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The Way Ahead

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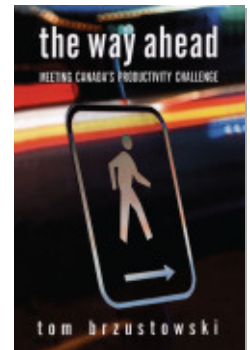
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Sustaining our Prosperity

A prosperous nation has the private and public wealth to invest and consume in ways that reflect the values of its people, and thus improve their quality of life.

The key to sustainable prosperity is sustainable wealth creation in the economy. Wealth creation is the business of business. Wealth is created where value is added, and value is added when a product, whether a good or a service, is sold for more than the cost of the inputs that had to be bought to produce it. The value added provides wages, produces profits, and pays taxes. In this way, it creates both private wealth and public wealth.

In today's global knowledge-based economy, new knowledge originating in science and engineering research is an important and frequent source of added value. That knowledge is imbedded in products and in the processes that produce them, and much of that is done through R&D. This is the case for many goods produced by industry and for knowledge-intensive services. In Canada's case, the domestic market is generally too small to recover today's high costs of research and development of a new product, so success in export sales must be a goal from the outset.

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Value added

Two simple equations make the key points about value added. The first one shows how it is created:

$$\text{value added} = \text{sales revenue} - \text{cost of purchased inputs}$$

These purchased inputs do not include labour costs for the reason that is made obvious in the second equation, which describes how the value that is added is then used:

$$\text{value added} = \text{wages} + \text{profits} + \text{taxes}$$

It provides the connection between value added and wealth creation. Wages and profits create private wealth; taxes create public wealth.

The first equation shows that value added does not exist in isolation from a market. It is obvious that value added will be positive only when there is sales revenue that exceeds the cost of purchased inputs. A product may be the best thing since sliced bread, but it creates no wealth unless there are customers willing to buy it at an adequate price.

Time is a very important dimension in business, but the equation does not contain time explicitly. That means that it cannot be used to track value added day by day. The sales revenue from new products usually lags behind the expense of producing them, creating a net cost for an initial period. If a product becomes a money-maker, there is a time when the accumulated sales revenue begins to exceed the total spent on production up to that time. A product is a commercial success if the total revenue significantly exceeds the total production costs over its lifetime.

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Such elementary considerations have strategic implications. The definition of value added shows that, on its own, no amount of scientific sophistication and technical competence in creating new products will make Canada wealthy. Our products must be sold to create wealth, and in light of Canada's relatively small domestic market and the high costs of product development, they must be sold profitably on world markets. This means that we must develop our global marketing capacity, explicitly including good global market intelligence, at the same time as we develop our technical capacity for adding value. This must be done in all sectors, including natural resources and manufacturing, to loosen our dependence on commodity exports.

To make this happen, we need the right mix of the right people with the right skills. Excellent researchers must be working at the leading edge of current scientific developments to show the way, and first-rate engineers need to exploit research results from around the world to develop new technologies and ideas for products. Experts in marketing and business must be working to commercialize these products. Canadian businesses in all sectors also have to develop a cadre of entrepreneurial managers who will keep an eye on the long term and always be on the prowl for new opportunities to add value. They must have the long-term market intelligence to position their value-added products where they might best succeed. Canadian business must also develop a pool of well-informed international marketers who will know Canada's potential customers around the world and be able to develop the appropriate business deals; in this connection, our multicultural society should be an ace up our sleeve.

But making our prosperity sustainable requires more. Successes can't be one-off events that persist in memory but

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fade in the market; they need to keep coming. That requires a full pipeline of new value-added products, positioned for success according to the most up-to-date market intelligence. Existing industries must evolve to maintain success in their markets. New ventures need to be created to exploit entirely new developments. And each generation of Canadian products must be sold at high enough margins to cover the cost of the R&D that produced them, and to invest in the R&D for the next generation.

Which brings us to commodities and innovations.

Commodities and innovations

Commodities are products available from many sources. They have similar properties or functionality, meet the same standards, are of comparable quality, and can generally be substituted one for another. Their prices are set by the commodity markets, and commodity producers have little choice but to take the market price. And therefore, as already discussed, commodity producers rely principally on cost cutting to remain competitive and profitable.

At the opposite end of the product spectrum are innovations. Innovations are new products introduced into the market. They are initially available from one or only very few producers. Innovations are generally quite different from anything already in the market, and some (like the SONY Walkman®) can stimulate a new demand and create a new market. The producers of innovations are able to set their own prices, with margins ideally high enough to pay for the cost of developing them, as well as investing in the R&D for the next new product.

Commodities and innovations can be found in all sectors. Agricultural products, metals, lumber, construction materials,

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food, household goods, and many manufactured products are commodities. Even the professional services offered by an engineering company that uses routine methods to work on routine projects can be classed as a commodity. But innovations are not just the preserve of the high-tech industry. Innovations in clothing and household goods are marketed routinely, with new designs providing their distinguishing features. And cost-reducing process innovations can be the source of advantage for commodity producers in all sectors.

Furthermore, innovations do not remain innovations forever, or even for long. Successful new products are copied by producers competing in the same market and are gradually turned into commodities. This process is called “commoditization” and is characterized by improving performance, falling prices, and a proliferation of versions of the product under different brand names. For example, the Skidoo® was an innovation as a recreational product in the 1960s, and has long since become a commodity product. The VCR was an innovation 35 years ago, became a commodity in the early 1990s, and is no longer manufactured today. Its successor, the DVD player has become a commodity this decade, as has the personal computer. And the digital camera is becoming a commodity as this is being written.

However, it is also possible for some innovations to last for a long time without becoming commodities, for example, specialty chemicals. These might be products that have a very limited market and are so expensive to manufacture that most competitors stay away from them. Or they may be the products of some proprietary process that has been protected by trade secrets. Once they are too old to be called innovations, they may be called differentiated or specialty products.

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When Canada's innovation performance is being measured, generally by surveying the business community, innovations are labelled in three categories: first in the world, first in Canada, or first in the company. Given Canada's dependence on exports, innovations that are first in the world are potentially the most valuable. Innovations that are first in the company may have a global impact as well if the company is a multinational enterprise (MNE), but there is no guarantee that their commercialization will be of particular benefit to the Canadian economy. Innovations that are first in Canada or first in the company are more about keeping up than taking the lead.

For emphasis, in certain parts this book, all products will be labelled as one of the two extremes: commodities or innovations.

A note on the many kinds of innovation

Innovation seems a difficult concept to grasp. I have sat frustrated in many meetings at which busy people spent a lot of time trying to answer the apparently innocent question, "What does innovation mean to you?" The usual outcome was some vague language attempting to accommodate most of the views expressed. I think that the reason for this difficulty is that innovation takes so many forms that the word itself is almost a generic term.¹

The dictionary definition of innovation has two elements: first, having a new idea and, second, putting it into practice. There is an additional complication because the same word can mean either the action of having a new idea and putting it into practice, or the result of that action.

In the discussion of wealth creation and value added in this chapter, the focus so far has been mainly on product innovations

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in contrast with commodity products. Innovation was defined as a new product introduced into the market. The corresponding action definition is (the action of) introducing a new product into the market. These definitions are now acknowledged to be those of *product innovation*.

That action definition of product innovation can be restated more crisply as an equation

$$\text{innovation} = \text{invention} + \text{commercialization}$$

where invention is the new idea, and commercialization is putting it into practice.

Process innovation involves materials, methods, and tools (e.g., building aircraft wings by gluing sheets of composite plastic material rather than by riveting aluminum panels). It can be described by the same equation. In that case, the commercialization of the new process involves its competition with existing processes on the basis of cost and performance, for example, quality, throughput, and the potential for enabling the development of new products, etc.

Product innovations come in two flavours: sustaining and disruptive. *Sustaining innovations* improve and sustain an existing product line that meets customers' current needs and makes money for the firm. *Disruptive innovations* are appropriately named. They can undermine a company's existing product but often create an entirely new and much more profitable market. These ideas are very fully discussed by Christensen in his excellent book "The Innovator's Dilemma."²

Marketing innovation is another very important category. A good example of this is the appearance of "big box stores" about two decades ago, and a decade before that the introduction of

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“no-name” and house brands (e.g., President’s Choice®) of grocery products when supermarkets moved away from acting as sales agents for manufacturers and towards serving as purchasing agents for consumers.

There are many other kinds of innovation. Here are some whose names provide an obvious description: *organizational innovation*, *institutional innovation*, *governance innovation*, etc. Another kind is *complementary innovation*, which consists of the changes in organization, etc. that a firm must make in order to implement successfully some particular product or process innovation.

And most of these innovations come in one of two self-explanatory shades: *incremental innovation* and *radical or revolutionary innovation*.

In all innovation, there is a new idea and it is put into practice. Putting new ideas into practice requires learning new things and abandoning old ones. In the classical words of Schumpeter,³ this is “creative destruction.” In more modern terms, we might speak of people and organizations “reinventing themselves.”

The connection between innovation, productivity, and wealth creation

Innovation, productivity, and wealth creation are all connected through value added. Innovations for which producers can set the prices provide the best opportunity to achieve high value added. What generally makes the addition of value possible is new knowledge embedded in the products, whether goods or services. And most of the time, it’s R&D that makes the embedding possible.

This might appear most obvious in the case of product innovation in the tech sectors, but I believe that there is

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room for innovation and increasing the Canadian value added in all sectors. So we need more innovations, more value added, and more R&D in all sectors of industry. And as these activities begin to bear fruit and Canadian producers increase the value added in all sectors, the nation's productivity will rise.

The big picture

Figure 4.1 is a big picture of the flows of knowledge, people, capital, and products between Canada and the world as it exists today. The two arrows at the top show the flows of codified knowledge arising from research. Canadian researchers publish about 4.7% of the world's papers in science and engineering. Being very good at that 4.7% is our ticket to the entire 100%. Research publications from around the world are readily available in libraries and on the Internet, but full access to new knowledge requires knowing that it exists, what it means, how reliable it is, and what can be done with it. And that requires the first-hand knowledge that comes with being active in the world's important research fields.

The two arrows at the 3-o'clock position show the flows of people carrying tacit knowledge in and out of Canada. This is not the place for a debate on whether there is or is not a brain drain today, so these arrows are depicted as equal. The two sets of three arrows each at the 9-o'clock position refer to foreign direct investment (FDI)⁴ that simultaneously brings capital, codified knowledge, and new people with their tacit knowledge. For example, when Toyota builds a new plant in Woodstock, Ontario, they invest in the plant and equipment, they bring their technology codified in manuals and software, and they bring in new people with

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particular management and engineering skills they consider necessary. FDI flowing out of Canada, for example, investments by Celestica or RIM, has the same three dimensions.

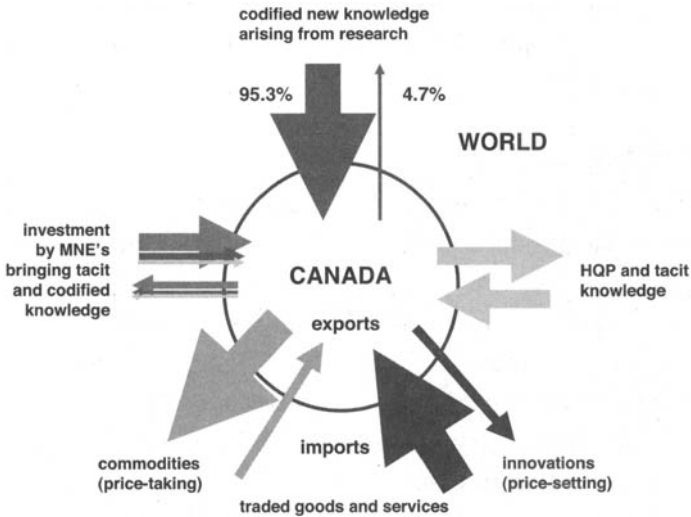


FIGURE 4.1 The big picture

The remaining four arrows at the bottom deal with the way that Canada pays its way in the world: our traded goods and services. At the present time our exports in commodities from natural resources and commodity manufactured products dominate our exports. Their producers must take the world market price. Our exports in innovations, where Canadian producers can set their own prices, are modest compared to our imports of innovations from around the world.

In light of the discussion so far, Figure 4.2 shows a big picture that would be far better for Canada. In that case, the volume of Canadian research is significantly greater than 4.7% (shown as $>4.7\%$). The tacit knowledge brought into Canada by immigrants is shown much increased, primarily through

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the more effective use of the professional knowledge of immigrants who are already coming here. The growing capacity to add value in Canada has attracted a greater inflow of FDI. The net result is that in the better big picture we have reduced our reliance on exporting commodities and have increased very significantly our exports of innovations. Figure 4.2 shows a Canada whose economy adds much more value than today, a more productive and prosperous country with better prospects for the future.

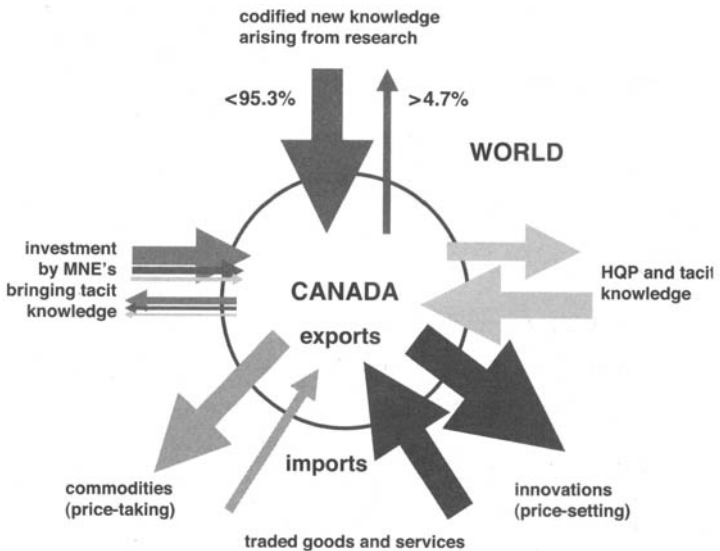


FIGURE 4.2 The better big picture

To make sure that we don't lose sight of our goal in these discussions, the arguments in this chapter can be summarized in one simple diagram. Figure 4.3 shows the desirable sequence of events starting with more and better R&D in Canada, and ending with a better quality of life for people in our country.

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FIGURE 4.3 Improving life in Canada by improving R&D

NOTES:

- 1 A historical note: In the Middle Ages, innovation was considered to be a dangerous departure from the established religious doctrine, a step toward heresy punishable by burning at the stake. Innovators are treated far better these days!
- 2 Clayton M. Christensen, "The Innovator's Dilemma," Harvard Business School Press (1997).
- 3 The phrase "creative destruction" emerges from the work of Joseph Schumpeter on innovation in the first part of the twentieth century, in which innovation is seen as emerging from a struggle between entrepreneurs and people's resistance to change; see multiple references to it in Jan Fagerberg, David C. Mowery, and Richard R. Nelson: "The Oxford Handbook of Innovation" Oxford University Press, 2005.
- 4 Portfolio investment is not shown in this diagram.