A Macdonald-Laurier Institute Publication

MACDONALD-LAURIER INSTITUTE

Six Myths Surrounding the Development of Canada's Natural Resources

Philip Cross

May 2013

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Executive Summary

Canada's abundant natural resources have always been an important source of economic growth. However, some economists have been critical of relying on resources for development. From this skepticism evolved the notion of a staples *trap* – that growth based on natural resources lowers our terms of trade, stifles innovation, and is a source of economic instability. This paper examines a half dozen of these myths surrounding Canada's natural resource sector.

MYTH 1: The price of natural resources lags the price of Canada's imports, slowing our long-term income growth.

This myth evolved out of flawed research that argued commodity prices would fall relative to prices for manufactured goods. Instead, since Confederation prices for Canada's exports have steadily risen more than import prices, led by higher commodity prices. This has added about 18 percent to real incomes in Canada.

MYTH 2: Demand for natural resources is excessively cyclical, injecting unwanted instability into the economy.

Manufacturing and construction are the most cyclically sensitive sectors of the economy, with output contracting four times more than natural resources during recessions. Instead, the major impact in commodities is felt by prices, and investment in future output. Moreover, not all commodities move together: the commodity price boom over the last decade has been sequential, not synchronized, with each sector passing the baton to another as its price leveled off.

MYTH 3: Canada exports raw materials and imports finished goods, and this gap is widening.

Natural resources are the fastest growing component of imports. This reflects more imports of crude oil, precious metals, and metal ores for smelting and refining in Canada, sometimes for re-export. Imports of natural resources rose faster than exports of natural resources between 1988 and 2012. Over the past century, Canada's export base has diversified away from its near-total reliance on natural resources.

MYTH 4: Natural resources are the leading source of regional inequality in Canada.

All regions have a sizeable resource sector. The boom in the resource sector over the past decade has helped narrow regional variations in the unemployment rate to their lowest on record. This narrowing of inter-provincial inequality was most evident in Saskatchewan and Newfoundland, where higher incomes led to a resumption of population growth after decades of decline. Ontario moved to "have not" status largely due to its dependence on manufacturing, which is disproportionately located in central Canada.

MYTH 5: Natural resources are technologically primitive, slowing innovation in Canada's economy.

Resource industries are well-represented in broad measures of innovation, such as the share of knowledge workers in the labour force. Canada's resource boom arguably began in the late 1990s, when oil sands output started to ramp up in response to innovative production techniques, even as oil prices cratered.

MYTH 6: Development of our natural resource industries hampers growth in other industries, notably manufacturing.

In the 1990s, rapid growth in manufacturing accompanied a withering away of both capital and labour invested in Canada's resource sector, which laid the foundation for today's shortages in the resource sector. From 2002 to 2008, capital and labour shifted back to the resource sector, while parts of manufacturing contracted. Since 2009, resources and manufacturing have grown together, helping Canada diversify from an over-reliance on any one sector.

Sommaire exécutif

Les abondantes ressources naturelles du Canada ont toujours été un important facteur de croissance économique. Cepen-dant, plusieurs économistes demeurent critiques à l'égard d'un développement économique axé sur les ressources. Ce scepticisme a donné naissance à la notion de « piège des ressources de base », ou staples *trap,* pour désigner une situation de croissance qui, parce qu'elle repose sur les ressources naturelles, diminue nos termes d'échange, bloque l'innovation et constitue une source d'instabilité économique. Le présent article explore une demi-douzaine de mythes qui, comme celui-là, entourent le rôle du secteur canadien des ressources naturelles.

MYTHE UN : les prix des ressources naturelles restent à la traîne des prix des importations canadiennes, ce qui ralentit la croissance du revenu à long terme.

Ce mythe provient de la recherche qui a faussement démontré que les prix des marchandises de base diminuent par rapport aux prix des biens manufacturés. Au contraire, depuis la Confédération, c'est en raison des marchandises de base que les prix des exportations canadiennes ont constamment augmenté à un rythme supérieur à ceux des importations. Cet écart a relevé d'environ 18 percent les revenus réels au Canada.

MYTHE DEUX : la demande de ressources naturelles est excessivement cyclique, ce qui introduit une source importune d'instabilité dans l'économie.

La fabrication et la construction sont en fait les secteurs les plus cycliques de l'économie, leur production baissant à un rythme quatre fois supérieur à celui des ressources naturelles durant les récessions. Les principaux impacts liés aux marchandises de base sont plutôt ressentis par les prix et l'investissement dans la production future. De plus, toutes les marchandises de base n'évoluent pas au même diapason : leur essor au cours de la dernière décennie s'est présenté de manière séquentielle et désynchronisée, chacune d'entre elles passant le relais à la suivante, une fois son prix stabilisé.

MYTHE TROIS : les exportations du Canada sont dominées par les matières premières, les importations, par les produits finis, et l'écart entre les deux s'élargit.

Les ressources naturelles représentent la composante des importations qui augmente le plus. Cette situation s'explique par le fait que davantage d'importations de pétrole brut, de métaux précieux et de mines métalliques alimentent les activités de fonte et d'affinage au Canada et se destinent parfois à la réexportation. La croissance des importations a dépassé la croissance des exportations de ressources naturelles entre 1988 et 2012. Les exportations canadiennes se sont diversifiées au cours du siècle écoulé par rapport à la dépendance quasi exclusive à l'égard des ressources naturelles observée il y a cent ans.

MYTHE QUATRE : les ressources naturelles expliquent en grande partie les inégalités régionales au Canada.

Toutes les régions sont dotées d'un important secteur des ressources. L'essor du secteur des ressources au cours de la décennie écoulée a contribué en fait à réduire l'écart du taux de chômage entre les régions, le ramenant à un niveau minimum. Cette diminution des inégalités interprovinciales s'est surtout manifestée en Saskatchewan et à Terre-Neuve et Labrador, où la hausse des revenus s'est traduite par une croissance de la population, renversant ainsi plusieurs dizaines d'années de déclin. L'Ontario est passé au rang des provinces démunies principalement en raison de sa dépendance à l'égard de la fabrication, secteur qui est disproportionnellement localisé au centre du Canada.

MYTHE CINQ : les ressources naturelles présentent un déficit technologique, ce qui ralentit l'innovation dans l'économie canadienne.

Les ressources naturelles sont bien représentées dans les mesures de l'innovation au sens large, telles que la part des travailleurs du savoir dans la population active. L'essor des ressources au Canada a

débuté vers la fin des années 90, au moment même où la mise en œuvre de nouvelles techniques novatrices relevait la production des sables bitumineux. Or, les prix du pétrole s'effondraient alors.

MYTHE SIX : la mise en valeur des ressources naturelles limite la croissance dans d'autres industries, notamment dans la fabrication.

Durant les années 90, la fabrication s'accroissait rapidement tandis que tant le capital que la main-d'œuvre quittaient le secteur canadien des ressources, jetant ainsi les bases des pénuries qui sont ressenties de nos jours dans ce secteur. Entre 2002 et 2008, le capital et la main-d'œuvre ont repris la direction du secteur des ressources, alors que de grands pans de la fabrication battaient en retraite. Depuis 2009, les ressources et la fabrication augmentent en tandem, ce qui a contribué à diversifier l'économie du Canada et ainsi lui épargner une dépendance trop grande à l'égard d'un seul secteur, quel qu'il soit.

Introduction

Extracting wealth from our natural resources has been pivotal to long-term growth in Canada, which has the largest resource sector among the G7 nations. However, rather than taking pride in the uniqueness and diversity of their industrial base, some economists have long tended to disparage natural resources as a source of income growth. In Canada, the staples *thesis* – that a dominant export drives growth – quickly evolved into the notion of a staples *trap* – that growth based on natural resources lowers our terms of trade (the ratio of the price of exports to the price of imports), stifles innovation, and increases our susceptibility to demand shocks that could wipe out large investments overnight. Internationally and for decades, development economists were pessimistic about the terms of trade for resources products relative to manufactured goods. More recently, natural resource development was held to be a "curse" that stifled overall growth because it weakened institutions, depressed investment in physical and especially human capital, and even raised the risk of civil war.[1]

The idea that resources are a curse has come under closer scrutiny. One finding is that booming resource nations in the 1970s used them as collateral for debt, which they had trouble servicing when commodity prices fell in the 1980s.[2] The latest research has found that discovering a new resource raised the income of those countries relative to those that remained resource-poor. Smith concluded that resource discoveries had "a positive effect on GDP per capita following extraction that persists in the long term …. "[3] This paper focuses on whether Canada has benefited from its natural resources by examining six of the many myths that surround their development:

1. The price of natural resources lags the price of Canada's imports, slowing our long-term income growth.
2. Demand for natural resources is excessively cyclical, injecting unwanted instability into the economy.
3. Canada exports raw materials and imports finished goods, and this gap is widening.
4. Natural resources are the leading source of regional inequality in Canada.
5. Natural resources are technologically primitive, slowing innovation in Canada's economy.
6. Development of our natural resource industries hampers growth in other industries, notably manufacturing.

MYTH 1:
The price of natural resources lags the price of Canada's imports, slowing our long-term income growth

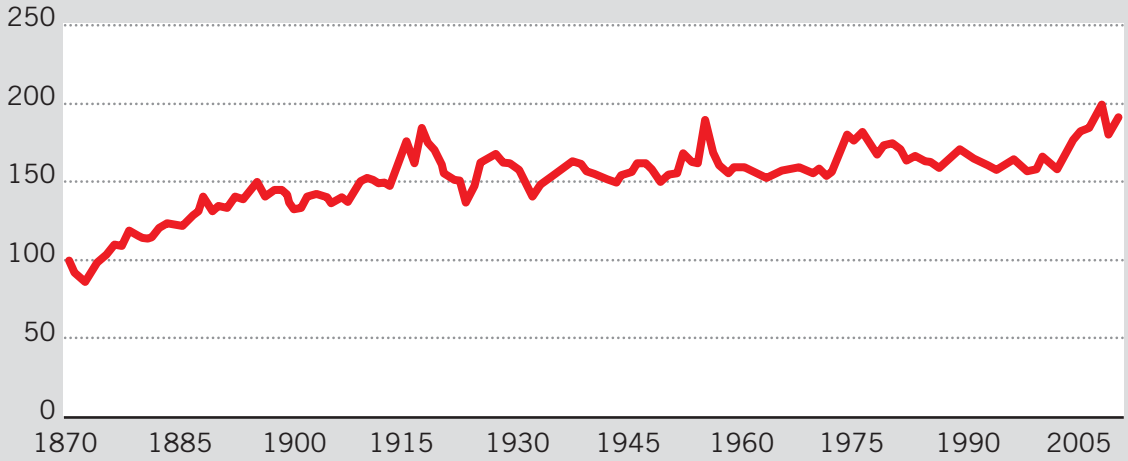
The argument that prices for manufactured goods rose over the long term relative to commodity prices, depressing the terms of trade for commodity producers, originated in 1950s research about development economics, and resonates to this day.[4] The Singer-Prebisch thesis said that the terms of trade moved against commodity producers.[5] Terms of trade (the ratio of the price of exports to the price of imports) have a direct impact on real incomes. Basically, an increase in the price of exports or a drop in the price of imports increases the purchasing power of domestic income, which is not reflected in the statistics for domestic output. This difference is captured in real Gross Domestic Income (GDI), which is real GDP adjusted for changes in the terms of trade.

Real income grew 18 percent more than did output.

Statistics Canada published a major study in 2010 comparing real GDI, GDP, and the terms of trade back almost to Confederation. It found that, from 1870 to 2010, real income (GDI) grew 18 percent more than did output (GDP), reflecting a near-doubling in our terms of trade that was "directly linked to the relative price of resources".[6]

Nor was the improvement in the terms of trade an isolated event (figure 1). It rose in every one of the eight decades following Confederation, displaying an upward ratchet where "each set of gains led to higher permanent levels of real income."[7] After the Second World War, the terms of trade oscillated between decades of small increases and small declines before a historic surge since 2000.

Figure 1: The terms of trade, 1870 – 2010



While the Singer-Prebisch thesis predicted that the terms of trade for commodity producers would fall, the integration of developing nations into the world economy after 1990 had the opposite effect.

The increased output of these countries lowered the price of manufactured goods while their rising incomes and rapid urbanization helped fuel the boom in commodity prices. This is consistent with other research findings that over the long term, "prices of manufactured goods have tended to decline, at least in relation to costs in other parts of economic output."[8] A 2009 IMF study of commodity prices found that "commodity-price booms tend to be larger than commodity-price busts", with median annual long-term growth of nearly 2 percent.[9] These two forces drove the terms of trade for commodity producers to new highs since 2002.

MYTH 2:
Demand for natural resources is excessively cyclical, injecting unwanted instability into the economy

The whole question of what causes the business cycle is complex enough to justify a separate paper. Fundamentally, it is incorrect to attribute the boom/ bust cycle to industry structures rather than to human psychology.[10] For the purposes of this paper, we will look at how recessions manifest in different industries, without implying that some industries cause the business cycle.

The resource sector shows fewer and less severe declines than do manufacturing or construction.

The best Canadian example of what the business cycle looks like is depicted in figure 2, showing Information and Communications Technology (ICT) manufacturing output during its boom-bust cycle around 2000: two years of almost unbroken increases that saw output nearly double, followed by two years of relentless decline that left output back where it started before the boom (figure 2).

Figure 2: ICT manufacturing GDP

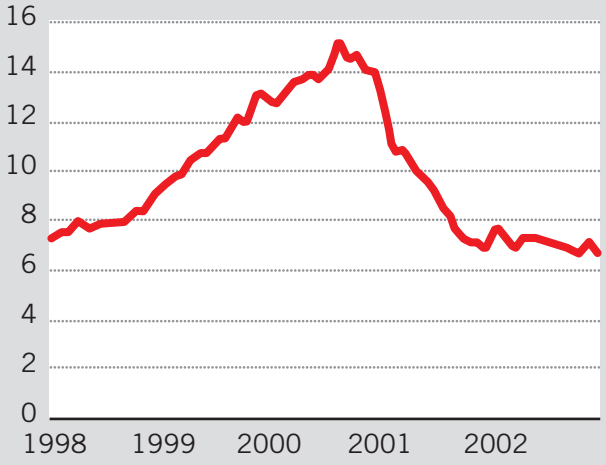
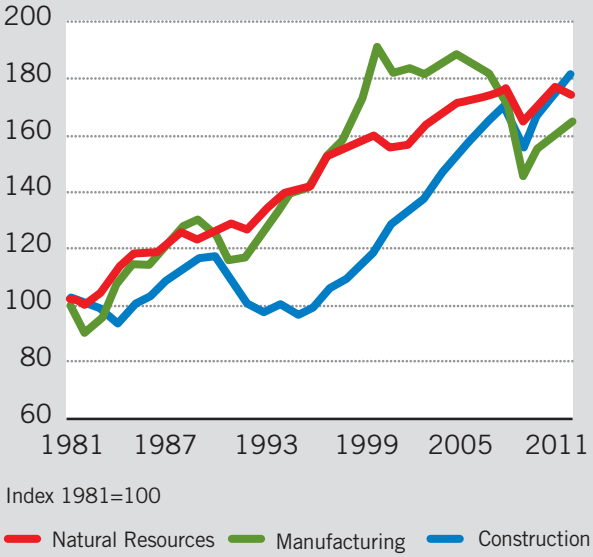


Figure 3: Real GDP



Irrespective of the cause of recessions, manufacturing and construction are by far the most cyclically-sensitive sectors of the economy. The auto and housing sectors are notoriously prone to the business cycle. Some services move closely with the business cycle, notably wholesaling and transportation (which depend on the flow of goods), business services, and real estate. By comparison with manufacturing, construction, and some services, output in the resource sector is a beacon of stability (figure 3).

Annual GDP in the resource sector[11] shows fewer and less severe declines than do manufacturing or construction – even during recessions. Overall, annual output in natural resources fell in five years between 1981 and 2012, compared with eight declines in construction and nine in manufacturing. The average drop in the three recessions (1982, 1991/92, and 2009) was 13.3 percent in construction, 12 percent in manufacturing – and 3 percent in natural resources.

The greater stability in resource sector output reflects the basic economics of capital-intensive resource industries. Because of the large fixed costs made ahead of production and the low costs of keeping output flowing, it is rare that these projects shut down for more than routine maintenance. As a result, fluctuations in both output and jobs in these industries are much lower than in the other two goods-producing industries. Most of the cyclical instability in resources is confined to prices rather than to output and employment. Since prices absorb most of the cyclical fluctuations in demand for resources, the impact is largely borne by profits, which impact investment. It is investment, not the output of the natural resources themselves, that feels the largest effect of cyclical fluctuations in commodities on GDP.[12] Conversely, in manufacturing, real variables like output and jobs, not prices, bear the brunt of a cyclical downturn.

One of the critiques of proponents of the staples trap is that short-lived booms for commodities quickly dissipate, stranding long-term investments in infrastructure. While export prices fluctuate, figure 4 shows that exports of almost all resources are remarkably stable, implying that investments in infrastructure (such as transportation links) are unlikely to be wasted. During the 2008/09 recession, for example, the volume of demand for energy exports barely budged, even as their prices plunged 35 percent.

Figure 4: Volume of exports

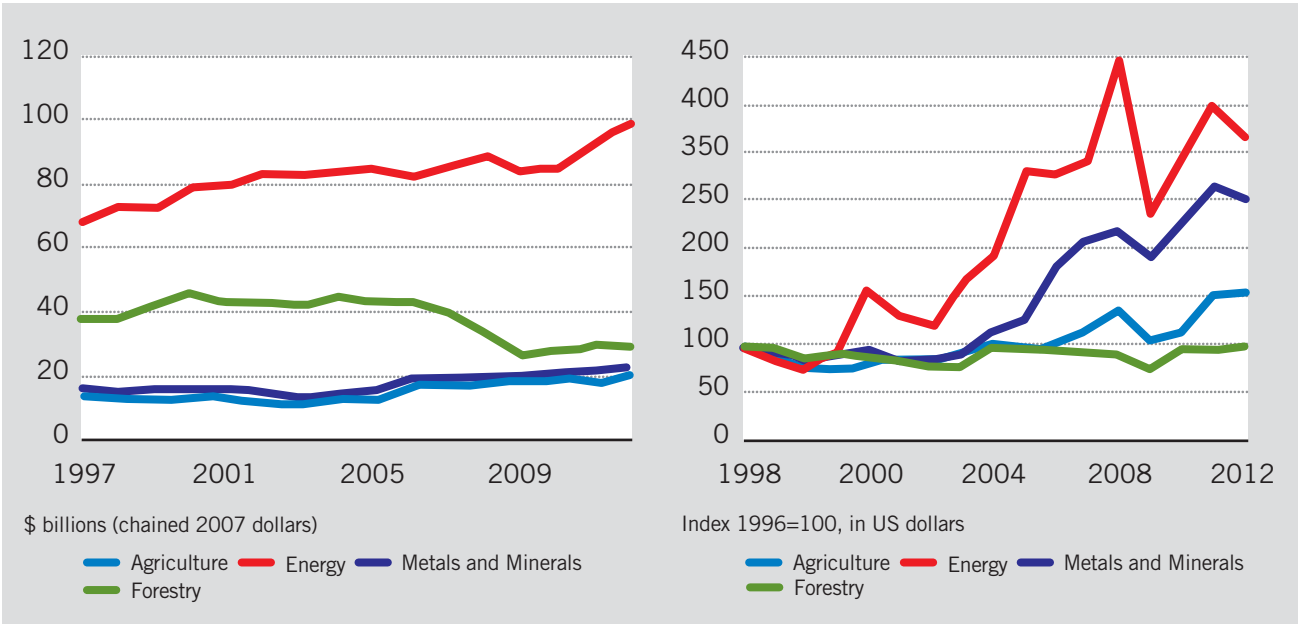


Figure 5: Commodity prices

It is noteworthy that the private sector bears the financial risk of under-capacity, having financed and built most of the transportation infrastructure of pipelines for oil and gas, our largest commodity export. Similarly, privately owned rail carries most metals, minerals, and agricultural goods. This contrasts with the public funding of roads and harbours used by other exports, especially manufactured goods. While demand for resources is cyclical, investments in key manufacturing goods (like ICT goods or vehicles) are more likely to become stranded.

Nor do commodity prices move in tandem with the business cycle. Examining prices for the four major commodities since 2000 reveals a broadening gap among them, despite the lower prices they all posted in the 2009 recession (figure 5). Energy prices tripled between 2000 and 2005 due to a surge in demand. Since then, they have risen only 14 percent, weighed down by lower prices for natural gas. Meanwhile, the price of metals and minerals rose a mere 39 percent up to 2005. After 2005, however, the price of metals more than doubled (108 percent), even as energy prices levelled off. When the price of metals faltered in 2012 and 2013, prices of agricultural goods set new records. Finally, forestry prices began to pull out of a prolonged slump in late 2012. The increase in resource prices since 2000 has been sequential, not synchronized – with each sector passing the baton to another as their own price levelled off.

Commodity prices do not move in tandem with the business cycle.

The lack of synchronization among commodity prices reflects the varying speeds and directions at which demand in different parts of the world is increasingly moving in. Prices for Canadian energy and forestry products are largely driven by events in North America, such as US demand for lumber, the exploitation of shale gas in the US, and a lack of pipeline capacity for oil. The price of metals and agricultural products is increasingly driven by demand in developing countries overseas. According to the IMF, growth in developing countries became uncoupled from that of developed countries, especially after 2008 when the former accounted for all the growth in the global economy.[13] This diversification is proving beneficial early in 2013, as slowing overseas demand for metals is being partly offset by higher prices in North America for lumber and natural gas.

In addition, prices within each major commodity groups are not synchronized. The most notable example is in the energy sector, where the price of crude oil and natural gas have diverged significantly as production costs for shale gas have substantially decreased. The divergence of prices within the oil market is almost as significant, with the discount for western Canadian crude oil from world prices briefly approaching $40/barrel early in 2013. Sometimes, commodity prices automatically move in the opposite direction: for example, high grain prices raise the cost of animal feed, forcing some farmers to liquidate their herds, in turn depressing the price of pork and beef in the short term. Other commodity prices move in tandem, such as coal and natural gas which are "joined at the hip" as utilities in the US switch from one to the other, depending on price (as of 2013, it pays to switch from gas to coal when gas prices approach US$4 MMbtu).[14]

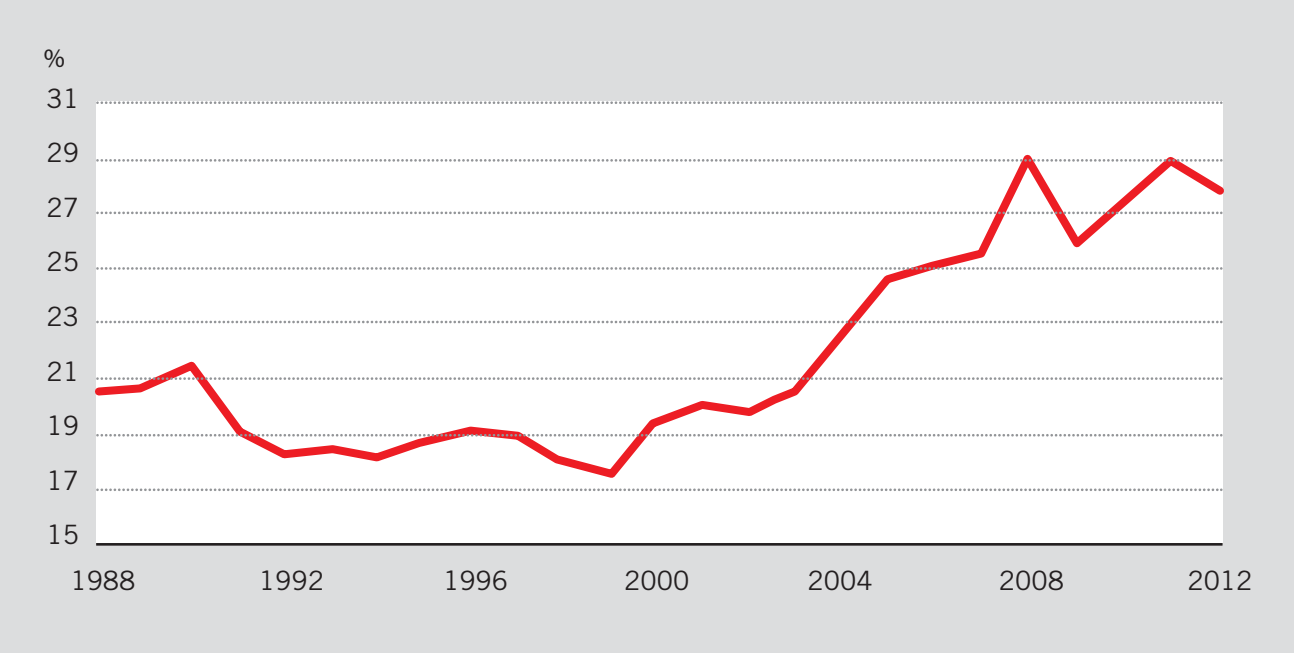
MYTH 3:
Canada exports raw materials and imports finished goods, and this gap is widening

Imports of natural resources[15] have grown much faster than imports of finished goods since 2000. After hovering around 20 percent of all imports from 1988 to 2003, they rose steadily to 27.8 percent of Canada's imports by 2012 (figure 6). The increase has been concentrated in energy products and precious metals, followed by metal ores. Energy imports are dominated by the crude oil needed to feed the refineries of Eastern Canada. Metals and minerals include bauxite, gold, and copper from South America. These raw materials are smelted and refined in Canada, and sometimes re-exported as gasoline, aluminum, or bullion. Now upgraded, these exports still count as natural resources, although they are clearly no longer "raw."

Canada now has its most diverse export base ever.

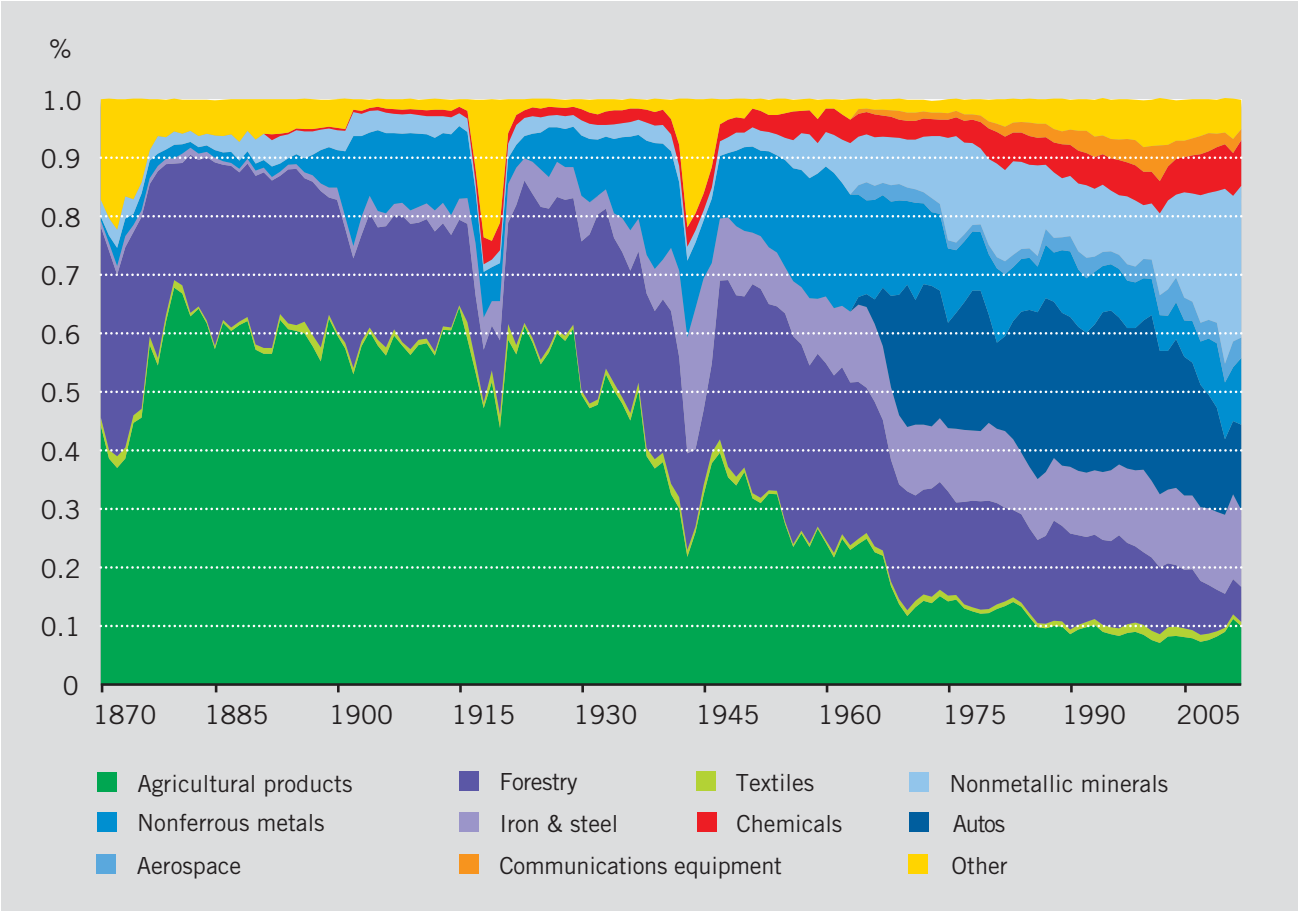
Exports of natural resources used to dominate Canada's exports: they accounted for almost half in 1988 (46.2 percent). This share fell steadily in the 1990s, slumping to a low of 33.7 percent in 1999, largely due to falling prices. By 2012, the resource boom had recouped all of these losses, raising their share to just over half (51 percent). The gap between the share of natural resources imports compared with exports has narrowed from 25.7 percent in 1988 to 23.2 percent in 2012, a reflection that imports of natural resources have risen faster than for exports. This dichotomy was even more true in volume, where imports of natural resources have increased 31 percent since 2002, while exports are up 8 percent.

Figure 6: Natural resources share of total imports



The staples thesis conjures up an image of a single dominant staple: in Canada, cod and fur drove exports first, then lumber, followed by wheat. Figure 7 shows how Canada has steadily diversified its export base since Confederation. In the late 19th century, nearly 90 percent of Canada's exports came from just two products – agricultural and forestry products. Metals early in the 20th century lifted the share of resources to near 95 percent. Rising energy exports (seen in the growth of non-metallic minerals) after the Second World War largely offset falling agricultural exports, and kept the natural resource share of exports above 80 percent in the 1950s. After 1960, the export base began to diversify from natural resources, as vehicles, aerospace, and communications equipment grew rapidly. In every case, however, these new exports did not displace other exports. As a result, far from relying on one or two staples, Canada now has its most diverse export base ever, with no product category in figure 7 accounting for more than 25 percent of total exports. As noted above, there is significant diversification and lack of synchronization between the components of each resource industry. Ontario's lack of diversification of its manufacturing base increased its vulnerability to the recession. Canada as a whole has more diversity than ever.

Figure 7: Share of exports 1870 – 2010



MYTH 4:
Natural resources are the leading source of regional inequality in Canada

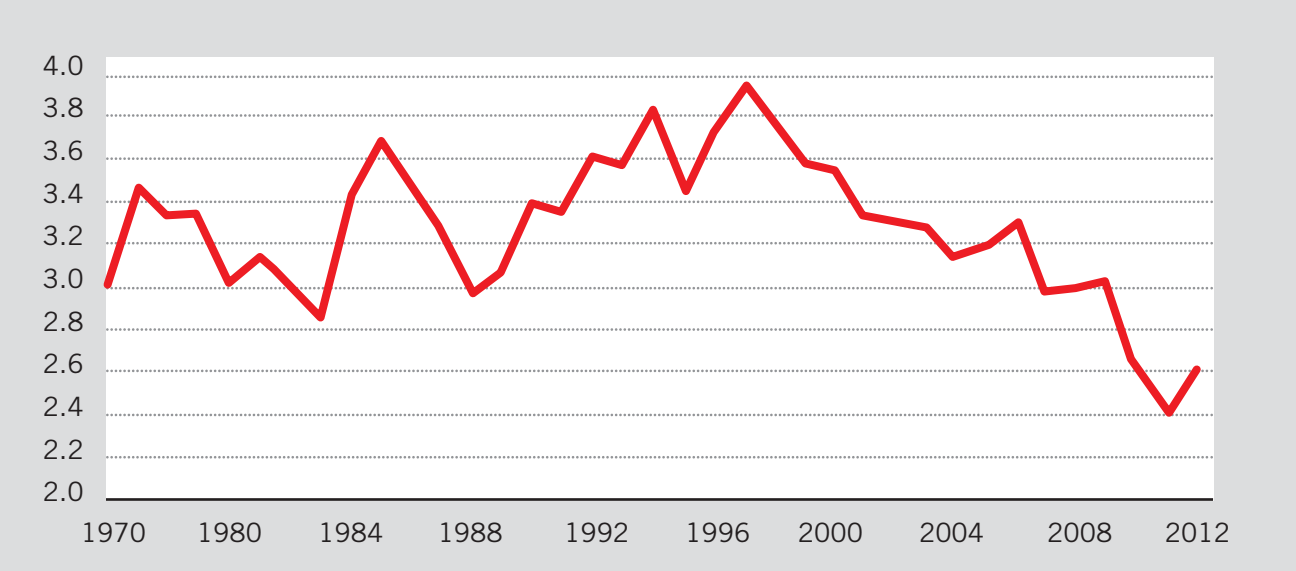
All Canadian regions have a sizeable resource sector, especially for forestry, mining, and most agricultural products. Ontario has the second largest agricultural industry in Canada (behind Saskatchewan), is the largest producer of metal ores (gold, copper, and nickel) and is the second largest producer of non-metallic minerals (its diamond industry trails only Saskatchewan's potash in value). Quebec has the second largest forestry industry, after BC.[16] Including electric power, all regions have sizeable energy sectors.

The distribution of energy output across Canada is no more unequal than manufacturing. Canada's manufacturing heartland of Ontario and Quebec accounts for 72.3 percent of manufacturing GDP, while Western Canada produces 23.7 percent of manufacturing output. These shares are almost the mirror image of energy production, where Western Canada produces 70.5 percent and Central Canada 21.2 percent of energy.[17] From this perspective, manufacturing also contributes substantially to inequality across regions.

Central Canada has almost no oil and gas production, while Alberta's oilsands are a unique natural endowment that lifted pre-recession incomes in Alberta above the Canadian average to an extent never seen before. Often lost in the debate about inequality, however, are that Alberta's experience is clearly an outlier, and most measures of inequality across the rest of Canada have fallen during the resource boom.

The buoyancy of the resource and construction sectors across the country since 2002 is one factor in the convergence of unemployment rates across the provinces. The standard deviation of unemployment rates across the provinces stood at 2.62 in 2012, close to the record low of 2.41 set in 2011 (figure 8). The record high for this measure (3.94) of inter-provincial differences in unemployment rates occurred in the late 1990s, when the boom in Ontario's auto and ICT manufacturing industries plunged its unemployment rate from 9.0 percent in 1996 to 5.7 percent in 2000 – double the rate of decline in the other provinces.

Figure 8: Annual standard deviation of provincial unemployment rates



Several factors contributed to narrowing inter-provincial differences in unemployment. Most importantly, inter-provincial differences in real (unlike nominal) GDP in 2011 are also at their lowest level in three decades, which reflects the greater impact of the resource boom on prices than on output and employment. As well, migration from provinces with chronic high unemployment to the booming Western provinces helped unemployment rates to converge. Finally, the resource boom clearly has been beneficial to some chronic laggards in provincial economic growth.

The two best examples are Newfoundland and Saskatchewan. After years of below-average incomes, the GDP per capita of both provinces soared to near Alberta's level. In 2001, GDP per capita in most provinces fell within a narrow band between $27,000 and $33,000. There were two exceptions – Alberta had GDP per capita of almost $49,500 and Ontario's was nearly $38,100. In 2011, GDP per capita was mostly between $40,000 and $50,000, with three exceptions: Alberta at $78,200, Saskatchewan at $70,700 and Newfoundland at $65,600.

The impact of rising incomes in Saskatchewan and Newfoundland has been dramatic.

Newfoundland and Saskatchewan are closing the GDP gap with Alberta. Between 2004 and 2011, nominal GDP per capita increased 75 percent in Newfoundland and 73 percent in Saskatchewan. Alberta's per-capita gain over this period of 33 percent was closer to that of Quebec (24 percent) and Ontario (18 percent), and even lagged that of New Brunswick (35 percent). The relatively slow increase in Alberta after 2004 partly reflects much faster population growth than elsewhere, but after 2008, it mostly reflects sharply lower prices for natural gas. By comparison, Saskatchewan and Newfoundland produce little natural gas, allowing them to fully benefit from high oil prices.

The impact of rising incomes in Saskatchewan and Newfoundland has been dramatic. After decades of seeing their population shrink as their incomes lagged, their populations began to grow again (starting in 2007 in Saskatchewan and 2009 in Newfoundland). Not surprisingly, this accompanied a rise in their average weekly earnings to above the national average in 2011 for the first time since 1991.[18]

Of course, the data on nominal incomes reflect the impact of booming commodity prices. The regional distribution of real GDP and employment is more equal than incomes. Using data from the Labour Force Survey, which has the advantage of going back to 1976,[19] resource jobs represent 4.7 percent of all employment in Canada (this includes agriculture, forestry, fishing, mining, and utilities). This share ranges from a high of 10.8 percent in the prairie provinces to a low of 2.6 percent in Quebec. This dispersion has narrowed markedly since 1976, from a range of 18.9 percent in the prairies in 1976 to 5.8 percent in Ontario.

Factory jobs accounted for about 11.8 percent of employment in Ontario and 12.5 percent in Quebec in 2012 (down from 23 percent in both in 1976). This compares with between 7 percent and 8 percent in the Maritimes, the prairie provinces, and BC. The type of work done in factories is more uneven: while all regions produce essentials like food, cement, and gasoline, Ontario specializes in autos and ICT goods, while Quebec hosts most of Canada's aerospace industry.

Most famously, Ontario has become a "have-not" province. Most of this shift lies in the misfortunes of its manufacturing base. First, its high-tech sector lost 31,000 jobs after the ITC bubble burst in 2001. As well, 50,000 jobs were lost in the auto sector led since 2008. Ontario's reliance (and near-monopoly in Canada) on these two industries left it vulnerable to the inevitable cyclical fluctuations in demand. The Maritimes also have not participated in the resource boom to a great extent, partly because their resource base depends on forestry, the one major sector lagging the current resource boom.

MYTH 5:
Natural resources are technologically primitive, slowing innovation in Canada's economy

Natural resource industries suffer from an image problem. They must always fend off the misconception that they are low-technology, muscle-based, and old-fashioned. This image ignores the basic fact that resource industries are capital-intensive, and that capital is increasingly among the most sophisticated anywhere in the economy. What could be more high-tech than an offshore oil rig pumping thousands of barrels a day from a sea bed kilometres below it, staffed by only a few dozen workers? Well, perhaps a farmer using GPS technology to map precisely his planting area, electronically injecting seeds at just the right depth and distance from each other to optimize yields, using his smartphone to check wind speed and direction to calculate how many hours the GPS-guided irrigation drip tape should be run and at what rate, and selling his expected harvest on a futures market in Chicago. All this technology allows the farmer to "think, and act more like accountant[s]."[20] All from his tractor seat.

Indeed, Canada's resource boom really began with innovations in oil sands technology in the late 1990s, which led to a surge in oil production[21] even before commodity prices took off in late 2002. That oil sands output began to surge when oil fell below US$11 a barrel in 1998 reflects how innovative technology, such as 'shovel-and-truck' operations and *in situ* steam-assisted gravity drainage (developed by the Alberta Oil Sands Technology and Research Authority), could lower production costs.[22] These new techniques replaced old methods modelled on European coal mining that used "monster bucket wheels, draglines and conveyor belts.[23]

There are numerous examples of transformative innovations in the oil and gas industry.

There are numerous examples of transformative innovations in the oil and gas industry alone. Three innovations combined to create the breakthrough in developing shale gas. The best known is (1) fracturing (fracking), which was built on the innovation of (2) horizontal drilling, once (3) seismic information technologies directed efforts to the best deposits.[24] A broader innovation was drilling rigs that can be transported by helicopter, which eliminated the need for access roads and opened up remote areas for development. Innovations abound in metal mining: Vale's Long Harbour nickel refinery in Newfoundland has a unique hydrometallurgy technology (developed at its Mississauga research centre), specifically designed for the unique mix of nickel, copper, and cobalt from its Voisey Bay mine.[25]

Conventional R&D statistics downplay innovation in the natural resources sector. One of the problems is that they exclude exploration and development in the mining sector, leaving many technology innovations uncounted in the data on innovation.

While there is no way to directly ascertain innovation by industry, broader measures of innovative capacity paint a different picture for resources. Knowledge workers are one measure of the labour force available to do innovative work for their employers. In ranking industries with the most knowledge workers, Statistics Canada found that six of the 32 top-ranked industries (out of 265) were in the resource sector – matching the number of manufacturing industries.[26] These resource industries include oil and gas, petroleum refining, pipeline transport, utilities, and services for both fishing and farming.

While manufacturers account for over half of all business spending on R&D, they do not all innovate *rapidly*. Although there has been considerable innovation in the energy industry, today's automobiles still operate on the same general principles as a century ago. To quote *Car Mania*, "there has been no major innovation in car technology this [20th] century."[27]

Myth 6:
Development of our natural resource industries hampers growth in other industries, notably manufacturing

Lost in the debate about the benefits of the post-2002 resource boom is the contrast between it and the severe slump in resources in the 1990s. This is why the share of GDP and employment that resources account for are still lower today than in 1990 despite a decade of sustained growth. Canada allowed the capital stock invested in the resource sector to literally rust away, while its share of employment fell to 0.7 percent. The lack of investment in both capital and labour over a prolonged period undoubtedly contributed to the shortages the resource sector is experiencing today as it tries to ramp up production to keep up with demand.

Canada invested so little in its resource base in the 1990s that the usable stock of capital in non-farm resources fell outright (figure 9 shows the net capital stock in resources excluding oil and gas fell 28.7 percent between 1987 and 2003; including oil and gas reduces the drop to 12 percent from 1987 to 1992).[28]

Meanwhile, the labour force in the resource sector aged rapidly as hiring of young people was sharply curtailed. Fewer young people entered the resource industry than any other industry in the 1990s (only 3.3 percent of youth worked in resources by 2002).[29] Young people (aged 15 to 24) represented 23.8 percent of the non-farm resource sector's labour force at its peak in 1981. Over the next three decades, the number of young people employed in that sector fell in absolute terms by 64 percent, from 91,000 in 1981 to 33,000 in 2002, at which time it represented only 11 percent of the labour force in this industry. Despite hiring more young people since 2000, their numbers still hover at 10 percent (figure 10). Meanwhile, the share of workers aged 55 years and over rose from 10.7 percent to 14.9 percent since 2002.[30]

Figure 9: Net capital stock in non-farm natural resources

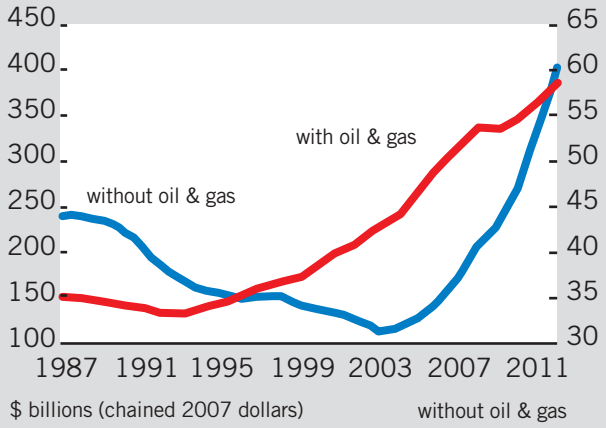
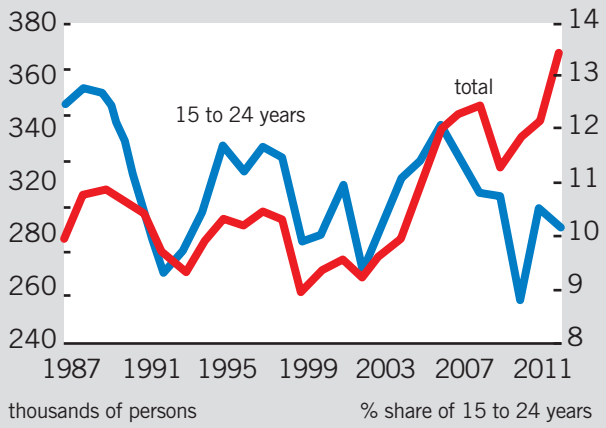


Figure 10: Employment in natural resources



Instead, Canada shifted its resources to the manufacturing sector in the 1990s. Canada was the only G7 country where manufacturing jobs increased during that decade (including low-wage industries such as apparel and furniture, due in part to the low exchange rate), while the capital stock invested in manufacturing rose 35 percent. If anything, the over-emphasis on manufacturing in the 1990s hampered the growth of the resource sector, sowing the seeds for today's shortages. After the implosion of the American auto and housing markets, which undercut the vehicle and lumber industries in Canada, manufacturing suffered the largest losses of any industry.

In services, whole new industries have sprung up around the wealth created by resources. The financial system in Canada has benefited enormously from the resource boom. Mining and energy dominate the Toronto stock market. Investment banking benefited from the creation of so-called Maple bonds – bonds issued in Canada by foreign entities and denominated in Canadian dollars to access the large pools of investment capital here. Over $85 billion of such bonds were issued since 2003, generating considerable commissions for investment dealers. Professionals such as engineers and architects designed resource projects, and lawyers and accountants financed them. This was most evident in Calgary, where employment in business services grew 41 percent between 2002 and 2012, the most of any major city in Canada. Of course, real estate agents and retailers near resource sectors across the country benefited disproportionately from rising household incomes and spending.

The most recent variant of the complaint that the resource sector harms other sectors is the so-called Dutch disease, in which rising commodity prices are blamed for raising the exchange rate, which slowed manufacturing activity. As discussed in an MLI paper,[31] this theory does not adequately explain the slump in manufacturing after 2003, as commodity prices were not the principal driver behind the exchange rate, the losses in manufacturing were largely confined to industries that also struggled in the US, and manufacturing has recovered since 2009 despite parity with the American dollar.

Conclusion

Natural resources in Canada do not deserve their poor image as a source of economic growth. On the contrary, over the long term, incomes in Canada have benefited from a higher terms of trade driven by commodity prices. The resource sector has been at the forefront of innovation, creating whole new industries from the oil sands to shale gas, while keeping costs down. Output in resources is less cyclical than in manufacturing or construction. The resource boom has contributed to narrowing regional differences in unemployment, while higher incomes helped reverse the long-term loss of population in Saskatchewan and Newfoundland. Canada's ability to process resources efficiently has led to a growing share of raw materials in our imports, boosting those manufacturers who refine them. This shows how growth in resources and other sectors can reinforce each other.

Too often, natural resources have been presented as an adversary of other industries. In the 1990s, the boom in manufacturing, culminating in the ICT bubble, accompanied steady losses in natural resources. Under-investing in both capital and labour in the resource sector in the 1990s laid the basis for today's shortages. While resources boomed from 2002 to 2008, manufacturing struggled. The recovery of manufacturing since 2009 and the ongoing boom in resources shows that both can prosper simultaneously.

About the Author

Philip Cross is now the Research Coordinator at the Macdonald-Laurier Institute, a non-partisan Ottawa think tank that promotes better public policy. He is also a member of the Business Cycle Dating Committee at the CD Howe Institute. Before that, he spent 36 years at Statistics Canada, the last few as its Chief Economic Analyst. He wrote Statistics Canada's monthly assessment of the economy for years, as well as many feature articles for the *Canadian Economic Observer*.

Endnotes

1. Sachs and Warner coined the idea of a resource curse in their 1995 paper, J. Sachs and A. Warner, "Natural Resource Abundance and Economic Growth," NBER Working Paper. The idea was developed by researchers such as G. Atkinson and K. Hamilton, 2003, "Savings, Growth and the Resource Curse Hypothesis," *World Development* 31 (11): 1793-1807. See also P. Collier and A. Hoeffler, 1998, "On Economic Causes of Civil War," Oxford economic papers, 50(4): 563.

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3. Brock Smith, 2012, "The Resource Curse Exorcised: Evidence from a Panel of Countries," UC Davis, Dept of Economics Working Paper Series Paper No 13-3, p. 1.

4. See J. A. Ocampo and M. Parra, 2006, "The Commodity Terms of Trade and Their Strategic Implications for Development." Chapter in *Economic Globalization, Hegemony and the Changing World Economy During the Long Twentieth Century*, edited by K. S. Jomo, 164–194, New Delhi and Oxford: Oxford University Press.

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6. J. Baldwin and R. Macdonald. 2010. *Natural Resources, the Terms of Trade, and Real Income Growth in Canada, 1870 to 2010.* Statistics Canada Catalogue no. 11F0027M No. 079, p. 7.

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11. Defined as agriculture, fishing, forestry, and mining. The industry GDP data are from Cansim Table 379-0031.

12. The effect is difficult to quantify precisely, since investment data by industry are only available on an annual basis and in current dollars. A first approximation for the 2009 recession is that investment in resource industries fell about $19.2 billion, which is equivalent to 23.5 percent of the overall drop in nominal GDP.

13. International Monetary Fund, 2013, *World Economic Outlook*, Chapter 4, p. 2.

14. From "Back in the Black" by Bryan Borzykowski, April 15, 2013, *Canadian Business*.

15. Using the new classification for trade data, this paper defines raw materials as food, energy, forestry, metal ores and non-metallic minerals, metal ore and non-metallic mineral products, and chemical, plastic, and rubber products.

16. From Cansim Table 381-0031.

17. All the provincial GDP data is from Cansim Table 379-0030. The latest data point available is 2009.

18. Cansim Table 281-0026 .

19. Looking at the share of GDP reveals very similar trends, although this data only goes back to 1997 after the recent historical revision to the National Accounts.

20. Frederick Kaufman, 2012, *Bet the Farm*, Hoboken: John Wiley & Sons, p. 61.

21. Non-conventional oil output rose 33 percent between 1996 and 1998, accounting for almost all of the growth in total oil production over that period.

22. *In situ* operations themselves require much different labour skills than open pit mining operations. See "The Future of Jobs" in *Canadian Business*, March 25, 2013, p. 46.

23. From Darren Campbell, 2011, "Syncrude's new boss finds his 'dream job'," *Alberta Oil*. Retrieved from www.albertaoilmagazine.com/2011/09/company-man/ on April 12, 2013.

24. Dieter Helm, 2012, *The Carbon Crunch*, New Haven: Yale University Press, p. 142.

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28. The capital stock data come from Cansim Table 031-0002.

29. It has since recovered slightly to 1.6 percent, as gains in mining were partly offset by continued losses in forestry. This slow recovery of youth employment in resources contrasts with construction, which, after a sharp drop to just 3.5 percent of all youth in 1996, has since recovered to 7.0 percent. From the Labour Force Survey, Cansim Table 282-0008.

30. All the data in this paragraph is from the Labour Force Survey, Cansim Table 282-0008.

31. Philip Cross, 2013, *Dutch Disease, Canadian Cure*, Macdonald-Laurier Institute.

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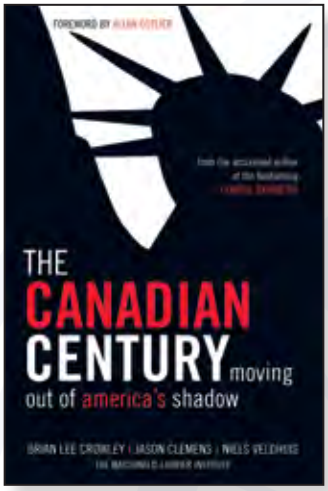

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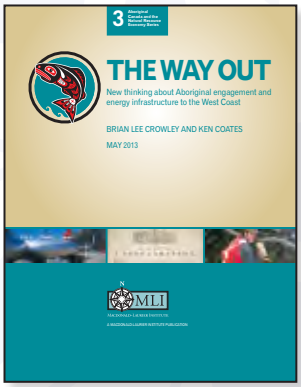

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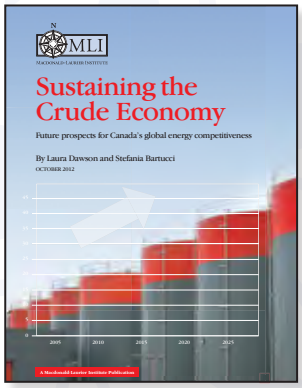

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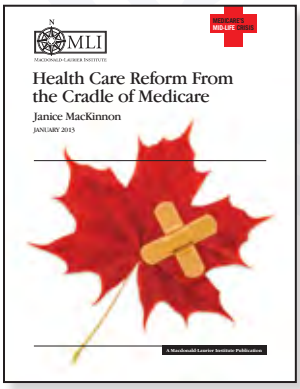

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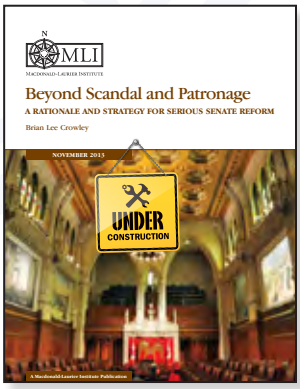

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