do not pollute as much, which themselves may not suit everyone in a jurisdiction that covers as much land as B.C., are also necessary factors to consider when designing a tax that one wants others not to have to pay. It is usually safe to assume that every person is the world's expert on their own life and that one policy does not always affect everyone justly or equally.

After comparing the background period I studied to responses from the individuals I interviewed more than five years after the background period ended, I found most interview participants believed it had had either no or negative effect in achieving sustainable development—which most

of them also agreed was a worthy objective—broadly or their lives specifically. They knew of it as a tax, not a shift; simply ‘tax’ was simpler and more intuitive but more negative and less accurate. Most agreed that they were paying more money in exchange for no discernible benefit, and that no viable ways for them to avoid the tax by using less carbon-based fuel, the stated intended way to avoid it, in the long term were forthcoming. In Elkford and Smithers, many participants said that they felt left out of the B.C. government’s decision-making, lending credence to my theory, adapted from Peet and Harrison (2012), of hinterland alienation. In Coquitlam, many participants also agreed with this sentiment, but it did not have the ‘rural’ tinge to it. I have concluded that the tax may have been operating at cross purposes with such objectives as reducing GHG emissions as quickly as possible and others recommended by the IPCC if it had the goal of growing the economy more ‘efficiently’ as well. It seems most logical, therefore, that the B.C. government change its messaging and mechanism of carbon taxation to tell and show people that they will be getting an important benefit and involve them in redesigning this to improve both its objective outcomes and its subjective legitimacy. I have proposed that it is more important to reduce emissions and thus to reorder the purpose of B.C.’s carbon tax program.

Chapter 6: Conclusion

6.1: Introduction

I have studied British Columbia's provincial carbon tax to see if its implementation is correlated with progress towards sustainable development. From my purposes, progress towards sustainable development included lower impacts on the environment, a more equal and democratic society, and richer people as measured by GDP. To evaluate B.C.'s progress towards these ideals, I consulted the United Nations' Sustainable Development Goals, choosing goals and, from there, indicators of the goals that represent each pillar of sustainable development: reduced GHG emissions, more intergovernmental co-operation on climate change, more wealth, higher employment rates, lower income inequality, more dollars per tonne of CO₂e, and less economic reliance on natural resources that pollute.

For each indicator, I collected data on progress related to each in B.C. from 2001 to 2015. Where I found quantitative data from the provincial and federal governments relating to B.C.'s sustainable-development indicators, I evaluated them using linear models in the data-science program RStudio to evaluate whether the introduction of B.C.'s carbon tax and increases therein, while it was in effect, were correlated with my chosen indicators.

In addition to my evaluation of factors of sustainable development via literature review and quantitative data analysis, I conducted interviews with twenty-four British Columbians by telephone. I asked them questions to find out whether they supported the carbon tax and sustainable development, whether they thought the carbon tax had helped them and people they knew move towards more sustainable practices, whether they felt any less dependent on fossil fuels with the tax, how it had affected their work, and whether they believed their provincial government was acting in their best interests.

6.2: Conclusions about the Non-experimental Quantitative Research

6.2.1: Changes in Carbon Dioxide Equivalent Emissions with and without the Carbon Tax Shift

B.C.'s carbon tax is not associated with much change in CO₂e emissions over the background study period, partly because its CO₂e emissions did not change much during this time; therefore, its progress towards SDG 13 and the target to reduce GHG emissions was small. From Environment and Climate Change Canada's inventory (2019), related in Table 1 in Chapter 4, B.C.'s emissions were relatively level rather than getting considerably higher or lower. On the individual level, Antweiler and Gulati (2016) and Xiang and Lawley (2019) find reductions in automotive and residential fuel use, these being drivers of climate change, during the study period, as I also find in Table 4 in Chapter 4. Lawley and Thivierge (2018) suggest these trends are more pronounced in large communities than in small ones during the study period. Erutku and Hildebrand (2018) agree that the carbon tax was more significant in reducing fuel consumption and, hence, emissions than raising the base price of fuel, but note that fuel purchases in B.C. began rising from April 2012, just before the Liberals' last scheduled increase to the carbon tax. Guzman and Clapp (2017) interview experts who agree, among other things, that a \$30/tCO₂e is too low to encourage major changes in individual behaviour. This suggests to me that the carbon tax shift as it was implemented did not contribute meaningfully to reducing B.C.'s responsibility for climate change. My data show that introducing the tax is correlated with a statistically significant, though small, effect on CO₂e reductions, so there is little progress on reducing GHG emissions to avert future climate change. My data also show that there is a statistically significant and larger effect on fuel sales from the introduction of the tax, so there is stronger but still modest progress towards achieving more sustainable consumption, which is a target under SDGs 12 and 13.

6.2.2: Changes in Climate Co-operation with and without the Carbon Tax Shift

The B.C. government did not co-operate much with other governments on addressing climate change before or after introducing its carbon tax. During the background study period, B.C. was nominally a member of the Western Climate Initiative but did not adopt its major policy tool, and indeed has since left it (WCI, 2020). Nor did B.C.'s adoption of a carbon tax move any of the other provinces that eventually joined the WCI—Manitoba, Nova Scotia, Ontario, and Quebec—in either direction, let alone the federal government. As of 2020, the WCI consisted solely of California, Nova Scotia, and Quebec (WCI, 2020).

Hsu et al. (2017) note that the B.C. government's co-operation with other levels of government, equivalent, higher, or lower, was inadequate to achieving their GHG-reduction targets. Giest (2014) notes that governments tend to pass action against climate change to the lowest possible levels, which have less money and time to act meaningfully. Peet and Harrison (2012) go even further and imply that the B.C. Campbell government's behaviour was almost authoritarian to municipalities and, because people felt more connected to their hometown than the province, this gave rise to hinterland alienation and a reluctance to work with the provincial government. While the federal government did help fund initiatives to enhance mass transportation and expansion of low-carbon hydroelectric development in B.C., it did not supplement these carrots with what might have been a necessary stick in the form of a nationally applied charge on GHG emissions. What is more, the largest expansion of hydropower I observed as taking place during the background study period was part of an initiative with three other provinces that generate hydroelectricity en masse. From these data, I am led to conclude that horizontal co-operation and the even more important vertical relationship of subnational-national co-operation were therefore weak in B.C. and it did not make much progress towards the goal, associated with SDG 13, of integrating climate change-related

considerations into governmental policy, as indicated by governments co-operating to adapt to and mitigate it, with the carbon tax.

6.2.3: Changes in GDP and Gini Coefficient with and without the Carbon Tax Shift

B.C.'s GDP growth was considerable over the whole study period, with and without the carbon tax (Tables 5 and 6 in Chapter 4). My data show that introducing the tax correlates with B.C.'s total and per-capita GDP growth being moderately sized and statistically significant, and economic inequality by three measurements of the Gini coefficient decreasing by statistically significant but small amounts. Beck et al. (2015) argue, in this regard, that there was at least a weak double dividend from this program, as proposed by Goulder (1995). Beck et al. (2016) also find that B.C.'s tax shift was revenue-negative, with the government cutting more pre-existing taxes than it reaped from the carbon tax. This may have stimulated more GDP growth than a revenue-neutral shift would have done. The introduction of the tax shift was correlated with moderately sized increases in total and per-capita GDP chained to 2012, while the impacts of increasing the tax in the with-tax period were statistically insignificant (Tables 5, 6, and 12 in Chapter 4).

It may be the case that, as Beck et al. (2015) find, rich British Columbians were paying the most dollars in carbon tax while less rich British Columbians were paying greater percentages of their funds to it, as Lee and Sanger (2008) predict and as I confirm in Table 7 in Chapter 4. Lee's (2013) observation that the government cut taxes more for corporations than for individuals may have led to this and. Beck et al. (2015), studying programs through which the B.C. government cut individual taxes through the 2011/12 fiscal year, find that revenue recycling mitigated some of the wealth losses for all income deciles in B.C. and most of all for the lowest four deciles. In the whole with-tax period in B.C., the Gini coefficient evinced statistically significant but small drops relative to the pre-tax period and statistically insignificant changes on a per-dollar-per-unit-added basis

(Tables 8 and 12 in Chapter 4), leading me to suggest that it has led to little progress towards mitigating socioeconomic inequalities in B.C., a target under SDG 10, though it is more strongly correlated with higher rates of economic growth, a target under SDG 12.

6.2.4: Changes in Employment with and without the Carbon Tax Shift

According to Yip (2018), the only demographics that faced a statistically significant loss in employment rates due to the carbon tax were low- and moderately educated males of working age. He does not find a statistically significant change in the employment rate from the tax across the whole province; nor do I, analyzing B.C.'s aggregate and average figures (Table 9 in Chapter 4), beginning in 2001. My data show that introducing the tax correlates with the annual labour force participation rate, employment rate, and unemployment rate declining by small and statistically insignificant amounts (Table 12 in Chapter 4). I have only studied the collective impacts on B.C., so I go on only those. I also note again that Yamazaki (2017) overstates the net number of jobs added in B.C. between 2007 and 2013. This leads me to think that it is not related to major or significant progress towards or away from the aim, associated with SDG 8, to ensure decent work for all British Columbians irrespective of their other characteristics.

6.2.5: Changes in Economic Structure with and without the Carbon Tax Shift

The B.C. government's carbon tax did not do much for or against the natural-resources and agricultural sectors in B.C. Olele et al. (2019) find that it raised farmers' costs and reduced their incomes, while Rivers and Schaufele (2015b) find it did not reduce export volumes for eleven crops by a statistically significant amount during the background study period. These are compatible statements if the tax did not affect farmers' ability to get their products to market. Rivers and Schaufele (Ibid.) suggest that the tax might have encouraged some internal 'greening' of B.C.'s agricultural sector by encouraging farmers to grow less carbon-intensive crops and that "factor

endowments such as land quality, climate, and human capital” (p. 251) have greater impacts than a carbon tax anyway. Introducing the tax correlates with shares of GDP and jobs in B.C. from the fuel-intensive production of agriculture and natural resources decreasing by statistically significant but small amounts; with GDP from natural resources and agriculture production increasing by a substantial amount in human terms, but a small amount relative to government budgets, and not statistically significantly; and with jobs from natural resources and agriculture decreasing by a small, statistically insignificant amount. Because I did not find even a statistically significant correlation with reduced dependence on natural resources and agriculture with the carbon tax versus without it on most of the metrics I analyzed (Table 13 in Chapter 4), I conclude it did not contribute to economic growth being separated much from the deterioration of the climate, which is a target under SDGs 8 and 12. I also find, however, that B.C.’s basket of goods and services provided collectively became more carbon-efficient, with dollars per tonne of CO₂e per year rising 61.363 per cent between 2001 and 2015. Compared to Canada overall, its efficiency rose by nearly double. By this metric, there was considerably more movement towards economic decoupling than at the rest of Canada; both the introduction and elevation of the carbon tax are positively correlated with small but statistically significant increases in this greater efficiency of using emitted GHGs.

6.3: Conclusions from Interviews

As many respondents said they thought the carbon tax should be lower than its present per-metric-ton level as that it should be higher than or equal to its present per-metric-ton level. Most respondents said they agreed with the idea of sustainable development and that they would support a sustainable-development policy if it attempted to make their lives ‘better’ in various ways, but their responses suggest doubt that the carbon tax as the B.C. government has applied it is achieving this, and one respondent even said so. Most of my respondents said the carbon tax had not helped

them reduce their GHG emissions—that they had either taken steps to reduce their fossil-fuel use, from home-heating, driving, or both of their own volition, or that they had not done so. Several respondents said such switching was unworkable for them because their employment, environment, or both required them to drive or heat more, echoing former MLA Simpson quoted earlier, who said fuel use was “not a lifestyle choice”. Many respondents were not working at the time I spoke with them, though belief that the carbon tax was not good for the dominant industries in their communities cut across employment status and location. Belief in the efficacy and necessity of the carbon tax was much more negative than what Horne (2011) and Jaccard (2012) found years before me. Most participants said they were buying more fuel than before the carbon tax, which would lead to them emitting more CO₂e (while they did not say this, it follows logically from buying more fuel), and that it was simply making them poorer, all contra the correlations of the 2001–2015 trends. Meanwhile, a plurality also said it harmed important local industries, implying they experienced or believed there were mostly negative outcomes in the labour-market indicators, which, as I have also shown above, changed little in aggregate during the early period of the tax’s introduction relative to the seven previous years, but which may have caused more harm to some persons grouped by such factors as region, gender, and education level.

6.4: Policy Implications

Because B.C.’s carbon tax was designed more from the top down than from the bottom up, which contributed to antipathy to the government (especially among rural British Columbians) that many of my respondents seem to have retained, I propose that it should be renegotiated, with the people involved in policymaking so that they can address omissions that politicians and bureaucrats make. Many people support the stated objectives but are unconvinced that it is effective or convinced that it is ineffective; they need both a change in the message the government sends and

the opportunity to shape policy so they get to see clear benefits from it, guided by the promise of cutting emissions and enhancing public services (and the former should be considered part of the latter). This will make B.C.'s carbon tax more sustainable and more effective. Where some people feel alienated due to some demographic feature that applies to them but not others, as in rural and northern B.C. (Peet and Harrison, 2012; Harrison, 2013), involvement in policymaking is imperative for rectifying this problem, since democratic regimes depend on the knowledge and participation of their people to survive. Participant 2 from Elkford (2021, 8 January, pers. comm.) suggested that everyone in rural B.C. should get a living allowance in exchange for their acceptance of any carbon tax. I am not endorsing this, nor any other measure, but I do believe it is necessary for the B.C. government to consider what the people say and try both to develop more equitable solutions and to present them in an attractive way.

6.5: Concluding Comments

I had believed that B.C.'s carbon tax shift was an overwhelmingly positive policy when I began studying it. I thought it was necessary to instil an ethic of 'the greater good' and thought, after the famous line from the film *Star Trek II: The Wrath of Khan*, that the needs of the many outweighed the needs of the few. Because climate change is such an existential threat to everybody, I thought of opposition to carbon taxes as largely shirking of the necessary self-sacrifice, and I presumed opposition was largely 'Astroturfed' (i.e., stoked by powerful organizations posing as ordinary concerned citizens). I had read of, but had not read, reports that the carbon tax caused B.C. to reduce its GHG emissions, which I regarded then as now as the most important objective, because a planet where people have all they need to live is an irreducible necessity for life. I thought more strongly that economic growth could be achieved while enhancing ecosystems and the climate, and I thought less of jobs in polluting sectors. I believed governments and businesses would more

happily facilitate the transition of workers from jobs in the most GHG-intensive sectors to jobs in low- or no-GHG sectors, with better conditions, which would lead to more growth, more broadly shared. I also believed that these jobs were easier to achieve using present policy than they were and that they would be so self-evidently welcomed that everybody would want and have a good job in the non-polluting fields of tomorrow.

Now that I have read and heard about how the shift was implemented on the ground, however, my data force me to update my perspective on this. I have learned that, in some ways, the shift's implementation was inequitable and measures to alleviate the inequities were only temporary and that the inequitable parts of the tax shift sometimes outweighed those that were more equitable. This manifested, for example, in hinterland alienation. The feature of parliamentary politics where people largely cede power to politicians, as well as negative features of climates and built environments that limit what people can feasibly do to reduce their fuel consumption, also play a role. Many of my participants told me they had done things to reduce their fossil-fuel consumption, but that they were using no less fossil fuel than before, suggesting that they had increased their consumption elsewhere. Since the 2001–2015 study period, according to these participants, their GHG emissions have increased, their consumption has become less sustainable, and they are less well-off, among other failures of the policy. Although there were some encouraging trends from the study period in statistically significant lower average GHG emissions per year, lower sales of fuel in most months, lower income inequality, and greater total and per-capita GDP, most participants could not name potential or actual positive effects from the carbon tax. There are at least three potential reasons for this, any combination of which may be true. The first is that the gains did not continue into the winter of 2020–2021. The second is that these average gains did continue, but the B.C. government did not publicize these gains in a way that reached, let alone convinced, most

British Columbians. The third is that these average gains continued, but since no one lives in the statistical aggregate and few live at the mean or median, the people I interviewed really did lose out from it in important ways.

For this reason, I am advocating only a 'purer' democracy that puts the people's concerns at the centre of every issue. I chose to study the carbon tax because I value environmentalism, borne of my pragmatic approach to social science, and I promote a more bottom-up democracy as a solution to the problems with this intended environmentalist measure because I also believe democracy is the least bad conceivable form of human government, to paraphrase Winston Churchill's famous quotation. If limited democracy led to problems with the carbon tax, greater democracy may help solve them.

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Appendix A: Interview Schedule for Community Members

Interview Questions

Introduction

Hello, and I thank you again for your time with this interview. Do you have any new questions about this interview that you got after reading the consent form?

As you know, I am exploring sustainable development in British Columbia before and after it introduced its carbon tax. You may recall that when the tax was introduced British Columbians were told that it would reduce greenhouse gas and stimulate the economy. I am talking to people to understand their experience with the carbon tax to see if it is fulfilling these goals.

If at any point during the interview you need me to repeat or clarify anything, please let me know.

We can skip any questions you do not feel comfortable answering. Also, take as much time as you need to think about a question before you respond.

You may end this interview now or at any time during the interview by saying “I wish to stop” or “I wish to withdraw.” I have a copy of the consent form I sent you. I will write “Do not call back” on your form, and I will not call you back after. I will not use any information you have given me, and I will permanently delete all audio and text files that contain that information.

Lastly, I want to remind you that I will not quote you by name unless you want me to quote you by name. Do you have any questions before we start?

Demographic Questions

1. I will list some age groupings. Please stop me at the grouping in which your age is included.
(18–34 years) (35–49 years) (50–64 years) (65 years or older)
2. Do you identify as male, female, other?
3. What is the highest level of education that you have completed?

- a. Grade 9 or less
- b. Some high school
- c. High school graduate
- d. Some community college or technical school
- e. Community college or technical school degree or diploma
- f. Some university (bachelor's)
- g. University degree (bachelor's)
- h. Some graduate study
- i. Graduate university degree

Fuels in the Participant's Personal Life

- 4. As you probably know, the present carbon tax applies a fee of \$40 per tonne of carbon dioxide equivalent to most fossil fuels burned in B.C. This fee will rise to \$45 and later \$50 per tonne. Do you think this price should be higher, lower, or the same as it is now? Why?
- 5. Are certain industries especially important in your community? If so, what industry or industries are they?
 - a. Do you think the carbon tax has been good, bad, or neutral for that industry or those industries? Why?
- 6. Are you, or is anybody in your family, a wage earner at present? (If yes, pursue the sub-question below. If no, skip to question 7.)
 - a. Does anybody in your household (you do not have to mention names or relationships) engage in any of the following industries for their economic livelihood?
 - i. Fishing?
 - ii. Forestry?

- iii. Mining?
 - iv. Oil and gas?
 - v. Agriculture?
7. What has been the general effect of the carbon tax on fuel prices for your household?
 8. Do you think the carbon tax has encouraged you to use less fuel?
 9. What fuel(s) do you use to heat and cool your home?
 - a. Have you switched your fuel sources in the past twelve years?
 - i. If so, what did you use formerly and with what did you replace it? And were there any incentives that persuaded you to switch? What were they?
 - ii. If not, what barrier or barriers kept you from switching? What incentives might help you to switch?

Now, I am going to ask you a couple of questions that may involve other people in your community.

You do not have to name anybody or identify your relationship to them. Do you understand?

- b. Have you or any of your neighbours, friends, relatives, etc., participated in individual or co-operative initiatives to use less heating and cooling fuel?
 - c. Have you, or has anybody you know, offered suggestions to the municipal government regarding ways to reduce fuel use?
10. Do you own a personal passenger vehicle, such as a car, SUV, or a truck? (If yes, ask the sub-question below and questions 11 through 13. If no, skip to question 14.)
 - a. If yes, what type of vehicle(s)?
 11. Can you walk, cycle, carpool or take public transit, or do you have to drive your own vehicle...?
 - a. ...to get to work?

- b. ...to visit relatives and friends?
12. Have you gone to Alberta or the U.S. to buy gas? Why or why not?
13. Have you tried to drive less in the last twelve years? (If so, explain how successful you were or were not in doing so.)
- a. What incentives would help you drive less?
 - b. Have you tried to get one or more vehicles that are more fuel-efficient in the last twelve years?
 - i. If so, have there been any incentives that encouraged you to switch? What incentives would encourage you to switch?
 - ii. If not, have there been any barriers that kept you from switching? What were they?
 - c. Would you prefer to transport yourself some other way if you did not have to drive? Why and how?

Broader Context: Sustainable Development

14. Thank you for these insightful answers. I'm going to move into a bigger picture now and describe sustainable development briefly. It is a philosophy that aims to balance economic, environmental, and social needs and interests. Would you support a government policy branded as improving sustainable development if it attempted to...?
- a. Improve the quality of your job?
 - b. Reduce your dependence on fuel?
 - c. Cut income taxes for you?
 - d. Make the government more accountable to you?
 - e. Make the government co-operate with other governments on fighting climate change?
15. Do you feel that your local politicians (municipal officials, members of the Legislative

Assembly) represent your interests well on climate issues generally and the carbon tax specifically? Why or why not?

16. Is there anything else you would like to say about the carbon tax, such as how it was implemented or how it is functioning?

Conclusion

Thank you for your time. I am grateful for your assistance. Have a terrific day.

Appendix B: Community Members' Responses to Questions about Their Support for a Hypothetical Policy of Sustainable Development

Table 27: Responses to questions I4(a) through (e) from participants from Elkford, B.C. All interviews were conducted by telephone after receiving consent forms.

Participant no.	1	2	3	4	5	6	7	8
Question I4(a)	Yes, conditional	Yes	Yes	Yes	Yes, conditional	Yes, conditional	Yes	Yes, conditional
Question I4(b)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question I4(c)	Yes	Yes, conditional	Yes	Yes	Yes	Yes	Yes	Yes
Question I4(d)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question I4(e)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unsure

Table 28: Responses to questions I4(a) through (e) from participants from Coquitlam, B.C. All interviews were conducted by telephone after receiving consent forms.

Participant no.	1	2	3	4	5	6	7	8
Question I4(a)	Yes	No	Yes, conditional	Yes	Yes	Unsure	Yes	Yes
Question I4(b)	Yes	No	Yes	Yes	Yes	No	Yes	Yes, conditional
Question I4(c)	Yes	Yes, conditional	Yes	Yes	Yes	Yes	Yes	Yes
Question I4(d)	Yes	Yes	Yes, conditional	Yes	Yes	Yes, conditional	Yes	Yes
Question I4(e)	Yes	Yes, conditional	Unsure	No	Yes	Yes	Yes	Yes, conditional

Table 29: Responses to questions 14(a) through (e) from participants from Smithers, B.C. All interviews were conducted by telephone after receiving consent forms.

Participant no.	1	2	3	4	5	6	7	8
Question 14(a)	Yes	Yes	Yes	Yes, conditional	Yes	Yes, conditional	Yes	Yes
Question 14(b)	Yes	Yes	Yes	Yes, conditional	Yes	Yes, conditional	Yes	Yes, conditional
Question 14(c)	Yes	Yes	Yes	Yes	Yes, conditional	Yes	Yes, conditional	Yes
Question 14(d)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question 14(e)	Yes	Yes	Yes	Yes	Yes	Yes, conditional	Yes	Yes