The Dutch Disease and the Canadian Economy: Challenges for Policy-Makers

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Prepared for *Thinking Outside the Box*, a Conference in Celebration of Thomas J. Courchene, Queen's University, October 26-27, 2012. The themes touched on in this paper reflect some of Tom Courchene's interests and contributions to Canadian policy debates. These include fiscal federalism (especially equalization), regional policy, monetary and exchange rate policy and natural resources. He may well disagree with some of our policy suggestions, but perhaps he will welcome the spirit of the exercise.

Abstract

We focus on the challenges facing Canadian policy-makers in response to the rapid growth of resource-based sectors. This raises the possibility of Dutch disease whereby the exploitation of non-renewable natural resources in some regions is accompanied by stagnation of manufacturing industries in other regions. We outline the elements of the Dutch disease, one version of which is that a natural resource boom draws factors of production from manufacturing and other tradable product sectors via an increase in the real exchange rate. The concern is that declining sectors are the most innovative, and produce knowledge externalities for the economy more generally. We summarize the evidence for the Dutch disease in Canada, drawing on Beine, Bos and Coulombe (2012). We suggest that these effects can be exacerbated when the provinces have prior claims to resource rents. They have an incentive to use the rents for provincial development and diversification at the expense of other provinces, and instead of saving them for future generations. As well, provinces may take too small a share of resource rents as a way to attract resource investment. Natural resource rents will also set up incentives for inefficient migration to the extent that they are not equalized across provinces. Given these problems, serious policy challenges emerge. For the resource-producing provinces, the challenge is to collect a share of the rents efficiently and manage them with long-run objectives in mind. At the same time, there are consequences for the national economy, and only the federal government is in a position to address those. Resource industries are favoured by the federal corporate tax through generous deductions for capital and deductibility of royalties. More generally, the corporate tax structure distorts both the investment and financing decisions of firms, and is prone to international tax shifting. There are sound arguments for changing the structure of the corporate tax into one that taxes rents rather than acting as a withholding device for the personal tax. This would remove distortions between the resource and non-resource sectors, and provide the federal government with revenues to finance equalization. Other reforms to the federal-provincial fiscal arrangements could complement these changes. We explore these and other policy options.

1. Introduction and Overview

The Dutch disease is a seemingly paradoxical phenomenon. The terminology and the discourse to which it has given rise leave the impression that the gift of resource wealth to a nation can be disadvantageous, and under some conditions (like the lack of institutions for good governance) can be a 'curse'. There is something counterintuitive about the idea that an increase in wealth can make one worse off. In this paper, we explore the sense in which natural resource endowments or shocks can have adverse effects, apply this thinking to the Canadian context, and consider policy options that might mitigate any negative consequences. In so doing, it is important to bear in mind some key institutional features of the Canadian setting. Of particular relevance for us is the decentralized nature of the Canadian federation, the fact that natural resource shocks apply very unevenly and to some extent unpredictably across the regions of the country, the presumed ownership of natural resource wealth by the provinces, and the constraints imposed on policy by the division of fiscal authority between the federal government and the provinces.

In principle, a natural resource bounty, whether originating in new discoveries, increases in commodity prices or innovations in extractive technology, can lead to a potential improvement in economic welfare if the development of the resource and the use of its rents are well managed. This improvement could even be transmitted to all segments of the society as well as to future generations. If a resource curse ensues, there must be something wanting in the policy response. There are several potential sources and types of curses, not all of which we focus on. It is worth briefly recounting them here, though we discuss some of them in detail in the following sections.

Note that while some of our discussion will be couched in the language of oil and gas, the potential for Dutch disease applies to all forms of natural resources, including renewable resources. A key distinguishing feature of natural resources is their potential to generate rents for the public sector. That distinguishes a resource boom from, say, a

boom in manufacturing or services resulting from terms of trade or technology improvements.

First, the development and extraction of the resource may not be optimal. Government policies may adversely influence the pace of exploitation because of distorting tax, royalty or regulatory policies, or because of political uncertainty arising from the fact that the government cannot commit to a set of policies. In theory, resource extraction should be guided by Hotelling's rule, which roughly speaking says that the rate of extraction should be such that the growth rate of the marginal net revenue from extracting should equal the rate of interest. Though this rule is difficult to apply in practice because of uncertainties in resource prices and technologies of extraction, there is a presumption that the private sector will exploit resources efficiently if policies are non-distorting, property rights are secure and all externalities of resource production are internalized. In particular, efficient extraction requires that environmental costs be properly accounted for. We set aside the environmental dimension to resource exploitation in this paper, not because it is unimportant but because it would take us too far afield. Even without environmental concerns, there are benefits and costs to resource production. As Beine, Bos and Coulombe (2012) put it: "Analyses of oil-sands extraction from Alberta often underline the opposition between economic benefits and environmental costs. Nevertheless, this view neglects that the economic effects display a bright and a dark side. While the rise in energy and commodity prices indeed brings obvious benefits for Canada as a whole, it has also raised many concerns for policy-makers and economists."

Second, natural resource production necessarily has an effect on the rest of the economy, and this is the source of concerns about the Dutch disease. There is a large theoretical and empirical literature on the Dutch disease, which we summarize in the next sections. Much of it is purely positive and studies the effect of a natural resource shock on other sectors of the economy, especially the traded goods (manufacturing) and non-traded goods sectors. The common message of that literature is that a resource

boom diverts economic activity and factors of production away from manufacturing, and has an ambiguous effect on non-traded goods and services production. The extent of the reallocation depends on many factors, such as the capital intensity of the various sectors, the mobility of labour, the ownership of natural resource firms, the extent of inter-industry linkages between resource and non-resource sectors, and so on.

This reallocation is not necessarily a bad thing. If markets are operating efficiently, the response to a resource shock will be efficient in the same way as the economy's response to any other terms of trade shock or to, say, free trade will be efficient. The concern about the Dutch disease might arise for two main reasons. One is that there are necessarily gainers and losers to a resource shock. Most important, workers will be displaced in declining sectors, and those attracted to resource and non-traded sectors by higher wages will be better off. Moreover, adjustment to the shock may be costly and structural unemployment might apply for a period of time. These consequences might call for adjustment assistance policies, but the case for resisting natural resource exploitation on these grounds is not convincing.

The second concern might be that there are potential inefficiencies in the market that are exacerbated by the resource shock. One such argument is that the manufacturing sector is subject to agglomeration economies because it is concentrated in core regions, whereas natural resource activity is in the hinterland or periphery (Krugman 1991). A reallocation of factors of production from manufacturing to resources entails forgoing some of these agglomeration economies. This argument is appealing at first sight, but it does require that the agglomeration economies are not being fully internalized. The presumption is that these economies are to some extent external to the firm so lead to market failure. One example is learning-by-doing that improves the skills of workers and managers, and that becomes spread among firms by worker mobility or knowledge transmission. As well, innovations by one firm may benefit other firms, and these are more readily transmitted to firms in the same industry than elsewhere. It is certainly conceivable that these agglomeration externalities exist and are quantitatively

significant. Any reallocation of activity away from industries exhibiting inter-firm externalities that have not been internalized will lead to a welfare loss (assuming that such economies do not exist in the expanding sector). An appropriate policy response would be to correct the externalities by government policy, but this is not easily done because the government itself cannot observe the externalities. Nonetheless, the extent of these uncorrected externalities might be over-estimated to the extent that government policies do support agglomeration. These include the provision of infrastructure and the education and training of the industrial workforce.

This concern over inter-firm externalities plays an especially important role in a dynamic context. An influential argument is that the rate of productivity growth in manufacturing is greater than that in natural resources, so that diverting activity from the former to the latter will reduce economic growth in the long-run (Sachs and Warner 2001). For example, it is conceivable that the *level* of productivity is higher in resource production than in the manufacturing sector because the capital-intensity is higher, but the *growth rate* of productivity is smaller. (It can even be negative if the most profitable resources are exploited first). Shifting factors from the low-productivity (but fast-growing) manufacturing sector to the high-productivity (but slow-growing) resource sector is likely to increase productivity in the short and the medium run but can decrease it when the expansion of the resource sector is over or the resource is depleted. The response to this argument is similar to the above. If there are externalities from innovation activities in the manufacturing sector that are not internalized, the appropriate policy response is to encourage innovation, for example, by the tax treatment of R&D spending. The innovation might alternatively result from experience, investment and creative destruction forces, which in turn are driven by the level of manufacturing activity. If policy-makers believe this to be the case, manufacturing activity should be encouraged rather than discouraging natural resource production.

A third major set of issues concerns the disposition of the rents from natural resources. There are several dimensions to this. One is the division of the rents between the

private resource-producing firms and the public sector. In theory, the rents from resources are the returns over and above the full costs of resource production, including all phases of activity from exploration to extraction and processing. In principle, since resources are publicly owned, one could argue that all rents should accrue to the public sector. In practice, this is unlikely to be the case. For one thing, policies used to divert resources to the public sector, such as royalties and profit taxes, are typically distorting, so some of the rents are dissipated. Related to that, the government may not have the requisite information to be able to extract all rents from the private producers. And, because of policy uncertainty, producers may discount future returns at a rate that is higher than the market rate of return, so require a higher-than-normal profit rate to encourage production. There may also be political economy reasons for governments not fully extracting rents from producers, reasons that were in full display in the recent attempt by the Australian government to impose a 40 percent rent tax on mining. There, large mining firms were able to influence public opinion to such an extent that the Prime Minister was forced to resign, and the new government reduced the tax rate to 30 percent.

Another dimension related to the disposition of rents concerns the manner in which those that are collected by the government are used. A common meaning of the term resource curse refers to the fact that some of the revenues from natural resources are wasted by governments and their bureaucrats when governance is weak. They may be used to enrich politicians and officials, or they may be wasted on so-called white elephant projects of limited real value. In the context of resource-rich countries with low-quality political institutions, some of the rents may be dissipated through rent-seeking activities by groups that are hard to control (e.g., warlord-supported producers). These governance problems are regarded as the most serious concerns with resource shocks in some countries, but we choose not to pursue them for the Canadian case on the presumption that political institutions are of high quality.

Even if resource revenues are not wasted, they may still be used inefficiently or inequitably. Given that the rents will accrue for a finite period of time, a key question is how much should be saved for future generations. This obviously involves making inter-generational welfare comparisons. To the extent that one puts weight on future generations, one would want to spread the benefits over time. In the extreme, if one adopts a maximin intergenerational social welfare function, one would want to equalize consumption across generations as captured in the Hartwick Rule or the permanent income hypothesis (Hartwick 1977; van der Ploeg 2011). However, matters are not so simple if we recognize that society's revealed preference for intergenerational equity is not to equalize per capita consumption over time. Indeed, per capita consumption is increasing over time, and we might take that into account in deciding how much to save for future generations. In any case, it is unlikely that on ethical grounds we would want to consume all resource rents as they accrue rather than saving a substantial proportion. Moreover, the amount we choose to save will affect the size of the Dutch disease effects on the current economy as we discuss below.

A further dimension of resource shocks that will affect how both the private and public sectors will respond is the volatility of resource prices and innovations. This complicates the Dutch disease problem by transmitting uncertainty to the manufacturing sector, compounding the uncertainty that it might already face because of exchange rate volatility originating abroad. As we show later, variations in the Canadian exchange rate tend to stabilize the resource sector and to destabilize the manufacturing sector. To a certain extent, one can rely on capital markets to insure against exchange rate volatility. There might be other pro-active measures that governments can take, such as encouraging diversification of export markets through international trade agreements. The public sector also faces uncertainty of resource revenues against which it must self-insure. This constitutes a precautionary argument for saving resource revenues that reinforces the argument for saving for future generations. It should be noted that an alternative to saving in financial assets is to invest in domestic assets like infrastructure

and human capital. The balance among these forms of asset accumulation depends on their relative rates of return.

An important final dimension of the response to resource shocks that is particularly relevant for the Canadian case is the regional dimension. On the one hand, resource endowments are unevenly distributed across regions, and are prone to occur in less populated regions some distance from the manufacturing base. The implication is that reallocations of productive factors involve interregional migration, with the result the some regions are losers in the sense that they face losses in employment and production. This does not imply inefficient adjustment unless there are prevailing market failures, as discussed above. The adjustments induced by resource shocks are similar to those induced by externally sourced exchange rate shocks, which in the Canadian case especially means shocks originating in the US.

A further consideration in the Canadian case is that the rents primarily accrue to the provincial governments. The federal government obtains a share of revenue from its general income and sales taxes, but resource-specific taxes and the majority of natural resource revenues are provincial. This has several potential implications that we explore later. The provinces may be reluctant to fully exploit resource taxation because they perceive that there is some competition for natural resource investments. They may be reluctant to save resource revenues when the alternative is to use them to enhance public services and reduce taxes, which will attract workers and capital into their province at the expense of other provinces. Such fiscally induced migration is inefficient. Moreover, those revenues that they do spend may go disproportionately into regional development infrastructure-type investments designed to diversify their provincial economies at the expense of other provinces.

These consequences of natural resource shocks and their estimated magnitude for Canada will be discussed in the following sections. In addition, we discuss the policy implications. We shall pay particular attention to the perceived inadequacies of existing policies involving resources. These include especially the favourable treatment given to

natural resource industries in the business tax system, the adverse consequences for the Canadian federation from the horizontal imbalances created by the geographical dispersion of natural resources, the pressure that this puts on the equalization and fiscal arrangements systems, and the exacerbating effect of the fact that natural resource revenues are not being saved by the provinces.

Although natural resources are owned by the provinces, and they alone have dedicated resource tax regimes, the existence of provincial non-renewable resource wealth has consequences for the national economy, and only the federal government is in a position to address those. We therefore pay particular attention to potential federal policy responses. As it stands, the resource industries are favoured by the federal corporate tax through generous deductions for capital expenditures and deductibility of provincial royalties. More generally, there are sound arguments for changing the structure of the corporate tax into one that taxes corporate rents rather than acting as a withholding device for the personal tax. Not only would such a reform make the tax neutral, it would also remove the bias of the tax in favour of debt financing and all that this entails.

Such a reform would also go some way to addressing some of the fiscal federalism problems that result from regional resource development. It would provide the federal government with a source of revenues that could be used to meet its constitutional obligation to equalization, and reduce the unprecedented disparities between the resource-rich provinces and the others. Other reforms to the federal-provincial fiscal arrangements could complement these changes. For example, the GDP ceiling on equalization growth could be eliminated, and social transfers could be adjusted to account for provincial disparities. More generally, enhancing the proportion of the tax room occupied by the federal government, especially the income tax room, is critical for both ensuring a continuing ability to fund equalization and preserving vertical equity in the federation in the face of inequalities induced by resource production.

Finally, two other possible policy options that could potentially reduce the extent of Dutch disease will be discussed. One of these is the possibility of increased immigration of skilled workers into resource-rich regions. This could substitute for migration of workers from other regions, which would otherwise deplete their productive labour force. The other is to explore the possibility of a monetary union with the United States as a way of undoing exchange rate effects on manufacturing industries.

2. Dutch Disease 101 and 401

There is a large literature on the Dutch disease, and we cannot do full justice to it here.[1] Instead, we present a 101-level summary of the key arguments and a 401-level outline of the application to Canada, including the most recent empirical facts and findings.

The classical approach to the Dutch disease was formulated by Corden and Neary (1982), who used a static international trade model to study the effects of a resource shock on a small open economy consisting of a traded (manufacturing) sector and a non-traded sector. It is useful to begin with some simple assumptions to focus on the main general equilibrium effects of the shock. The consequences of relaxing these are considered later.

Suppose first that the resource firms are at least partly foreign owned,[2] and that all revenues obtained by the public sector from resources are put into a sovereign wealth fund (SWF) and invested in foreign assets. For the time being, suppose as a benchmark that only the federal government collects resource revenues through taxes and royalties. Later we consider the consequences of the fact that the provinces obtain most of the resource revenues. Only the real return from the SWF is turned over to the federal government for spending, so the real wealth of the SWF is kept intact. The economy is a small open one so it does not influence natural resource prices, and the

[1] A comprehensive recent treatment may be found in van der Ploeg (2011).
[2] Evidence suggests that the majority of oil-sands producers are foreign owned. According to a report released in May 2012 by the environmental group ForestEthics based on financial data collected by Bloomberg, 71 percent of the ownership of Canada oil-sands firms are foreign owned (ForestEthics 2012).

natural resources are exported after some given amount of refinement and processing. Thus, the value of a natural resource reflects the costs of exploration, extraction, processing and refining, as well as any rents accruing to the owners and revenues to the government. It should be noted that the more processing there is, the greater will be the effects of the resource boom outlined below, since more factors of production would have to be diverted to do the processing. (This is relevant for the oil-sands case since an option to exporting bitumen for processing elsewhere, such as the USA, is to process the bitumen before exporting. It is also relevant for resource taxation since producers might be able to avoid some royalties by exporting before processing.)

What are the effects of a resource boom on the national economy in this setting? The most significant immediate effect is on the traded goods sector, which is typically identified with manufacturing, but increasingly includes services. Corden and Neary (1982) identify two effects by which a resource boom generates a crowding-out of the traded goods sector, referred to as the *spending effect* and the *resource movement effect*.

The spending effect abstracts from the production of resources and focuses on the effect of the spending of the extra income that is generated by the booming resources. Conceptually, it is as if the resource boom took the form of an endowment of finished resources ready for sale on the world market. The export sale of resources leads to a nominal appreciation of the domestic currency by the trade balance channel. Domestically, the spending of the income from the sale of the resources generates an increased demand for both traded and non-traded goods, with the former partially offsetting the exchange rate effect of the resource exports. The prices of primary inputs go up and the prices of non-traded goods rise. At the same time, the prices of inputs used in traded goods production rise except to the extent that inputs are traded goods. While the output of non-traded goods rises from this spending effect, the output of traded goods falls for two exchange rate related reasons. First, the prices of traded goods in international market are fixed (in US dollars). The nominal appreciation of the

domestic currency coming from the export boom causes a decline in the competitiveness of the trade-exposed manufacturing sector. Second, because there is upward pressure on prices in the non-traded sector, the aggregate price level will tend to increase more domestically than abroad, so there will be a real exchange rate appreciation. The resulting appreciation of the real exchange from the domestic and the trade-balance channels results in a decline in the competitiveness of the trade-exposed manufacturing sector. The decline of the manufacturing sector will be mitigated to the extent that the resource sector purchases manufacturing inputs from the domestic economy.

The resource-movement effect results from the use of capital and labour in the booming sector. Labour and capital required for the production of natural resource products to sell on world markets are diverted from the non-trade sector and the trade-exposed manufacturing sector.[3] Taken together, the spending and resource-movement effects unambiguously cause output in the traded goods sector to decline. However, non-traded sector output could rise or fall depending on whether the spending effect outweighs the resource movement effect.

Note that the real exchange rate appreciates and resources move out of traded goods and into resources despite the extent of foreign ownership of resource firms and the investment of government resource revenues into a SWF holding foreign assets. The full value of resources is exported, but part of that is diluted because the return to the foreign owners of the resources plus the government revenues in the SWF are held as foreign-denominated assets, reducing the demand for domestic currency. The exchange rate increase comes about from the part of the value of resource exports that come from domestic value-added (factors of production attracted from other sectors).

To the extent that resource firms are domestically owned or the government spends current resource revenues, the spending effect of the resource boom will be larger. For

[3] Intermediate goods are also diverted from non-resource to resource industries, but these can be reduced to labour and capital as well so we do not highlight them.

example, if resource revenues are spent on non-traded goods and services, this further diverts resources from the traded sector, which will magnify the Dutch disease effect.

This simple Dutch disease story will be revised if some of the key assumptions of the model are changed. The trade-balance channel is not the only channel by which the resource boom leads to a nominal exchange rate appreciation. The domestic exchange rate is also likely to be affected by movements in the capital account of the balance of payments, given that the resource sector is capital-intensive and relies to a considerable extent on foreign direct investment (FDI) finance (Neary and Purvis 1982). (Recall that oil-sands firms are more than two-thirds foreign-owned). In the exploration and development phases of the resource boom, foreign capital flows into the resource sector and the domestic currency appreciates. The development phase might overlap the exploitation phase during which both the capital account (FDI) and the trade balance (export of resources) contribute to currency appreciation and crowd out the trade-exposed manufacturing sector. When the development phase is over, profits are repatriated abroad, and the effect of past capital movements on the exchange rate is reversed. In a stylized simple framework when the development phase precedes the beginning of the exploitation and export phase, the capital-movement channel has mainly an effect on the timing of the appreciation of the currency. Following that, during the exploitation phase, the repatriation of profits tempers the appreciation generated by the export channel. Of course, the real world is more complicated that this stylized framework and the development phase certainly overlaps with the exploitation phase when a variety of development projects coexist.

While foreign ownership of resource firms and the creation of a SWF holding foreign assets can limit, but not eliminate, the spending effect, the resource-movement effect can be reduced by immigration flows. As emphasized by Beine, Coulombe and Vermeulen (2012), this will be the case to the extent that immigration involves the movement of foreign workers into resource-sector employment. This reduces the need

for a reallocation of workers from the non-resource sectors of the economy and the accompanying rise in wage rates.

The classical Dutch disease story is a static one, but there is an important inter-temporal dimension. The implications of a resource boom depend on how long it is likely to last and how frequently it occurs. It is useful to characterize three distinct types of resource booms that give rise to different forms of Dutch disease, all of which can have lasting effects. These can co-exist to some extent.

The first of these we can call the *Ghost Town* version. This is the result of a temporary resource boom that generates a permanent crowding out of trade-exposed manufacturing industries, as synthesized in Krugman (1987). Production generates learning-by-doing, which is not transferable between resource and manufacturing sectors, as exemplified historically by nuclear engineers in Canada. When the resource boom is over, productivity in manufacturing is lower than it would have been without the boom because of forgone learning-by-doing. Arguably, the Canadian version of the Dutch disease falls into the ghost town version, at least for non-renewable resources. Renewable resources, such as the forests, hydro-electricity and fisheries, potentially last indefinitely, although to the extent that they use fewer factors of production than non-renewable resources, their Dutch disease effects should be less pronounced.

In the case of the oil sands, there might be 300 years of reserves, but, with the real prospect of economical substitutes, perhaps only 20 to 30 years of profitability remains in the foreseeable future. It would therefore be reasonable to characterize our potential Dutch disease problems as belonging to this ghost town category. Probably similar arguments apply for other resources, such as uranium and potash, though coal may be much longer lasting. The temporary nature of important resource endowments highlights the need to save resource revenues for future use, long after the resource runs out. Not only does this mitigate the Dutch disease effect, it also spreads the benefits to future generations. In the limit where future generations are afforded equal weight to current ones, this could call for a Norwegian-type SWF whereby all the

resource revenues are saved, and the government spends only the real return (the Hartwick rule).

The second version of the Dutch disease can be called the *Resource Curse*. This is the case of a permanent, or very long-lasting, resource boom that translates into slower productivity growth. The negative correlation between resource abundance and long-run growth was coined the resource curse by Sachs and Warner (2001). As they argue and as was discussed above, one reason why the rate of growth is hampered by resources is that productivity growth might be higher in the manufacturing sector than in resource production, and thus the long-run growth rate might be smaller in a resource-based economy. Another reason is related to the quality of institutions and rent-seeking. As emphasized by Mehlum, Moene and Torvik (2006), countries such as Canada, Australia, and Norway are well endowed by natural resources and stand among the richest countries. In others, especially developing countries, resource abundance does not translate into high and growing output. Mehlem et al. argue that the key difference between the winners and losers among resource-abundant countries is the quality of institutions. The losers are characterized by poor institutions where wasteful rent-seeking activities compete with production activities. In countries with good institutions, rent-seeking and production are complementary. The quality of institutions is important for economic growth in all countries, but it might be more critical in countries where the rent from resource extractions is a large part of national income. In many countries, the rent is collected by a few well-connected people who have no incentive to invest in the education of the majority of the population and to create public goods. The implementation of rules of law and property rights for the purpose of improving the welfare of the overall society appears to be a more delicate issue in resource-abundant and rent-generating countries.

The third form of Dutch disease results from the volatility that is an intrinsic characteristic of natural resources. The prices of energy and non-energy commodities are highly variable and do not display a clear rising or falling historical trend. The price

of oil is particularly unstable and appears to be mainly determined by geopolitical and economic events.[4] Moreover, many important oil-producing countries are either politically unstable or located or surrounded by politically unstable neighbours. Between 1945 and 1972, the price of oil in 2012 US dollars was relatively stable around US$20.[5] Between 1974 (OPEC and the Yom Kippur war) and 1980 (Iran hostage crisis and Iran-Iraq war), the prices rose to US$105. Then, in the following two decades, the price of oil declined steadily to reach an historical low of US$16.80 in 1998. The trend was reverted thereafter and the price rose to US$125 in 2008 before falling rapidly and sharply with the financial crisis.

Such oil price fluctuations have affected the Canadian exchange rate and the competitiveness of the manufacturing core in international markets. During the 1990s, the weakness of the Canadian dollar artificially boosted the competitiveness of our trade-exposed manufacturing sector in central Canada. Canadian manufacturers were in effect protected and could thrive without investing in new capital or adopting new technologies during this period. Furthermore, the devalued currency increased the cost of purchasing machinery and equipment goods that are mainly imported. This was reversed after 2000 with the rapid rise of China and the increased demand for energy and non-energy commodities. As discussed further below, the substantial and rapid appreciation of the Canadian dollar eliminated about 350,000 workers in Canadian manufacturing sector between 2002 and 2008 (Beine, Bos and Coulombe 2012). Many Canadian firms did not have the time to invest, adopt new technologies, and become competitive, despite the fact that the appreciation brought with it a decreased cost of investment in imported machinery and equipment goods. These fluctuations in resource prices, which translate into exchange rate volatility, imply that Canadian trade-exposed manufacturing firms have to do business in a much more volatile and unpredictable business environment than their American, Japanese and European competitors. Some argue that the manufacturing industries of the core would greatly benefit from

[4] Discrete technological progress, such as that caused the recent boom in shale oil extraction, also affect the price of oil.

[5] All prices are taken from inflationdata.com and refer to the US domestic crude oil price in 2012 dollars.

belonging to a currency area that is not commodity and oil-driven, such as that of the US (Courchene and Harris 1999).

3. Evidence of the Dutch Disease in Canada

There has been much public discussion and some empirical work on the symptoms of the Dutch disease in Canada. We cannot do justice to that literature in this paper. We shall highlight some of the more recent findings, which give an indication of the orders of magnitude of effects of the recent resource boom.

A standard approach to estimating the existence and magnitude of the Dutch disease is to focus on the effect of the real exchange rate on manufacturing industries. In particular, a two-stage analysis is adopted whereby in the first stage the effect of a resource boom on the real exchange rate is identified, and in the second the effect of the real exchange rate on manufacturing activity is estimated. In interpreting those two effects, it is important to keep in mind that natural resources are not the sole driver of the Canadian real exchange rate.

A common approach to estimating the determinants of the real exchange rate is exemplified by the exchange rate equation used by researchers at the Bank of Canada.[6] They model the Canadian-US bilateral exchange rate as a function of the prices of energy and non-energy commodities, and the Canada-US interest rate differential. The obvious shortcoming of this approach is that idiosyncratic shocks to the US dollar, which Beine, Bos, and Coulombe (2012) have coined as the US component of exchange rate determination, affect both the bilateral exchange rate and the prices of energy and non-energy commodities which are measured in US dollar in international markets and in the Bank of Canada equation.

[6] The exchange rate equation at the Bank of Canada was suggested by Amano and van Norden (1993). For a recent update, see Maier and DePratto (2008).

To be more precise, Beine et al. show that the Canada-US bilateral real exchange rate is driven by both a Canadian and a US component.[7] The Canadian component represents movements in the exchange rate caused by changes in Canadian exports in response to changing world prices of natural resources and other tradable goods. The US component reflects changes in the exchange rate originating in the US either because of shocks to the US capital account or aggregate demand shocks in the US that affect the demand for Canadian exports. The evolution of the Canadian component is determined by energy and non-energy prices, whereas the US component is not. It is determined by US events such as the capital inflows that came with the dot-com bubble during the period 1995-2000. The strengthening of the US dollar during this period was an important driver of the fall of commodities and energy prices and the devaluation of the Canadian dollar.

Beine, Bos, and Coulombe (2012) study the period of Canadian dollar appreciation, 2001-2008. They show that it can be divided into two sub-periods. Between 2001 and 2005, the appreciation of the Canadian dollar was mainly due to the depreciation of the US component that followed the collapse of the dot.com bubble. This US dollar depreciation resulted also in the increase in the price of commodities measured in US dollar. On the other hand, between 2005 and 2008, the appreciation of the Canadian dollar was mainly driven by the Canadian component, that is, expansion of the resource sector.

As Beine et al. argue, only the appreciation that originates with the Canadian component is potentially generating the Dutch disease, not the appreciation generated from depreciation of the US dollar. A depreciation of the US dollar also exerts a negative impact on the trade-exposed manufacturing sector, but the causality does not run from the resource boom to the crowding-out of the manufacturing base. The resulting increase in the prices of commodities does not generate an income effect in the domestic resource sector since it is offset by the appreciation of the Canadian dollar.

[7] As showed in Beine, Bos, and Coulombe (2012), evolutions of the trade-weighted Canadian exchange rate are very comparable to the evolution of the bilateral exchange rate.

Incomes measured in Canadian dollars generated by the resource sector remain the same. Resources are simply reallocated from the trade (manufacturing) to the non-trade (service) sector. Put another way, even without a significant resource sector in the Canadian economy, the trade-exposed Canadian manufacturing sector would be negatively affected by an idiosyncratic depreciation of the US dollar. Contrary to the US, which might be viewed as a large and relatively closed economy, Canada is a small open economy and its trade, for geographical reasons, is highly dependent on the US economy.

Bearing in mind this distinction between the US and the Canadian components of exchange rate changes, we can now turn to the question of the extent to which the Canadian economy is affected by the Dutch Disease, given the recent appreciation of the Canadian dollar. Two preconditions have to be met. First, the appreciation of the Canadian exchange rate has to be at least partly driven by commodity prices, and second, it has to have a negative impact on the manufacturing sector. Regarding the first question, Beine, Bos, and Coulombe (2012) estimate that during the resource boom of 2002-08, 42 percent of the appreciation of the Canadian-US exchange rate is related to the natural resource boom. The remaining 58 percent is driven by the US component of the bilateral exchange rate and thus unrelated to the change in the prices of commodities produced in Canada. So, the first condition is satisfied.

Regarding the second precondition, Beine et al. also find evidence that the appreciation due to commodity prices has a negative impact on many trade-exposed manufacturing industries. They estimate that out of 21 industries, ten have experience employment losses that have been generated by the commodity-driven component (Canadian) of the exchange rate. That accounts for 100,000 permanent job losses in the manufacturing sector between 2002 and 2008. Industries most affected by the Dutch disease are textile mills, machinery, and computer and electronics with long-run elasticities ranging between 2.7 and 4.5. Other industries affected include plastics and rubber, furniture,

paper, printing, transportation equipment. The degree to which an industry is affected by the Dutch Disease appears unrelated to the degree of technology intensity.

Beine, Bos and Coulombe (2012) further decomposed the total employment losses in the manufacturing sector between 2002 and 2008 in three components. The first one, the 100,000 losses due to the Dutch Disease mentioned above, accounts for 31 percent of the total employment losses in manufacturing during the period. The most important share of employment losses is related to the US component of the exchange rate appreciation. It accounts for 180,000 workers or 55 percent of total employment losses. Finally, the remaining 14 percent of losses in manufacturing employment (46,000 jobs) from 2002-08 are related to the long-run structural decline of the manufacturing sector in most developed countries in the last decades. This decline has been especially associated with the rise of the Chinese economy in the past fifteen years.

These results might be compared with those estimated by Shakeri, Gray and Leonard (2012). They performed an empirical analysis of 80 Canadian manufacturing industries over the period 1992-2007 using quarterly data. They also deployed a two-stage procedure. In the first stage, they estimated a relationship between energy prices and the Canada-US real exchange rate. In the second step, they estimate the effect of energy-price-induced exchange rate movements on Canadian manufacturing industries. They found that over the resource boom period of 2004-07, 11 out of 18 industry groups experienced a decline in output due to exchange rate appreciation that was induced by rising energy prices. However, they did not distinguish between the US and the Canadian component, which as we have mentioned is the Dutch disease component.

Beine, Bos and Coulombe (2012) further estimated that in the period 2002-08, improvements in the terms of trade account for around 30 per cent of the aggregate increase living standards in Canada.[8] In other words, a substantial proportion of total

[8] This estimation is based on differences between the cumulative growth rate of national income and gross domestic product between the first quarters of 2002 and 2008. Of course most terms of trade gains

income improvement in the first decade of the twenty-first century is simply good luck rather than improvements in productivity. One could argue that these windfall gains should be saved and spread over future generations, in the extreme case in accordance with the Hartwick (1977) rule.[9]

Beine, Bos and Coulombe (2012) emphasize that in addition to the Canadian exchange rate effect representing the Dutch disease, the effect of the depreciation of the US component also has a significant and negative impact on trade-exposed manufacturing employment. Canada is a very special case because our export base, particularly our manufacturing base, is not diversified. This is why the US component (which is not related to energy) is so important. Of course, geography is very important as demonstrated by the robustness of the gravity model: our industrial core is so close to the United States. Nonetheless, diversification of our export base could mitigate the US component, and should be an important element of our trade policy. This could be done through pursuing new free trade agreements, such as the one being negotiated with the European Union.

A natural response to the US component might be to form a currency union with the US to alleviate fluctuations in the exchange rate (Courchene and Harris 1999). However, the Euro crisis demonstrates that a country that gives the right to print money to an external central bank loses the margin to manoeuvre in period of banking, financial, public debt crisis. Who will be the lender of last resorts in case of banking crisis? Even in Europe, countries that kept the right to print money (UK, Denmark) are paying substantially lower interest rates than in Euro countries. So dollarizing is not an attractive proposition. A fixed exchange rate might be more desirable, but is it possible? The other important developed countries with a resource sector (Australia and Norway)

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are concentrated in Alberta, Saskatchewan, and Newfoundland. For more on terms of trade refer to Coulombe (2011).

[9] One is reminded of a micro version of this principle, which we might call the Lavigueur family rule. In the mid-1980s, members of a poor family, the Lavigueurs, in Quebec won an $8 million lottery jackpot. Overnight they were millionaires. They stopped working and started spending their money, sometime fighting each other in court. After a few years, the jackpot was gone, the jobs were gone, and most Lavigueur family members were poorer than before winning the jackpot.

have a floating exchange rate. Canada was not able to maintain a fixed exchange rate in the 1950 and 1960 because of big changes to commodity prices.

By the same token, the official Party Québecois line for the currency option of an independent Québec is still to keep the Canadian dollar. This is reasonable. One of the possible gains for Québec to become independent is to have a currency that is less dependent on commodities, thereby avoiding the Dutch Disease. The cost however is to lose the advantages of fiscal federalism. The lack of the stabilizing effect of fiscal federalism in Europe at the moment explains a good part of the reasons why Spain is doing badly compared with Florida, both of which are cases of real estate bubbles. Leaving fiscal federalism and keeping the Canadian dollar implies that Québec would only be paying the costs and harvesting no gains in terms of stabilization from the breakup.

Two last pieces of evidence are worth mentioning. The first is the analysis of Raveh (2012) who investigates, both theoretically and empirically, the potential of a Dutch disease at the provincial or state level within federations. He analyses income and sectoral data for 231 regions of 10 federations (Australia, Belgium, Brazil, Canada, Germany, India, Malaysia, Russia, United Arab Emirates, and United States). The periods of analysis depends on the availability of regional data and vary from 1977 to 2008 for the United States to 2004 to 2008 for Russia. The analysis first shows that there is a negative correlation at the cross-country level between the initial endowment of natural resources and subsequent growth, a fact consistent with Sachs and Warner (2001). However the correlation is reversed and significant when pooling regions within countries. However, the correlation is not significant at the five % level when the sample excludes the booming period of 2006-2008.

Raveh's explanation for this interesting stylized fact is based on an 'Alberta Effect'. This effect, analysed theoretically and empirically (at the US states level), derives from the possibility for provincial or state governments within a federation to use the resource rent to attract factors (capital and labour) from other provinces or states within the

federation. Well-endowed states or provinces can offer better public goods at lower tax rates. Within this framework, the relatively high mobility of factors within a federation implies that the Dutch disease is reversed in resource-rich regions but is transmitted to resource-poor regions.

As mentioned earlier, the international mobility of labour is a factor that could mitigate the resource movement effect, as well as the type of fiscally-induced migration found in Raveh (2012). Beine, Coulombe, and Wermeulen (2012) empirical analysis illustrates the mitigation effect of various migration channels on the provincial Dutch Disease in Canada. Their findings suggest that migration flows associated with temporary foreign workers can effectively mitigate the effect of the Dutch Disease at the provincial level. Conversely, flows coming from the permanent international immigrant program (for skilled workers) are ineffective in mitigating the Dutch Disease. Contrary to permanent immigrants which are selected through a point system, Immigrants coming in Canada for the temporary worker program respond to labour market shortages (resource movement effect). They also found that interprovincial migration is effective in mitigating the Dutch Disease in booming provinces, but it also translates into a spreading of the Dutch Disease to non-booming provinces. This raises the issue of the regional consequences of the Dutch disease to which we now turn.

4. The Regional/Federal Element

The geographical diversity and federal governance structure adds some important considerations to the analysis of resource shocks in Canada and their implications for the Dutch disease. From a stylized point of view, the Canadian case can be viewed as an example of the core-periphery model as described in Krugman (1991),[10] which emphasizes the fact that natural resources tend to be located in the periphery of less-populated regions/provinces, while the core contains manufacturing and service

[10]Krugman used Canada as an example of the core periphery model in his classic 1991 book. Of course, Alberta is well urbanized with its two big metropolitan areas. However, the density of urbanization and economic activities in Canada remains concentrated in the Quebec City – Windsor corridor which contains more than 50 percent of Canadian population and three out of four largest metropolitan areas.

industries in highly populated, more urbanized regions where agglomeration economies apply. In this setting, the Dutch disease is a mechanism whereby booms and busts in the periphery are transmitted to the core partly due to exchange rate movements, at least those exchange rate movements that are induced by the resource boom.

This reallocation of activity from the core to the periphery presumably feeds into the productivity growth differences and employment adjustments that are often identified with the Dutch disease. The core of the economy offers more opportunity for endogenous growth than the periphery because of the thickness of skilled labour markets and entrepreneurial activities, as well as economies of scale. (Romer 1986; Lucas 1988). As well, the core can take advantage of superior productivity growth rates that are especially identified with manufacturing and other advanced industries. When activity is diverted from the core to the periphery, productivity increases might be forgone.

In evaluating the consequences of diverting activity from the core to the periphery, two issues are particularly relevant. The first is whether the productivity gains are the consequence of externalities that are external to firms. Any diversion of activity away from externality-generating activities constitutes a welfare loss. The presumption is that at least some of the benefits of agglomeration are external-to-the-firm externalities that are difficult for firms to appropriate and hard for the government to observe and therefore correct.

The second is whether productivity losses are temporary, so can be recouped after the resource boom subsides, or permanent. On theoretical grounds, the degree to which productivity losses are temporary or permanent depends on the sources of productivity gains and the underlying endogenous growth framework. When productivity improvements are based on cumulative experience due to learning-by-doing, productivity losses are irreversible when economic activity is diverted from high learning-by-doing generating activities to lower-learning activities. Productivity losses might be only temporary however if productivity gains come from economies of scale.

When the resource is exhausted and economic activities return to the core, productivity could catch-up to the level it would have reached without the resource boom if there is some sort of decreasing returns to capital accumulation. In this case, productivity gains are larger in the catch-up process. Finally, if returns to capital accumulation are constant as in the so-called *AK*-type endogenous growth model (Barro and Sala-i-Martin 1995), the growth rate of productivity will come back to its initial level (before the resource boom) but the level of productivity will remain permanently lower.

As mentioned above with the analysis of Beine, Bos and Coulombe (2012), Canadian exchange rate movements are mainly induced by the Canadian component (resources and energy) and the US component (idiosyncratic shocks to the US dollar). In responding to shocks to the Canadian component, and to some extent to shocks to the US component, the Canadian exchange rate operates in such a way that it stabilizes the economy of the periphery and destabilizes the economy of the core.

Major booms and busts in the resources sector generate an increase in the price of commodities and a long swing of the Canadian exchange rate (the Canadian component). The effect of the exchange rate movements in stabilizing the periphery or destabilizing the core is best exemplified with the case of idiosyncratic swings in the price of oil (assuming that the US component remains unchanged). When the price of oil in USD goes up, incomes in USD from oil production per barrel in Canada go up. However, the increase in income per barrel in CAD is not as important as in USD since the exchange rate is also appreciating (due to the Canadian component). When the price of oil in USD goes down, the reverse occurs. Canadian producers receive less USD per barrel but the drop in income per barrel in CAD is less important with the depreciation of the CAD. The Canadian periphery is partly immune from the sudden swing in the prices of commodities in international markets due to the stabilizing effect of the CAD.

A shock to the US component can also induce exchange rate responses that will stabilize the economy of the Canadian periphery while destabilizing the economy of the core.

For example, the expansion of the dot-com bubble in the second part of the 1990s was characterized by large capital inflows in the US. The US component appreciated and the price of energy and non-energy commodities went down in USD. The income of commodity producers measured in USD went down. Fortunately, the devaluation of the CAD contributed to stabilize the income in the periphery measured in CAD. At the same time, in economy of the core, the depreciation of the CAD was pouring oil on the fire, and the trade-exposed manufacturing industries were artificially boosted. Of course, the reverse occurred after 2001. It is important to note that shocks to the US component are not always destabilizing the Canadian core. For example, after the bankruptcy of Lehman Brothers in September 2008, financial capital flowed to the US economy translating into an appreciation of the US component. The resulting depreciation of the CAD helped stabilized the Canadian manufacturing sector at the start of Great Recession.

Because of these mechanisms, Beine and Coulombe (2003) argued that the core would benefit from belonging to a more diversified currency like the USD. Experience of the Euro however shows the danger of a currency union without political union. The costs of giving up the right to print money (lender of last resorts) and of rapidly adjusting its real exchange rate have been highly underestimated.

The implications of the core-periphery model for the Dutch disease take on greater importance in a federalism context. The key relevant feature of the Canadian federation, which distinguishes it from many others, is the ownership of natural resources by the provinces and the implied right of the provinces to impose resource-specific taxes. This was made explicit in the 1982 amendment to the Constitution Act, which added Section 92A pertaining to non-renewable natural resources, forestry resources and electrical energy. This section gave the provinces exclusive rights to legislate in relation to exploration, development, conservation and management of these natural resources and in relation to exports from a province to other parts of Canada provided there is no discrimination in prices or quantities supplied. More

important, provinces could raise money by any form of taxation in respect of these resources, provided the taxation does not discriminate between production that is exported to the rest of Canada and that is not. Note that this power to legislate taxes on natural resources is not an exclusive power; that is, it does not explicitly preclude the federal government from taxing resource activities under its own taxing power. Of course, having the legal power and choosing to exercise it are two different things, especially given the provincial prerogative to tax resources.

In practice, the provinces alone deploy resource-specific taxes and levies. These include mining taxes, typically based on some measure of profits; royalties on oil and gas, which are related to production; sale of leases for the right to explore, develop and extract resources; taxes on timber production; and various forms of revenue from electricity, including profits from crown corporations. The federal government also obtains tax revenues from natural resources, including from income taxes, sales taxes and excises. However, the provinces obtain a much higher share of revenues overall from natural resources than does the federal government.[11] In the case of income taxes, the same general rules apply to resource and non-resource industries, although there are some resource-specific provisions that lead to relatively favourable treatment. For instance, the investment cost for most types of assets in the resource sector is eligible for an annual depreciation allowance of 25 percent of the unclaimed balance, while certain types of investment are eligible for an accelerated capital cost allowance, which can provide an immediate deduction of up to 100 percent of the investment cost. There are also generous deductions and credits for exploration and development investment in the pre-production period. For example, it is possible to deduct 100 percent of exploration expenses in the year when the expense is incurred. There is a rapid write-off of development expenses (up to 30 percent of unclaimed balance each year) and a 10

[11] Calculations done by Finance Canada (2003) showed that the federal government collected approximately 23 percent of total federal and provincial revenues from the oil and gas sector at the end of the 1990s. The federal share in the mining sector was estimated at 24 percent. These calculations included revenues collected from federal and provincial income and capital taxes, as well as provincial royalties and mining taxes.

percent investment tax credit in the mining sector for expenditures in the pre-production period. In addition to these provisions, provincial royalties and mining taxes are fully deductible from federal taxable income. There are also advantages at the financing stage provided by the flow-through-share mechanism by which firms in the mining and oil and gas sectors can pass deductions for investment in the pre-production stage to their owners. Exploration and development expenditures that are financed under this mechanism are considered to have been incurred by the investors who buy the flow-through shares and are deductible from the investors' taxable income in the current year. In effect, this provides for an immediate 100 percent write-off of these expenditures, as well as a deduction from income which may be taxed at a higher rate that the income tax rate faced by the corporation who issues the shares.

There are several possible implications of the provinces having primary access to resource revenues. The first and most obvious is that since natural resource revenues accrue very unequally among provinces, they lead to substantial horizontal imbalances in the federation. In 2011-12, provincial fiscal capacities before equalization ranged from 67 percent of the national average in Prince Edward Island to 166 percent in Alberta, with the fiscal capacities of Québec and Ontario respectively being equal to 83 percent and 93 percent of the national average. The impact of the resource boom on fiscal capacities has been particularly striking for Newfoundland & Labrador, Saskatchewan and Ontario. Between 2001-02 and 2011-12, Newfoundland & Labrador and Saskatchewan became have-provinces with their fiscal capacities increasing from 67 percent to 153 percent of the national average in the case of Newfoundland & Labrador and from 93 percent to 133 percent in the case of Saskatchewan. On the other hand, Ontario's fiscal capacity decreased from 104 percent to 93 percent of the national average (based on data provided by Finance Canada). To the extent that these imbalances are not equalized, they lead to fiscal inefficiency to the extent that households and businesses are lured to resource-rich provinces by lower taxes and/or

better public services (so-called net fiscal benefits).[12] This fiscal inefficiency is over and above the inefficiency that might result from the forgone agglomeration economies due to the resource-movement. Differences in provincial capacity also give rise to fiscal inequity: comparable persons get more net fiscal benefits in resource-rich provinces than elsewhere.

It is precisely these fiscal inefficiencies and inequities that the equalization system is meant to address. Literally interpreted, Section 36(2) of the *Constitution Act, 1982* would oblige the federal government to make equalization payments to undo differences in fiscal capacity from provincial resource revenues. There is a lengthy and contentious literature on the issue of equalization of resource revenues, and we only highlight two key issues here. One is that there is an apparent conflict between the commitment imposed on the federal government in Section 36(2) and the presumed provincial ownership of resources. Those who give primacy to provincial property rights argue that natural resource revenues should be treated as implicit income of provincial residents and at most should be 'taxed' at the federal income tax rate (Boadway and Flatters 1982). The second issue is that attempting to equalize natural resource revenue will have adverse effects on provincial incentives to develop resources.

Different observers have come down differently on how to resolve these issues. The Royal Commission on Renewing and Strengthening Our Place in Canada (2003) set up in Newfoundland & Labrador called for a renegotiation of the Atlantic Accord to ensure that the provincial government be the main beneficiary of offshore oil revenues, at least until the province's fiscal capacity reached the national average. The Commission estimated that, at that point in time, the provincial government was effectively capturing only 20 to 25 percent of offshore oil revenues. Partly in response to the Commission's recommendations, the federal government signed the 2005 Offshore Arrangement with Newfoundland & Labrador and Nova Scotia which guaranteed that,

[12] Day and Winer (2012) found evidence that interprovincial variations in income tax rates and in benefits from expenditure programs, social assistance payments in particular, have some impact of interprovincial migration flows, although quantitatively, the effects of variations in provincial policies on migration decisions are much smaller than the effects of earnings differentials and moving costs.

for a limited period of time, these provinces would face no reduction in their equalization entitlements as a result of including offshore oil revenues in fiscal capacity calculations. The Council of the Federation Advisory Panel on Fiscal Imbalance (2006) recommended using a ten-province standard and including 100 percent of resource revenues in the calculation of fiscal capacities despite concerns regarding the impact of the full inclusion of resource revenues on the volatility of equalization payments and on the affordability of the program for the federal government. Because of these concerns, the Panel also recommended using three-year moving averages of fiscal capacities and lagging two years, as well as scaling back the standard to address the affordability issue. The Expert Panel on Equalization and Territorial Formula Financing (2006) recommended including only 50 percent of provinces' actual resource revenues in the calculation of fiscal capacities and determine equalization entitlements based on a ten-province standard. This approach ensures that provinces retain some net fiscal benefits from the extraction of their resources.

Over the years, resources have received various equalization treatments. Typically, natural resources revenues have been significantly equalized, but with provisions that imply less than full equalization. Sometimes less than 100 percent of resource revenues have been equalized, and sometimes the standard to which recipient provinces are equalized has been based on five provinces rather than all ten. Equalization has always been based on a gross rather than a net mechanism, implying that provinces with above average fiscal capacity have not been equalized down (except implicitly through the system of social transfers). Special provisions have been in place for natural resources whose ownership is highly concentrated in one province. There have been limits placed on the growth of equalization based on GDP growth. And, special provisions have protected offshore oil and gas revenues accruing to Newfoundland and Nova Scotia from equalization, as mentioned above. Nonetheless, equalization of natural resources has typically recognized the principle that they should be substantially equalized, albeit with some special provisions reflecting incentive effects and other things.

The current system of equalization mimics the main proposals of the Expert Panel. A ten-province standard is used with 50 percent of resource revenues being included in the base, and a growth limit is imposed, based on affordability arguments. Given the very large horizontal disparities currently existing between resource-rich provinces and the others, there remain significant disparities after equalization. In 2011-12, equalization brought the average fiscal capacities of recipient provinces up to approximately 95 percent of the national average, while the fiscal capacities of Saskatchewan, Newfoundland and Alberta were equal to, respectively, 133 percent, 153 percent and 166 percent of the national average (based on data from Finance Canada).

The full extent of equalization also depends on the system of social transfers, and equivalently the extent to which revenue-raising is decentralized. A system in which the federal government raises more revenues that it needs for its own programs, including equalization, and transfers the rest to the provinces in equal per capita form is highly equalizing. Conversely, a more decentralized revenue-raising system increases horizontal disparities and puts more stress on the equalization system. However, to the extent that natural resource revenues belong to the provinces, an equal per capita transfer scheme financed by federal revenues cannot mitigate fiscal disparities resulting from uneven provincial resource endowments. That could only be done either by the federal government collecting more revenues from resources, or social transfers being conditioned on revenue needs.

Let us now turn to how the provinces choose to use their resource ownership. First, there is the question of to what extent provinces capture a reasonable share of the rents for the public sector. The Alberta Royalty Review Panel (2007) argued that Alberta did not get a 'fair share' of revenues from oil and gas. They estimated that the total public sector share of rents was 44 percent for conventional oil, 47 percent for oil sands and 58 percent for natural gas, with the remaining share being captured by producers. The total public sector share includes government revenues generated from royalties and taxes, and for all levels of governments (so it includes federal corporate tax

revenues levied in these sectors). The panel recommended that the public sector shares be increased in these three sectors, although to a much larger extent in the oil sands sector (from 47 to 64 percent, compared with an increase from 44 to 49 percent for conventional oil and from 58 to 63 percent for natural gas).

The obvious question is why the public shares of resource rents should be so low given that the resources are publicly owned, especially since some revenues come from the sale of leases, which in ideal circumstances should yield a high proportion of expected rents. One possibility is that Alberta is a relatively small open economy, and feels the brunt of fiscal competition as a constraint on setting royalties. Indeed, the Alberta Royalty Review panel itself voiced the need to maintain international competitiveness so as to continue attracting sufficient investment as a consideration. However, if resource taxes really were taxes on rents, the forces of tax competition would be much diminished in a world where returns to capital are determined on world markets: natural resources are after all immobile. The fact that resource taxes are not on rents might account for some of the competitiveness pressure that the government perceives. There might also be significant political uncertainty arising from the inability of the provincial government to commit to royalty rates in advance. To the extent that the government increases royalty rates when resource prices rise, which seems to be the case, this reflects an absence of commitment and leads to resource firms facing political risk for which they must be compensated. This may also account for the fact that the sale of leases does not capture all the rents. Whether federal access to resource taxation would lead to a higher proportion of the rents being collected is an open question, but in principle the federal government should face less competitive pressure than a province. Of course, the fact that the provinces fail to collect a fair share of resource rents does not aggravate the Dutch disease. On the contrary, to the extent that resource firms are foreign-owned, the profits will be expatriated and exchange rate-induced reallocations of factors diminished.

Even if a fair share of rents is not collected for the province, the amount of revenues is nonetheless substantial, and what the provinces do with them can influence the extent of the Dutch disease. For whatever reason, the provinces seem unable to save a significant proportion of resource revenues for future generations.[13] The Alberta government has a Heritage Fund in place, but it accounts for a very limited proportion of cumulated oil and gas revenues. As of 2012, the value of the fund's assets was approximately $16 billion. This corresponds to only about 1.4 times the non-renewable resource revenues of the Alberta government for the fiscal year 2011-12 alone, which were approximately equal to $11.6 billion (Alberta Department of Energy). In comparison, the Norwegian sovereign wealth fund was valued in 2011 at $660 billion (Sovereign Wealth Funds Institute)**.** No doubt some of the resource revenues in Alberta have been used for capital spending, including human capital investment. But, a substantial proportion of them have been used to reduce taxes and increase current spending. The additional spending generated by both provincial residents and governments adds to the Dutch disease via the Corden-Neary spending effect, as well as contributing to fiscal inefficiency and inequity in the federal system as mentioned above.

Another reason why provinces have not been able to save resource revenues could be because of the temptation to use them for provincial regional development, or what has been called province-building, at the expense of other provinces. To the extent that the provinces choose their policies in the interest of their own citizens, incentives exist to develop the province via diversification strategies and infrastructure investments of various sorts. This may be one of the major Dutch disease-augmenting effects of decentralization. The province-building that provincial ownership of resource rents allows, whether by relatively low tax rates, relatively high levels of public services or infrastructure building, attracts factors of production away from other provinces,

[13] Bruce (1995) has argued that the inter-provincial mobility of labour gives provinces an incentive to increase debt. The average voter can escape the consequences of the debt by moving away when it comes time to repay. Perhaps something similar induces the average voter to want to spend resource rents now, given that their descendants may well not be living in the same province.

including those that are more suitable for exploiting agglomeration economies. This induced movement of activity from the core to the periphery to use Krugman's terminology once again, compounds the inefficiencies of fiscally induced migration.

The point can be made rather forcefully by contrasting the effects of decentralized resource rent collection with how the revenues would be used by a benevolent national government. It is not likely that such a government would use natural resource revenues as a vehicle for diversifying the region in which the resources happen to be found. There is no particular reason to seek to develop proactively regions of the country where large resource deposits are located. Of course, a benevolent national government collecting resource rents is not necessarily the alternative to the rents being collected by provincial governments. But, it is nonetheless a useful normative benchmark.

5. Policy Options

As we stressed in the Introduction, in principle a windfall resource boom could benefit all Canadians with the right policies in place. There are three main reasons why this might not occur in the absence of policy measures. One is that the response to the resource boom might entail inefficiencies either by exacerbating existing distortions or creating new distortions in the resource sector. Thus, if there are unexploited agglomeration economies or opportunities for productivity growth that are not captured by firms affected by the resource boom, or if there are externalities emitted in the resource industries, corrective action is called for. Second, the resource boom inevitably makes some groups better off and others worse off, and the two groups might be especially concentrated in resource-rich and resource-poor regions. Third, the ready availability of potential resource revenues might induce governance issues, such as rent-seeking or non-productive use of the resources, which can adversely affect the performance of both the government and the economy. As mentioned, we set aside the third problem on the presumption that good governance is not an issue in Canada. In dealing with the first two issues — inefficiencies and inequities resulting from the

resource boom — the response is further complicated in Canada because of the provincial role in developing and taxing natural resources in their jurisdictions.

Resource-rich provincial governments could enact policies that would exploit the benefits of natural resources and mitigate adverse consequences. They could adopt efficient resource taxation regimes that ensure that the bulk of the rents are collected without interfering with the incentive to explore, develop, extract and close down resource properties. There are known regimes for achieving this, such as the Resource Rent Tax (RRT) touted by the Henry Report (2008), and the Allowance for Corporate Equity (ACE) tax set out, for example, by Auerbach, Devereux and Simpson (2010) and recommended by the Mirrlees Review (Mirrlees et al 2011).[14] These regimes, when combined with competitive auctioning of leases, can be effective ways of collecting resource rents for the public sector.

There are some pitfalls that must be recognized in implementing such regimes. One is that governments should commit to a tax regime and maintain it regardless of future fluctuations in prices. The temptation of governments to raise tax rates when prices rise, and vice versa, leads to political risk that compromises the efficiency of taxation. The second is that losses must be treated symmetrically with gains. This is particularly important in natural resources given the uncertainty associated with exploration as well as with resource prices.

Unfortunately, existing provincial resource regimes are not fully efficient revenue-raisers. In oil and gas, royalties are relied on rather the rent-type taxes. Moreover, royalty rates are too low to generate a fair share of the rent for the government, as discussed in the case of Alberta in the previous section. And, royalty rates tend to vary or be changed with resource prices, leading to political uncertainty.

Next, those revenues that are collected should be used for good purposes. First and foremost, they should be used in ways that benefit future generations adequately. One

[14] A detailed survey of natural resource tax regimes and their properties may be found in Boadway and Keen (2010).

way to do this is to create an SWF and to draw the wealth down in a way that takes account of the moral rights that future generations have to the benefits of resources, recognizing that they may be expected to have higher standards of living. To mitigate the Dutch disease effects on other regions and industries, the SWF could be invested in foreign assets, as in the Norwegian case. At the same time, a case can be made for investing some of the rents in capital projects that generate implicit rates of return, such as infrastructure and human capital.

The problem, as mentioned above, is that provincial governments face incentives that may result in decisions being made that might enhance the Dutch disease. They apparently feel tax competition pressures that discourage them from capturing a fair share of resource rents. They seem to be reluctant to save resource revenues. Instead they spend them in part on provincial regional development investments that draw economic activity from other regions. Moreover, the relatively low tax rates and possibly high public service levels that resource revenues allow result in inefficient fiscally induced migration of labour and businesses. Note that the fact that provincial governments are not capturing a fair share of the rents, combined with the relatively high proportion of foreign-ownership in the resource sector, will actually tend to mitigate the Dutch disease since the expatriation of profits will dampen the exchange-rate effects that are leading to the reallocation of production factors away from the traded-goods sector. However, the exchange-rate effects can also be mitigated, while accumulating assets for future generations, by simply taxing a greater share of the rents and investing the revenues into a SWF holding foreign assets.

What policies might the federal government follow in light of the response of the provinces and the broader national interest?[15] There are obviously important political and constitutional issues that constrain what the federal government can practically or legally do to address the efficiency issues arising from Dutch disease effects as well as equity concerns. The options we suggest exploring recognize that the provinces have

[15] Some of the policies discussed below have been advocated in Boadway (2009).

jurisdiction over resource development, and have the right to levy resource-specific taxes. At the same time, the federal government has legitimate efficiency and equity obligations, some of them explicitly set out in the two parts of Section 36 of the Constitution Act 1982, and others recognized to fall within the scope of national interest. Moreover, although the federal government may choose not to impose resource-specific taxes (apart from excise taxes on petroleum products), it has always collected a share of natural resource revenues through its general power of taxation. We regard it as an open question as to the share of resource revenues that go to the federal government. We also take it as given that the federal government cannot directly control the pace of resource development. It can however address the consequences.

The two most pressing consequences of the resource boom are the reallocation of activity from the non-resource tradable goods sector to the resource sector and the inter-provincial fiscal imbalance created by the uneven distribution of resource revenues among provinces. The former effect, which potentially affects the growth rate of the economy, is aggravated by the fact that resource revenues are spent rather than saved. Consider first the federal role in addressing the horizontal fiscal imbalance.

The federal government has a longstanding and widely accepted commitment to addressing horizontal fiscal imbalances through its transfer system, including both equalization and social transfers. This commitment follows the practice in Canada, but it also follows from the commitments expressed in both Sections 36(1) and 36(2) in the Constitution. The current fiscal imbalance is unprecedented, and if not addressed would lead to a combination of fiscally induced migration and sizeable fiscal inequities. If all Canadians are to benefit from the resource boom, which politicians assure us should be the case, the consequences of this fiscal imbalance must be addressed.

There are various elements to addressing this imbalance. The most apparent is the equalization system, whose purpose is precisely to undo fiscal capacity imbalances among provinces. The current system of equalization cannot do so by itself. Because it

only equalizes have-not provinces up, it cannot undo imbalances between have and have-not provinces. Moreover, it only includes half of provincial natural resource revenues. It is also increasingly difficult, though not impossible, for the federal government to finance full equalization commitments with limited access to the main source of imbalances. The GDP growth cap on equalization reflects this difficulty. The system of social transfers contributes to equalization, and does so in a way that effectively equalizes both up and down. But, it does little to equalize resource revenues.

There are four main ingredients that would deal with the fiscal imbalance and the shortcomings of the equalization system to deal with it. The first is simply to maintain the integrity of the equalization system despite the apparent affordability issue with equalizing natural resource revenues. Ideally, the equalization budget should be fully formula driven, rather than being subject to discretionary limits or caps in growth. A well-functioning equalization system is absolutely critical for ensuring that the resource boom does in fact benefit all Canadians.

A second ingredient is to maintain an important federal presence in the income tax room. There is an intimate relationship between federal tax room and equalization in the sense that the more tax room is decentralized to the provinces, the greater will the horizontal imbalance be and the more difficult will it be to address it. Moreover, the more decentralized is the personal income tax, the less progressive it is likely to be, given that provincial income tax systems have less progressive rate structures. A national progressive income tax structure is an important element in a federal system for ensuring that shocks do not lead to significant inequities.[16]

Greater federal tax room allows for greater transfers, including social transfers. Although there is some equalization value in social transfers being equal per capita, a more pro-active approach could be taken in light of the deficiencies of the equalization

[16] One approach discussed by Tremblay (2009) to address the problem of fiscal balance that fosters harmonization and cooperation is to adopt federal-provincial revenue sharing of major tax bases like the income tax and the GST/HST. This has proven to be effective in Australia and Germany. Elsewhere, Tremblay (2012) has discussed the potential benefits of a transfer of corporate tax room to the federal government combined with the adoption of formula-based revenue-sharing arrangements.

system to deal with the vast disparities among have and have-not provinces. Thus, as suggested by Courchene (2010), transfers to the have provinces could be conditioned on their fiscal capacity without necessarily undoing their role as vehicles for facilitating good social programs with minimal national standards. This is the third ingredient.

A final ingredient is to enhance the federal share of resource revenues so that achieving fiscal balance is affordable. The principle of the federal government acquiring a share of natural resource revenues is well-established, at least as long as it is done in a way that is not explicitly discriminatory toward resource industries. On the contrary, the existing corporate income tax system favours natural resources, as briefly described in the previous section. There are a couple of structural changes that could be made to the corporate tax system so that it is fairer and more efficient and generates potentially more revenue for the federal government. One is to eliminate the deductibility of resource taxes from the corporate tax base. Apart from this being an unnecessary transfer from the federal government to the provinces, it also introduces distortions into the tax system.[17] In fact, the deductibility of resource taxes may well act as a disincentive for provinces to reform their resource taxation regime into more efficient rent-type taxes. This would tend to be the case if rent taxes were viewed as corporate income taxes (rather than production taxes), even if applied specifically to the resource sector, and were expected to receive the same treatment in the federal tax system as general provincial corporate income taxes.

More substantially, a corporate tax reform that has much merit in its own right is to convert the tax into an effective tax on rents. It is well-known that a tax on corporate cash flow, as advocated by the Meade Report (1978) is equivalent to a tax on rents, so

[17] Dahlby, Mintz and Wilson (2000) show that the deductibility of provincial royalties from federal taxable income will tend to distort provincial policy choices because of a vertical fiscal externality. Broadly speaking, because of the deductibility of provincial taxes, part of the cost of provincial taxation is shifted to the residents of other provinces through lower federal revenues. This tends to distort the cost of taxation as perceived by provincial governments. They show that the policy required to eliminate this distortion necessarily involve less than full deductibility, and may even require the deductible to be negative.

does not distort firms' decisions.[18] A cash flow tax might be viewed as being politically difficult since it requires full refundability of losses. However, there exist cash-flow equivalent business taxes that avoid this problem. The most general case was outlined by Boadway and Bruce (1984) and Bond and Devereux (1995). It involved adding all capital expenditures into an account that could be depreciated at any arbitrary rate, and allowing write-off each tax year equal to a depreciation rate and a risk-free interest rate applied to the undepreciated book value of the account. In effect, tax deductions on expenditures that are not immediately written off can be carried forward at the risk-free rate of interest. Special cases of this have been advocated and applied in different contexts, including the ACE in various EU countries and the RRT in Australia. The advantage of this tax is that it avoids the inefficiencies of the current business tax system documented in the Mintz Report (1998), such as the discouragement of investment (e.g., positive marginal effective tax rates), the favourable treatment of the resource industries, the encouragement of debt finance, the imperfect system of integration with the personal income tax, and the incentive for tax competition. Such a reform would also contribute to reducing variations across industries in marginal effective tax rates on capital, as recently calculated by Chen and Mintz (2011), which would improve the allocation of investment across all industries and increase aggregate productivity. A tax on rents would capture revenues for the public sector from rents or pure profits generated from all sources, including monopoly rents, resource rents, locational rents and rents due to special advantages. A corporate tax based on rents would generate for the federal government a share of resource rents using a tax that is not explicitly discriminatory, and would contribute to the federal government's ability to address fiscal imbalances arising from natural resources.

Turn now to the other serious issue, the failure of the provinces to save natural resource revenues, and instead either to spend them or to use them to reduce provincial tax rates. The options available to the federal government to address this are limited. In

[18] Technically speaking, this is true as long as the rents are not mobile. For example, rents from intellectual property can be taken in another country in which case a rent tax would influence location decisions.

principle, it could set up a SWF from its own revenues to save for future generations. For example, a higher proportion of the Canada Pension Plan could be held as foreign assets as suggested by Shakeri, Gray and Leonard (2012). This could also potentially reduce the risk level of the CPP fund associated with commodity price fluctuations. That is, through the Canadian component of the exchange rate, a negative shock to the price of commodities will generate a shortfall in national income and in CPP contributions. This will be partly offset by a depreciation of the exchange rate and a corresponding increase in the value of foreign-denominated assets measured in Canadian dollars. However, this policy would conflict with the independence of the CPP Pension Board. By the same token, large provincial pension funds like the Québec Caisse de Depot and Ontario public sector pension funds could also invest more heavily abroad, though this would be subject to similar objection.

A federal SWF would not mimic one formed by resource revenues that accrue to the provinces, so it would not undo the effects arising from the provincial inability to save them. The use of resource revenues for current purposes has various adverse effects. As mentioned, to the extent that the revenues are used to benefit provincial citizens, inefficiently fiscally induced migration is a result that can be dealt with by equalization. The spending of resource revenues enhances the spending effect magnifying the exchange rate effect of a resource boom and thereby aggravating the Dutch disease. Though a federal SWF can partly offset this, it cannot offset the regional reallocation of factors of production that arise from province-specific spending. Finally, some of the spending of resource revenues is for provincial regional development purposes, such as the building of infrastructure intended to attract businesses from elsewhere, including other provinces. To the extent that this involves foregoing economies of scale in more populous regions, it is a source of inefficiency over and above that reflected in fiscally induced migration.

These problems would be mitigated to the extent that resource-rich provinces were induced to save more of the resource revenues. One lever that the federal government

might use is manipulation of federal-provincial transfers. For example, equalization of resource revenues might be restricted to resource revenues that are spend rather than saved. Provincial resource revenues put into a SWF could be left out of the equalization formula, and brought back in only when the fund is drawn down. This would have to be thought through carefully, because there would be an incentive for provinces to game the system. Moreover, it should be noted that in the current equalization system, this proposal would be completed ineffective at increasing the saving of resource-rich provinces since they are not equalization recipients and the total equalization budget is determined by the GDP growth rate. However, as discussed above, conditioning the CHT/CST system on provincial fiscal capacities could overcome this problem.

Counterbalancing the negative impact of provincial regional development policies on other regions is even harder. One might argue that the federal government should invest in infrastructure for the traded goods sectors to improve productivity there. That will be difficult to do effectively and would only work to the extent that it reduced the diversion of factors of production from the traded sector to the resource industries. That is, traded industries would have to be favoured relative to non-traded ones. This would amount to a pro-active industrial policy that presumes a government that is better informed than is likely to be the case. Some might argue instead that exchange rate policy could be used to undo the effects of the Dutch disease on the traded goods sector. However, this policy seems destined to be self-defeating except perhaps in the volatility version of the Dutch disease.

There may be some room for discretion in terms of how much value to add to resources before exporting them. From the point of view of Dutch disease consequences, this would seem to be bad policy because it exacerbates the problem. On the other hand, the prospect of adding value to raw resources might open the possibility of spreading the benefits to other regions. A variant of this argument has recently been voiced by Dodge (2012). He suggested active support for a pipeline from Alberta to central Canada

to transport oil to eastern refineries. This would at least ensure the spreading of some of the industrial activity associated with oil sands exploitation to firms in central Canada.

The mention of pipelines reminds us of one more problem that decentralized control of resources implies for policy. Resource production and marketing requires transportation infrastructure that involves non-producing provinces. This gives rise to natural coordination problems among producing and non-producing provinces, and suggests a role for the federal government in facilitating cooperation.

More provocatively, Dodge's eastern pipeline proposal was part of a broader proposal for the federal government to undertake public investments to build productive and fiscal capacity in all provinces, especially low-income ones. His argument is based on the idea that compensating provinces for deficiencies in fiscal capacity through equalization and other transfers will be insufficient to meet the commitments of Section 36(2), given the growing disparities. Instead, these fiscal capacities must be addressed pro-actively. The argument for federal intervention draws on Section 36(1) of the Constitution Act, which commits the federal government and the provinces to (a) promoting equal opportunities for the well-being of Canadians; (b) furthering the economic development to reduce disparity in opportunities; and (c) providing essential public services of reasonable quality to all Canadians. Federal infrastructure investment is a potential policy instrument for that purpose.

6. References

Alberta Royalty Review Panel (2007). *Our Fair Share.* (Edmonton: Ministry of Finance). http://www.albertaroyaltyreview.ca/panel/final_report.pdf

Amano, R. and S. van Norden (1993). 'Terms of Trade and Real Exchange Rates: The Canadian Evidence.' *Bank of Canada Working Paper* No. 93–3.

Auerbach, A.J., M.P. Devereux and H. Simpson (2010). 'Taxing Corporate Income'. In *Dimensions of Tax Design: the Mirrlees Review*, edited by J. Mirrlees, S. Adam, T. Besley, R. Blundell, S. Bond, R. Chote, M. Gammie, P. Johnson, G. Myles and J. Poterba (Oxford: Oxford University Press).

Australian Treasury (The Henry Review) (2010). *Australia's Future Tax System.* (Canberra: Commonwealth of Australia).

Barro, R. J., and X. Sala-i-Martin (1995). *Economic Growth.* (New York: Mc-Graw-Hill).

Beine, M., C. Bos and S. Coulombe (2012). 'Does the Canadian Economy Suffer from Dutch Disease?' *Resource and Energy Economics,* 34(4): 468–92.

Beine, M. and S. Coulombe (2003). 'Regional Perspectives on Dollarization in Canada.' *Journal of Regional Science,* 43(3): 541–70.

Beine, M., S. Coulombe and W.N. Vermeulen (2012). 'Dutch Disease and the Mitigation Effect of Migration: Evidence from Canadian Provinces.' *CESifo Working Paper* No. 3813, Munich.

Boadway, R. (2009). 'Natural Resource Shocks and the Federal System: Boon or Curse?' In *Canada: The State of the Federation 2006/07, Transitions: Fiscal and Political Federalism in an Era of Change.* Allan, J.R., T.J. Courchene, C. Leuprecht (eds.). (Montreal & Kingston: McGill-Queen's University Press), 107-30.

Boadway, R. and N. Bruce (1984). 'A General Proposition on the Design of a Neutral Business Tax.' *Journal of Public Economics,* 24: 231-39.

Boadway, R. and M. Keen (2010). *Theoretical Perspectives on Resource Tax Design*. In *The Taxation of Petroleum and Minerals: Principles, Problems and Practice*. Daniel, P., M. Keen, C. McPherson (eds.). (United Kingdom: Routledge), 13-74.

Bonds, S.R. and M.P. Devereux (1995). 'On the Design of a Neutral Business Tax under Uncertainty.' *Journal of Public Economics*, 58: 57-71.

Bruce, Neil (1995), 'A Fiscal Federation Analysis of Debt Policies by Sovereign Regional Governments.' *Canadian Journal of Economics,* 28: S195–S206.

Chen, D. and J. Mintz (2011). 'Federal-Provincial Business Tax Reform: A Growth Agenda with Competitive Rates and A Neutral Treatment of Business Activities.' *School of Public Policy Research Paper,* vol. 4(1), University of Calgary.

Corden, W. M., and J.P. Neary (1982). 'Booming Sector and De-industrialisation in a Small Open Economy.' *Economic Journal,* 92(368): 825–48.

Coulombe, S. (2011). 'Lagging Behind: Productivity and the Good Fortune of Canadian Provinces.' *C.D.Howe Institute Commentary 331* (Toronto: C.D. Howe Institute).

Council of the Federation Advisory Panel on Fiscal Imbalance (2006). *Reconciling the Irreconcilable: Addressing Canada's Fiscal Imbalance* (Ottawa: Council of the Federation). http://www.councilofthefederation.ca/pdfs/Report_Fiscalim_Mar3106.pdf

Courchene, T. (2010). 'Intergovernmental Transfers and Canadian Values: Retrospect and Prospect.' *Policy Options* (May), 32-40.

Courchene, T.J. and R.G. Harris (1999). 'From Fixing to Monetary Union: Options for North American Currency Integration.' *C.D. Howe Institute Commentary 127* (Toronto: C.D. Howe Institute).

Dahlby, B., J, Mintz, and S. Wilson (2000). 'The Deductibility of Provincial Business Taxes in a Federation with Vertical Fiscal Externalities.' *Canadian Journal of Economics,* 33: 677-694.

Day, K. and S. Winer (2012). *Interregional Migration and Public Policy in Canada: An Empirical Study*. (McGill-Queen's University Press).

Dodge, D. (2012). 'Strengthening the Canadian Economic Union in a Period of Fluctuating Resource Prices.' Lecture at the Public Policy Forum 25th Anniversary Lecture Series, Carleton University, October 10, 2012.

Expert Panel on Equalization and Territorial Formula Financing (2006). *Achieving National Purpose: Putting Equalization Back On Track* (Ottawa: Department of Finance). http://www.eqtff-pfft.ca/epreports/EQ_Report_e.pdf

Finance Canada (2003), *Improving the Income Taxation of the Resource Sector in Canada*. (Ottawa: Department of Finance).

ForestEthic Advocacy (2012). 'Who Benefits? An Investigation of Foreign Investment in the Tar Sands.'

Hartwick, J.M. (1977). 'Intergenerational Equity and the Investing of Rents from Exhaustible Resources.' *American Economic Review*, 67(5): 972–74.

Krugman, P. (1987). 'The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes on Trade in the Presence of Dynamic Scale Economies.' *Journal of Development Economics*, 27(1–2): 41–55.

Krugman, P. (1991). *Geography and Trade.* (Cambridge, MA.: MIT Press).

Lucas, R.E., Jr. (1988). 'On the Mechanics of Economic Growth.' *Journal of Monetary Economics*, 22: 3–42.

Maier, P. and B. DePratto (2008). 'The Canadian Dollar and Commodity Prices: Has the Relationship Changed over Time?' *Bank of Canada Discussion Paper* 2008–5.

Mehlum, H., K. Moene, and R. Torvik (2006). 'Institutions and the Dutch Disease.' *The Economic Journal*, 116(1): 1–20.

Mirrlees, J., S. Adam, T. Besley, R. Blundell, S. Bond, R. Chote, M. Gammie, P. Johnson, G. Myles, and J. Poterba (The Mirrlees Review) (2011), *Tax by Design* (Oxford: Oxford University Press).

Neary, J.P., and D.D. Purvis (1982). 'Sectoral Shocks in a Dependent Economy: Long-Run Adjustment and Short-Run Accommodation.' *Scandinavian Journal of Economics*, 84(2): 229–53.

Raveh, O. (2012). 'Dutch Disease, Factor Mobility, and the Alberta Effect – The Case of Federations.' Hebrew University of Jerusalem, mimeo.

Report of a Committee Chaired by Professor James Meade (The Meade Report) (1978). *The Structure and Reform of Direct Taxation.* (London: Allen and Unwin).

Romer, P.M. (1986). 'Increasing Returns and Long-run Growth.' *Journal of Political Economy,* 94: 1002–37.

Royal Commission on Renewing and Strengthening Our Place in Canada (2003). *Main Report.* (St. John's: Office of the Queen's Printer). http://www.exec.gov.nl.ca/royalcomm/finalreport/default.html

Sachs, J.D. and A.M. Warner (2001). 'The Curse of Natural Resources.' *European Economic Review*, 45(4–6): 827–38.

Shakeri, M., R. Gray and J. Leonard (2012). 'Dutch Disease or Failure to Compete?' *IRPP Study* No. 30, Montréal.

Technical Committee on Business Taxation (Mintz Report) (1998). *Report.* (Ottawa: Department of Finance).

Tremblay, J.-F. (2009). 'Fiscal Balance and Revenue-Sharing.' In *Canada: The State of the Federation 2006/07, Transitions: Fiscal and Political Federalism in an Era of Change.*

Allan, J.R., T.J. Courchene, C. Leuprecht (eds.). (Montreal & Kingston: McGill-Queen's University Press), 131-43.

Tremblay, J.-F. (2012). 'Fiscal Problems, Taxation Solutions: Options for Reforming Canada's Tax and Transfer System.' Mowat Centre for Policy Innovation, School of Public Policy and Governance, University of Toronto.

van der Ploeg, F. (2011). 'Natural Resources: Curse or Blessing?' *Journal of Economic Literature*, 49(2): 366–420.