

## RESEARCH NOTE: IT'S NOT A JOB KILLING POLICY — THE CASE OF BC'S *REVENUE NEUTRAL* CARBON TAX

Written by: Akio Yamazaki

This research note is based on a paper (*Jobs and Climate Policy: Evidence from British Columbia's Revenue-Neutral Carbon Tax*) written by Akio Yamazaki, PhD Candidate, University of Calgary.

### Key Messages

- In 2008 the government of British Columbia (BC) implemented North America's first revenue neutral carbon tax. It raises revenues from taxing the carbon content of fossil fuels, and redistributes the revenues back to residents of BC through reductions of other taxes, such as personal and corporate income taxes, as well as lump-sum transfers to low-income households.
- A recent report<sup>1</sup> showed that the per capita use of fossil fuels in BC has declined by 17% during the first four years following its implementation, which is 19% more than in the rest of Canada. Similarly, the per capita greenhouse gas (GHG) emissions have declined by 10% in BC from 2008 to 2011. Thus far, the BC carbon tax appears to be fulfilling its purpose.
- However, critics have questioned the impact of BC's carbon tax on employment. This research note explores the employment effects of the BC carbon tax.
- The effect of the BC carbon tax on employment differs significantly across industries as it depends on how much energy each industry uses, and how sensitive the market demand response is for each industry.
- Although there are winners and losers from the BC carbon tax, aggregate employment in the province increased since its introduction in 2008.
- Understanding the effect of the BC carbon tax on employment across different industries could help design a future climate policy in BC and other jurisdictions.

---

<sup>1</sup> Elgie, S., & McClay, J. (2013). BC's Carbon Tax Shift Is Working Well after Four Years (Attention Ottawa). *Canadian Public Policy*, 39 2S, S1-S10.

## The Issue

To address climate change, many local jurisdictions have implemented various forms of climate policies including emission trading schemes and carbon taxes. As of 2015, there were 39 countries and 23 sub-national jurisdictions implementing or scheduled to implement a carbon pricing policy.<sup>2</sup> Despite the growing number of adopters around the world, concerns over the unintended consequences of climate policies are still debated by the public and politicians. One prominent concern is job loss. Those who express such concern often claim that climate policies are “job killers” as the financial burden imposed by these policies would lead to substantial layoffs due to major adjustments or a shutdown of firms. On the other hand, some policy analysts argue that implementing a climate policy could strengthen the economy by creating more green jobs.<sup>3</sup>

To better understand the relationship between jobs and climate policy, this research note presents an evaluation of BC’s revenue neutral carbon tax. Although each climate policy is unique and would have different economic implications, this research note will show that policy-makers in other provinces — and even at the federal level — can turn to BC’s carbon tax experience as an example of how to reduce greenhouse gas emissions in a cost-effective way and without hurting aggregate employment rates.

## The Knowledge Base

This research note provides a quantitative analysis of BC’s carbon tax, particularly focusing on its employment impacts. By using data from Statistics Canada,<sup>4</sup> it employs an econometric technique to compare changes in employment for industries in BC, with changes in employment for industries in the rest of Canada before and after the unilateral implementation of the policy in order to identify the employment effect of the BC carbon tax.

### *How the Tax Works*

BC introduced a carbon tax on the purchased of all fossil fuels on July 1<sup>st</sup>, 2008. Its purpose is to give incentives to households and businesses to consume less of the fuels that release GHG emissions into the atmosphere. The target reduction of GHG emissions is set at a minimum of 33% below the 2007 levels by 2020.<sup>5</sup>

---

<sup>2</sup> The World Bank. 2015, September. State & Trends of Carbon Pricing. Retrieved November 28, 2015, from [http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/09/21/090224b0830f0f31/2\\_0/Rendered/PDF/State0and0trends0of0carb0n0pricing02015.pdf](http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/09/21/090224b0830f0f31/2_0/Rendered/PDF/State0and0trends0of0carb0n0pricing02015.pdf)

<sup>3</sup> A definition of a green job is loosely defined as a job that contributes substantially to preserving or restoring environmental quality [http://www.unep.org/PDF/UNEPGreenjobs\\_report08.pdf](http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf).

<sup>4</sup> The analysis uses data from Tables of Statistics Canada: 281-0024, 153-0034, 379-0029, 386-0003. Statistics Canada. (2015). CANSIM. Retrieved from <http://www5.statcan.gc.ca/cansim/>

<sup>5</sup> Ministry of Finance. (2008). *Budget and Fiscal Plan 2008/09 – 2010/11*. British Columbia: Canada

In its initial year, the tax was set at \$10/t CO<sub>2</sub>e from burning fossil fuels and set to increase by \$5/t CO<sub>2</sub>e annually until 2012. This means that the carbon tax would increase gradually from its 2008 level of 2.41 cents per litre for gasoline, to 7.24 cents per litre by 2012 (more details shown in Table 1). The tax rate’s gradual increase allows consumers to adjust their fuel usage slowly to minimize the financial burden from the tax.

Tax Rate (\$/t CO <sub>2</sub> e)		Tax Rates by Selected Fuel Type in 2008		
2008	\$10	Gasoline	¢/litre	2.41
2009	\$15	Diesel	¢/litre	2.76
2010	\$20	Jet fuel	¢/litre	2.62
2011	\$25	Natural gas	¢/gigajoule	49.88
2012	\$30	Propane	¢/litre	1.53
2013	\$30	Coal - Canadian bituminous	¢/t	20.79
2014	\$30	Coal - sub-bituminous	¢/t	17.72

The design of carbon taxes often includes some form of exemptions — mostly for energy-intensive and trade-exposed industries — aimed at protecting the domestic economy, which makes the tax relatively narrow-based. However, the BC carbon tax is intended to be broad-based, i.e., no exemptions were applied to any industry.<sup>7</sup>

One of the most unique features of the BC carbon tax is its revenue neutrality. The revenue raised by the carbon tax is redistributed back to residents of BC via reductions in personal and corporate income taxes, as well as lump-sum transfers to low income households. According to the Budget and Fiscal Plan, the tax revenue was \$1.2 billion for 2013-2014 and is estimated to be \$1.4 billion for 2014-2015.<sup>8</sup> Since the implementation, tax credits have been exceeding tax revenues.

### Key Finding 1: Differential Impacts of BC’s Carbon Tax on Employment Across industries

Previous studies in the jobs and environmental regulation literature found contradicting results. These differing results can be explained because each study investigated a different policy, in a

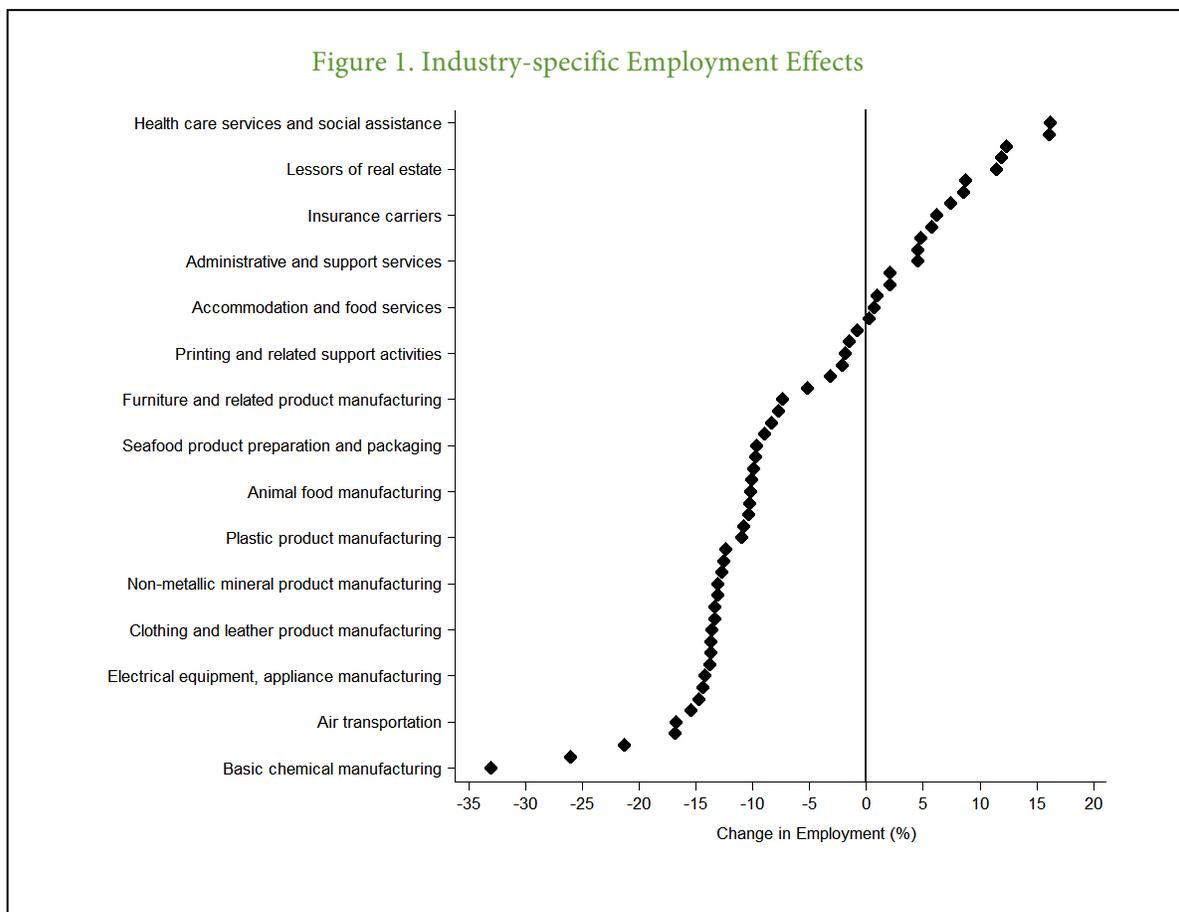
<sup>6</sup> Ministry of Finance. (2008). *Budget and Fiscal Plan 2008/09 – 2010/11*. British Columbia: Canada

<sup>7</sup> This has been changed as of March, 2012. To protect agricultural industries, a carbon tax relief was granted to commercial greenhouse growers. A temporary relief of \$7.6 million was provided in 2012, and then the relief program was made into a permanent program in 2013. As of January 1, 2014, the farmers is exempted from carbon tax on the purchase of coloured gasoline and coloured diesel fuel used for farm purposes. For further information, see <http://www.gov.bc.ca/agri>

<sup>8</sup> Ministry of Finance. (2008). *Budget and Fiscal Plan 20014/15 – 2016/17*. British Columbia: Canada

different location, and during a different time. However, a number of studies agree and emphasize that the employment effects differ significantly across industries<sup>9</sup> although all industries are faced with the same policy. This point is important for the BC carbon tax as the size of actual financial burdens depends on how much fossil fuels are purchased by each industry.

In this study, of 57 industries, 18 industries (32%) experienced an increase in employment in response to the carbon tax. The size of the effect on employment ranges from -33% to 16% at \$10/t CO<sub>2</sub>e (Figure 1). To list a few; health care industry experienced an increase in employment by 16%, while basic chemical manufacturing industry experienced a decline in employment by 33%. Table 2 lists the top 5 and the bottom 5 industries.<sup>10</sup>



Note: Not all industries are shown in the y-axis due to the limited space.

Source: Author’s calculations based on estimations

<sup>9</sup> Wendling, R., & Bezdek, R. (1989). Acid rain abatement legislation—Costs and benefits. *Omega*, 17(3), 251-261.

Greenstone, M. (2002). The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures. *Journal of Political Economy*, 110 (6), 1175-1219.

<sup>10</sup> For more detail about results, see Yamazaki, A. (2015) Jobs and Climate Policy: Evidence from British Columbia’s Revenue-Neutral Carbon Tax. mimeo

Table 2. Top 5 and Bottom 5 Industries

Top 5 - Positive Employment Effect	%
Health care services (except hospitals) and social assistance	16.19
Hospitals	16.13
Rental and leasing services and lessors of non-financial intangible associations	12.33
Retail trade	11.92
Lessors of real estate	11.43
Bottom 5 - Negative Employment Effect	%
Basic chemical manufacturing	-33.07
Petroleum and coal product manufacturing	-26.10
Primary metal manufacturing	-21.33
Pulp, paper and paperboard mills	-16.92
Air transportation	-16.75

These results are derived from an assumption that changes in employment in response to the carbon tax depend on two factors: a negative cost shock and positive demand shock.

**Two factors**

- Negative cost shock

There are two channels through which a negative cost shock comes about:

- Emission intensity – The more emission intensive an industry is, the more taxes the industry has to pay. This is simply because emission intensive industries purchase more fossil fuels. It is now more costly to produce their goods and services.
- Demand elasticity<sup>11,12</sup> – When the demand curve an industry faces is highly elastic, an increase in price due to the carbon tax would result in a large reduction of product demand.

These two channels would lead industries to produce less and thus demanding less labour.

- Positive demand shock

After tax revenues are redistributed back to residents of BC, this additional income can be spent on all industries. This additional spending would increase product demand. In response to this increase in demand, industries increase production leading to an increase in labour demand.

<sup>11</sup> Emission intensity is used as a proxy for energy intensity, and trade intensity is used to measure an elasticity of demand. See Yamazaki, A. (2015) for more detail description of data and models.

<sup>12</sup> As a trade-exposed industry tends to face more elastic demand, an increase in price due to the carbon tax would result in a large reduction of product demand.

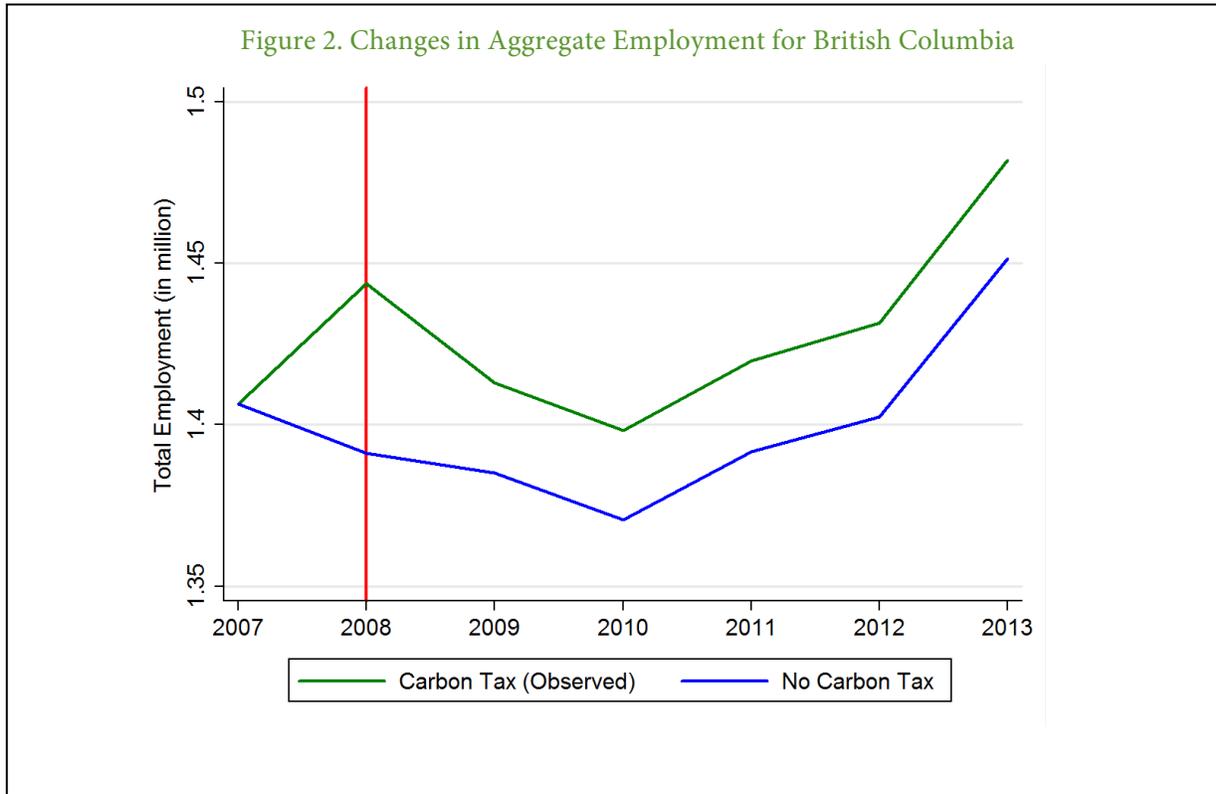
The employment effect for an industry is determined by comparing its negative cost shock and positive demand shock. As such, it suggests that emission-intensive and trade-exposed (EITE) industries suffer from the tax as their production requires a greater use of fossil fuels and they face relatively elastic demand. EITI industries, most likely, experience a negative employment effect as the negative cost shock is much larger than the positive demand shock. On the other hand, employment rises in clean service industries as their production is hardly emission-intensive and they face relatively inelastic demand.

## **Key Finding 2: Impacts on Aggregate Provincial Employment**

Increases in employment in non-EITE industries and decreases in employment in EITE industries suggest that jobs moved from industries with large GHG emissions to industries with low GHG emissions. This is not necessarily a bad outcome as these shifts will help achieve an overall reduction of GHG emissions in the province. However, policy-makers — and the public in general — still worry about the effect of the carbon tax on aggregate employment, in other words, does the implementation of the carbon tax lead to a higher unemployment rate?

Despite a decline in employment in some industries, (Figure 1), the carbon tax's effect on aggregate employment is positive. The analysis suggests that the BC carbon tax increased employment by 2% over the six years following the implementation, an average of 5,000 jobs annually (Figure 2).

The positive aggregate employment effect implies that increases in employment in cleaner industries who face relative inelastic demand exceeded declines in employment in dirty industries who face relatively elastic demand.



Note: This figure plots a comparison of employment trends between the cases with and without a carbon tax. No carbon tax is “what if” scenario, i.e., this is the employment level if BC did not implement a carbon tax.

Source: Author’s calculation based on counterfactual analysis

---

## Implications for Policy-Makers

This research note reviews the effect of the BC carbon tax on the province's employment. The following conclusions are of direct relevance to policy-makers engaged in the development of future carbon taxes in other Canadian provinces. There are two important elements in the design of the tax; the treatment of the tax revenue and the tax rates.

First, with BC's total GHG emission (60 megatonnes CO<sub>2</sub>e), the tax revenues raised ranges from \$600 million at \$10/t CO<sub>2</sub>e to \$1.8 billion at \$30/t CO<sub>2</sub>e. The government has many options to deal with these revenues,<sup>13</sup> such as financing public services or reducing the budget deficit. However, to minimize the costs of the carbon tax, a revenue neutral approach seems the least harmful to its economy. The BC case suggests that the positive demand shock from the revenue recycling played an important role for generating the aggregate employment effect.

Second, the tax rate was set at \$10/t CO<sub>2</sub>e in the initial year and then gradually increased to \$30/t CO<sub>2</sub>e. If the tax rate is too low, it may not harm the economy but the reduction of GHG emission may not be achieved either. Also, the low tax rate would not raise enough tax revenues to provide enough positive demand shock. On the other hand, if the rate is too high, it could raise large tax revenues but harm its economy as the negative cost shock could outweigh the positive demand shock. Although \$30/t CO<sub>2</sub>e is relatively high, the gradual increases in the tax rate gave businesses in BC enough time to adjust their behaviour in order to minimize the negative cost shocks before the rate reached \$30. Therefore, not only did the policy succeed in reducing GHG emissions, but it also enabled policy cost mitigation through the positive demand shocks resulting from enough tax revenues raised.

Even with the successful case in BC, it is important for policy-makers to carefully design a climate policy for each province. There is no one-size-fits-all carbon pricing policy. Although some manufacturing industries suffer from the carbon tax in BC, aggregate employment in the province increased. This may not necessarily happen in other provinces. The negative hit in manufacturing industries could outweigh the positive hit in service industries in other provinces. Yet, the bottom line is that a well-designed carbon tax could increase aggregate employment. Understanding the channels and mechanisms through which a carbon tax affects employment is crucial to the design of policy that would help achieve the maximum amount of GHGs reductions with the lowest negative impact on employment.

---

<sup>13</sup> See Beck and Wingle (2014) Carbon Pricing and Mind Hissing. SP Research Paper  
<http://www.sustainableprosperity.ca/sites/default/files/publications/files/Mind%20the%20Hissing.pdf>