How Does Industrial Policy Impact Output, Hours and Productivity? The Canadian Experience

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Abstract

The article looks at the Canadian experience with industrial policy, and whether those industries that have been the principal focus of industrial policy have performed better than comparable sectors. It outlines the history of industrial policy in Canada and examine the empirical performance of four sectors: steel mills, aluminum smelting, auto assembly and aerospace. It finds that while the aluminum industry has performed better than comparable industries in terms of output, total hours worked and productivity, the same is not true of the other three sectors, which have had a relatively disappointing performance. While the analysis cannot unequivocally prove that industrial policy impact positively or negatively on productivity growth, it acknowledges the possibility that performance could have been worse without such policies. The article also highlights that industrial policy can maintain higher overall productivity by supporting high-productivity industries, preventing their decline.

Industrial policy is definitely having a moment. The Biden administration made huge investments in chip manufacturing through the CHIPS Act and in Green Technology through the Inflation Reduction Act. In Canada, as we shall discuss below, the Trudeau government has promoted industrial policy across a broad swathe of the economy, for example with its Superclusters program. The European Union also has also embraced industrial policy (EU, 2024). Even the OECD, which has historically been skeptical of many government interventions in markets, has concluded that industrial strategies can be legitimate (OECD, 2022).

However, the literature on the actual impacts of industrial policy is surprisingly

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thin (Lane, 2020), particularly when it comes to some key economic variables of interest such as output, hours worked or productivity—perhaps most important of all productivity given weak growth growth in this variable in recent years in many advanced countries.

In this article we try to understand the economic impacts of industrial policy by looking at the Canadian experience. Canada has had some sort of industrial policy almost since it was founded in 1867, and even during the 1980s and 1990s, when industrial policy had very much fallen out of fashion in the Western world, Canadian governments, both federal and provincial, continued to provide support to what were perceived as key sectors of the economy. By comparing the performance of those sectors that have been the main focus of industrial policy in recent years—autos, aerospace, steel and aluminum—with comparable sectors, we try to see if industrial policy in Canada in recent years has had a discernible impact on productivity in those sectors, either positive or negative.

Before embarking on an analysis of industrial policy, it is worth beginning with clarity about what set of policies we are engaged in. While the OECD defines industrial policy as "interventions intended to improve structurally the performance of the domestic business sector," (Criscuolo *et al.*, 2022) we view this as too broad, as this definition would include "horizontal" interventions such as education policy which are generally not targeted to particular sectors (even though they may affect some sectors more than others). Rather, what we are concerned with here is "vertical" interventions that are explicitly intended to favour a particular industry sector.

It should be noted straight away that there are many similarities between industrial policy and regional economic development policy—which uses many of the same tools. There is also a close relation to trade policy, which requires a view on what level of protection a given industry sector should enjoy. We nonetheless focus on what might be termed classic industrial policy, which generally relies on various kinds of subsidies to assist particular industries, without any explicit regional restrictions.

The rest of the article is organized as follows. We begin by sketching the evolution of industrial policy in Canada, at both provincial and federal levels, focussing on four industries that have received particular attention from policymakers: steel mills, aluminum smelting, auto assembly and aerospace. We then look at the performance of output, hours and productivity in these four industries in recent years. We compare performance of each industry to closely related industries and to manufacturing overall. We then offer some conclusions.

Evolution of Industrial Policy in Canada

Industrial policy in Canada has long been bound up with the broader question issue of Canadian national identity. Canadia has traditionally sought to resist the economic pull of first the British Empire—not wanting to be simply "hewers of wood and drawers of water", exporting natural resources to be processed in the United Kingdom in return for manufactured goods—and then the United

States—resisting complete economic integration which, it was feared, would lead to political integration. Thus Canadian policymakers, almost since Confederation in 1867, have sought to develop and protect manufacturing industries.

Initially this was done largely through tariffs, beginning with Sir John A. Macdonald's National Policy of 1879; Government procurement during the First and Second World Wars gave an additional boost to this policy objective, as governments expanded industrial capacity to meet wartime needs for military equipment, following which the capacity was retooled to meet civilian needs. Strategic industries, particularly in transportation, were nationalized (CN Rail in 1919), or created by government if they did not already exist (Trans-Canada Airlines in 1936, which subsequently became Air Canada).

It should be noted that this policy approach has often been controversial, particularly in Western Canada, which is much more reliant on resource exports, and which therefore has tended to favour less protection and greater access to export markets.

This interventionist approach continued after World War Two (Ciuriak and Curtis, 2013), and intensified during the 1970s when the Canadian economy, like so many others in the Western world, began to hit significant economic headwinds. When the Mulroney government entered power in 1984 it inherited an economy with significant tariffs on manufactured goods, high levels of government ownership (including CN Rail and Air Canada in transportation, Petro-Canada in energy, and De Havilland Canada and Canadair in aerospace), and price controls, most notably on energy (the National Energy Policy) but also on dairy and poultry products (supply management).

The Mulroney government set about energetically dismantling much of this architecture. Most state-owned industries were privatized (including the above-named companies), the National Energy Policy was scrapped (although not supply management), and the government negotiated a free trade agreement with the United States that eliminated most tariffs with Canada's largest trading partner, destination for four-fifths of Canadian exports.

The explicit aim of this suite of policies was to make the economy more efficient, to ensure that price signals would guide economic decisions, and to transform Canada from a "Branch Plant Economy", where foreign-owned factories produced goods for the Canadian market (in order to get around the tariff wall), into an export-oriented economy that could be efficient by producing at much larger scale. Allied to significant tax reforms, including replacement of a manufacturers' sales tax with a VAT, the policy agenda was explicitly free market, with, rhetorically at least, little room for industrial policy as we have defined it.

Industrial Policy – 1986 to 2015

However, this move to economic liberalization did not mean the complete end of industrial policy. The recession of the early 1980s had led to large scale unemployment, particularly in traditional manufacturing sectors, and in an environment of increasing mechanization, including robots, and competition from devel-

oping countries, particularly ChinaJapan, governments were under increasing pressure to protect blue-collar manufacturing jobs, particularly in unionized industries with relatively high rates of pay. While Canada did not necessarily have "an articulated industrial policy per se" (Ciuriak and Curtis 2013), government intervention began to increase again. Four sectors in particular were the main focus of government attention from the mid 1980s until the arrival of the Trudeau government in 2015—aluminum, steel, aerospace, and motor vehicle manufacturing. We shall go through each of them in turn.

Aluminum Smelting

The bulk of Canada's aluminum smelting industry is in the province of Quebec. In 1987, that province instituted a scheme that linked the price of electricity from its provincially-owned power company, Hydro-Quebec, to the world price of aluminum. Electricity is a key input into the production of aluminum, and the scheme helped attract three new companies into Quebec (Aluminium Association of Canada, 2024). Since its inception the pricing scheme has resulted in implicit subsidies of billions of dollars to the aluminum smelting industry (Yakabuski, 2022). In 2019, the (OECD, 2019) found that Canada had the third highest level of support to its aluminum industry, behind China and Bahrain .

Steelmaking

While industrial policy in the aluminium industry was undertaken for essentially offensive reasons, to lure new companies and new investment into the province of Quebec, policy in the area of steel has been much more defensive and ad hoc. The industry is largely concentrated in the province of Ontario, where it helps supply key downstream manufacturing industries, particularly the auto sector. Intense competition from subsidised producers, particularly in China, has made life difficult for steelmakers, and in the early 1990s the Ontario government was forced to bail out one of the largest companies. In the wake of the 2009 financial crisis, federal support was forthcoming through the newly created Federal Development Agency for Southern Ontario.

Aerospace

Like steel, the aerospace sector is one where countries have long protected their domestic industries, partly for economic and partly for security reasons. In the aerospace sector, for example, the Brazilian company Embraer, initially state-owned, began to be a serious competitor for Canadian companies such as Bombardier in the 1990s, and the two companies embarked on a long battle at the World Trade Organization (WTO) over subsidies, which resulted in both countries being found to have subsidized their industries.

A key element of federal support for aerospace is the Industrial and Regional Benefits (IRB) policy (now called the Industrial and Technological Benefits Policy), which was introduced in 1986. It requires companies winning defence contracts to undertake business investments in Canada in advanced manufacturing (generally in the defence and aerospace sector) equal to the

contract value (Canada, 2015). Thus if a company wants to undertake some activities offshore to fulfill a contract, it must offset that loss to the Canadian economy by undertaking other work in Canada, perhaps to fulfill a foreign order. This provides a strong incentive for a company to undertake the work in Canada.

While innovative, the IRB policy was not felt to be enough, and in 1996 the federal government launched Technology Partnerships Canada (Canada, 1996), which provided matching funds for investments in high technology products and processes, and which was squarely aimed at the aerospace sector, although environmental technologies and advanced manufacturing were also mentioned. (It is this program which led to Canada being taken to the WTO as mentioned above).

With a change in federal Government, TPC was wound down in 2006 and replaced by the Strategic Aerospace and Defence Initiative (SADI). This program provided repayable contributions to support research and development in the aerospace, defence and security sectors (Canada, 2014). As an example of its activities, in 2017 the federal government announced a major contribution to the development of two new aircraft by Bombardier (Canada, 2017a) (one of which—the C-series—was subsequently sold to Airbus which produces the aircraft in Canada).

Automotive

The automotive industry and its associated network of suppliers, is one of Canada's most important industries. However, like other industries mentioned here it has faced competition from often subsidized competitors, in this case from the United States. In the 1980s southern US states such as Kentucky and Tennessee began to offer large incentives to foreign automakers to build new factories in their states (Minchin, 2021). These states were joined in the 1990s by Alabama and South Carolina, and by the early 2000s even Michigan was offering significant incentives in the form of tax credits, infrastructure support and worker retraining.

The Ontario government, where most of Canada's auto sector is located, responded with financial incentives of its own to attract and keep investment in the province. The province was successful in attracting two major Japanese manufacturers, Honda and Toyota, to Canada.

The pressure to help the auto sector became particularly intense during the Great Financial Crisis of 2008–2009, when the big three American automakers—all of which had facilities in Canada—where faced with bankruptcy. Although Ford ultimately managed to make it through without government help, General Motors and Chrysler (as it then was) were not so lucky. The Canadian government participated in the US government's bailout of the two companies with a $9 billion contribution (Financial Post, 2014).

The federal government added to this temporary support by launching the Automotive Innovation Fund (AIF) in 2008, which provided contributions for large automotive R&D and manufacturing projects.

Industrial Policy since 2015

The election of the Liberal government in 2015 marked a significant shift in both the rhetoric and substance of industrial policy. Instead of being largely focused on particular sectors such as autos, or aerospace, the new government made clear its desire to actively support businesses across the economy by helping them to become more innovative. Indeed, the Department of Industry was renamed the Department of Innovation, Science and Economic Development (Financial Post, 2015). Innovation was seen as closely linked to clusters: "dense areas of business activity that contain large and small companies, post-secondary institutions and specialized talent and infrastructure—energize economies and act as engines of growth (Canada, 2017b)."

The 2017 Budget laid out the two key components of this approach. The first was the Strategic Innovation Fund, which combined earlier sector specific programs—including SADI and the AIF, into one entity which, while continuing to support the aerospace and auto industries, would also be open to other sectors of the economy. The second component, even more of a break from the previous government's policy approach, was the Superclusters initiative (subsequently renamed Global Innovation Clusters). Each cluster is focused on a specific sector in a specific region, and is an attempt to bring business, government and academia together in order to decide on funding for innovation-focused projects where contributions from government would be matched by contributions from business. (Owens, 2022).

Following a competition, the government announced five region/sector pairs: marine industries in Atlantic Canada, artificial intelligence in Quebec, advanced manufacturing in Ontario, protein industries in the three Prairie provinces, and digital technology in British Columbia. While critics were quick to note that the government was unable to resist giving each region of the country (apart from Canada's sparsely populated north) its own supercluster, what is notable for our purposes is the government's willingness to expand the government's footprint well beyond the sectors that had traditionally been the focus of industrial policy in Canada.

In recent years the policy approach has evolved to place much greater emphasis on "clean" technology that will help Canada meet its greenhouse gas emissions objectives. The 2021 Budget announced a substantial increase in money for the SIF, three-quarters of which was for a "net-zero accelerator", to help industries decarbonize and develop clean technology (Canada, 2021).

It is important to note that the expansion of industrial policy under the Trudeau government has not meant that industries such as autos, steel and aerospace are no longer receiving support. On the contrary, given their political salience, the government has been careful to ensure that support has continued. Indeed, in 2021, the government announced additional support to the aerospace sector, and the government has provided, along with the provinces of Ontario, large sums of money for electric vehicle battery manufacturing (Parliamentary Budget Office, 2023).

Industrial Policy: What Do We See Empirically?

Table 1: Key Indicators for Industries of Interest 2019.

	Share of Total Hours	GDP per Hour($)	Hourly Wage ($)
Manufacturing	100	68.8	41.7
Primary Metals	3.9	96.1	57.4
Steel Mills	1.1	72.2	59.3
Aluminium Mills	0.8	137.2	59.3
Transportation Equipment	13.6	74.1	49.9
Motor Vehicle Assembly	2.8	81.7	58.4
Aerospace	3.7	89.9	56.7

Source: Statistics Canada: Table 36-10-0480-01
Note: GDP per hour and hourly wage are in nominal dollars.

Industrial policies are usually justified as increasing growth, increasing (or at least safeguarding jobs) and increasing productivity. In Budget 2017 for example, the Canadian government introduced its broadening of industrial policy by proclaiming its desire for

> "Dynamic, globally connected firms [that] will propel clean economic growth, increase Canada's productivity and support well-paying jobs for the middle class."

(Canada 2017b).

What has been the actual impact of the various industrial policies we have outlined above on these economic variables of interest, in particular output, hours and labour productivity?

Our empirical strategy will be to compare the four sectors where industrial policy has been the most active, to aggregate manufacturing in Canada from 1989 to 2019. The four sectors correspond to the following four digit manufacturing industries: steel mills (BS3311); aluminum smelting (BS3313); motor vehicles (BS3361); and aerospace (BS3364).

We also compare steel mills and aluminum smelting to the overall primary metals sector: the other constituent industries in the primary metals are steel products, foundries, and other non ferrous metal production and processing. For motor vehicles and Aerospace, we also compare to the overall transportation equipment sector: the other constituent industries in that sector are motor vehicle parts, railroad rolling stock and shipbuilding.

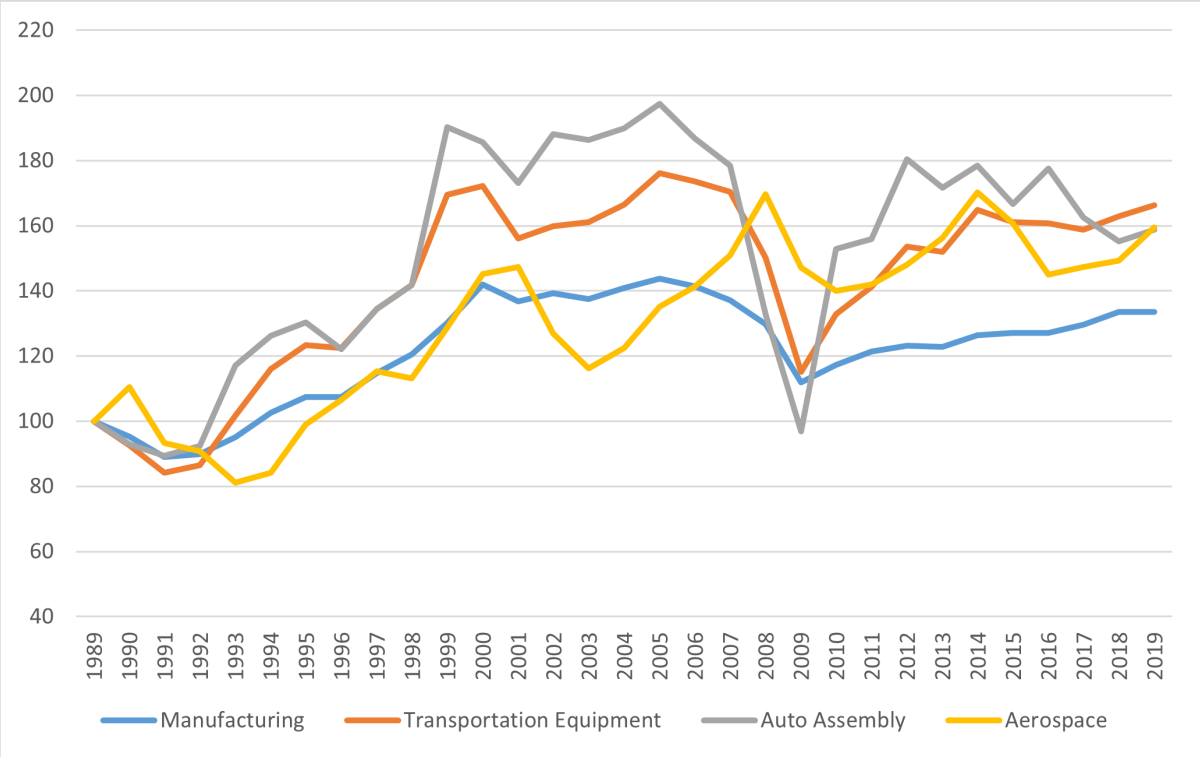
We should note that the motor vehicle parts sector has also been the recipient of some government support, particularly from the AIF, although it did not benefit directly from the 2009 bailouts, or the incentives to attract or maintain auto assembly plants that were instituted to respond to US incentives.

We begin in 1989, a cyclically neutral year. We stop in 2019 to avoid having to deal with the impacts of COVID and associated supply disruptions, which would overwhelm any impact from industrial policy. Furthermore, as we have seen, federal government industrial policy increasing broadened out after 2016 and the introduction of the Supercluster program and the SIF, and particularly in 2021 with the shift on focus to Net Zero.

Description of the Four Industries of Interest

We begin our empirical analysis by looking at the basic characteristics of the four industries of interest. Table 1 shows the

Chart 1: Real Output in Manufacturing, Transportation Equipment, Motor Vehicle Assembly and Aerospace 1989-2019 (1989=100)



Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

share of total hours, nominal GDP per hour, and nominal hourly wages per hour (on a total compensation basis) for manufacturing, the sectors of primary metals and transportation equipment, and the four subsectors.

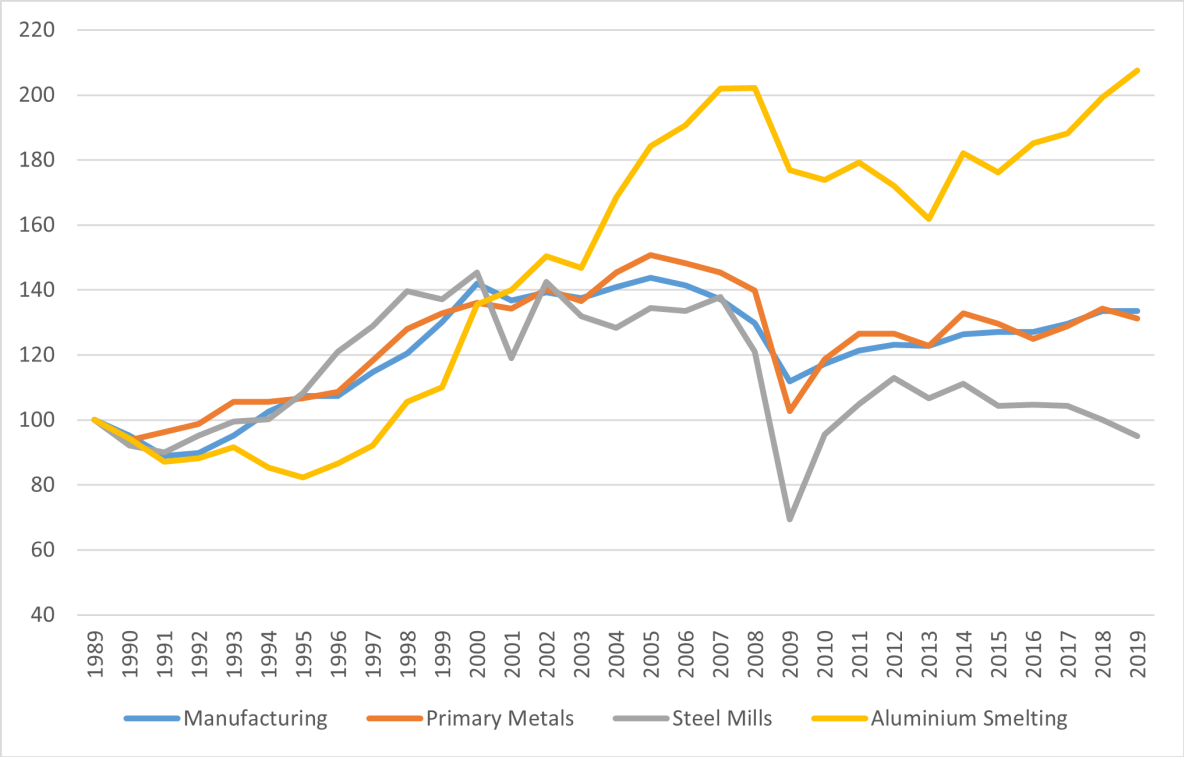
We can see that labour productivity is above average for manufacturing in all four industries, although in the case of steel mills the difference is not large ($72.2 dollars per hour, compared to the average for manufacturing at $68.8). Motor vehicle assembly and aerospace are well above both the manufacturing average and the average for transportation equipment as a whole. Turning to hourly wages, we can see that these are very similar across the four industries—ranging from $57.7 per hour to $59.3 per hour, well above the manufacturing average of $41.7 per hour. This wage premium helps explain to the enduring political popularity of preserving or creating jobs in these sectors.

Performance of Output

We now look at the actual performance of the four industries, beginning with real output. Chart 1 shows real output (defined as real value added) for motor vehicle assembly and aerospace.

We see that the output of the motor vehicle assembly and aerospace sectors have grown faster than manufacturing as a whole—by 2019 both were 59 per cent above their 1989 levels, compared to 33.5 per cent above for manufacturing. However, neither sub-sector grew faster than

Chart 2: Real Output in Manufacturing, Primary Metals, Steel Mills and Aluminum Smelting, 1989-2019 (1989=100)



Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

the overall transportation sector, which grew 66 per cent over this period.

Turning now to the other two industries, Chart 2 shows real output for steel mills, aluminum smelting, the overall primary metals sector and total manufacturing.

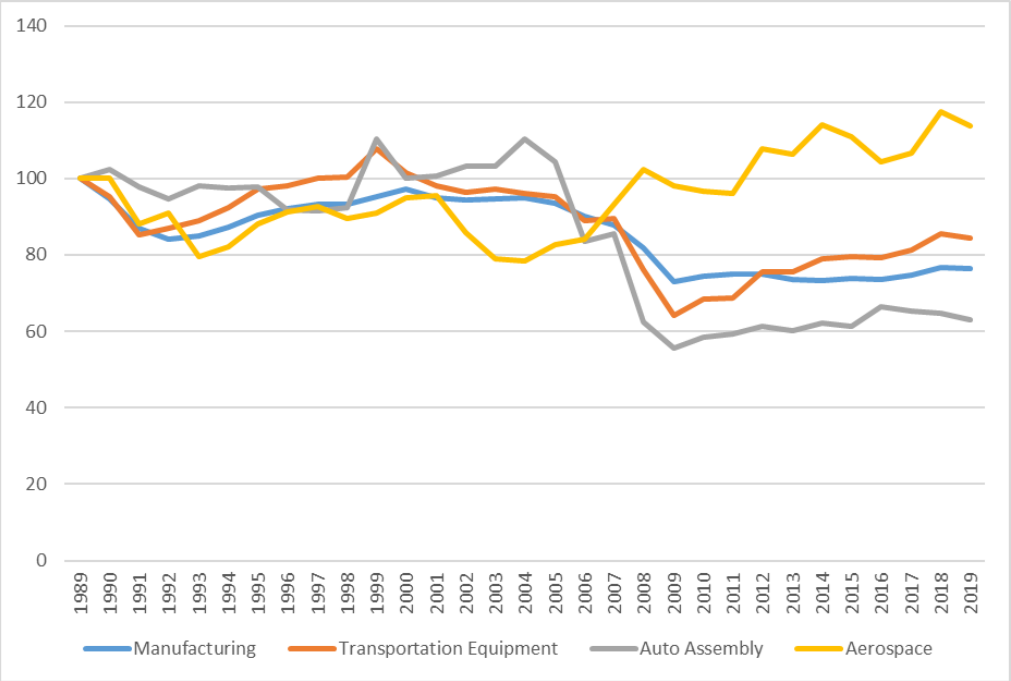
We can see that the two subsectors have had a very different performance. Aluminum has done significantly better than either manufacturing or the whole primary metal sector, having grown by 110 per cent since 1989, compared to 33.5 per cent for manufacturing and 31 per cent for primary metals. However, steel mills have underperformed, with output shrinking 5 per cent. Thus only aluminum smelting has outperformed both manufacturing as a whole and its overall sector.

Performance of Hours Worked

As we discussed above, higher real output is rarely the only goal of industrial policy: rather, another goal is to increase or safeguard highly paying jobs. In this section we compare the performance of hours worked across the four sub-sectors. Chart 3 shows this measure for overall manufacturing, the transportation equipment sector, and the auto assembly and aerospace sectors.

It is evident that the two subsectors have performed very differently. In the aerospace sector, hours worked weakened between 1989 and 2004, falling to 78 per cent of its 1989 level, before climbing to 13 per cent above its 1989 level in 2019. Auto assembly, in contrast, saw hours worked

Chart 3: Hours Worked in Manufacturing, Transportation Equipment, Motor Vehicle Assembly and Aerospace, 1989-2019 (1989=100)



Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

rise to 10 per cent above its 1989 level by 2004, only to decline rapidly to 56 per cent of that level by 2009, and then recovering only very slightly, to 63 per cent in 2019. The overall transportation equipment sector saw a decline as well, but only to 84 per cent of 1989 levels, slightly above the 76 per cent of manufacturing as a whole.

Turning to the primary metals sector, Chart 4 shows the hours worked for this sector, manufacturing overall, and the two subsectors of interest: steel mills and aluminum smelting.

As with real output, the two subsectors exhibit quite different behaviour. Hours worked in steel mills declined significantly, so that by 2019, the sub sector was only at 40 per cent of 1989 levels, compared to the primary metals sector as a whole, at 59 per cent, and manufacturing at 76 per cent. On the other hand, hours worked in aluminum smelting grew steadily between 1992 and 2008, declining subsequently, but still relatively healthy at 90 per cent of 2019 levels.

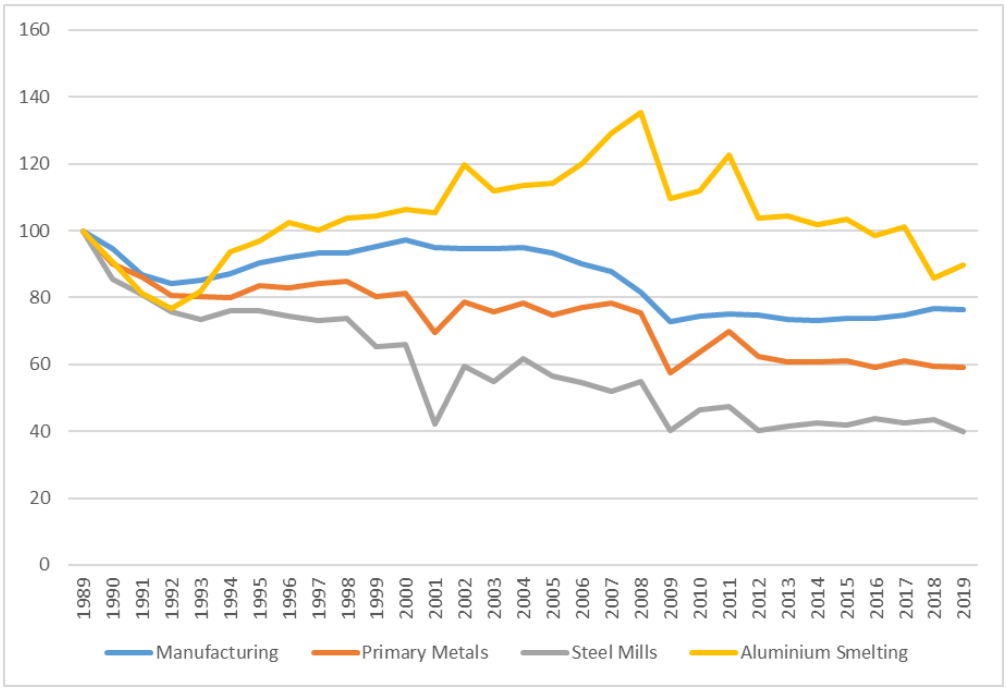
Thus only the aerospace sector has seen growth in employment, although aluminium smelting has done better than manufacturing as a whole. Both the auto assembly and steel mills sectors have done very poorly.

Performance of Productivity

We now turn our attention to labour productivity. Chart 5 illustrates the performance of manufacturing as a whole, the transportation subsector, and the two subsectors of interest.

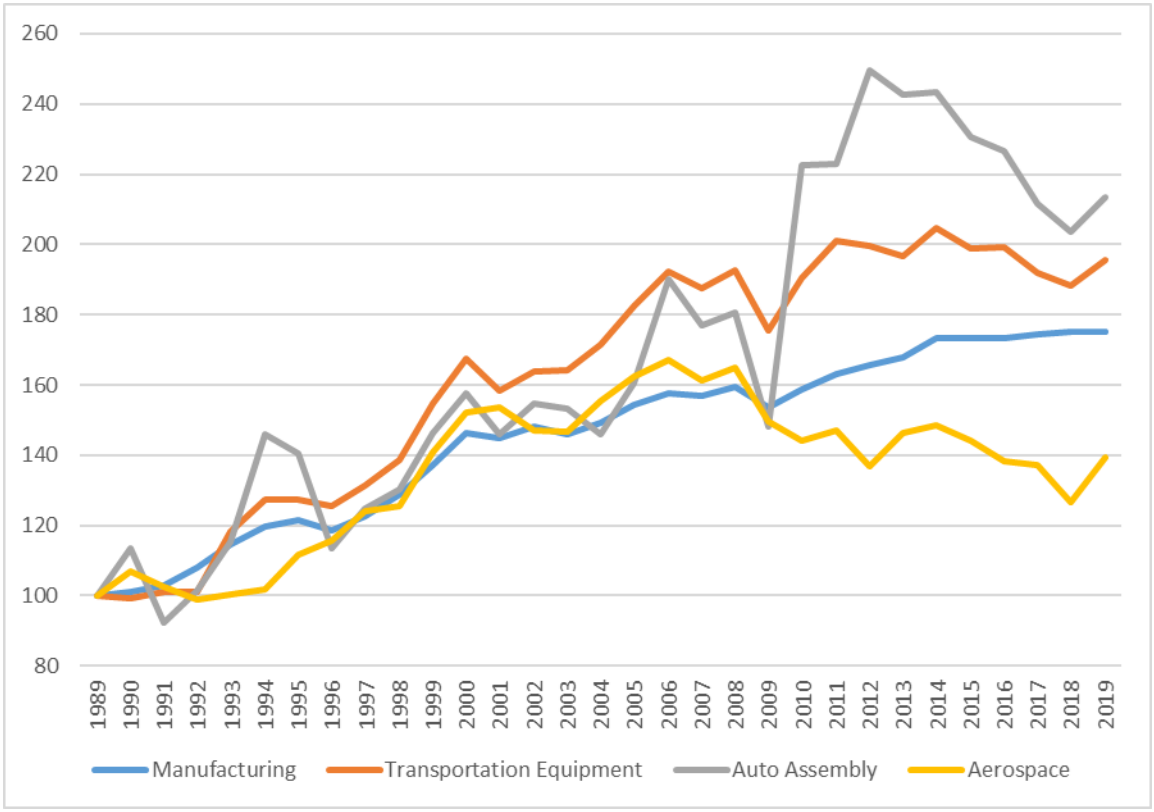
Here we can see that productivity, mea-

Chart 4: Hours Worked in Manufacturing, Primary Metals, Steel Mills and Aluminum Smelting 1989-2019 (1989=100)



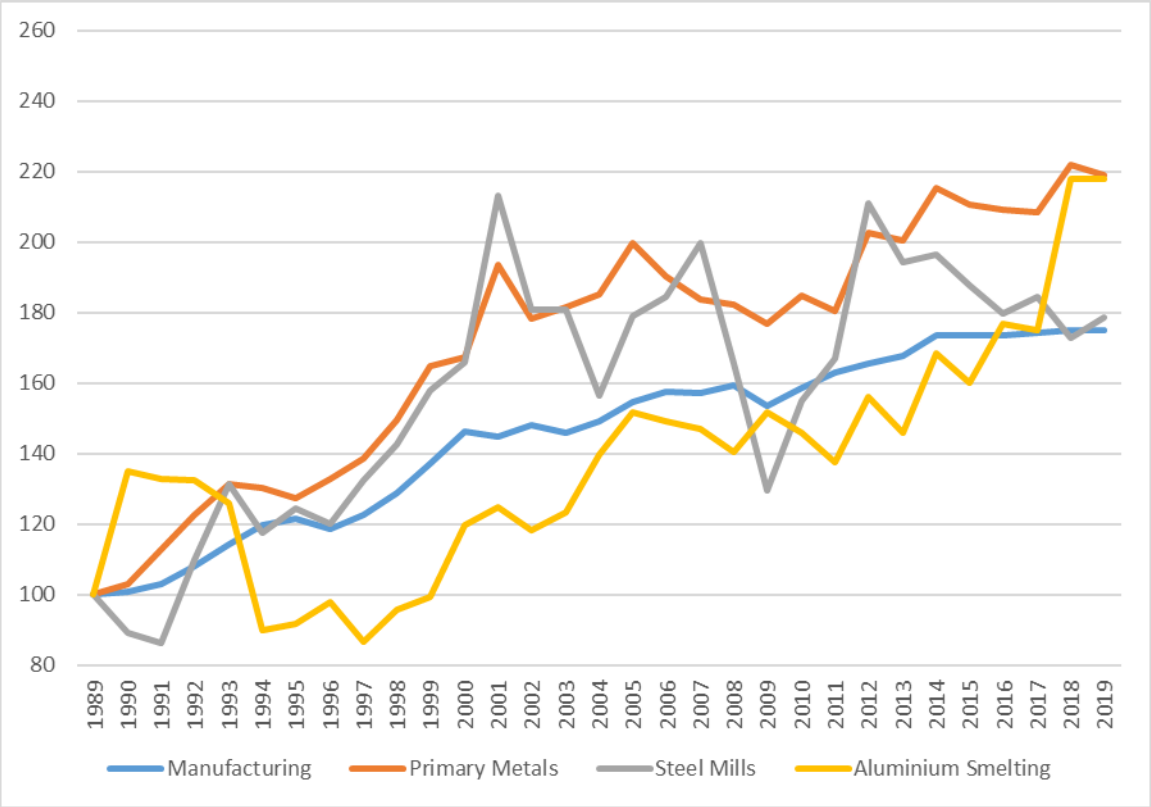
Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

Chart 5: Productivity (Output per Hour Worked) in Manufacturing, Transportation Equipment, Motor Vehicle Assembly and Aerospace 1989-2019 (1989=100)



Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

Chart 6: Productivity (Output per Hour) in Manufacturing, Primary Metals, Steel Mills and Aluminum Smelting 1989-2019 (1989=100)



Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01.

sured as output per hour, in the auto assembly sector has increased dramatically since 1989, to 113 per cent above its 1989 level. This contrasts with manufacturing as a whole, where productivity is 75 per cent above its 1989 level, and the transportation equipment sector, which is 95 per cent above. In contrast, aerospace is only 40 per cent above 1989 levels.

Turning to primary metals, Chart 6 shows the performance of productivity between 1989 and 2019.

Productivity in steel mills, while quite volatile, was 79 per cent above its 1989 level, similar to manufacturing overall, which was 75 per cent above 1989 level, but below the total primary metals sector, which was 119 per cent above 1989 levels. In contrast, the aluminum smelting subsector was 118 per cent above 1989 levels.

Thus both auto assembly and aluminum smelting had a strong productivity performance relative to total manufacturing.

Summary of Results

It is time to summarize our results. Table 2 below show the behaviour of each of our key variables of interest in 2019, relative to their levels in 1989.

Beginning with primary metals, we see that productivity grew significantly faster in aluminum smelting than in the primary metals sector as a whole as well as in aggregate manufacturing. This was driven entirely by stronger growth in output, as

Table 2: Output, Hours, and Productivity, (1989=100)

	GDP	Hours	GDP / Hour
Manufacturing	133.5	76.4	175.0
Transportation Equipment	166.4	84.4	195.4
Motor Vehicle Assembly	158.7	63.1	213.5
Aerospace	159.4	113.7	139.5
Primary Metals	131.3	59.1	219.0
Steel Mills	95.0	40.0	178.7
Aluminium Smelting	207.5	89.6	217.9

Sources: Statistics Canada Tables 36-10-0305-01; 36-10-0480-01; 36-10-0217-01

hours actually rose a little faster than in aggregate manufacturing and quite a lot faster than the primary metals sector as a whole. Steel mills had a very different performance. Here, productivity growth was similar to that in aggregate manufacturing, and lower than primary metals. Furthermore, the growth was only achieved because hours grew much more slowly: growth in output also lagged but not as much.

Thus the subsidies to the aluminum sector do look as if they have helped boost output growth, with hours growth also faster, at least compared to the rest of primary metals. However, investment subsidies to steel mills do not seem to have contributed to a stronger performance relative to other sectors—output, hours and productivity have all lagged.

Turning now to transportation equipment, we see from Table 2 that productivity growth in motor vehicle assembly was stronger than in transportation equipment as a whole. This was entirely driven by weaker hours growth; output growth was slightly slower. Productivity growth in motor vehicle assembly relative to aggregate manufacturing was driven both by slower hours growth and faster output growth.

For aerospace productivity growth lagged behind both transportation equipment and aggregate manufacturing. This weaker growth is largely (relative to transportation equipment) or entirely (relative to aggregate manufacturing) explained by much faster hours growth.

Conclusion

In this article we have looked at the four manufacturing industries that have been the principal focus of Canada's industrial policy between 1989 and 2019. For two of those industries—steel mills, aerospace—productivity growth has been comparatively weak. However, for aluminum smelting and motor vehicle assembly we did find comparatively faster productivity growth over the period studied.

Of course, we cannot make strong conclusions about the impact of industrial policy on productivity growth as we have not performed an econometric study that controls for the many other factors that could have affected, the performance of these sectors; it is entirely possible that without industrial policy performance would have been different.

Furthermore, we also have to consider the compositional effect of policy: to the extent that industrial policy keeps indus-

tries with an above average level of productivity viable, it keeps economy-wide productivity higher than if the industry were to disappear and workers move to sectors with lower productivity (or leave the labour force entirely). Without the support provided to the motor vehicle assembly industry during the great financial crisis, for example, there would almost certainly have been a significant shrinkage in this comparatively high productivity industry, especially given the support the U.S. provided to its auto sector during this period.

Whatever its impacts on productivity may have been, one thing we can say is that Canadian policymakers have not moved away from industrial policy. If anything, successive governments have increasingly embraced industrial policy as an essential part of their economic policy suite. One should be careful though to claim that productivity growth will benefit from industrial policy interventions.

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