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# The Carbon Tax Win-Win: Too Good To Be True?

THE TAX INTERACTION EFFECT AND POLITICAL REALITIES

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# Executive Summary

**I**t has become a common assumption in Canadian policy debates that, even without the challenges of controlling greenhouse gas emissions and climate change, a carbon tax would still be welcome on economic grounds. A growing number of academics and policy-makers have recommended a carbon “tax swap” deal, under which some (or all) revenues from a new carbon tax would be used to reduce pre-existing taxes. In both theory and practice, the addition of a new carbon tax, even in a proposed swap, likely would not lead to the hoped-for economic benefits.

Carbon tax swap proponents argue that a carbon tax, calibrated to the “social cost of carbon,” will correctly align incentives and lead to a more efficient use of resources. Tax harmful activities we are told, not investment or wages. Proponents argue that such a swap could both correct the “negative externality” of greenhouse gas emissions, while at the same time provide a boost to conventional economic growth. If the carbon receipts are distributed back to citizens *not* through lump sum refunds, but instead by offsetting conventional taxes, the argument continues, then the benefit is magnified: Not only does the carbon tax cause private sector participants to fully take into account the true social cost of their activities, but it *also* reduces the government’s interference in the labour market.

Unfortunately such a “double dividend” from a carbon tax is unlikely, both on theoretical and practical grounds. This paper focuses on the tax interaction effect to show that pre-existing taxes on labour and capital most likely *weaken* the case for imposing a carbon tax, because the new tax *exacerbates* the efficiency losses from the pre-existing taxes.

This counterintuitive conclusion directly contradicts a major argument put forth by proponents of a carbon tax, but the result is in fact the default position in the environmental economics literature. By itself, the tax interaction effect does not necessarily eliminate the textbook case for a carbon tax. But it *does* mean that the “optimal” tax is likely lower than the level of the environmental externality, even if carbon tax receipts were devoted dollar-for-dollar to reducing the marginal rates of other, distortionary taxes. Once we factor in the political reality that a new carbon tax will surely lead to higher government spending than would otherwise occur, the case for a carbon tax becomes weaker still.

Conservatives and liberals uniting behind a revenue-neutral carbon tax swap are fooling themselves if they believe a politically realistic deal will give them what they both want.

# Sommaire

Dans les débats politiques au Canada, on présume maintenant que, même si l'on n'avait pas à relever les défis que présente la lutte contre les émissions de gaz à effet de serre et le changement climatique, une taxe sur le carbone serait toujours économiquement fondée. Un nombre croissant d'universitaires et de décideurs ont recommandé de substituer à d'autres taxes une taxe sur le carbone (*tax swap*), dont les recettes totales (ou partielles) viendraient réduire les impôts préexistants. En théorie comme en pratique, l'ajout d'une nouvelle taxe sur le carbone, même sous la forme de l'échange proposé, n'entraînerait probablement pas les avantages économiques escomptés.

Les partisans de l'échange de taxes font valoir qu'une taxe sur le carbone en rapport avec le « coût social du carbone » entraînerait des incitatifs adéquats et une utilisation plus efficace des ressources. Les taxes doivent être imposées sur les activités nuisibles nous disent-ils, et non pas sur l'investissement ou les salaires. Selon ses partisans, un tel échange, tout en corrigeant les « externalités négatives » représentées par les émissions de gaz à effet de serre, encouragerait du même coup la croissance économique traditionnelle. Selon l'argument présenté, si les recettes du carbone étaient redistribuées aux citoyens *non* pas sous forme de remboursements forfaitaires, mais par le biais d'une réduction de même grandeur des impôts traditionnels, l'avantage serait amplifié : non seulement la taxe sur le carbone amènerait le secteur privé à tenir pleinement compte du véritable coût social de ses activités, mais elle diminuerait *également* l'ingérence gouvernementale sur le marché du travail.

Malheureusement, un tel « double dividende » résultant d'une taxe sur le carbone est peu probable, à la fois pour des raisons théoriques et pratiques. Cette étude met l'accent sur « l'effet d'interaction fiscale » pour montrer que les taxes préexistantes sur la main-d'œuvre et le capital *affaiblissent* plutôt les arguments à l'appui d'une taxe sur le carbone, parce que la nouvelle taxe *aggrave* les pertes d'efficacité engendrées par les taxes préexistantes.

Cette conclusion contre-intuitive entre carrément en contradiction avec un argument déterminant mis de l'avant par les partisans d'une taxe sur le carbone. Toutefois, en fait, elle évoque la position habituelle en économie environnementale. En soi, l'effet d'interaction fiscale n'élimine pas nécessairement le cas d'école pour une taxe sur le carbone. Mais cet effet *signifie réellement* que la taxe « optimale » est probablement inférieure à l'externalité environnementale, même si les recettes fiscales tirées du carbone servent entièrement à réduire les taux marginaux d'autres taxes génératrices de distorsions. Les arguments qui justifient une taxe sur le carbone s'étiolent encore, une fois prise en compte la réalité politique susceptible d'émerger avec la nouvelle taxe sur le carbone, soit un accroissement des dépenses publiques par rapport à ce qu'elles seraient en cas contraire.

Les conservateurs et les libéraux qui, dans un effort uni, soutiennent le principe d'un échange de taxes sans incidence sur les recettes se trompent s'ils croient pouvoir conclure un accord politique réaliste qui répond aux demandes des uns comme des autres.

# I Introduction

The 2007 Nobel Peace Prize awarded to Al Gore and the Intergovernmental Panel on Climate Change (IPCC) underscored the public's growing awareness of and concern over anthropogenic (man-made) global warming. Many climatologists and other relevant scientists claim that unchecked emissions of greenhouse gases (GHGs) from human activity will lead to significantly rising temperatures, which in turn will spell potentially catastrophic hardship for future generations (IPCC 2007). Nicholas Stern, formerly chief economist of the World Bank, described man-made global warming in his famous report to the British government as “the greatest example of market failure we have ever seen” (Stern 2007, 1).

With the physical science of climate change so stipulated, the standard reaction of most economists is to recommend a government policy to internalize the externality. The debate has revolved largely around the best mechanism (for instance, “cap-and-trade” versus a carbon tax) and the appropriate magnitude of the corrective penalty on carbon emissions. Initially, the proponents of government intervention in this arena were left-leaning types who favoured government management of the macroeconomy on *other* grounds as well (see Nordhaus 2008 for an example). However, in recent years, more and more self-described conservatives and libertarians, who generally embrace the free market and are suspicious of taxation and government regulation of business, have come out in favor of a carbon tax, so long as its revenues are used to reduce pre-existing tax burdens.

A popular motto among the proponents of a carbon tax swap: “Tax bads, not goods.”

This endorsement rests on the possibility of what is called a “double dividend” in the literature. A double dividend occurs when a new carbon tax – the revenues of which are (at least partially) used to reduce other distortionary taxes – would simultaneously mitigate future climate change damages, as well as reduce the drag on the economy from conventional taxes. The logic behind such proposals is straightforward enough: Emit-

ting greenhouse gases is something the government ought to discourage, while working and saving are things the government ought to encourage. Thus the popular motto among the proponents of a carbon tax swap: “Tax bads, not goods.”

Perhaps the most succinct summary of the conservative case for a carbon tax is the 2008 op-ed in the *New York Times* written by one of the founding fathers of supply-side economics, Arthur Laffer, and South Carolina Republican congressman Bob Inglis. They write:

Conservatives don't support tax increases that are veiled as “cap and trade” schemes for pollution permits. But offer us a tax swap, and we could become the new [Obama] administration's best allies on climate change.

A climate-change bill withered in Congress this summer [in 2008] because families don't need an enormous, and hidden, tax increase. If the bill's authors had instead proposed a simple carbon tax coupled with an equal, offsetting reduction in income taxes or payroll taxes, a dynamic new energy security policy could have taken root. . . .

**We need to impose a tax on the thing we want less of (carbon dioxide) and reduce taxes on the things we want more of (income and jobs).** A carbon tax would attach the national security and environmental costs to carbon-based fuels like oil, causing the market to recognize the price of these negative externalities. . . .



Conservatives do not have to agree that humans are causing climate change to recognize a sensible energy solution. All we need to assume is that burning less fossil fuels would be a good thing. . . .

Yet the costs of reducing carbon emissions are not trivial . . . **It is essential, therefore, that any taxes on carbon emissions be accompanied by equal, pro-growth tax cuts.** A carbon tax that isn't accompanied by a reduction in other taxes is a non-starter. **Fiscal conservatives would gladly trade a carbon tax for a reduction in payroll or income taxes,** but we can't go along with an overall tax increase. (Inglis and Laffer 2008, emphasis added)

In Canada we see the same pattern of seemingly unusual alliances between groups from the left and right of the political spectrum (McCarthy 7 March 2012). For a concrete example, in 2008 Jack Mintz and Nancy Olewiler proposed a revenue-neutral green tax swap. As they described it:

The report recommends that the federal government, in co-ordination and consultation with the provinces, replace the federal fuel excise tax with a more broadly based environmental tax designed to reduce emissions of greenhouse gases and air contaminants. . . . [T]his would be equivalent to a tax on the carbon in fuels of approximately \$42 per tonne CO<sub>2</sub>. . . .

The restructured tax would raise approximately \$12 to \$15 billion in new tax revenue annually. This substantial increase in revenue could be used to reduce taxes or fund government tax credits related to climate change technologies. **The authors support a revenue-neutral tax shift: the incremental tax revenues should be returned to the economy in the form of lower taxes. In other words, there should be no net increase in taxes associated with this proposal.**

The report estimates that the additional revenues from this broader environmental tax would allow the federal government to reduce corporate and personal income taxes by 10 percent in the short run and eight percent in the longer-term (given that the tax revenue should diminish with lower fuel consumption over time). This is a substantial tax cut. The form of the tax cut can help mitigate impacts on low-income individuals or businesses and to accelerate the development of clean technologies. For example, the tax rates on the lowest brackets can be cut the most, as was done in British Columbia's carbon tax. . . .

Reforming the fuel tax would be a first step towards more comprehensive tax reform that would broaden tax bases while shifting away from income and other taxes that discourage savings, investment, employment and innovation – towards more consumption and user-pay taxes, such as environmental taxes. **This restructuring of the tax system would promote sustainable economic growth and incomes, and protect our natural environment today and for generations to come. In short, it would be good for the environment and the economy.** (vi-vii, emphasis added)

This paper will critique the case for a carbon tax swap on both theoretical and practical grounds. The primary theoretical objection centres on the *tax interaction effect*, a subtle and initially counterintuitive result but one that is now orthodox in the environmental economics literature. The tax interaction effect shows that the “textbook” formula for a carbon tax, calibrated to reflect the “social costs of carbon,” likely will be *too high* in the presence of other, distortionary taxes on labour and capital, because the carbon tax will *exacerbate* the efficiency losses from these pre-existing taxes. Ironically, this means that even if some (or all) of the revenues from a new carbon tax are used to reduce these distortionary taxes, the net result could still be an economy that grows more sluggishly in conven-

tional terms. In other words, the tax interaction effect shows that the “double dividend” may not materialize, especially if policy-makers set the carbon tax rate too high and/or use the new revenues for spending, rather than exclusively for other tax reductions. To be clear, by itself the tax interaction effect does not eliminate the textbook case for a carbon tax, but it *does* mean that the intuition of many commenters is exactly backwards: A pre-existing, distortionary tax code actually *weakens* the case for a carbon tax swap, rather than strengthening it. It is the primary purpose of this paper to explain this initially counterintuitive claim.

Leaving the formal models aside and introducing political realism, the case for a carbon tax is even weaker because its new revenues will *not* be used to fuel the “pro-growth” tax reforms that some conservatives propose. Governments habitually succumb to the temptation to spend more when revenues increase, and a new carbon tax would give the Canadian government a flood of new receipts. (Canadians should recognize the pattern here, as the GST was originally introduced with claims of revenue neutrality – a short-lived promise.) Furthermore, by its very nature a carbon tax would raise gasoline and electricity prices, which would impact poorer households most heavily. This will make it politically difficult to devote carbon tax revenues to across-the-board income tax reductions. Any politically viable “carbon tax swap” deal will likely involve concessions for poorer households that may well be appropriate from the standpoint of equity, but will not be ideal in terms of promoting economic efficiency.

In addition, commentators typically fail to note that potential double dividends only arise for relatively small tax swaps, but a small carbon tax would not have enough effect on emissions to affect the climate. A carbon tax set at a very high level might mitigate climate change, but the tax interaction effect would have swamped any revenue recycling effect and yielded an overall negative effect on the economy. Thus, on both theoretical and practical grounds, the case for a carbon tax swap deal – with its promise of a double dividend that will reduce CO<sub>2</sub> emissions by enough to mitigate global warming and simultaneously boost conventional economic growth – is dubious indeed. As Ross McKittrick – a University of Guelph economist specializing in environmental analysis – argued in a conference last year, once policy-makers take into account the tax interaction effect and other real-world con-

siderations, the resulting “optimal” carbon tax might be so low as to hardly reduce emissions, thus defeating the original environmental motivation (McKittrick 2013).

A pre-existing, distortionary tax code *weakens* the case for a carbon tax swap.

If policy-makers still support a carbon tax because they feel the threat from climate change is just that severe, the considerations in this paper will not be decisive. However, conservatives and liberals uniting behind a revenue-neutral carbon tax swap are fooling themselves if they believe a

politically realistic deal will give them what they both want. In any politically realistic scenario, a new carbon tax will very likely result in lower conventional economic growth, in exchange for what may well be only modest environmental benefits. The supporters of such a policy should be clear on what to expect; the popular arguments about a “double dividend” do not line up with the default findings in the peer-reviewed literature.



## II Theoretical Problems: The Tax Interaction Effect

The most serious *theoretical* problem with the entire carbon tax swap mindset is that *a carbon tax may cause significantly more economic distortions than a generic tax on labour or capital*. This is a crucial point to make, because some proponents of a so-called double dividend tell the public that a carbon tax would be a good move for the economy *even if we completely disregard the greenhouse effect*.

For just one recent example, an MIT study by Rausch and Reilly (2012) explicitly makes the case that a carbon tax – so long as it were offset by reductions in other taxes – would bestow net economic benefits, and describes a carbon tax (in the subtitle of the paper) as a “win-win-win” solution: The authors are claiming that the carbon tax swap deal is good for mitigating climate change (to make environmentalists happy), can reduce oil imports (referring to the United States, of course), *and* (to make conservatives happy) can render the tax code more efficient and thus promote general economic growth. In other words, they are arguing that even if we completely ignored climate change, such a deal would actually help the conventional economy by implementing a revenue-neutral carbon tax. Here is how Rausch and Reilly describe their results in their concluding summary:

[W]e find that [the] combination of a carbon tax with general tax cuts improves overall economic performance. **As a result we get other benefits of the carbon tax, reduced emissions and lower oil imports, at no cost.** This surprisingly positive result comes through the tax interaction effect that has been widely studied. By avoiding increases in general income taxes we avoid their drag on the economy, and the avoided drag is actually greater than the direct cost of the carbon tax. The economy thus benefits. (16, emphasis added)

This position is not unique to Rausch and Reilly; there are many advocates of a carbon tax who are currently arguing – both in formal papers and in general pieces for the layperson – the same thing, namely that a carbon tax has the potential to reduce other taxes and hence provide a boost to the conventional economy. The irony in the above quotation is that the “tax interaction effect that has been widely studied” – and which Rausch and Reilly specifically cite on page 2 of their own paper – actually has the exactly *opposite* impact of what Rausch and Reilly report.

A carbon tax may cause significantly more economic distortions than a generic tax on labour or capital.

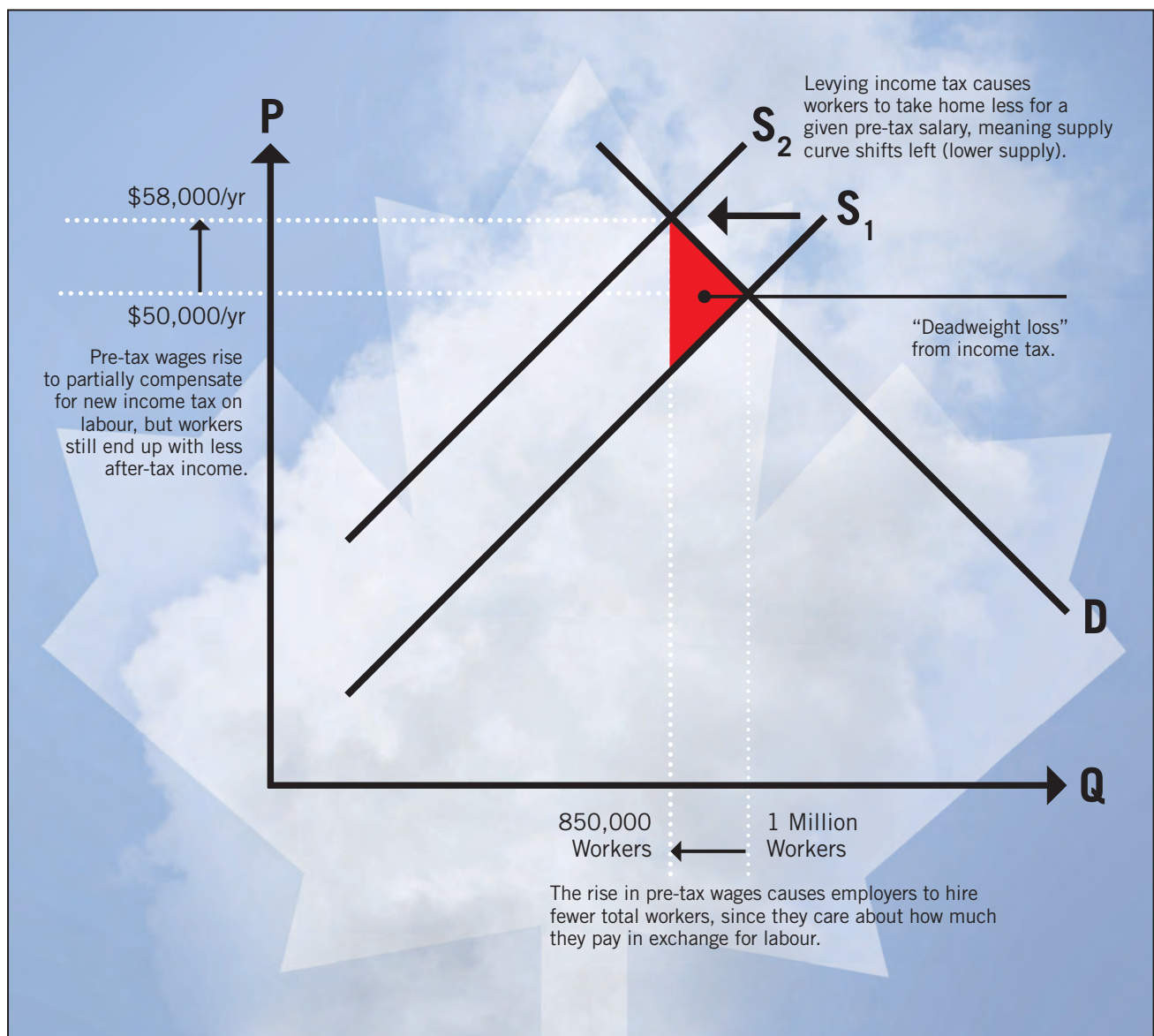
### Background: The Economic Analysis of Taxation and Environmental (Negative) Externalities

In order to explain the so-called tax interaction effect, it is first necessary to review the general economic analysis of taxation. Although the taxpayer may chafe when sending, say, \$10,000 to the government, this doesn't represent the true *opportunity* cost of taxation from a social perspective, because the government can transfer the money to others and/or spend it in ways that can bestow

benefits on some individuals. Thus, even though the particular taxpayer is “down” \$10,000 because of his payment, the community as a whole isn’t \$10,000 poorer.

Instead, when economists speak of the *deadweight loss* of taxation, they refer to the fact that mutually advantageous transactions do not occur in the presence of most types of taxes. *This* is the true, social cost of taxation. For example, if the government levies a 29 percent tax on labour income, not only does it draw revenue from workers, but it also causes workers (other things equal) to work *fewer total hours in the aggregate* than they otherwise would, because the individual worker’s reward for labour is reduced. On the margin, the individual now has the incentive to engage in more leisure than would otherwise have been the case, especially when “leisure” can mean a spouse staying home with the children rather than seeking official employment and outsourcing childcare. Thus, a government tax on labour income causes labourers to sell fewer total hours to employers, showing that there is a “cost” to the tax that doesn’t show up at all in the flow of revenues to the government. The following chart illustrates the shift in labour supply as the result of a tax.

**CHART 1: Labour deadweight loss due to a new income tax**



In the chart above – which is perfectly standard in the economic analysis of taxation – we have an original equilibrium in a certain labour market at annual wages of \$50,000 and total employment of one million workers. Then the government introduces an income tax, meaning that for any particular *pre-tax* wage rate, the workers actually bring home less money. Since they presumably won't increase their willingness to perform labour in exchange for money, just because the government is now taxing them, the workers' supply curve of labour shifts to the left. In other words, to draw forth the same quantity of labour from the workforce, it now takes a higher *pre-tax wage*, since the workers ultimately care about how much *after-tax* pay they take home in exchange for their labour.

However, in general the rise in pre-tax wages won't perfectly offset the new income tax, because the employers will react to the new situation. From their perspective, they don't care about the fact that their workers now have a portion of their gross wages taken by the government; the employers still care about how much they pay out of pocket, in exchange for particular quantities of labour. In other words, the demand curve for labour doesn't move in response to a new income tax levied on the workers.

Consequently, the result is a new equilibrium in which the pre-tax wage rate rises, but not enough to fully offset the new income tax. Thus the workers end up taking home less than they did originally, and the employers have to pay more for a given amount of labour. In the chart above, the new equilibrium occurs with a pre-tax wage of \$58,000 and total employment at this higher wage falls to 850,000 workers. The red triangle represents the *deadweight loss* of the income tax; it represents forfeited economic opportunities that aren't counterbalanced by any gain to anyone else in society, not even the government collecting the taxes. Specifically, the fact that the demand curve lies above the (original) supply curve in this region shows that there are potential workers and potential employers who could have made mutually advantageous deals, yet this is now not occurring because of the artificial wedge introduced by the income tax. Thus one way to understand why the income tax is inefficient, is that it causes workers to put in fewer total hours than they otherwise would have. This potential output is totally wasted; it is production that simply doesn't occur, because of the perverse incentives of an income tax.

An income tax decreases potential output because workers put in fewer total hours.

In the economic analysis of taxation, the greater the distortion a tax provides to private decisions, the more it disrupts economic efficiency. *Given* that the government must raise a certain amount of revenue, the least disruptive (or the most efficient) type of tax is a *lump sum* tax, in which each individual's tax burden is a fixed dollar amount.<sup>1</sup> Although this type of tax is the most *efficient* imaginable, it obviously fails according to widespread views on *equity* in tax design. Because most people endorse the ability-to-pay principle in tax design, governments typically apportion tax burdens either in proportion to income (in a flat tax approach), or often even with a *higher* proportion based on income (in a "progressive" tax code). Although a percentage income tax (whether flat or graduated) seems fairer to most people than a lump sum approach, it carries the undesirable feature of economic inefficiency.

At the same time, the field of environmental economics discusses the role of taxation in curbing activities that carry a *negative externality*. For example, if emitting a ton of carbon dioxide into the atmosphere exacerbates man-made climate change and thereby increases total social damages (measured in present value terms) by \$20, then the "social cost of carbon" is \$20 and the free market will produce a mix of goods and services that requires the emission of too much carbon dioxide. The textbook way to fix this "market failure" is for the government to impose a tax of \$20 per ton of emissions, leading those in the private sector to "internalize the externality." Such a tax on carbon

emissions improves economic efficiency, *not* because of the government's use of the revenue, but because it provides individuals with the correct prices to guide their behaviour. The government can simply return the carbon tax revenue to everyone in a lump sum fashion, so as not to disturb decisions because of a subsidy.

Today's proponents of a carbon tax swap, and those who argue for a double dividend, are simply combining the two textbook approaches described above. First they argue that a carbon tax, calibrated to the "social cost of carbon," will correctly align incentives and lead to a more efficient use of resources. But then if the carbon receipts are distributed back to citizens *not* through lump sum refunds, but instead by offsetting conventional taxes, then the benefit is magnified: Not only does the carbon tax cause private sector participants to fully take into account the true social cost of their activities, but it *also* reduces the government's interference in the labour market.<sup>2</sup>

To see an example of this mindset of particular relevance to a Canadian audience, consider a (pro-carbon-tax) discussion found in a July 4, 2012, *New York Times* op-ed by environmental economist Yoram Bauman and law professor Shi-Ling Hsu. They write:

On Sunday, the best climate policy in the world got even better: British Columbia's carbon tax – a tax on the carbon content of all fossil fuels burned in the province – increased from \$25 to \$30 per metric ton of carbon dioxide, making it more expensive to pollute.

This was good news not only for the environment but for nearly everyone who pays taxes in British Columbia, because the carbon tax is used to reduce taxes for individuals and businesses. . . .

The only bad news is that this is the last increase scheduled in British Columbia. In our view, the reason is simple: the province is waiting for the rest of North America to catch up so that its tax system will not become unbalanced or put energy-intensive industries at a competitive disadvantage. . . .

Substituting a carbon tax for some of our current taxes – on payroll, on investment, on businesses and on workers – is a no-brainer. Why tax good things when you can tax bad things, like emissions? The idea has support from economists across the political spectrum, from Arthur B. Laffer and N. Gregory Mankiw on the right to Peter Orszag and Joseph E. Stiglitz on the left. That's because economists know that a carbon tax swap can reduce the economic drag created by our current tax system and increase long-run growth by nudging the economy away from consumption and borrowing and toward saving and investment.

Of course, carbon taxes also lower carbon emissions. Economic theory suggests that putting a price on pollution reduces emissions more affordably and more effectively than any other measure. . . . British Columbia's carbon tax is only four years old, but preliminary data show that greenhouse gas emissions are down 4.5 percent even as population and gross domestic product have been growing. Sales of motor gasoline have fallen by 2 percent since 2007, compared with a 5 percent increase for Canada as a whole. . . .

A carbon tax makes sense whether you are a Republican or a Democrat, a climate change skeptic or a believer, a conservative or a conservationist (or both). We can move past the partisan fireworks over global warming by turning British Columbia's carbon tax into a made-in-America solution.

The Bauman and Hsu piece echoes the sentiments of the other discussions quoted earlier in this



paper. In light of the background provided on the standard economic analysis of tax design and environmental externalities, Bauman and Hsu (as well as the earlier quoted authors) seem to make perfect sense. Indeed, their argument *is* valid, insofar as it goes. The problem is, their analysis *leaves out* a crucial consideration, which has been dubbed the tax interaction effect in the environmental economics literature.<sup>3</sup>

## The Tax Interaction Effect

The tax interaction effect involves what economists call *second-best analysis*. The efficient, or first-best, tax system would levy environmental taxes in proportion to environmental damages, and then raise any additional revenue through lump sum burdens imposed on the citizenry. Because of this, many analysts simply assume that in the real world, if carbon emissions cause, say, \$20/ton in social damages, then it improves efficiency for the government to levy a \$20/ton tax on emissions.

Yet in a second-best analysis, this conclusion is not obvious. The problem is that in the presence of other, distortionary taxes, any new tax, including a new environmental tax, will “interact” with the original system, and *exacerbate* its inefficiency – so even if the carbon tax revenues are used dollar-for-dollar to reduce pre-existing taxes the net effect may be negative for the economy. Lawrence Goulder, one of the pioneers in this line of research, has explained the consensus in various articles (such as Goulder 2000 and 2013) that are intuitive for trained economists but might prove difficult reading for the layperson. Here I will try to summarize his explanation in simple terms.

By introducing an extra hurdle on the use of carbon-intensive production techniques, a carbon tax reduces the options available to firms and therefore makes goods and services more expensive than they otherwise would be. Now, starting from a baseline of no taxation, this harm or cost to the conventional economy is offset by the benefit of reduced climate change damages. If there were no other taxes or “green” policies in place, the optimal thing to do would be to impose a carbon tax calibrated precisely to the “social cost of carbon,” which measures the external damage to others caused by emitting an additional amount of carbon dioxide. For example, we can imagine economists estimating the current social cost of carbon at \$30/ton, and the government setting an “optimal” carbon tax accordingly.

However, the tax interaction effect shows that this analysis is incomplete, if the carbon tax is imposed in a world that already suffers from distortionary taxes. By implementing a carbon tax, as we have already said, the prices of goods and services will rise (particularly those that used to rely on carbon-intensive processes of production). Yet this is similar to a new tax on labour and capital, because workers and investors now receive less “real” compensation for their contributions. For example, a worker’s wages of \$58,000 per year will mean less to him, if now electricity, gasoline, and food have become more expensive.

The effect here is similar to that of a genuine income tax. The workers’ supply curve shifts left again, *exacerbating* the deadweight loss emanating from the original income tax. This is something that the proponents of a carbon tax rarely discuss, particularly in public forums. The new carbon tax will interact with pre-existing, distortionary taxes, and these costs must be counted when choosing the optimal rate. The optimal carbon tax will turn out to be less than the conventionally-determined “social cost of carbon.” I show below that the proportionate reductions can turn out to be quite large.

The case for a carbon tax is *weaker* in the presence of a distortionary tax code.

Now it's true, the total impact of a carbon tax on the economy can be influenced by what the government does with the revenues. If they use the carbon tax receipts to reduce marginal income tax rates, then the tax interaction effect can be mitigated. But the crucial point – which at first seems very counterintuitive – is that the case for a carbon tax is *weaker* in the presence of a distortionary tax code. This is because the carbon tax will exacerbate the original inefficiencies; that's the tax interaction effect. It's theoretically possible that a revenue swap can totally offset this *prima facie* hurdle, thus leading to a “double dividend” in which a new carbon tax is good for the environment *and* good for the economy, but the consensus in the literature says that this is probably not true empirically. In his 2011 graduate-level text *Economic Analysis of Environmental Policy*, Ross McKittrick concludes his discussion of the tax interaction effect in this way:

If the MCPF [marginal cost of public funds] rises towards infinity (taxes get extremely distorting and burdensome), then . . . the efficient tax system would be based only on revenue-raising components, and the environmental component on [negative externality goods] would vanish. **This is somewhat counter-intuitive, and indeed goes against the double-dividend argument that in economies with very distorting tax systems we should raise pollution taxes and lower other taxes. It turns out that the opposite is true: in very distorting tax systems we should not raise pollution taxes; other things being equal we should lower them.** The reason is that as the level of distortions in the tax system rise, all public goods – including environmental protection – get more costly and optimal provision levels go down. Suppose the externality in this case were a benefit, rather than a cost. Then the ‘tax’ would be a negative one – a subsidy. But if the tax system were heavily distorting, we would intuitively expect that the subsidy for provision of the external benefit should be scaled back. In the same way, the tax places a cost on the externality and in that sense provides a public good, namely environmental cleanliness. But in doing so it increases the distortions in the market for the [taxed] good, and if these distortions are already severe, we will not want to exacerbate them, even to improve environmental quality. (187, emphasis added)

To reiterate, the problem with the popular advocacy of carbon taxes as a “win-win” solution is not that the analysis is *wrong* per se, but rather that it leaves out a crucial consideration: By raising the final prices of carbon-intensive goods, carbon taxes reduce the returns to labour and capital, thus reducing their own supply schedules. Thus the new carbon tax implicitly acts as a tax on workers and investors, thereby exacerbating the economic inefficiency from pre-existing taxes on labour and capital. It is theoretically possible, and empirically likely, that this effect outweighs the benefits from using the carbon tax receipts to reduce revenues coming from explicit taxes on labour and capital. Thus we reach the initially counterintuitive conclusion that pre-existing, distortionary taxes *weaken* the textbook case for imposing a carbon tax because of the assumed climate change externality.

## Numerical Estimates of the Tax Interaction Effect for US Environmental Taxes

In the previous subsection I laid out the theoretical case for an injurious tax interaction effect. Here I provide estimates of the *size* of this effect. In table 1 below, I reproduce Bovenberg and Goulder's (1994) numerical simulation of the US economy and its tax code, as it stood in the early 1990s. They found that the magnitude of the tax interaction effect is quite severe, leading to much lower “optimal” environmental taxes than the textbook analysis would recommend.

**TABLE 1: Textbook carbon tax versus optimal carbon tax, in presence of tax code distortions (\$/ton)**

Assumed Marginal Environmental Damages From Carbon Emissions (\$/ton)	“Optimal” Textbook Carbon Tax (Ignoring Other Taxes)	Optimal Carbon Tax from Numerical Model, Taking Account of Interactions with Existing US Tax Code (circa early 1990s)	
		Carbon Tax Receipts Distributed Lump-Sum to Citizens	Carbon Tax Receipts Reduce Personal Income Tax
\$25	\$25	\$0	\$7
\$50	\$50	\$0	\$27
\$75	\$75	\$13	\$48
\$100	\$100	\$31	\$68

Source: Adapted from table 2 (appendix) from Bovenberg and Goulder (1994).

The results reported in table 1 are quite severe, and should give serious pause to those calling for a revenue-neutral carbon tax swap. Because of pre-existing distortions in the US tax code, Bovenberg and Goulder – in the very paper cited by the 2012 MIT study, recall – estimated that if the proceeds from a carbon tax were simply distributed as lump-sum rebate checks to American citizens, then even a \$50 “social cost” per ton of carbon emissions would translate into an optimal carbon tax of . . . *zero*. This is because the harm to the economy from the new carbon tax – harm that would be exacerbated by the pre-existing distortions in the tax code – would outweigh the benefits of reduced environmental damages (from carbon emissions). To repeat, Bovenberg and Goulder estimated that instead of the textbook recommendation of a \$50 per ton tax on carbon emissions, the tax interaction effect would yield an actual ideal carbon tax of \$0 per ton, in the scenario where carbon tax revenues are returned to citizens in the form of lump-sum rebate checks.

Now, the intuition of the pro-tax-swap crowd is correct, insofar as it goes. The gross costs of a carbon tax *can* be reduced, if its proceeds are not distributed back to the citizens (or spent by the government), but instead are used to reduce other, distortionary taxes. We see that this intuition is correct by the last column in table 1. When carbon tax receipts are used to reduce the personal income tax dollar-for-dollar, Bovenberg and Goulder found, it makes sense to levy higher carbon taxes compared to the lump-sum rebate scenario. To continue with our example of a social cost of carbon of \$50/ton, we see in table 1 that the ideal carbon tax is \$27. It is greater than \$0, to be sure, but it is also a mere 54 percent of the textbook recommendation of a carbon tax of \$50/ton. In other words, once we take into account the complex interaction of a new carbon tax with pre-existing (and distortionary) taxes, the optimal carbon tax – even in the best possible case, where all of its receipts are used to offset those other taxes – might fall *by half*.

The estimates in table 1 are offered merely to give an idea of the magnitude of the tax interaction effect, and how it completely alters – or *should* completely alter – the nature of the carbon tax debate. If even a theoretically perfect carbon tax deal, in which 100 percent of its revenues are used to offset other taxes, can have its efficacy cut in half because of the tax interaction effect, then this is truly something that policy-makers must consider before implementing a real-world tax.

A \$50 “social cost” per ton of carbon emissions would translate into an optimal carbon tax of *zero*.

Although the numbers in table 1 were calibrated using US data, they should be comparable enough to Canadian estimates if the purpose is merely to give a sense of the significance of the tax interaction effect. The OECD estimates that in 2011, the average “tax wedge” – defined as average income taxes, plus employee and employer contributions to social security programs, less cash benefits – as a percentage of total labour costs was 19 percent in Canada and 18 percent in the United States. (These figures refer to a married, single-earner household with two children.) On this basis, then, if anything we should expect the tax interaction effect to be more severe in Canada than in the United States.

Before leaving the theoretical section, we should stress one final point. Besides worrying about a new carbon tax’s interaction with pre-existing, distortionary taxes, we also must realize that there are currently a slew of regulations, mandates, and implicit taxes on carbon-intensive processes. Thus, even if the theoretical calculation showed that the government should impose an “ideal” carbon tax of a certain magnitude, we would first need to quantify the implicit penalty to carbon dioxide emissions from the suite of existing policies.

### III Practical Problems With a Carbon Tax Swap

In Part II of this paper, I reviewed the theoretical case for a carbon tax swap deal, which cites a “double dividend” benefit from recycling tax receipts. I explained that the tax interaction effect – in which a new carbon tax exacerbates the economic inefficiencies caused by pre-existing taxes – can and likely does swamp the recycling effect, meaning that the “optimal” carbon tax (all things considered) should be lower than the “social cost of carbon” would suggest.

However, the argument for a carbon tax swap deal in the real world are even weaker than these theoretical considerations indicate. In the first place, governments have a tendency to raise spending when they enjoy influxes of new revenue; the familiar boom-bust cycle for provincial governments with large natural resource endowments fits the pattern. Therefore, it is quite naïve to assess the possible

benefits of a “revenue-neutral” carbon tax, because in practice it will almost surely end up being a revenue-*increasing* carbon tax.

Higher costs caused by a carbon tax would disproportionately affect lower-income households.

Another practical problem is that a carbon tax, by its very nature, will raise energy, food, and other consumer prices, impacting lower-income households far more than upper-income households. Consequently, it will be very unlikely politically to get the type of tax swap deal that would

most enhance economic efficiency. Rather than using carbon tax receipts to fund across-the-board reductions in personal income tax rates, or even to provide lump sum refunds to citizens, in reality a politically feasible deal will almost certainly involve targeted tax breaks – if not actual federal expenditures – to help poorer citizens shoulder the burden of the carbon tax.

To see a real-world example, consider the 2008 Canadian federal election, in which the Liberal Party proposed a national carbon tax that would begin at \$10/ton and rise \$10 each year to a maximum of



\$40/ton. As described by Merkley et al. (2012), to build political support the Liberal Party agreed to use the projected carbon tax revenue to:

- Cut the bottom tax bracket 10 percent, from 15 percent to 13.5 percent and cut the middle-class tax rates from 22 percent to 21 percent and 26 percent to 25 percent.
- Cut corporate tax from 15 percent to 14 percent . . . and cut the small-business tax rate by 1 percent. . . .
- Increase the Northern Residents Deduction to \$7000 from \$6000 and introduce a green rural credit to compensate rural residents for higher energy costs.
- Introduce the Liberal 30-50 plan to cut poverty by 30 percent and child poverty by 50 percent within five years by introducing a universal child-tax benefit of \$350 and a \$1850 refundable employment credit, by enriching the Working Income Tax Benefit and by making the Disability Tax Credit refundable. (20–21)

We have already seen that even if the revenues from a new carbon tax were used to reduce income taxes dollar-for-dollar, it likely would still impose net harms on the conventional economy, and for that reason should be scaled *down* (compared to the estimated social damages of climate change). Yet now we see that such theoretical estimates – unflattering though they were to a carbon tax swap – were actually far too generous. In practice, carbon tax revenues will likely not be used to reduce dollar-for-dollar the most economically inefficient taxes currently in the federal code. Besides the Canadian example, we also saw this pattern in Australia when they still had their carbon tax in place, and proposed “relief” measures to ease the burden on families (Maiden 8 April 2012). Such measures make sense politically, but they are hardly optimal from the viewpoint of reforming the tax code to reduce deadweight losses and promote (conventional) economic growth.

## IV Conclusion

If the more alarming projections are accurate, human emissions of carbon dioxide and other greenhouse gases represent a serious threat to future generations. To the extent that current market prices do not fully reflect these potential harms, there is a textbook *prima facie* case for a corrective carbon tax. Furthermore, it is also true that – other things equal – using carbon tax revenues to reduce tax rates on labour and capital can mitigate the distortions that those inefficient taxes currently cause.

However, some proponents of a carbon tax have taken these facts and erroneously concluded that there is a slam-dunk case for a carbon tax swap deal, in which a new carbon tax would be swapped in, dollar-for-dollar, to offset pre-existing taxes. They go so far as to claim this would be a “win-win” scenario, in which humanity would enjoy reduced climate change damages and Canadians would enjoy stronger economic growth, even ignoring environmental quality.

Such optimism is misplaced. Although there are models that show the possibility of such “win-win” outcomes, the default conclusion in the technical peer-reviewed literature is that a new carbon tax would *exacerbate* the distortions of a pre-existing tax code, because the new carbon tax would implicitly act as a tax hike on workers and investors (by raising the final prices of goods and ser-

On net, the carbon tax – even with revenue neutrality – would still harm the economy.

vices). It’s true that this harm could be partially mitigated by “recycling” the new revenue in the form of other tax cuts, but the consensus in the literature is that on net, the carbon tax – even with revenue neutrality – would still harm the conventional economy.

To be sure, acknowledging the tax interaction effect does *not* completely overturn the case for a carbon tax. Yet it *does* show that the pre-existing, distortionary tax code *weakens* the case for a

new carbon tax, even if the revenues are used to reduce the distortionary tax rates. It might still make sense to implement the carbon tax, but only at a lower level and in full recognition that policy-makers are trading off economic growth in exchange for environmental benefits. In particular, conservatives should not believe that a carbon tax swap deal will give them conventional economic growth while liberals get to enjoy radically lower carbon dioxide emissions: these two goals remain incompatible in mainstream economic analysis. To repeat, the default finding in the literature is that conventional economic growth will indeed be hurt by a carbon tax, even with full revenue recycling.

If the case for a new carbon tax is significantly weaker *in theory* because of the tax interaction effect, it is all the more dubious in light of practical considerations. Numerous examples show that a new carbon tax would *not* be devoted exclusively to offsetting other taxes, and that current energy regulations and mandates – which are very inefficient from a textbook perspective – would persist, even with a new carbon tax.

All in all, conservative supporters of the market economy must think very hard before endorsing a carbon tax – even if promised with other tax cuts. Even in theory, it is unlikely that such a policy would be “good for the economy,” and in practice it would be very inefficient.

# About The Author



Robert P. Murphy has a PhD in economics from New York University. After teaching for three years at Hillsdale College, he left academia for the financial sector. Murphy moved to Nashville, Tennessee in 2006 to work for Laffer Investments, where he co-authored research papers for clients and maintained portfolio models. Murphy is now the president of Consulting By RPM, where he specializes in economic analysis for a lay audience. Murphy is the Senior Economist for the Institute for Energy Research, based in Washington, D.C. He has testified on oil markets and climate change regulation before Congress on several occasions.

Murphy is also the author of hundreds of articles and several books, including *The Politically Incorrect Guide to Capitalism*, *The Study Guide to Ludwig von Mises' Human Action*, and *Lessons for the Young Economist*.

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## Endnotes

- 1 A lump sum tax system needn't assign *equal* tax burdens to each individual. In principle, some individuals could owe the government a greater lump sum than others. However, to minimize distortions in private decisions, it is crucial that the criteria for determining lump sum tax burdens are completely independent of individual behavior.
- 2 Indeed, because of the possibility of using its receipts to offset other, inefficient taxes, some economists have even advocated imposing a carbon tax at a rate *higher* than the "social cost of carbon" would recommend.
- 3 As explained earlier, Rausch and Reilly (2012) don't *ignore* the tax interaction effect, because they specifically mention it and cite a pioneering paper on the topic. However, they lead their readers to believe that the term involves the benefits of using a carbon tax to reduce other taxes, when in fact the term refers to the opposite.



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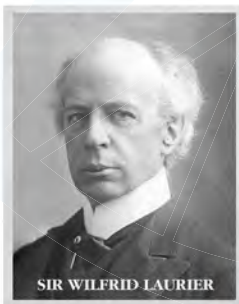
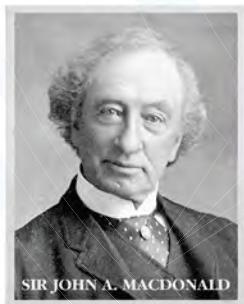
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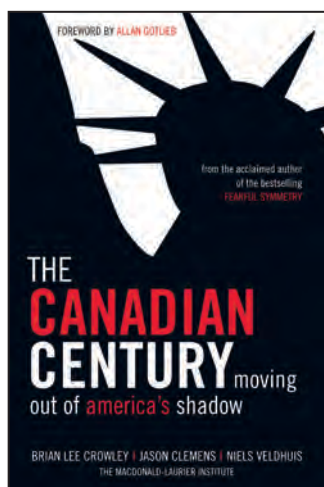
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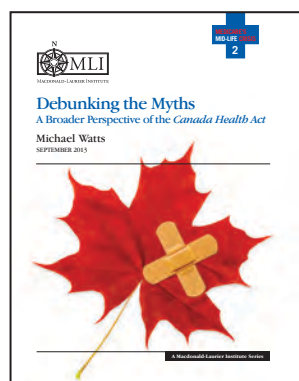
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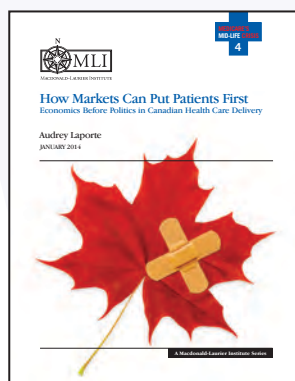
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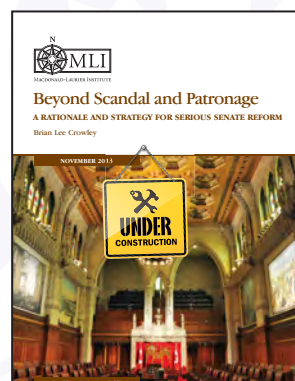
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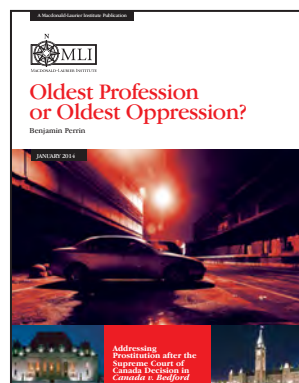
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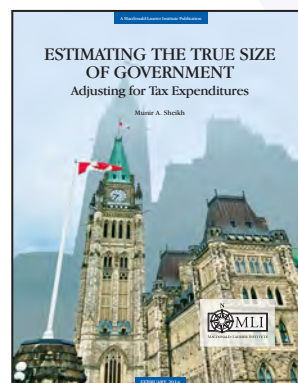
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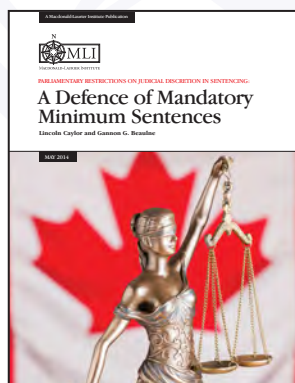
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