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CANADA IN THE 21ST CENTURY

III. RESPONDING TO THE CHALLENGES

THE CORPORATE RESPONSE — INNOVATION IN THE INFORMATION AGE

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CANADA IN THE 21ST CENTURY

III. RESPONDING TO THE CHALLENGES

THE CORPORATE RESPONSE — INNOVATION IN THE INFORMATION AGE

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PREFACE

AS A NEW MILLENNIUM APPROACHES, Canadians are going through a time of dramatic economic change. Markets are becoming global, and economic activity across nations is becoming increasingly integrated. Revolutionary developments in computer and communications technology are facilitating globalization, and are also altering a great deal the workplace and the lifestyles of Canadians. At the same time, largely as a consequence of the information revolution, knowledge-based activities are becoming increasingly important within the Canadian economy and the economies of other industrialized nations.

These and related major transformations of the economic environment invite a comparison with the Industrial Revolution of the 1800s. As in the earlier time, major structural changes are giving rise to uncertainties. Firms and workers are struggling to find their place in the new economic order. Canadians collectively face the question of whether their nation's physical, human and institutional resources will provide a firm foundation for continued prosperity. Many see Canada's prospects as being much less secure than in earlier years, when the country's rich natural resources played a major role in shaping the Canadian economy.

To examine fully the medium to longer-term opportunities and challenges of these developments, the Micro-Economic Policy Analysis Branch of Industry Canada asked a group of experts to provide their "vision" for Canada in the 21st Century on a number of important issues. Each author was required to undertake two formidable tasks: first, to identify major historical trends and develop scenarios to illustrate how developments in his/her respective area might unfold over the next ten to fifteen years; and second, to examine the medium-term consequences of these developments for the Canadian economy.

The papers coming out of this exercise are now being published under the general heading of "Canada in the 21st Century". This series consists of eleven papers on different aspects of Canada's medium-term outlook. The papers are divided into three major sections. The first section, *Scene Setting*, focuses on important developments that are going to shape the medium-term economic environment in Canada. The second section, *Resources and Technology*, looks at trends among some important components of Canada's wealth creation and considers the actions needed to ensure that these factors provide a firm foundation for continued prosperity. The last section, *Responding to the Challenges*, explores individual, corporate and government responses to the medium-term challenges and offers some options for an appropriate course of action.

As part of the third section, *Responding to the Challenges*, this paper by Professors Randall Morck of the University of Alberta and Bernard Yeung of the University of Michigan examines the corporate response to the major forces driving economic change: the accelerating pace of innovation, the emerging global free market economy and the aging of Canada's population. In

this new environment, firms must enhance their ability to collect and process information so as to create innovations.

The authors suggest the need for market-type incentives within organizations so that firms can imitate the market's ability to foster efficient information generation and processing. Policy should be directed only at significant market problems that governments can usefully address. One such problem is inadequate competition in parts of the banking and financial sector, which partly explains the financing problems of small firms. Equally addressable are failures in markets for education, training and basic R&D. These inhibit innovation and justify the provision of government subsidies. More generally, the authors point out, government itself has become a competitive business; governments must deliver valuable public goods at competitive tax rates or risk an outflow of capital, ideas and skilled labour.

SUMMARY

IN FORECASTING COURSES, undergraduate students of economics are routinely taught to plot trends in variables of interest, and then to use statistics to extrapolate them into the future. This procedure has the advantage of requiring virtually no work in understanding the thing being predicted. It also leads to spectacularly wrong results. We believe the key to making educated guesses about the future is understanding some basic elements of economics. We believe an economic theory called Austrian economics, part of which has recently emerged from a half-century of obscurity in the guise of endogenous growth theory, is the key to understanding our current situation.

Predictions that the world is on the verge of a totally new age are fun to make but the world usually does not co-operate. Corporations and jobs 10 years from now will probably not be that different from what they are now. However, there are a few changes that probably will matter. We believe the most important of these to be the accelerating pace of innovations, globalization, and the changing demographics of Canada's population. These three changes are not unrelated.

Immigration is probably the only way to rescue Canada from demographic disaster as its existing population ages. This leads us to what we think are some reasonably safe predictions about Canada 10 years from now: its population will be more diverse than that of other advanced Western countries, and the diversity will be a tremendous competitive advantage in forging economic links with newly rich countries in Asia and elsewhere.

Accordingly, globalization can be a very good thing for Canada. We may be in a better position to benefit from the shift of the world's centre of economic gravity out of the North Atlantic. Canada's current policy of pushing for global free trade makes sense. But the accelerating pace of innovation is an even stronger rationale for Canada to push for free trade.

Innovations have unique economic properties. Once a firm has spent money on R&D to develop a new process or product, it makes a higher return if the innovation can be marketed on a larger scale. We believe it will become increasingly obvious that the real competition in the global free market economy will be competition to innovate. If Canadian firms are to be competitive innovators, they must be able to earn high returns on their innovations. To do that, they must have access to the largest market possible: the global market.

In our view, government has a crucial role to play in fostering Canada's economic health in the next decade, but this role is quite different from the one it has assumed in much of the 20th century. Government is becoming a competitive business. Governments that fail to provide high-quality tangible and intangible public infrastructure at competitive tax rates will lose capital, skilled labour and therefore knowledge to other economies. A critical part of this infrastructure, we believe, is a sound, reliable and fair legal system that protects property rights, both tangible and intellectual. Essential to the legal system are

corporate governance laws that promote investment by strengthening investors' trust in corporations. Education, public order and social safety nets are other basic components of the infrastructure. Subsidies to corporations, for whatever allegedly good cause, are not.

We conclude with a brief description of the corporate job of the future and end with a forecast that we believe to be a sure bet, in case the others fail to pan out.

FUTURES PAST

The future is not what it used to be.
— Paul Valéry (1871–1945).

WHAT HAPPENED TO THE JET PACKS, robot dogs, videophones, Mars colonies and 15-hour work weeks that were just over the horizon in 1965? Why did 1960s predictions by *Popular Mechanics* writers completely miss the personal computer, fax machines and the Internet? The global winter that scientists had earnestly said was inevitable if Saddam Hussein lit the Kuwaiti oil fields never came, presumably much to the disgust of the distraught dictator. Physical scientists seem to be lousy at predicting the future, and economics is much less exact than physics. Why should anyone pay attention to an economist's ravings?

Many eminent economists have been surprisingly good at predicting the world decades ahead. Thorstein Veblen, Friederich August von Hayek and even Karl Marx made surprisingly astute forecasts of things to come.[1] Of course, professional economic forecasters are often compared to monkeys with darts.[2] What is the trick? What does it take to make sensible forecasts? We believe there are a few basic principles.

HISTORY DOES NOT EXTRAPOLATE FROM TRENDS

> *In the space of 176 years the Lower Mississippi has shortened itself by 242 miles. That is a trifle over an average of one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oölitic Silurian Period, just a million years ago next November, the Lower Mississippi river was upwards of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing rod. And by the same token, any person can see that 742 years from now the lower Mississippi will be only a mile and three quarters long, and Cairo and New Orleans will have joined their streets together and be plodding comfortably along under a single mayor and mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment in fact.*
> — Mark Twain, *Life on the Mississippi*, 1863.

IN FORECASTING COURSES, undergraduate students of economics are routinely taught to plot trends in variables of interest, and then to use statistical techniques to extrapolate them into the future. This procedure has the advantage of requiring virtually no work in understanding the thing being predicted. It also routinely leads to spectacularly wrong results.

In 1968 a group of MIT scientists calling themselves the Club of Rome made stark predictions of imminent global shortages of almost all metals and fuels. They projected 1960s exponential growth rates in the use of raw materials indefinitely into the future, and concluded that the world's reserves of

aluminum, copper, gold, molybdenum, natural gas and zinc would soon be totally exhausted. Their report, *The Limits to Growth*, was instrumental in launching the modern environmentalist movement.[3]

The Club of Rome's predictions were also completely wrong (at least so far). Exploration greatly increased available reserves; price increases reduced demand, fostered innovation to increase efficiency and develop substitutes, and made recycling profitable. The MIT scientists' extrapolation of the future from then-current trends was unwarranted, and it failed to capture how supply and demand would change as prices changed and knowledge was accumulated. Few economists in the 1990s expect raw materials shortages to impede economic growth in the foreseeable future.

UNDERSTAND THE SYSTEM

> *Socialism was embraced by the greater part of the intelligentsia as the apparent heir of the liberal tradition: therefore it is not surprising that to them the idea of socialism leading to the opposite of liberty should appear inconceivable*.
>
> — Friedrich August von Hayek, *The Road to Serfdom*, 1944, p. 27.

HAYEK, A NOBEL LAUREATE IN ECONOMICS, predicted the totalitarian nature of all communist economies at a time when intellectuals everywhere were enthralled with Marxism. He did so by trying to understand how a communist economy could function. If economic decisions are made centrally, how can the central government know what to do without a huge information-gathering (i.e., surveillance) apparatus? How is it to make sure its decisions are implemented without a huge police presence in all aspects of life? Hayek predicted that communist economies could not endure and would eventually collapse into chaos. First, they had no mechanism for rewarding creativity, innovation or initiative and so would cease growing; and second, the problem of gathering information and co-ordinating economic actions would only worsen with time. He was right on both counts.[4]

Unlike the Club of Rome or the Who's Who of 20th-century Western intellectuals who supported communism (and national socialism too), Hayek thought hard about the economic system he was studying. He took human nature and basic principles of economics as given, and asked where they would lead to in such a system. We believe this contrast between Hayek and the Club of Rome is at the nub of problems in economic forecasting.

Hayek was a leading member of the Austrian School, a group of economists that rises to the fore whenever records in long-term prediction are compared.[5] We shall therefore invest several pages of the reader's time in an overview of this school of thoughts and what it has to say about our present situation. Although Austrian economics was important in the late 19th and early 20th century, it meshed poorly with the mathematical approach of postwar economic theory and so was regarded as little more than an intellectual curiosity until recently, when it was resurrected and re-anointed as endogenous growth theory.

Austrian economics is not superseding standard micro- or macro-economics but is increasingly supplying missing pieces in their explanations of the world.

Basic Principles of Economics

Economics is About Supply and Demand, Not Just Supply

> *Before man reaches the moon, your mail will be delivered within hours from New York to California, to England, to India, or to Australia by guided missiles…. We stand on the threshold of rocket mail.*
>
> — A. Summerfield, U.S. Postmaster General, 1959.

Rocket mail, jet packs, robot dogs, videophones and Mars colonies actually were technologies that were "just over the horizon" in the 1960s. They are all technologically feasible now, they could be "supplied." So where are they?

The U.S. military was the biggest potential customer for jet packs in the 1960s, but it quickly found that jet packs exposed troops to sniper fire, needed too much fuel and were hard to manoeuvre. Further R&D probably could have overcome the last two problems but the first was insurmountable. Jet packs died not for technological but economic reasons: demand dried up.

Videophones were tested but consumers disliked the greater invasion of privacy caused by a camera in the kitchen. Carrying pictures on telephone lines is technologically possible now but no manufacturer is pushing videophones. Given consumers' profound lack of interest, the economics do not justify it. Robot pets and Mars colonies may yet happen but the consumer lobby groups are so far still quiet. We keep our fingers crossed for the 15-hour work week and against a nuclear winter. We sincerely hope that the demand for quick mail delivery will never justify a Canada Post program to bombard cities with guided missiles.

In all of these cases, supply was not an insurmountable problem. The technology for producing these goods is there and probably could be refined substantially if demand existed. The problem is that people do not want them; there is no demand. Since the purpose of production is to meet demand, there is no production.

The Source of Value Is Subjective

> *Value is the most invincible and impalpable of ghosts, and comes and goes unthought of while the visible and dense matter remains as it was.*
>
> — W. S. Jevons, *Investigations in Currency and Finance*, 1884, Pt. 2, Ch. 4.

Aristotle argued that goods have an objective "just price" determined by moral principles.[6] It has taken humanity more than two millennia to overcome this folly, and "ethical pricing" continues to rear its ugly head even now. If a nuclear

winter were coming and modern economists could pick one piece of knowledge to hand down to survivors of the apocalypse, it would unquestionably be the idea that value is subjective. It is nonsense to say that three talents is an objectively "just" price for a load of wheat but that four talents is not.

Philosophers before Adam Smith argued long about value. A popular theological view suggested that value was "need": a medicine is valuable because people need it. But what about water, an absolutely essential good that is virtually free? Water is abundant but medicines are scarce. Does "scarcity" determine value? But valuable land is abundant; and two-headed chickens are rare, yet little cherished.

A great triumph of 19th-century economics was to make sense of this jumble. Value is determined by the relative weight of supply and demand. High demand and relatively low supply push prices up. Water has high demand but also high supply, and two-headed chickens may have low supply but the demand is subterranean.

The demand for a good depends on how many people can use it to satisfy their "wants," and "want" is a subjective notion. The supply of a good depends on people's ability to make it. This depends in turn on a combination of natural scarcities of raw materials and knowledge about production processes. Knowledge is also a subjective concept and is often far more important than natural scarcity.

Value Creates Supply

> *Justice is to allow people to exercise their unequal skills to satisfy their self-interest*.
> — Confucian saying.

When demand exceeds supply, prices rise. This makes finding ways to increase supply lucrative. Finding new raw materials, expanding production capabilities and (most important) devising innovations to increase productive efficiency all become more profitable when prices rise, at least if people are free to keep the economic gains from these activities. When supply exceeds demand, prices fall and these sorts of activity look unprofitable. This "market mechanism" is the deceptively simple basis of market economies.

A Failed Experiment

> *Psychology cannot experiment with men, and there is no apparatus for this purpose. So much the more carefully must we make use of mathematics*.
> — Johann Friedrich Herbart, *Lehbuch zur Psychologie*, 1816.

Like human psychology and astronomy, economics must be an observational science. We cannot test theories by doing controlled experiments. Subjecting half the population to an experimental economic regime while

using the other half as a control group is impractical and probably unethical. It is therefore fortunate that history has performed such an experiment for us in the guise of international communism. Applying communism to one half of Germany, Korea, China and the former Austro-Hungarian empire, and capitalism to the other is a controlled, replicated experiment in the best tradition of the natural sciences. The conclusion is inescapable: market mechanisms of the sort we have described are critically important.

The underlying aim of international communism was to change human nature — to create a "new socialist man" [sic] who would be altruistic instead of selfish. Altruistic workers would happily toil for the good of their comrades and without thought for their own reward. If communist regimes had succeeded in fostering such a change, they might well have survived and prospered. Their spectacular failure suggests that human nature is, if not immutable, then at least rather hard to change. Economics must be fashioned around human nature, with all its flaws and imperfections.

HUMAN NATURE

> *To succeed, be in the right climate, on the right land and in harmony with people.*
> — *Confucius*.

A SOUND UNDERSTANDING OF HUMAN NATURE is the basis for good economics, good government and good management. Is human nature subject to predictable regularities? The premise of all psychology is that it is. That being so, which regularities in human nature can help forecasters make predictions?

Self-Interest

> *By 1960, work will be limited to three hours a day.*
> — John Langdon-Davies, *A Short History of the Future*, 1936.

Most animals, including humans, appear to be hard-wired with various survival responses. These instincts arguably direct much human behaviour, especially when snap decisions are required. From the economist's viewpoint, the most important of these instincts are greed and risk aversion.

Like many other animals, humans are hoarders. Greed increased the odds of survival for our Paleolithic ancestors and so it is an unalterable part of human nature. Why is this important for forecasting? Avarice is the abyss down which the 15-hour work week disappeared. Since 1950, real per capita GDP has increased by a factor of just under 4. If a person in 1996 were comfortable with the average income that prevailed in 1950, she could obtain it by working one fourth as much as would have been necessary then — a 15-hour work week. Few take up this opportunity. Human nature makes us want wealth more than leisure, so we toil on.

A second aspect of human nature that clearly has its roots in biological self-preservation is risk aversion. If there are a safe way and a risky way of achieving the same valued end, all else being equal, human beings prefer the safe route. This has deep implications in predicting things such as investment behaviour.

Self-preservation, it may be argued, leads to some rather sophisticated behaviour. People also strive for intangible possessions such as power, status and recognition, perhaps more than for tangible wealth. But this is still a strategy based on self-interest. These intangibles let their owners use other people's resources to satisfy their own wants. Self-preservation may also lead to a balancing of short-term and long-term self-interest. Our Paleolithic ancestors had to be able to sacrifice short-term consumption (say, eating tasty carrion) for long-term survival (avoiding a predator who might linger in the area).

Social Animals

> *"Never speak disrespectfully of Society, Algernon. Only people who can't get into it do that."*
>
> — Oscar Wilde (1854–1900), *The Importance of Being Earnest*.

Self-interested behaviour is not necessarily selfish behaviour. Many species have developed amazing co-operative behaviour to enhance their survival.[7] Humans fall into this group. Unco-operative behaviour that enhances instant happiness but threatens long-term survival will not last — because if it does, the species itself will not last. Economic experiments, mainly on undergraduates, suggest that a tendency to co-operate is a very basic part of human nature. Computer simulations show that the most effective form of co-operation is "tit for tat" interactions. People keep track of who has done favours for them and who has wronged them, and act accordingly in future dealings. This proclivity toward favour trading, combined with greed, is thought by many economists to have a central part in explaining much of the interaction between politicians and corporate lobbyists.

Our co-operation instinct leads us to develop and submit to social rules, regulations and institutions. Violators are punished, expelled from society (and thus exposed to predators) or killed. Good rules enhance survival, and societies with poor rules wither. Our survival instinct leads us to join societies with good rules and to desert societies with bad rules. This fact has deep implications for government-business relations in the global economy.

Conditioning

> *We are all controlled by the world in which we live, and part of that world has been made and will be constructed by men. The question is this: are we controlled by accidents, by tyrants, or by ourselves in an effective cultural design?*
>
> — B. F. Skinner, *Cumulative Record*, 1972.

Conditioning is a pervasive characteristic of animals, including human beings.[8] We are conditioned by our economic and social environment. We learn what yields rewards and what triggers punishment. For the most part, society rewards behaviour that enhances everyone's collective benefit. In communist state-owned factories, where self-initiative and work were not rewarded, workers developed the ethic "They pretend to pay us, we pretend to work." Stealing on the job was common since it was not punished and was rewarded in black markets. As the police presence receded in communist countries, on-the-job theft became so endemic that reformers referred to it as spontaneous privatization.[9] Yet these same workers, placed in Western-run businesses, can become honest, hard-working and creative employees or entrepreneurs.

Conditioning turns common behaviour into internalized habits, norms, precepts and virtue. Co-operative behaviour, self-sacrificing, caring for others, honesty, etc. — all become internalized virtues and norms after we have gone through enough tit for tat.

The downside of conditioning's importance in human behaviour is that it leads us to stick to old ways. Many managers distrust radical innovations, as many bureaucrats distrust deregulation. When faced with problems, managers conditioned to rely on government assistance may actually divert resources from modernizing to lobbying. A key to the success of capitalism is that it has created an environment where at least some people become conditioned to expect and accommodate change.

Cognitive Dissonance

> *Know thyself.*
>
> — Inscription at the Oracle of Delphi, ca 700 b.c.

Psychologists call the tension a person feels between his own life and his concept of a virtuous life "cognitive dissonance," and they believe people strive to minimize it.[10] This is why many rich heirs believe firmly in the genetic basis of intelligence, and why people's readiness to accept propaganda rises during wartime. We want to believe we are right, especially if what we are doing is at all disturbing. Cognitive dissonance disguises our self-interest as altruism, at least in our own eyes. Cognitive dissonance allows us to come up with ingenious and extremely sincere arguments to justify what we advocate, even when what we advocate appears outrightly self-serving. This has deep implications about the attraction of ideology.

> *We regard these elements of economics, and the principles of human nature upon which they are based, to be largely immutable — at least on anything less than a paleological time scale. They are therefore a reasonable basis from which to forecast the future.*

THE STARTING POINT: FADS OR FACTS?

Beware of enterprises that require new clothes.
— Henry David Thoreau (1817–62).

BUSINESS STRATEGY IS LIKE TEENAGERS' CLOTHING. Despite the relative permanence of basic human nature and the basis of value, fashions come and go with dizzying speed, and innovations catch on with little apparent logic or practical purpose. Diversification, down-sizing, re-engineering, total quality management, "just in time" inventory, quality circles and Zen philosophy each have their time in *Business Week* and then are gone. There is remarkably little evidence that any of these pieces of Vedic wisdom improves profits, value or productivity.[11] These mantras, however profound, are unlikely to have lasting effects.

The starting point in any serious attempt to understand businesses' likely response to structural changes in the economy is to distinguish real underlying changes from fads.

We are bombarded with predictions about the onset of a totally new era. It is fun to be radical but the world usually does not co-operate. We find exaggerated the radical predictions about the death of jobs or corporations as we know them, and the coming age of cottage offices connected by fibre optics. Corporations in 2006 will probably not look that different from corporations now. Head offices, physically proximate employees and nine-to-five hours will still be the norm. MBAs will still get jobs and firms will still lobby politicians for political favours. Against this backdrop of similarity, though, there are a few changes that probably matter.

We believe the most important of these to be the increasing importance of innovation. The information age is here. Although computer technology has exponentially increased our capabilities to collect and process information, this is not the most important aspect of the information age.[12] The real change is that corporations everywhere are feverishly competing to be the first to embed new information into production processes, distribution systems[13] and goods. Figure 1 shows that the number of new patents granted each year is rising sharply, and Figure 2 shows how Canadian firms' spending on R&D has grown apace as they struggle to keep up. According to these statistics, the information age is very real. Knowledge about using innovations is relatively scarce and in high demand. This increasing *value of knowledge*, rather than particular innovations such as the Internet, is the reason it makes economic sense to speak of an information age.

Yet corporate performance in the developed countries, as measured by productivity or accounting ratios, has not increased dramatically — presumably because price-cutting competition has intensified too.

This leads us to the second real change: the world economic system in which Canada must function is changing. Socialism is dead, and the world is embracing free markets and liberalism, as it did at the end of the 19th century.

FIGURE 1

U.S. PATENTS: 1790-1993

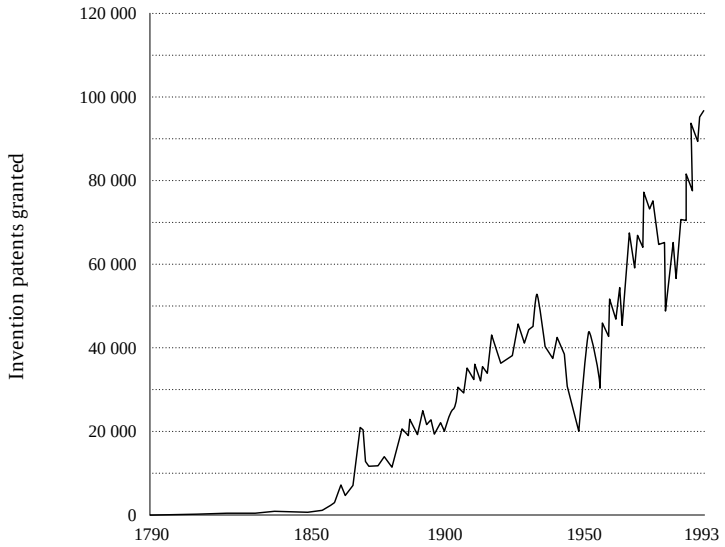
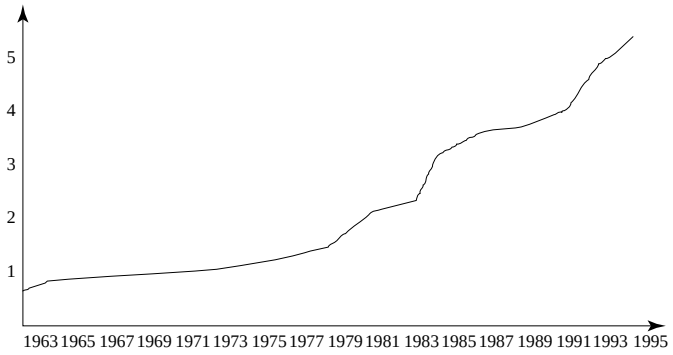


FIGURE 2

CANADIAN CORPORATE R&D SPENDING, 1963-1995
BILLIONS OF 1985 DOLLARS



Source: Statistics Canada, Cat. No. 88-202.

International trade and investment barriers are at their lowest in this century. New economic powers such as China, India, Indonesia and Russia are at various points on entry paths into the world economy. Many corporations are embracing global-scale business competition, though others dread it. Globalization is here, and it certainly will affect Canadian companies and limit the ways Canadian governments can interact with them.

The third real change that we see affecting Canadian corporations during the next 10 years is Canada's changing demographics. An aging population; Asian immigration to British Columbia, Alberta and Ontario; a shrinking pool of young native-born Canadians — these factors are all likely to have real economic impacts.

THE FUTURE CORPORATE WORLD

A general's success is built upon ten thousand corpses.
— Ancient Chinese saying.

TO PROJECT THE FUTURE OF THE CORPORATE WORLD in the context of the changes discussed, we need a framework that captures the essence of corporate behaviour.

What sort of conditioning are corporate managers subjected to? Corporate governance laws and managerial compensation packages are pushing managers to focus harder on increasing share values. Like any other values, these rise when demand outstrips supply. Consequently, managers are being pushed to make their firms' shares more attractive to investors. Since the typical investor is greedy and risk-averse, managers must find ways to increase investors' returns without increasing the risk to which stock ownership exposes them.

How can managers do this? They must find ways to increase corporate profits without taking improper risks. In a competitive economy, making more profits than rival firms is difficult. Competing corporations obtain raw materials, workers and basic financing at similar costs, and sell their products at competitive prices. Competition between them should lead to price cutting until their profits just cover their costs and provide a competitive return to shareholders.[14] Where can a corporate manager squeeze extra profit out of such a situation?

Although Canadian corporations may seek different solutions, we believe their best bet will be to find information-based "edges," some of which can be legally protected by patents, copyrights and trademarks — intangible property rights. Intangible assets are unique knowledge a corporation (or individual) owns that may enable it to meet consumers' wants at a uniquely low cost. By charging a price that is a bit less than the competitive price but still well above its costs, an innovative firm with such assets can steal all its rivals' customers and still make a hefty profit. It can win accolades from shareholders, fatten its managers' pay cheques and flood the public treasury with taxes.

> Prediction: Unique knowledge advantages will become increasingly important in gaining competitive "edges" over rivals.

The flip side of innovation is obsolescence. Obsolete skills have no economic value. In theory, every successful innovation could cause the deaths of many companies without new ideas. The innovator's rivals have now lost all their customers and cannot lower their prices without posting losses. They are doomed to shrink and ultimately fail unless they come up with competing innovations of their own or obtain external funds such as bailouts or legislatively guaranteed markets.

> Prediction: Firms that do not develop unique knowledge advantages will be under increasing economic pressure from competitors, suppliers, customers, creditors and shareholders. Business failures will increase.

Canadian investors, corporate managers and politicians must learn to accept that failure can happen. They must be conditioned to see profit in avoiding failure and imitating success. Only by weeding out corporations with poor governance can good governance come to prevail. This is the way evolution forges our economic institutions. Although it sounds paradoxical, a low business failure rate would actually be disturbing in such an environment. It would suggest that government was intervening to protect poorly governed businesses and thereby slowing the Canadian economy's development of better governance.

An innovative firm with an information-based "edge" cannot rest on its laurels either. If a rival hits upon a different innovation, it may suddenly lose its customers. Shareholder pressure and corporate managers' self-interest should lead to intensified competition to innovate.[15]

> Prediction: Firms that develop profitable innovations will need to invest a large part of their profits in developing further innovations.

This conceptualization of the source of competitive advantage is particularly relevant at the advent of the information age and global-scale economic liberalization. Given the economic importance of informational "edges," innovations in information manipulation are especially lucrative. The demand for information-processing capabilities has remained strong as costs have fallen and supply has expanded. Computerized research has revolutionized fields as diverse as genome mapping and marketing. The multi-year, multi-billion-dollar project to map the human genome is far ahead of schedule as increased information-processing power renders old DNA splicing techniques obsolete. Credit card companies such as American Express can use computers to sort through their customers' purchasing habits, and then target advertising more precisely than was previously possible.

Innovation begets innovation, in an upward spiral that at present appears to have no practical limit.[16] Advances in radio and television manufacturing led to computers. Computer networking and telecommunication capabilities continue to create new approaches to retailing, product design, accounting operations, financial control and banking.

Like Siamese twins, innovation and trade liberalization are inseparable and support each other. Access to foreign markets lets Canadian companies apply innovations to world-scale production. It therefore generates more profits, encouraging further innovation. Also, access to Canadian markets by foreign corporations brings foreign innovations here quickly, forcing Canadian corporations to innovate, obtain bailouts or die. A greater multinational presence

induces domestic companies to increase R&D spending.[17] Domestic companies with successful innovations are doing the equivalent of failing to pick up $20 bills lying on the sidewalk if they do not apply their innovations abroad.

> Prediction: Globalization will beget innovation, and innovation will beget globalization.

This symbiosis between globalization and innovation is the underlying dynamic of our age. The need for large markets to justify the up-front costs of innovation is leading to globalization of technology. The 20th-century technological predominance of the United States is gone, and we believe this to be the most important effect of the basic changes we are discussing.[18]

Of course, not all firms will be successful innovators.

> Prediction: Firms that fail to innovate will be threatened by foreign competitors even in the absence of domestic competitors. They will have a vested interest in opposing trade liberalization.

The Canadian situation is not unique. Non-innovative corporations everywhere will face the same consequences in a global innovation race. Again, cognitive dissonance may lead protectionists to cloak their arguments in pleas for charity on behalf of poor working people, national culture and the like. Of course, proponents of free trade may be equally driven by self-interest and cognitive dissonance. However, we shall argue that the pro-free trade position is more tenable.

Canadian corporations that own valuable innovations will of course view the world quite differently. Entrepreneurs, perhaps especially immigrants, will call for more economic freedom and particularly for free trade. As the population ages and retired baby-boomers become more concerned about cheap goods than about job security, they may be more open than ever to free trade; however, our bet is that corporate managers' lobbying will be harder to resist. Grey power lobbyists will be more likely to demand higher pensions than cheaper imports. If free trade does emerge as a grey power issue, freedom to invest RRSP money abroad is most likely to be the focal point.

> Prediction: Innovative corporations and consumers will benefit from free trade.

We believe the economic pressures pushing innovation are virtually irresistible. Canadian corporations will innovate or die. Consequently, there will be keen competition to hire the sorts of people who can generate innovative ideas. However, employees are free to leave a firm at any time. Accordingly, corporations will be loath to invest heavily in worker training or education

since their competitors might benefit from their investment by hiring their workers away.

> Prediction: Corporations will need highly educated employees but will be reluctant to pay for their education.

AUSTRIAN ECONOMICS: A PRIMER

IN THE PREVIOUS SECTION, we ventured a number of predictions about how corporations' environment will change and how they may respond. Our next task is to consider how these changes will affect other parts of the economy, and how government can deal with them. To do this, we must inflict a few pages of economics on the reader. This is because we strongly believe that government must first adopt a new economic perspective, and that the appropriate perspective supplements traditional economics with the Austrian School.

Standard economics textbooks model a corporation as a "production function." For a given firm *i* the formula is as follows:

$$Q_{it} = F_i\,(K_{it},\, L_{it}\,)$$

Here Q_{it} is the firm's output in year *t*, and K_{it} and L_{it} are the capital and labour it requires to produce Q_{it}[19]. Since an economy's output is the sum of all firms' Q_{it}, the production function approach led economists to assume that economies grow at a rate commensurate with the growth in their capital and labour. In fact they do not. Past data for a Western economy generates a diagram similar to Figure 3. Actual GDP rises much faster than predicted by capital and labour growth rates transformed by production functions.

The view of the corporate world presented in the previous section suggests the answer. It is clear that two variables should be added to the formula:

$$Q_{it} = F_i\,(K_{it},\, L_{it},\, R_{it},\, P_t)$$

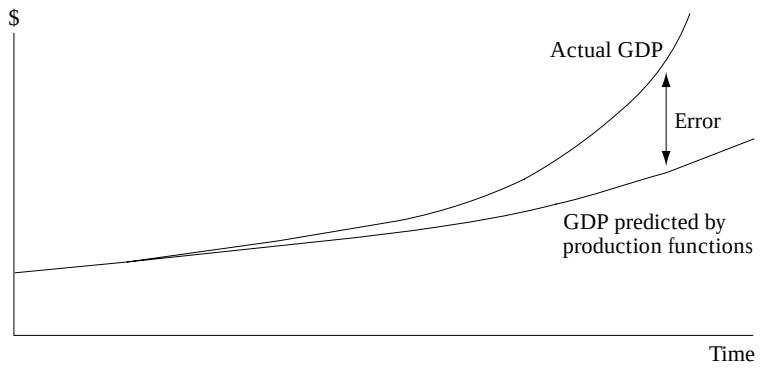
Here R_{it} is the firm's proprietary innovations in period *t*, and P_t is the stockpile of publicly available information. Since today's public information is yesterday's secrets, P_t is the sum of all firms' past innovations.

This representation changes the dynamics of the production function. "Ideas" matter now; they did not in the previous representation. Corporations that develop and implement profitable ideas grow faster than those that do not, even when they have identical capital and labour growth. Capital and labour in firms — and in countries — with ideas, earn more because they are capable of producing more with the same set of capital and labour. Because of this stockpiling of individual ideas into an economy-wide reservoir of knowledge (the attractive term is "spillovers"), both corporate growth and general economy-wide growth measures are higher in economies with such ideas than in economies without them. This is what economists now call *endogenous growth theory*.[20]

The fundamental insight of this approach is that the key to faster economic growth is the "creation" of ideas. That is, governments should aim to foster an environment that rewards the generation and application of useful ideas. An economy that fails to do this will fall further and further behind.

FIGURE 3

GDP AS PREDICTED BY PRODUCTION FUNCTIONS VS. ACTUAL GDP



The real surprise is that academic economists, who are mostly paid to sit around and develop ideas, were so slow to discover their ideas' economic importance. No entrepreneur would find anything at all controversial here. Our economy is built of ideas embodied in concrete and steel. In fact, the economists' profession has been saved by the Austrian School, which thought long and hard about innovations as early as the 1870s, and developed some penetrating insights. The idea of spillovers and the concepts underlying endogenous growth theory are modern representations of these insights. Consequently, a brief tour of Austrian economics is in order to search for other insights that might be applied to our current state.

The basic principles of the Austrian School that speak to the late 20th century are straightforward.

PROSPERITY IS BUILT ON INNOVATIONS MORE THAN ON CHEAP CAPITAL OR CHEAP LABOUR

> *The secret of business is to know something nobody else knows*.
> — Aristotle Onassis (1906–75).

FEW STILL TAKE SERIOUSLY KARL MARX'S IDEA that capitalist economies' successes are based on exploiting labour. Nevertheless, the idea persists that prosperity can be gained by lowering the cost of capital through savings incentives, subsidies to corporations, etc.

The easiest way to see why this idea may be misleading is to look at what corporations decide to do with the capital they obtain, and how corporate financial economists analyse their decisions. A capital investment by a corpo-

ration might involve taking perhaps $100,000 of current profits that could be paid out to investors (e.g. as dividends) and using this money to buy a new machine. The machine produces output that will be sold at a total profit of $14,000 each year for, say, 10 years, after which the machine must be replaced. The corporate financial analyst tries to estimate how much a typical investor would pay for an equivalent 10-year annuity paying $14,000 per year. If the estimated value to the average investor of a return of $14,000 per year for 10 years is $150,000, and the firm can obtain this return on its shareholders' behalf for a $100,000 investment in a new machine, then the machine is a bargain. Acting in the interests of its shareholders, as good corporate governance requires, the firm should undertake the investment. If the value of the annuity had worked out to be less than $100,000, the firm's corporate financial economist would have rejected the investment as financially unviable.

Financial economists call this a "net present value" (NPV) calculation. The machine's net present value is represented as follows:

NPV = market value of the future stream of profits from the machine, minus the machine's cost

The term "net present value" is used because financial economists employ a mathematical technique called a present value calculation to estimate the market value of an investment project's future profits.

In *Das Kapital*, Karl Marx correctly pointed out that in a static competitive economy, net present values (he called them "surplus values") should be zero. Pursuing our example, if many competing firms buy the same machine, they will try to steal customers from each other by cutting the price of the good made with that machine, thereby lowering their profits per unit sold. This can continue until the market value of the stream of future profits falls to $100,000. Marx argued that competition would push all net present values to zero, and that the only way corporations could still continue to prosper would be by cutting workers' pay. This is the famous "exploitation of the masses" that was central to Marx's thoughts.

In fact net present values have not gone to zero, and the flaw in Marx's argument was exposed by the great Austrian economist Joseph Schumpeter in the 1930s. Schumpeter pointed out that a firm with a patent on a machine has no competitors and therefore need not lower the price of the output to keep its customers. Even without a patent, if the machine's way of functioning is unknown to competitors, the firm's profits are secure — at least until its secret leaks out. This is the "information-based intangible capabilities" we referred to in the previous section.

Schumpeter realized that Marx had misunderstood the role of innovation in a capitalist economy. New technologies, new approaches to customers and new ideas in general underlie positive net present values. The machine creates value for its corporate owner because it embodies an innovation — information about how to produce and sell the output, available to no one else.

Proponents of national industrial strategies, government subsidy programs, investment tax breaks and other schemes to provide companies with cheap financing are all falling into the same error as Karl Marx. Subsidized financing (that is, exploitation of savers or taxpayers) is no more the driving force of prosperity than is exploited labour. Indeed, in the midst of global competition, corporate subsidies are beef for foreign consumers and grief for domestic taxpayers.

In the Austrian economist's world, information and its embodiment, innovation, are the true sources of value. This was always so, but in mature capitalist economies it has become so apparent that laymen now speak of the information economy.

The Real Competition in a Capitalist Economy is the Competition to Innovate

> *The reason a lot of people do not recognize opportunity is because it usually goes around wearing coveralls looking like hard work.*
>
> — Thomas Edison (1847–1931).

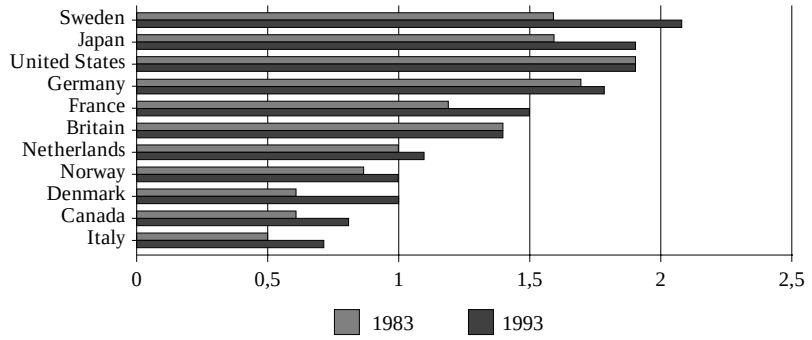
INNOVATION COSTS MONEY. The most obvious expense is that of R&D. Total R&D spending by Canadian businesses rose from $176 million in 1963 to $7 billion in 1995. Total R&D spending by Canadian business, governments, universities and institutions is now close to $12 billion per year. Despite this growth, Canada places poorly among industrialized countries in R&D spending (see Figure 4).

Of course the quality of innovation matters at least as much as the quantity of money spent on it. Nevertheless, the R&D gap could give rise to huge problems since innovation kills those who do not innovate. The first firm to apply new information and develop an innovation can obtain ownership of the information via patent, copyright or trade secret protection laws. This gives it a tremendous economic return, along with a tremendous advantage over its previous competitors. If the innovation is important enough it can change the economic landscape, laying waste whole industries, much as the personal computer all but eliminated the entire mechanical typewriter industry. Joseph Schumpeter called this linkage between innovation and obsolescence "creative destruction." Creative destruction is the primary form of competition in an information economy.

The importance of Austrian economics, and especially of creative destruction, is something of an embarrassment to economic theory, where the point of competition is to push prices to just the right levels so that supply and demand balance perfectly. Innovation, patents and obsolescence are dismissed as side issues.

FIGURE 4

SPENDING AS A PERCENTAGE OF GDP



Source: OECD.

Using standard micro-economic theory, economists have urged governments to nationalize or regulate firms with pricing policies that might not match what competitive economic theory prescribes. Telephone companies, power companies and other utilities had their pricing policies set by public authorities, and they often operated on a "cost plus" basis.

From the viewpoint of Austrian economics, these policies are not only ill advised but pernicious. By locking in profit rates, governments stifled competition to innovate in these industries for decades. Innovations to lower costs make little sense in a cost-plus environment. In a state-owned enterprise, innovation and the consequent disruption of established routine are often unwelcome. This was certainly the case in the socialist countries of the former Eastern Bloc, and Western investors there are still confronted with factories that continue to use whatever technology was in place when socialism was established. Factories in China continue to produce coal-fired steam locomotives in the 1990s. Public ownership and regulation turned these businesses into living museums. In retrospect, it is clear that the Soviet Union's low rate of innovation in all areas except armaments (in that field there was a competitive R&D race with foreign rivals) contributed much more to its demise than did inefficiently set prices.

Although Western state-owned corporations and regulated companies have never been as economically insulated as Chinese engine works, the same problems are evident. Telephones and power turbines changed much less between the 1920s and 1970s than did automobiles, airplanes or music recording.

This is not to say that the way businesses set prices is unimportant. It is, however, a sideshow of diminishing consequence in an information economy. As new information and its use in developing innovations assume greater importance, Austrian economics is likely to continue regaining prominence, and the prescriptive advice of traditional economics is likely to be increasingly questioned.

Capitalism's Success Lies in Bringing Together People With Ideas and People With Money

> *Branch banking … will mean, I suggest in all humility, the beginning of the end of the capitalist system.*
>
> — John Flynn, *The Dangers of Branch Banking*, 1933.

Despite the dire predictions, U.S. states that introduce interstate branch banking show subsequent statistically significant per-capita income rises relative to other states, and this phenomenon appears to be because loans are made of better quality rather than in greater volume.[21] In Third World countries, a more sophisticated financial system is known to lead to higher growth.[22] Why?

People with money often have few good ideas about how to spend it, and people with good ideas often have little money to implement them. In business terminology, wealthy people often lack good business ideas and entrepreneurs often start out poor.

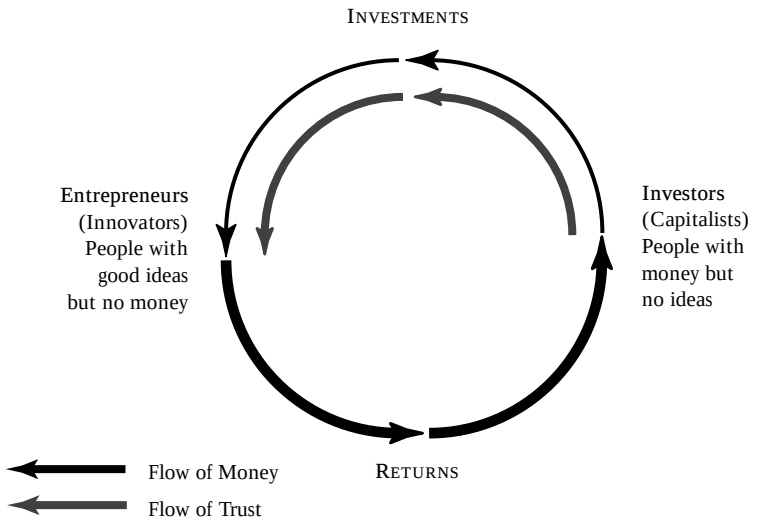
The crowning achievement of modern capitalist economies is that they create an environment where wealthy individuals freely give money to entrepreneurs with no guaranteed return, and where successful entrepreneurs actually pay financiers back. To someone from any pre-capitalist economy, and to visitors from many modern post-socialist or Third World economies, this situation seems not only remarkable but incredible. Why do corporate insiders not simply abscond with the money?

The answer is that capitalism has fostered a previously unheard-of level of trust. This is surprising to most economists, who regard things such as ethics and trust to be the fodder of "softer" disciplines. Yet trust and ethics underlie the most basic functions of capitalism.

In pre-industrial economies, one did not trust strangers. Trust was extended only to family members and long-time acquaintances. Businesses were limited in size by the funds an entrepreneur's relatives or close friends could supply. Most economic activity was undertaken by family businesses, and financial dealings with an outsider were acceptable only after a long-term relationship was established. Business gurus of late have emphasized the importance of relationships in business dealings in Asia and elsewhere, presenting these customs as cultural differences. In fact, they are historical differences. Relationships were central to business dealings in the West until modern times.

FIGURE 5

THE FLOW OF MONEY AND TRUST IN A CAPITALIST ECONOMY.
INVESTORS GIVE ENTREPRENEURS MONEY AND TRUST;
ENTREPRENEURS LATER GIVE INVESTORS MORE MONEY IN RETURN



In modern capitalist countries, trust does not come about because of higher morality. It comes from a credible and reasonably efficient legal and political system, and especially from securities law, bankruptcy law, contract law and fiduciary liabilities. These and other parts of our legal system have developed for the explicit purpose of forcing strangers to be trustworthy. The laws give investors recourse against fraudsters, and this makes investors more willing to entrust their savings to people they do not know well. The result is that capital becomes available to legitimate entrepreneurs. In short, capitalist economies are set up so that people's self-interest will lead them to act honourably (to avoid punishment), and so that they become conditioned to act in this way. Figure 5 illustrates the central role of trust in the most basic metabolic process of a capitalist economy.

The vitality of the flow of trust and money is a primary measure of the health of a capitalist economy. Trustworthy corporations, financial markets and financial institutions, including branch banking, appear to improve capitalism's circulation. This is why good corporate governance has moved to the top of many regulatory agendas.

THE COST OF CONTINUOUS INNOVATION IS INSTABILITY

> *Every act of creation is first of all an act of destruction*.
> — Pablo Picasso (1881–1973).

JOSEPH SCHUMPETER CALLED "CREATIVE DESTRUCTION" the innovative cycle that underlies the prosperity of capitalist economies because the economic destruction triggered by innovations is as important and essential as the creativity that goes into them. Creative firms maintain or increase their profits, stagnant firms' profits fall and corporate survival of the fittest unfolds as it should.

A high rate of innovation logically requires a high rate of obsolescence of equipment, companies, industries and training. In economists' jargon, "depreciation rates rise in response to innovations." This means machines must be junked before they wear out, companies can fail despite responsible management, and industries can falter despite healthy competition. Most disturbingly, people's investments in skills, careers and education can be wiped out virtually overnight.

This is a potential opportunity for government in the coming decade. Can people's lives be made more secure without destroying the engine of creative destruction? Yes, but it must be done carefully, and we return to this issue in more detail later. Ill-informed public policy here could kill the genetically engineered goose that lays the silicon eggs.

GOVERNMENT'S FREEDOM OF ACTION IS LIMITED IN A GLOBAL AUSTRIAN ECONOMY

> *There will not be any violations to speak of*.
> — Col. Daniel Porter, Supervising revenue agent in charge of enforcing prohibition, 1920.

GOVERNMENT POLICIES THAT DO NOT ACCEPT the reality of human nature and economic laws cannot prevail. In a global economy where the reach of national governments is limited, there is great profit in helping people evade their government's grasp — as the Bronfmans, the Kennedys, and others showed during the 1920s.

We believe the world economy is becoming a global Austrian economy. Firms compete with rivals around the world to innovate, and nations compete to host the most innovative firms. Governments of rich countries increasingly see high-technology industries as a way to maintain their people's standards of living in a world where unskilled labour is very cheap. Switzerland is a centre of pharmaceuticals research, Holland of electronics, and governments everywhere strive to find a high-tech niche.

However, the same Austrian perspective of economics that points to innovation as the engine of growth also declares that governments have very limited freedom to influence such matters. The Austrian perspective on public-sector economics has led to a number of insights, among them "public choice theory," which stresses lobbyists' influence and the dynamics of politicians' and bureaucrats' self-interest. In a nutshell, the idea is that politicians, bureaucrats and lobbyists all have the same human nature as everyone else, and that government should be designed with this in mind. For the present purpose, we need only a few basic essentials for government in an Austrian economy.

Basic Principles of Public Policy in an Austrian Economy

1. Government policies should assume that politicians, bureaucrats and people in general have the same human nature. They are self-interested social beings.

2. Governments feel pressure to find ways of encouraging innovation. R&D subsidies (or less politically vulnerable substitutes) will be increasingly popular but are probably not desirable.

3. Policies to correct "non-competitive prices" should be resisted. Setting prices at regulatory hearings creates no incentive for regulated firms to innovate. Lower costs would simply reduce their base for cost-plus pricing or lead to lower set rates in the future.

4. All potential government policies must be evaluated according to how they affect incentives for innovation.

5. Corporate governance laws and practices, which set the level of trust in financial markets, are important.

6. A higher innovation rate necessarily implies a higher obsolescence rate. This creates economic instability, which has real economic costs.

7. In a global economy, a small country such as Canada cannot have innovation policies differing substantially from those of its trading partners.

The most important of these points is probably the first. Politicians and bureaucrats are self-interested social animals like the rest of us. They want to accumulate wealth and understand the need to trade favours. Politicians need funding during elections and at other times. One way they can ensure that they get what they need is by giving large amounts of public funds to likely backers,

or by passing favourable legislation that will generate large profits for probable supporters. These then recycle the money as private election campaign contributions, etc.

Economists call the private individuals who twist public policy in this way "political rent seekers" and their profits "political rents."[23] There is overwhelming empirical evidence that rent seeking occurs on a scale that has macro-economic implications. Rent seeking is known to distort trade policy, public pension fund management and virtually every other aspect of public-sector management. A dedicated and independent public service, generally honest politicians and a free press may limit the scope of rent seeking in Canada but they do not eliminate it.

Political rent seeking is most damaging when corporate managers become conditioned to expect bailouts. Their conditioning may then lead them to respond to competitive pressure by lobbying harder rather than by innovating more.

Information as a Good With a Price

Can governments encourage or discourage innovation? Innovations are information cast in steel and plastic. To understand the economics governing innovation, it is necessary to understand the economics of information.

The value of information, and of the innovations that derive from it, cannot be determined from the same economics that governs the value of ordinary goods. This is because of two special characteristics of information.

Information Is Hard to Trade

> *A thing worth having is a thing worth cheating for.*
> — W. C. Fields (1879–1946).

"I have a wonderful marketing idea that would be worth millions to your firm, and I'll sell it to you for only $1 million!" says the idea man. "Let's hear the idea first," says the CEO. "OK, you just have to...." says the idea man. "Brilliant!" enthuses the CEO. "So how about my million dollars?" presses the idea man. "Oh," says the CEO, "By chance I thought of the very same idea myself — amazing how simultaneous discoveries are happening all the time these days, eh?"

A buyer cannot look over a piece of information before buying it, the way she can look over a used car or an electronic appliance. She cannot assess the value of a piece of information without acquiring it. But once the buyer has the information, the seller has lost possession of it and has no legal right to repayment under many circumstances. Information weighs nothing, has minimal transportation costs and therefore is very difficult to keep in one place. All this makes it very difficult to buy or sell. This "market failure" removes trading of information, or information gelled into innovations, from the normal framework that governs other economic transactions.

Patent and copyright laws make some sorts of information alienable under some circumstances, but they are by no means a solution. First, patent and copyright infringement in many parts of the developing world, especially in China, fuels rapid economic growth. It is highly unlikely that these countries will enforce international patent or copyright conventions except occasionally, when they need to influence the United States or other Western countries. Second, reverse engineering lets rivals dissect innovations and contrive alternative constructions that circumvent patents. And finally, many types of innovation (for example the idea man's marketing plan) can be neither patented nor copyrighted.

Firms often devise clever ways to sidestep this market failure. For example, Coca-Cola keeps the formula for its product a heavily guarded secret, while Microsoft is increasingly including its innovation, software, as part of a package

deal with a more tangible asset, a computer. Marketing and secrecy strategies can mitigate but not cure the problem.

Information Has Many of the Properties of a Public Good

> *The wonderful thing about software is that you only need to buy it once, then you can copy it as much as you want.*
>
> — Russian "biznessman," private conversation, 1995.

Students in introductory economics courses are taught about private and public goods. Private goods, such as apples and pizzas, can be consumed only once. Also, private goods cannot be consumed on the sly: if you eat a piece of pizza, the evidence of your deed is there for all to see in the form of a wedge-shaped gap in the cheese-covered round. The process of consuming private goods destroys them.

Consumption does not destroy public goods and so they can be consumed over and over by different people. They can also be consumed without leaving any evidence. My use of a public library does not prevent you from using it, nor does it change the library enough that you could tell whether I had ever used it or not. Other public goods, such as street lighting, roads and parks, work in the same way.[24]

Public goods provision is usually most efficient when it is for a large number of users. A small city cannot afford as big a library as can a large urban centre. The small city has fewer users to share the cost. Economists call this "increasing returns to scale." The more people who consume the public good, the greater its value to the economy.

Information is usually a public good. If I get a piece of information, that does not destroy it. The blueprints are still there to be copied by someone else.

Since information is a public good, it must have increasing returns to scale too. A piece of information useful to many people is of more social value than a piece of information useful to only a few. An innovation that improves the efficiency of every steel mill in North America is of more value than one that improves the efficiency of only a few mills by the same amount.

The Economics of Information and Innovation

> *A foolish consistency is the hobgoblin of little minds, adored by little statesmen and philosophers and divines.*
>
> — Ralph Waldo Emerson, 1841.

The economics of information is a set of contradictions. Since information is a public good, as many people as possible should be using it. But information is hard to buy and sell, and so innovators want to keep it secret.

The purpose of patent laws, copyright laws and other intellectual property rights is to convert information from a public good (its natural form) into a private good. Intellectual property rights restrict the use of a piece of information to its legal owner. The owner can then sell or grant access to the information, and the law backs up his authority and claim to payment. Here is the policy dilemma in a nutshell: s*tringent intellectual property rights increase innovators' returns but reduce the innovation's use; weak intellectual property rights reduce innovators' returns but increase the innovation's use*.

Strong protection of intellectual property rights means large and secure profits for innovators, and the laws of economics imply that the result should be more innovations. Obviously, this is only true up to a point. If innovations are too well protected, successful innovators will have less incentive to invest in further innovations.

One way to transcend this contradiction is to have really large firms. This is the logic underlying the refrain that Canadian firms must be large to compete in the global economy. Large firms can apply innovations quickly to large-scale operations. They also typically can use profits from previous investments to finance new investments in R&D. Finally, they have more resources to protect their intellectual property rights in court.

Despite this logically pleasing solution, many researchers feel that large bureaucratic firms are poor human environments for innovators. This is in part because large firms' hierarchical management and emphasis on routine both discourage innovation, just as central planning did in command economies. Innovation is an individualistic undertaking and fits poorly into corporate organizational diagrams. One prominent CEO has likened the task of managing researchers to herding cats. In contrast, the more flexible and informal environments of smaller firms may be more conducive to ideas. Also, although large firms may be in better positions to retain intellectual property rights, the innovators that work within them may not be. An employee whose reward for devising an innovation is a 2-per-cent bonus has less incentive to be creative than an entrepreneur who retains full ownership of the innovation. There are, therefore, good theoretical reasons not to rely on larger corporations as radical innovators.

Public Policy in an Information Economy

We have outlined some changes that we expect in the corporate environment, and have imposed upon the reader a few pages of Austrian economics and a discussion of the unique economic properties of information. We are now ready to examine some popular public policy prescriptions and, hopefully, to separate the penicillin from the snake oil.

Financing Initiatives From Small Firms

> *If you're small, you've got to be good!*
> — Billie Jean King (1943–).

One perennial public policy proposal is that governments should subsidize small businesses to foster innovation. The previous section showed how large and small firms both have advantages and disadvantages as focal points for innovation. We are skeptical because of public policy basics point 1: human nature.

Managers of small corporations often argue that small businesses have trouble obtaining financing in Canada. The reason private-sector financing is expensive for small innovative firms is because investors often cannot distinguish good innovators from poor ones, or even honest innovators from frauds. This sort of financing exposes investors' money to high risks. Since investors are risk-averse, high-risk projects must promise them very high returns to be attractive. For example suppose 9 out of every 10 high-tech firms fail and thus generate no returns. For the average return on all 10 projects to be a modest 15 percent, the sole successful project must generate a return of 150 percent. Initially, a venture capital fund would require a projected 150 percent return on all the projects it finances, but it would expect to realize a return of only 15 percent after 90 percent of its ventures fail. This leads to perceptions by businesses of an overly restrictive financing policy.

The basic problem is an information gap, and consequently a low level of trust and high perceived risk. Investors cannot tell good innovators from poor ones, or even honest innovators from crooks. We see no innate advantage governments have that would let them succeed where private investors such as banks, venture capital funds and the like fail.

Nutty inventors and scam artists aside, the vast majority of small firms produce no viable innovations and so general subsidies for small firms are unwarranted. Taxing individuals and large employers to subsidize shopkeepers, restaurant owners and other typical small business owners does little to foster important innovations on a macro-economic scale. Since such a policy would also attract fraud and subsidize useless innovations, it would appear economically inadvisable. It may be appealing to politicians anxious to attract the support of small business people, but it serves no higher purpose.

Instead, the best way for the government to help small firms with genuinely valuable innovations grow rapidly is by fostering more competitive, efficient and innovative financial institutions and markets. In an Austrian economy, we saw that the finance business is especially important because it brings together people with money and people with ideas.

Among the ways of doing this is establishing credible, well-enforced securities laws, meaningful disclosure rules and sound corporate governance laws for small as well as large firms. Since small firms are often financed with loans, protecting creditors' rights is a crucial component of good corporate governance legislation in this context.

But competition is perhaps more important. Private venture capital funds are a huge business in the United States but not in Canada. Our financial institutions see no reason to expand into such a risky area when profits from captive investors are there to be gleaned. Canadian mutual funds can charge higher management fees than U.S. funds and impose more onerous load restrictions yet still prosper. To many, Canada's banks are a paragon of cosy corporate safety — too big to fail and exploiting the fact to the utmost. Allowing Canadians to invest their savings and pension fund wealth abroad with no tax or other penalty would perhaps bring some needed life to Canadian financial markets, and make both Canadian investors and small Canadian corporations better off. The cost of a lazy financial sector is simply too high for the current situation to continue.

> Prediction: Business groups will lobby for subsidies to small firms. Government should resist. If viable small firms cannot raise funds, the real issue is that banking and finance industries need more competition.

INDUSTRIAL R&D POLICY

> *The income tax returns would indicate that there is untold wealth in Canada*.
> — Bob Edwards (ed.), *The Calgary Eye Opener,* 1920.

IF SMALL FIRMS ARE NOT A SPECIAL CASE, should government not subsidize all corporate R&D? Again, governments' options for supporting R&D are limited, first by the growing unwillingness of Canadians to pay high taxes and second by increasing global integration. The first effect is fairly straightforward. Industrial policy generally means taxing consumers, investors and some firms to subsidize other firms. Taxing individuals more heavily is politically unattractive, and so industrial policies must tax business. In a global economy, business can move to where taxes are lower. The move can be direct, with a company relocating to a friendlier fiscal regime; or it can be indirect, with a Canadian company losing business to foreign firms having lower tax costs. Globalization restricts governments' ability to undertake such policies.

In the information age, governments are no longer monopolies that can move supply and demand curves back and forth to adjust the economy. Governments are in a competitive business to provide the best assortment of public goods for the lowest taxes. It should be emphasized that competitive government does not mean small government, any more than competitive auto making means small autos. Arkansas has lower taxes and fewer public services than Minnesota, yet Minnesota firms are not rushing to relocate to Little Rock. Presumably, the better services in Minnesota are worth the taxes.

Is an industrial policy worth higher taxes? The evidence is unambiguously negative. Industrial policies in every country, including Japan, have been largely ineffective and have invited corruption.[25] The corporations that participated often became very innovative only at extracting government funds.

In fact, some economists argue that innovation in extracting money from government can actually crowd out real innovation.[26] Innovators understandably go where the profit is. If coming up with a new proposal to get a government subsidy is more lucrative than building a new plant, the entrepreneur will hustle for the subsidy and forget the plant.

Several subtler arguments for a government role in fostering R&D are based on various facets of economic theory. The firmest of these, which have long been part of mainstream economics, propose a key role for public education in training the skilled technical workers and researchers that a knowledge-based economy needs. Firms are unlikely to train workers when they are not sure the workers will remain with them. No one from Firm A wants to explain that the path-breaking innovation of its rival, Firm B, is due to the superb training that Firm A gave a former employee. However, the theoretical arguments justify subsidizing schools, colleges and universities, or giving students tuition vouchers. They are not arguments for subsidies to firms conducting R&D.

Another set of theoretical arguments highlights the distinction between basic research and research with apparent commercial applications. Basic research is often a necessary foundation for later applied work. However, *the financial returns from basic research are usually scant*. This is an argument for subsidies to university research and research institutes. It is, again, not an argument for subsidies to businesses. This is because it is usually in the public interest to have the results of basic research published as widely as possible. Its societal value is lessened when basic research is the property of one firm only.

Yet another set of theoretical arguments assumes that shareholders have short time horizons, thereby limiting a firm's ability to undertake long-term investments such as R&D. Empirical studies using U.S. firm-level data find that shareholders value long-term investments positively.[27] Press announcements of increased R&D spending by firms are associated with stock price increases.[28] It should be noted that such studies use only R&D announcements made on days when press reports contain no other new information about the firm, such as Defense Department subsidies, changes in marketing strategy, etc. Other U.S. studies show that a corporate history of R&D spending is closely correlated to

high *q* ratios (roughly, market-to-book ratios).[29] This is true both in industries that receive Defense Department subsidies and in industries that do not. In short, shareholders in the United States like R&D spending and would like to see more of it. Thus, theoretical economic models positing a role for government on the basis of a short-term bias in financial markets are on rather shaky empirical ground. At best, one can argue that patent law limits the viability of long-term R&D investments by ending firms' property rights over innovations after 20 years (the patent life specified as an international standard under the WTO). R&D that would not lead to financial gain within that time is understandably unattractive to individual firms, and thus might require government support.

Another set of arguments is based less on economic theory than on interpretations of the culture of Japan and related countries; it calls for government to orchestrate economic growth through an "industrial policy." In the Western world, governments are notoriously poor at picking winners. Even Japan, which once had a unique reputation for close co-operation between industry and government, is sullied by closer inspection of the hard facts. In the first-ever econometric study of the details of Japan's industrial policy, Beason and Weinstein (1995) examine the Japanese government's subsidy decisions in detail; they conclude that most subsidies went to losers, and that the performance of subsidy recipients actually declined after they received subsidies.[30] The reputation Japan enjoyed for running an effective industrial policy was due to selective information release for political reasons by the Japanese government, and to the gullibility of some Western academics. Theoretical economic models calling for government strategic planning are also on slippery empirical footing.

Other economic theories propose a role for clusters of R&D firms. The intuition underlying these theories is that a concentration of skilled experts is needed for high-tech firms to be viable. R&D ventures are risky, and moving home and family long distances to other jobs is costly for all concerned. Skilled R&D workers are attracted to clusters of similar firms because the failure of one employer is less catastrophic when other potential employers are nearby. New firms are attracted to clusters because it is easier to hire skilled workers there. People who live close to each other talk, share ideas and inspire each other. Economists call this positive feedback loop of economic growth a "spillover" effect. There is some empirical evidence that such effects are real and economically important, at least at some times for some industries.[31]

Last, we should not dismiss out of hand the argument that, since everyone else is doing it, we have to also. Despite the highly tenuous nature of arguments for government subsidies to corporate R&D, such subsidies are ubiquitous. If Canada is to attract and retain innovative businesses, we have to treat R&D-intensive firms as well as competing jurisdictions do. Although a good education system, good infrastructure, and a sound fiscal and monetary policy go some distance in this regard, some sort of R&D subsidy program might be necessary as well. However, a better approach would be to try to get such subsidy programs banned totally under international trade conventions. Unfortunately,

international agreements of this sort are unlikely to materialize in the near future. Indeed, even the most recent Uruguay Round of GATT agreements still allow subsidies for "economic development," under which heading governments can easily hide various forms of R&D subsidies.

From an Austrian economics perspective, it is not improbable that R&D subsidies are on many political agendas because corporate managers and politicians regard them as a politically acceptable opportunity to trade favours with each other. The politician can arrange an R&D subsidy now, and the corporation can make a smaller (but much-needed) campaign contribution later. Although it sounds jaded to the layperson, this sort of argument is quite credible among public finance economists.[32] Of course, stories about myopic shareholders, innovative small firms and so on do much to ease everyone's cognitive dissonance.

Another possibility is that R&D subsidies become "beggar thy neighbour" policies, where different political jurisdictions try to steal each others' R&D-related firms. Attracting many high-tech firms certainly adds to a politician's glory, but if these are not "new" high-tech firms the taxpayer's sacrifice has no value for the global economy as a whole. If other jurisdictions counter with even more tempting subsidies and lure the high-tech firms to relocate again, there is not even a local benefit. It is clearly not in Canada's interests to promote such a competition. We could not win. Our taxpayers are less docile than those of European countries, and our tax base is much smaller than those of our chief trading partners.

> Prediction: Lobbying by corporations and corporate interest groups for direct government R&D subsidies will intensify over the next decade. Governments should resist this pressure, except in the following cases:
>
> 1. Government can foster innovation by subsidizing education and training, something corporations are understandably reluctant to do so since employees who benefit may subsequently leave the firm. The funds should be paid to individuals, not corporations or educational institutions. Government should press educational institutions to improve their governance.
> 2. Policies to foster "clusters" may be defensible. Again, the emphasis should be on subsidizing training and education in specific areas for individuals, not on providing subsidies to corporations.
> 3. Government funding of basic research is also defensible. In a tighter fiscal environment, it may make sense to scrutinize current granting procedures to find more accurate and cost-effective ways of allocating government support than the procedures now in use.

PUBLIC-SECTOR R&D POLICY

Money is the mother's milk of politics.
— Tip O'Neill, former Speaker, U.S. House of Representatives.

SINCE INFORMATION AND INNOVATIONS HAVE PUBLIC GOOD PROPERTIES, should they not be produced using public money? Why can't the state finance research and then license innovations to Canadian corporations for minimal fees?

The first problem with this approach is that it severs innovation from market signals that encourage innovation where it is needed and discourage it elsewhere. Free markets are surprisingly effective information-processing devices. Traditional economics emphasizes markets' roles in adjusting supply and demand to efficient levels.

However, Austrian economics suggests that market prices' more important information-processing role is directing innovation. If copper is rare but in demand, the resulting high price makes valuable an innovation in refining lower-grade ores and innovative substitutes for copper. Privately financed innovation seeks out valuable niches and therefore works to satisfy public needs. State-financed research could turn up an innovation in copper-refining, or an innovation that increases demand for copper — or neither.

The second problem is that researchers, politicians and bureaucrats are self-interested social animals like the rest of us. State-sponsored applied R&D can be a political slush fund par excellence. The information gap that makes good innovators hard to distinguish from poor ones and frustrates private-sector R&D financing now becomes an advantage, at least to the insiders. Politicians can direct funds toward supporters, and who is to say they are not potentially good innovators too? In short, there is too much scope for rent seeking in a large-scale industrial policy.

One of government's greatest successes in the 20th century is universal public education. This role for government is not seriously questioned, even by the most ardent free marketers. We believe educational reform in the coming years will have to deal explicitly with the problem of entrenched vested interests and rent seeking in the public education establishment. De facto voucher programs have been implemented successfully in Edmonton and other cities, and appear to counter such problems nicely. Perhaps voucher programs should be used more widely in public and parochial schools, and perhaps similar programs should be considered for advanced education.

Prediction: New government programs will increasingly be assessed for their rent-seeking vulnerability.

1. Government financing for education, training and basic research will continue, but pressure will grow to limit rent seeking by entrenched vested interests.

2. Large-scale government funding of applied R&D will be too prone to rent seeking to gain the favour of honest politicians, and too conspicuous to gain support from corrupt politicians.

There may be ethically defensible reasons for government to seek a wider use of new technology than market forces allow. For instance, there may be a social benefit to making generic copies of patented drugs available. An alternative use of government funds toward this end might be to buy patents from innovators at a market price and then make the technology freely available. This approach rewards the innovator while allowing widespread use of the technology. It creates some scope for patronage through patent purchases at inflated prices, but it is more transparent than standard subsidy programs and therefore less open to abuse.

Fiscal Policy

> *The production of too many useful things results in too many useless people*.
> — Karl Marx, *Economic and Philosophic Manuscripts*, 1844.

Traditional economics presents fiscal policy in an equality-versus-efficiency trade-off. Taxes distort prices and therefore the allocation of goods, but if the government redistributes the money, equality is enhanced through social assistance programs. Tax policy and government spending must reflect the voters' preferences in this trade-off.[33]

In an Austrian economy, this view misses the point entirely. The trade-off is not between efficiency and equality but between innovation and stability. High incomes go to innovators; those with low incomes are the obsolete, the losers in the process of creative destruction. Equality supported by high and progressive taxes is essentially partial expropriation of innovators' returns (i.e., of their intellectual property) to compensate those whose skills or other investments have been made obsolete by innovation.[34] This is an indirect way of weakening intellectual property rights.

As macro-economists have learned, fiscal policy is not really a purely discretionary variable. Government spending and tax rates are often political racquet balls. Proportionally, Canada had a larger postwar baby boom than any other industrialized country.[35] As Canada's baby boomers age, there may be repercussions. In their teens and twenties, when baby boomers were in low tax brackets or untaxed niches of the economy, such as entry-level work or university studies, they tended to have leftist views. When they began paying taxes, their views shifted rightward. Cognitive dissonance may cause the baby boomers to rediscover the values of the 1960s when they are close to retirement, and it is in their economic self-interest to do so. This shift could precipitate a period of higher taxes and higher spending, which might compromise Canadian firms' ability to innovate at a globally competitive rate.

Prediction: The political left will espouse high income taxes and public employment or support for those made obsolete by innovation. The approach may cause leftists some consternation as they will be arguing for greater stability.

1. A small country will not be able to set a "socially optimal innovation rate" as a matter of public policy, any more than it can set traditional macro-economic variables such as interest rates. If Canada's economy is to be competitive in general, its innovation rate must be competitive with that of other countries.
2. If high income taxes push innovators out of Canada and/or lower the country's innovation rate by reducing the returns to innovators, there could be heavy costs to bear in the longer term.

The more Canada can resist the temptation to punish winners and reward losers, the faster it will grow. If income redistribution is important politically, some way should be found to excuse innovators. Perhaps more reliance on consumption taxes, wealth taxes or inheritance taxes should be considered. These taxes may also have negative effects but they are less directly targeted at innovators than is a steeply progressive income tax. At the very least, these options deserve more serious study.[36]

Conservative rightists and leftists may be uncomfortable bedfellows in arguing for high income taxes. Yet old-money conservatives see high income taxes, both personal and corporate, as ways to lock in their positions. (They vigorously oppose wealth and inheritance taxes, however.) Lowering the innovation rate is a way for them to maintain the value of their assets, as well as their social and political positions.

The full implications of fiscal policy issues in an Austrian economy are beyond the scope of this paper. Our intention here is merely to show that the issues must be approached from a fresh perspective in the information age.

MONETARY POLICY

The best way to destroy the capitalist system is to debauch the currency.
— John Maynard Keynes, *Essays in Persuasion*, 1931.

NOWADAYS IN THE ADVANCED INDUSTRIAL ECONOMIES, the purpose of monetary policy is to avoid inflation. Before 1979, monetary policy was a way of avoiding deficits. When governments spent more than they took in, they simply printed enough money to make up the difference. Keynesian macro-economists called this an "accommodative" monetary policy. The result was, unsurprisingly, inflation. When public concerns about inflation became politically important, accommodative monetary policy was replaced by the current approach, and the age of deficits began.

Might accommodative monetary policy and inflation return? Many politicians chaff at excessive fiscal discipline and also believe the public's memory to be short. There will be calls for accommodative monetary policies and there will certainly be calls for generally looser monetary policies.

A higher business failure rate is a necessary by-product of a higher innovation rate. Business failures may be misinterpreted or misrepresented as indicating weakened aggregate demand. Corporate failure in the context of an Austrian economy is indeed a reflection of weakened demand, but only for the products of firms that have failed to innovate enough. Monetary stimulation will not solve the problem.

Indeed, inflationary monetary policy may actually worsen it. When corporations evaluate new capital expenditures (such as building new factories), they forecast the prices of their inputs and outputs over the expected lifetime of the new assets. High inflation makes this difficult to do. Inflation is theoretically a uniform increase in all prices and wages, but in practice it is nothing of the kind. Some prices and wages rise quickly while others fall behind, only to overtake the first batch a few years later. The instability in relative prices, along with tax distortions created by inflation, makes predicting prices hard.

Good corporate governance means that corporations must act on behalf of their shareholders. Shareholders are happy to add high-risk investments to their portfolios if they get high returns. However, inflation increases the risk of corporate investments but does little to change the real returns.[37] All told, capital expenditures are riskier and no more lucrative in high- inflation economies. This is why corporate investment declines in periods of high inflation. Such a situation would only further compromise Canada's competitive position.

> Prediction: Political support for a low inflation policy will remain strong. Consumers fear inflation. Baby boomers, within sight of retirement, are heavily investing in the stock market. High inflation is correlated with stock price declines, and so it would risk their wrath at the polls. Innovators and innovative firms dislike inflation because it makes forecasting harder. The returns from future use of an innovation become more uncertain, and thus corporations are less willing to invest in innovations. Governments face pressure to lower taxes and increase spending, and thus to incur budget deficits; accordingly, they will see increasing appeal in the idea of monetizing those deficits with a bout of inflation. Any future bout of inflation would have to be large enough to erode the value of government debts substantially, but quick enough to be over early in a government's term of office. Given the Bank of Canada's structure, such a situation would seem unlikely.

Again, monetary policy is not normally thought of in terms of its effect on innovations. We do not claim that our interpretation is the final word; we merely point out the need to think harder about the link.

TRADE POLICY

> *It was floated through on champagne!*
> — Taunt by protectionists against reciprocity, 1854.

MANY CANADIANS SEEM UNCOMFORTABLE with the idea of free trade. We speculate that this is because Canadians, especially those who style themselves progressives, are actually deeply conservative: they dislike change and the instability it brings. The basic link between trade and innovation (discussed earlier in this paper) may partly explain why free trade is so contentious an issue. Free trade favours innovation and protectionism favours stability. Nationalism remains foreign to most Canadians. We suggest that nationalism is not the real issue in free trade debates. Instead it is a handy peg on which defenders of vested interests hang their cognitive dissonance, fooling a few deluded souls.

This is unfortunate because it obscures a deep and important question. What is the proper trade-off between innovation and stability? Is there an "optimal" amount of protection? These are difficult and (thus far) little-studied problems, yet they are important. Despite economists' limited grasp of the issues, the United States made international co-operation in enforcing intellectual property rights a key part of the recent WTO agreement.

> Prediction: Most corporate lobbying on trade issues will be by non-innovative firms seeking protection. Lobbying politicians will be the highest-return investment open to them. Innovative firms will have better uses for their money, such as R&D and capital plant expansions.

SOCIAL POLICY

> *So here is the Great Society. It's the time — and it's going to be soon — when nobody in this country is poor.*
> — Lyndon B. Johnson, 1965.

OVER THE YEARS, GOVERNMENTS HAVE ACQUIRED HUMILITY. However, there are clearly social policy problems in an information economy. The flip side of a high innovation rate is a high obsolescence rate. Workers at non-innovative firms will be hurt by their managers' failures when their corporations sink. We argued earlier that bailing out such corporations is dangerous because it reduces

the return to innovation by preventing innovators from gaining market share[38]; it also may condition managers to expect bailouts.

It is critically important that government bail out neither corporations nor their managers. Social policy should properly focus on the individual workers affected. If the most cost-effective way to assist them is to keep their employer afloat, this should be done as part of a bankruptcy procedure. The managers and shareholders of the company should be removed from the picture, and the creditors should take over. If liquidating the business is more attractive to creditors but the government wants the business to remain operating, it should require the creditors to sell the business as a going concern and then compensate them for the losses thereby created.

> Prediction: Innovations will put people out of work. Workers will find that skills they have invested heavily in developing have suddenly lost their economic value. Calls for government action to compensate them may be ethically irresistible. Compensation should be to workers, not corporations or their top managers.

The links between social policy and innovation are clearly important and merit much more study than they have received. We believe social policy in coming years will increasingly become an inseparable companion of innovation.

CANADIAN CORPORATIONS IN THE GLOBAL INFORMATION ECONOMY

SNAKE OIL

Cures Palsies, Cramps, Constipation and Baldness
— Advertisement for Carlton's & Fs.' Miracle Tonic, 1895.

MANY CORPORATE MANAGERS ARE DANGEROUSLY DEPENDENT on routine. They have been conditioned to believe that management techniques they have relied on in the past are optimal, and have given little thought to why those techniques worked and what might happen under different circumstances. Firms run by such managers will face severe pressure. The managers may understandably panic and seek quick fixes.

> Prediction: Desperate managers of non-innovative Canadian corporations will invest millions in implementing the untested ideas of management gurus in hopes of miracle cures.

CORPORATE CULTURE

Without freedom, no art.
— Albert Camus, interview in *Demain*, February 21, 1957.

THE LAWS OF ECONOMICS, based on the principles of human behaviour listed in the first part of this paper, are quite clear about how to fix an ailing corporation: develop a way of producing something consumers want at a lower cost than any other firm! But doing this is difficult and requires money; it also may require hierarchical changes in the way the firm is run; and so it is politically unpopular within many corporations. As we said, this is a good decade for the gurus.

The only really reliable corporate advantage in an information economy is the ability to collect, process and digest information continuously to create innovations. This takes the combined effort of every part of a company: research, marketing, finance, production workers, etc. How? Let us not forget the power of self-interest and the innate tendency to co-operate. When a company is run like a command economy, its demise in the innovation race may be predicted, just as Hayek predicted the demise of command economies. Current thinking is that a company should have an organizational architecture that rewards people for taking initiative, protects individual property rights and enforces rules of behaviour promoting effective co-operation. In short, the more a firm generally mimics a market economy, the better its chances of prospering in the information economy. The theory is that a free market is an efficient information-processing and information-generating machine for satisfying

consumers' wants, and that precisely the same words describe a successful company in the information age.

No one knows precisely how to perform this trick. Firms are trying employee empowerment, continuous workshops to facilitate exchange of ideas and information, entrepreneurial encouragement and other approaches. Some corporations have even taken the prescription to turn the firm into a market economy literally. They have turned to franchising: they allow employees to form their own subsidiary companies to do the work they previously did for the parent company.

As of now, no empirical evidence exists as to which approach works better for which sorts of companies. While the right governance system is unknown, it is certain that successful companies will not have command economy attitudes because these are known to impede innovation. It is also certain that successful companies will find some way to foster market economy thinking, which allows for decentralization, fee-based intracorporate transactions and merit-based compensation.

> Prediction: Canadian firms will move toward decentralization and more performance-linked pay.

We argued above that the Siamese twins of globalization and the information age go together. There is a Chinese saying that explains how to be truly learned: "Read ten thousand books and travel ten thousand miles." To be truly successful as an information processor and innovation creator, a company must scan the world.

> Prediction: Companies that prosper in the information age will need significant international experience.

Corporate managers with experience in foreign cultures will be increasingly in demand. Canada's immigrant population will be an especially useful resource. We would not be surprised if firms run by recent immigrants grow to national prominence much faster than in the past.

We do not know what the right governance structure is in the long run for making a company a successful information processor and innovator, but it is safe to predict that firms finding the right formula will prosper wildly, while those that do not find it or refuse to adopt it will fail. There will be intense political pressure to tax the successful firms and bail out the failing firms. It is important not to do this.

Corporate Canada and Emerging Markets

Danger is a blind man riding a blind horse next to a steep cliff at midnight.
— Ancient Chinese saying.

HIGH-GROWTH AREAS WITH POTENTIALLY LARGE MARKETS attract business. No doubt, China and Eastern Europe fit the bill. These markets are hard to crack and few firms have made much money in them yet. Then why have Canadian corporations flocked there?

One possibility is that corporate managers, being social animals, move in herds. Since few foreign corporations investing in China or other emerging markets have earned big profits yet, this explanation cannot be dismissed.

A more flattering appraisal is that the potential of these markets is great enough to justify years of losses while establishing a corporate presence. Large markets naturally attract manufacturing and regional head office activities. Distant manufacturing centres cause unnecessary transportation costs. Distant head offices limit a firm's ability to serve customers. This clustering of corporate activity is called "agglomeration" by international trade theorists. Large demand centres cause agglomeration, which leads to further concentration of corporate activity by facilitating information spillovers between firms. Companies in agglomeration centres prosper, while those located elsewhere fail. Although there is limited empirical evidence about how this agglomeration theory works, it has strong proponents in academia.[39] As communications become cheaper and easier, the importance of proximity for information flow may be more questionable and the basis of the theory less credible. We are frankly skeptical of agglomeration theory as a justification for foreign direct investment.

A third reason, which we believe to be more plausible, is that these economies were behind in using public information and that foreign firms had temporary opportunities to profit by introducing innovations. These profits disappeared as soon as enough firms, foreign or domestic, entered the market using the same technology and information.

This pattern of development is called "convergence" by economists. Once an economy has a minimally honest legal and political system that restricts political rent seeking and allows investors to place money safely with entrepreneurs, the growth cycle shown in Figure 5 begins.[40] Economies can grow quickly as corporations operating in them generate huge profits by applying publicly available technology and information that previously were unused locally.[41] The high growth rate can be maintained only until the economy has incorporated all public information. To grow further, its firms must compete with those in other developed countries to develop entirely new technologies and ideas. This is much more difficult than simply catching up.

> Prediction: The high growth rates of emerging economies will stall when they pull even with currently developed economies.

The legal and political systems of many emerging economies are turning out to be less mature than many Canadian corporate managers had hoped. Bribes, kickbacks and other forms of overt political rent seeking are common in virtually all emerging economies, and the rule of law is much less secure than

in the West. This is certain to lead to high-profile instances of dishonest corporate governance, along with pervasive poor corporate governance. We would not be surprised to see countries where these problems are biggest, such as China, follow erratic growth paths marked by periodic collapses of major industrial sectors. Government subsidies make rent seeking a highly profitable business in such countries, and the practice is as harmful there as here. Global competition will punish countries that let it get out of hand.

> Prediction: Emerging markets will become less attractive over time. There will be periodic high-profile crises, in which some Canadian corporations may be caught. Hedging against political risk in these countries will become a hot topic.

Many critics of free trade argue that Canadian corporations can get a competitive edge by evading Canada's costly environmental regulations and producing in Third World countries with irresponsible, corrupt or inefficient governments. The evidence is that lax environmental standards do not attract foreign firms.[42] The same irresponsibility, corruption and inefficiency that lead to lax environmental standards also make these countries difficult places in which to do any sort of business.

Another alleged attraction of developing countries is their cheap, readily exploitable labour. It is true that Third World countries such as Taiwan attracted foreign firms with cheap, well-educated labour. However, these firms quickly learned that well-educated labour is hard to exploit. Wages in countries with productive labour forces quickly rose to market levels. Countries with cheap, unproductive labour failed to attract foreign firms at all. A working paper by Stephen Golub of Pennsylvania's Swarthmore College finds that the so-called unfair advantage conferred on developing countries by low wages is illusory. Across a range of developed and developing countries, he finds a broad correlation between wage levels and productivity.[43]

In short, the advantages of Third World countries are greatly exaggerated and their disadvantages even more understated.

> Prediction: We see no mass migration of Canadian manufacturers to developing countries.

If Canadian firms relocate out of the country, we believe that they are more likely to go to other rich countries where acceptable physical, legal and social infrastructures exist but where the cost of government is lower.

These somewhat downbeat forecasts do not mean that emerging markets are unimportant but simply that they are subject to the same laws of economics and regularities of human nature as we are. Clearly, if we say that China will grow no faster than Canada once it has adopted best global practices through-

out its economy, we are implicitly saying that it will also have a huge economy by that point.

> Prediction: Emerging economies, especially China's, will become more and more important. Their cultures will increasingly influence global business practices.

At present, Chinese companies that want to enter the global market must adhere to Western customs and practices. This situation is not likely to persist once Asian economies have grown larger.

Demography and the Corporation

> *Immigration is the sincerest form of flattery.*
> — Jack Paar (1918–).

Of any nation, Canada has the most extreme baby boom bulge in its population. In 1996, there were approximately 550,000 Canadians who were 35 years of age but only 400,000 who were 20 years old. This demographic bulge is likely to cause severe strain on Canada's pension and social systems. The one way to ease the strain is through increased immigration of young people. We believe an immigration boom to be virtually inevitable. It will be politically attractive when baby boomers are old enough to fear insecurity in their retirement more than they fear job competition from immigrants.

Much of the immigration will be of visible minorities. Chinese Canadians are the fastest-growing minority in the country. They now number about 800,000, and a recent Statistics Canada study projects (in a high immigration scenario) that their number could reach 2 million by 2016.[44] This population will be concentrated in British Columbia, Alberta and Ontario, where Canadian business is also concentrated. Thirty-eight percent of Chinese Canadians have chosen to pursue careers in business management or the professions, a figure markedly higher than that for Canadians in general.

Most immigrants come because they are attracted to Canada's customs and lifestyle. This means that they expect to abandon many of their former ways. However, Canada is perhaps uniquely supportive of immigrants who seek to retain many elements of their old countries' cultures.

Together, these observations point to an interesting edge that Canadian companies may have in the near future.

> Prediction: An increasing Chinese Canadian flavour in Canadian corporate management is not improbable. Since China will undoubtedly influence international business culture when it fully joins the world economy, Canadian firms may find themselves with an advantage over many competitors in other Western countries.

BUSINESS-GOVERNMENT PARTNERSHIPS

CANADIAN CORPORATIONS THAT FAIL TO INNOVATE will be challenged by new Canadian firms, including firms run by immigrant entrepreneurs with non-Canadian mind sets as well as foreign firms from traditional trading partners or previously unheard-of places. Beyond a certain point, Canadian corporations' old reliable tools for competition (e.g., access to natural resources) will be insufficient to compensate for lack of innovation. After that, stagnant Canadian firms will confront the reality of global competition, as opposed to merely its rhetoric. Government handouts, market guarantees and other forms of protection can postpone this day of reckoning but cannot avert it altogether. On that day, Canadian corporate managers conditioned to believe in concepts such as "government-business partnership," "socially equitable regulations" and a slower pace of change as a valued characteristic of "Canadian culture" will be paralysed like a moose dazzled by headlights, and with the same ultimate result. They are not alone: many American, European and Japanese managers are in a similar position. Nobody really knows how to prepare for the unpreparable.

But beyond Canadian corporate conditioning, human self-interest and cognitive dissonance dictate one response:

> Prediction: Many with economic stakes in non-innovative Canadian corporations will develop enthusiasm for "government-business partnerships" providing financial assistance. A host of disguised government bailouts will find their way onto the political agenda.

Cognitive dissonance will make it difficult for some managers, who have espoused free enterprise in the past, to accept direct government bailouts. Therefore, there will be a soul-searching quest for an ideologically acceptable way of accomplishing the same thing. "Industrial policies," "government-aided international expansion programs," "orderly marketing arrangements," "preservation of Canadian jobs," "security nets to encourage investment," "regulations to protect Canadian culture, business and consumers," "regulations for market stability" and numerous other innovative constructs will surface.

The corporate lobbyists who push for such concessions will espouse noble motives of protecting jobs, communities and Canadian culture; through the power of cognitive dissonance, they may believe their own rhetoric. It may even be true, as far as it goes. However, the ultimate cause of failure will be that the afflicted corporation's managers failed to innovate and became too comfortable with established routines. This is bad corporate governance and should not be rewarded. Governments contemplating such bailouts should at the very least insist that the managers responsible not share in the manna. Since continued bailouts may condition corporate managers and shareholders to expect more bailouts in the future, they may lead to a rising spiral of lobbying.

A Potentially Bright Future for Resource Corporations

> *Ye stand before the Lord … from the hewer of thy wood unto the drawer of thy water.*
>
> — Deuteronomy, 29:11.

For natural resource companies, the end is probably not nigh. The demand for raw commodities by rapidly growing firms in Asia is likely to be considerable. This bodes well for Canadian resource-sector firms. Canada is politically stable and rich in resources, an enduring source of income. As other parts of the world adopt market economies and more stable political regimes emerge, Canadian firms' expertise could provide an initial edge in developing natural resources abroad. However, Canadian resource firms that fail to innovate will quickly lose their advantage.

> Prediction: Large Canadian resource firms able to create an internal environment conducive to innovation will prosper. Those that do not will be acquired by those that succeed, in some cases foreign owners.

Corporate Careers in the Global Information Economy

Blue-Collar Corporate Employees and Labour Organizations

> *At the age of 40 a man's mind sets like plaster of Paris.*
> — John Stewart Mill (1806–73).

Blue-collar workers typically learn a set of skills particular to a certain technology. An increased rate of technological obsolescence therefore poses the threat of unexpectedly rendering those skills obsolete. Also, while wages in emerging economies are catching up with wages in the West, blue-collar workers in Canada may be overpriced in the global economy. When mandated employee benefits are included in labour costs, the overpricing is even more prominent. These factors have caused Canadian union leaders to champion trade barriers.

We believe this to be a short-sighted policy, even from the perspective that only labour matters. Blue-collar jobs, even in industries that produce non-traded goods or services, depend on customers in export industries and therefore on healthy export levels. These can only be maintained by keeping pace with the global innovation rate. Economic isolation is not a serious option.

This realization and the need to deal with employee insecurity has led to increasing interest in "labour force retraining programs." Unfortunately, many corporations are finding that such programs are of dubious value.[45] It is difficult to mould 50-year-old pipe fitters into computer nerds who can compete with 20-year-olds.

All this leaves blue-collar workers in an uncomfortable position. Traditionally, seniority rules in layoffs have been central parts of union contracts. (By coincidence, union leaders are usually very senior employees.) This has meant that union leaders have happily accepted layoffs of junior workers to preserve the pay and jobs of senior workers. As the population of 20-year-olds is only about 70 percent that of 35-year-olds, junior workers are likely to become scarcer and job cuts based on seniority will increasingly affect older workers. This may change the priority of labour negotiators.

> Prediction: Blue-collar job security will be a more important issue in labour negotiations. Unions will press corporations to retain or at least retrain redundant workers. This may be of little real help.

WHITE-COLLAR CAREERS

> *Knowledge is a process of piling up facts; wisdom lies in their simplification.*
> — Martin Fischer (1879–1962).

THE SHEER MAGNITUDE OF THE INFORMATION available to a corporate manager makes decision-making difficult. It is not impossible that a new white-collar profession will arise, consisting of specialists in sorting through mounds of data. The job is likely to combine business, computer and librarian's training.

Other new white-collar professions may emerge: specialists in how to present information in usable formats. Governments and corporations need employees who can set up information reservoirs in cyberspace for customers, suppliers, shareholders and others. It will require skill to make these simple to use yet complex enough to be useful.

We very much doubt that traditional management jobs will disappear. Financial decisions can be informed by computer analysis but in essence they are still an art. They require judgment and experience. The same is true of human resource management, marketing or other head office functions.

Traditional middle-management jobs are less secure, and many perhaps should be shed in the name of economic efficiency. Such jobs may also be disproportionately affected by outsourcing. As we argued earlier, this essentially introduces a franchising architecture into corporate governance.

On the plus side, costly benefit packages for full-time employees need not be funded and independent entrepreneurial white-collar workers have strong incentives to innovate. Their contracts usually specify lump-sum payments for particular projects, so if they find more efficient approaches their income rises.

The downside of contracting out features problems of accountability, reduced loyalty and information gaps. Independent contractors who are found to have provided poor quality cannot be punished except by withholding future business. Independent contractors may be less willing to act in the long-term interests of the firm. Companies may be unwilling to give outside contractors the same access to information that employees would have, so the quality of decisions may suffer. We believe the downside to be more important than suggested by the scant attention it has received.

> Prediction: Middle managers may be shed as outsourcing gains popularity, but the downside to such arrangements will become more obvious and the trend will slow. Compromises, neither full-time employment nor independent contractor status, may emerge. These might be akin to franchising arrangements in retailing.

WORKPLACE TRAINING

> *Education costs money, but then so does ignorance*.
> — Sir Claus Moser, *Daily Telegraph*, London, 1990.

IN AN AUSTRIAN WORLD, BOTH BLUE- AND WHITE-COLLAR WORKERS must adopt and adapt to innovations fast. This raises two issues: employee selection and workplace training. Companies will prefer to hire employees who can be easily retrained. We believe these will be people with good training in basics. Corporations will find that they do not need employees with training only in what is "relevant" to their business, because relevance will be a rapidly moving target.

University programs that can genuinely teach students how to learn will be in high demand. Most universities have yet to develop such programs, despite their claims. Rigorous instruction in the liberal arts, languages, the sciences, mathematics and other traditional subjects would seem to be a good starting point. Politically correct fad subjects and narrow professional programs may be poorer investments than many students realize.

Workplace training is attracting attention. Prominent multinationals have built in-house training centres and require employees to enrol in training courses. There are three underlying issues. First, as of now there is no empirical evidence that extensive workplace training improves corporate performance. It may do so but at present we simply do not know. Second, workplace training is costly, both directly and indirectly in terms of lost hours on the job. In an era of tightened global competition, corporations are less able to afford that cost. Finally, as long as slavery remains illegal, managers cannot be certain that employees who have received training at the corporation's expense will not take that training to work for a competitor. Indeed, some corporations may rationally decide that it is cheaper to steal the graduates of a rival's training program than to train workers in-house. This "market failure" may lead firms to underinvest in worker training. One solution is to let firms in an industry jointly finance industry re-training centres or contract with educational institutions to provide such services. If every firm pays a part of every employee's training costs, the problem of footloose employees vanishes.

> Prediction: Corporations will lobby harder for better general education at all levels. They may spend more on in-house training but it will become apparent that broader solutions are needed to the problem of worker training.

A Final Word on Educated Guessing

A severe depression like that of 1920–21 is outside the range of probability.
— Harvard Economic Society, 1929.

Economists need a strong sense of fallibility, and we have perhaps been too bold in our confident prophecies. Yet we feel this to be the most intellectually honest approach. We have listed the most basic laws of economics and described how they derive from essential regularities in human nature. We have argued that these beginnings, vague as they are, are the only sensible basis on which to make long-term forecasts about the economy. In our view, the approach to economics called the Austrian School provides the best framework for describing the current changes in our economy because this approach, almost uniquely in our field, takes the economics of information seriously. From these starting points and taking this perspective on economics, we stick our necks out.

If our predictions do not materialize, understanding why they did not will provide insights into the validity of our assumptions. This is the way science progresses. It may be hoped that this will help us do better in the future. In the event that none of the above predictions materializes, to preserve some rags of our reputations we include the following prophecy pirated from an earlier work of long-expired copyright:

> Prediction: There shall be wars, and rumours of wars, and earthquakes in diverse places.

NOTES

1 For a discussion of Marx's and Veblen's predictions, see R. Heilbroner, *The Worldly Philosophers*, New York: Simon and Schuster, 1986. In the mid-19th century, Marx predicted the spread of capitalism throughout the world, along with socialist uprisings in the most advanced capitalist countries. He distanced himself from "Marxists," saying near the end of his life, "I am not a Marxist," and he did not recommend socialism as a development strategy for backward economies such as Russia or China. At the turn of the century, Veblen predicted much of the subsequent course of consumer-driven capitalism. For a quite accurate prediction of the collapse of communism, see F. A. von Hayek, *The Road to Serfdom*, Chicago: University of Chicago Press, 1944.

2 *Forbes Magazine* actually performed this experiment. The monkey did at least as well as the average professional market analyst. See B. Malkiel, *A Random Walk Down Wall Street*, New York: Norton, 1990.

3 D. Meadows, J. Randers and W. Behrens III, *The Limits to Growth*, New York: Universe Books, 1972.

4 Hayek, *The Road to Serfdom*.

5 Because it began in Vienna in the 1870s, this intellectual tradition is called Austrian economics. Historians regard Carl Menger as its founder and his 1871 *Principles of Economics* as the school's seminal work.

6 See Aristotle's *Nicomachean Ethics*, Vol. E, §1131-1133, esp. §1132b. See also St. Thomas Aquinas, Summa, II, 2, quaest. LXXVIII, art. 1. Schumpeter disputes this conventional interpretation of Aristotle and St. Thomas in his *History of Economic Analysis*, Oxford University Press, 1954; see esp. pp. 6061, 93 and 98-99.

7 On this point, and for a good summary of the experimental and computer simulation evidence discussed in this section, see Robert Axelrod, *The Evolution of Co-operation*, New York: Basic Books, 1982.

8 Much of the work of Kahneman and Tversky, Einhorn, Shoemaker and Thaler points to a deep relevance of conditioning to economic behaviour. For an introduction, see R. Hogarth and M. Reder (eds.), *Rational Choice*, Chicago: University of Chicago Press, 1986.

9 See M. Boycko, A. Shleifer and R. Vishny, *Privatizing Russia*, Cambridge, Mass.: MIT Press, 1995, pp. 53, 60.

10 The concept was originally proposed by Leon Festinger, *A Theory of Cognitive Dissonance*, Palo Alto: Stanford University Press, 1962.

11 Total quality management (TQM) is sold mainly on the basis of anecdotal evidence coming mainly from huge, previously very poorly managed U.S. firms. It is arguable that any shake-up in these firms' routine would have improved things. Florida Power and Light went to great lengths to win the Demming Award for TQM, won it and saw corporate performance subsequently plummet. Huson (1995) presents evidence that "just in time" (JIT) inventory improves performance in firms where inventory management is crucial. There is virtually no independent evidence on other management fads. We know of managers who view quality circles as little more than self-glorifying group therapy.

12 Measures of information storage or processing costs, such as dollars per bit stored, dollars per floating point operation, etc., have decreased exponentially since the late 1970s.

13 Some companies now have minute-by-minute updates of sales information.

14 This "dissipation of factor advantage" is likely to be much faster in the information age, when corporate news travel quickly.

15 There is a popular superstition, promoted by Michael Porter and others, that North American shareholders are fixated on short-term earnings, and that their fixation causes corporate managers to sacrifice sensible long-term investment projects. There is no empirical evidence to support this claim and a substantial body of evidence that refutes it. When a corporation announces long-term capital investments or R&D projects, its share price rises, indicating increased demand from market investors. Firms with high R&D spending have high market-to-book ratios. For an overview, see R. Giamarino, "Patient Capital?" in R. Daniels and R. Morck (eds.), *Corporate Decision Making in Canada*, Industry Canada and the University of Calgary Press, 1995. We speculate that corporate managers with impractical plans spurned by shareholders may be attracted to the "myopia" theory by cognitive dissonance.

16 John Horgan, a science writer, argues in his book *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age* (Addison-Wesley, 1996) that everything that can be invented has been. We know of no practicing scientists who take this view seriously, and many who regard it as nonsense. For a thoughtful reflection on why science is probably an infinite pursuit, see J. Casti, "Confronting Science's Logical Limits," *Scientific American* (October 1996):102–5. There are, however, many respected scientists who question the fruitfulness of "big science" such as government-funded megaprojects. This is an entirely different question and relates mainly to poor use of funds rather than any innate limitation on the quantity of knowledge in the universe.

17 See Will Mitchell, Randall Morck, J. Myles Shaver and Bernard Yeung, "Causality between International Expansion and Investment in Intangibles, with Implications for Financial Performance and Firm Survival," Ann Arbor: University of Michigan, 1996. This unpublished study confirms earlier results by Mansfield and others.

18 R. Nelson and G. Wright make the point nicely in "The Rise and Fall of American Technological Leadership: The Postwar Era in Historical Perspective," *Journal of Economic Literature*, 30, 4 (December 1992):1931–64. They argue that the postwar U.S. technological lead was eroded by the increasingly transnational nature of commodity and resource trade, business and finance, and technological communities. We believe this to be a direct consequence of the need for large-scale applications of new technologies to justify their costs.

19 In practice, more input variables should enter the function. This is a side issue, and does not alter the basic points discussed in this section.

20 See P. Romer, "The Origins of Endogenous Growth," *Journal of Economic Perspectives*, 8, 1 (winter 1994):3–22; "Increasing Returns and Long Run Growth," *Journal of Political Economy*, 94, 5 (October 1986):1002–37; "Endogenous Technological Change," *Journal of Political Economy*, 98 (1990):71–102; and "Increasing Returns and New Developments in the Theory of Growth," NBER Working Paper 3098 (1989). See also P. Aghion and P. Howitt, "A Model of Growth through Creative Destruction," *Econometrica*, 60 (1992):323–51.

21 J. Jayaratne and P. Strahan, "The Finance Growth Nexus: Evidence from Bank Branch Deregulation," *Quarterly Journal of Economics*, 111 (1996):639–70.

22 R. King and R. Levine, "Finance and Growth: Schumpeter Might Be Right," *Quarterly Journal of Economics*, 108 (1993):717–38.

23 Loosely speaking, economists use the term "rent" to denote unearned income in general, not only lease payments to landlords. Technically, rent is any income above the supplier's costs.

24 Economists are quick to point out that many, and perhaps most, goods fall somewhere between perfectly private and perfectly public goods. If I use the library so much that its collection becomes noticeably depleted, I have eroded its public good characteristics. Similarly, privately produced goods such as television transmissions have public good properties.

25 See R. Beason and D. Weinstein, "Growth, Economies of Scale and Targeting in Japan 1960–1990," *Review of Economics and Statistics*, 1995.

26 K. Murphy, A. Shleifer and R. Vishny, "The Allocation of Talent: Implications for Growth," *Quarterly Journal of Economics* (May 1991):503–30.

27 See J. McConnell and H. Servaes, "Additional Evidence on Equity Ownership and Corporate Value," *Journal of Financial Economics*, 27 (1990):595–610.

28 See S.-H. Chan, J. Martin and I. Kensinger, "Corporate Research and Development Expenditures and Share Value," *Journal of Financial Economics*, 26 (1990):255–66.

29 See Bronwyn H. Hall, Adam Jaffe and Edward Mansfield, "Industrial Research during the 1980s: Did the Rate of Return Fall? Comments and Discussion," *Brookings Papers on Economic Activity*, 2 (1993):289–343.

30 See Beason and Weinstein, "Growth, Economies of Scale and Targeting in Japan," *Review of Economics and Statistics*, 1995.

31 See A. Jaffe, M. Trajtenberg and R. Henderson, "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations," *Quarterly Journal of Economics*, 108, 3 (August 1993):577–98. For evidence against the existence of a cluster effect, see D. Irwin and P. Klenow, "Learning by Doing in the Semi Conductor Industry," J*ournal of Political Economy*, 102, 6:1200–27. This paper finds that employees learn by doing but that they are as likely to learn new techniques from nearby companies as from companies on other continents. It concludes that "cluster" effects and related theories are dubious.

32 See A. Krueger, "The Political Economy of the Rent Seeking Society," *American Economic Review*, June 1974; W. Baumol, "Entrepreneurship: Productive, Unproductive and Destructive," *Journal of Political Economy*, 98 (1990):893–921; Murphy, Shleifer and Vishny, "The Allocation of Talent," *Quarterly Journal of Economics* (May 1991).

33 If government spending funds public goods such as education and health care, it may be efficiency enhancing on its own.

34 Although Figure 4 shows the high-tax countries of Sweden and Germany as leaders in R&D spending, much of it is government R&D and the rest is mainly by very large multinationals. In fact, public and bureaucratic understanding of entrepreneurship is something of a national joke in some high-tax countries. See for example, "For Germany, It's Nothing Ventured ..." in *Euromoney* (February 1986):147–52. Other countries, most notably Sweden, have continued to produce innovations; see for example, T. Wallmark, "One Hundred Major Swedish Technical Innovations, from 1945 to 1980," *Research Policy*, 20, 4 (August 1991):325–44. More research is clearly needed on the relationship between taxes and innovation.

35 David K. Foot and Daniel Stoffman, *Boom, Bust and Echo: How to Profit from the Coming Demographic Shift*, Toronto: Macfarlane, Walter & Ross, 1996.

36 There is empirical evidence that bequests may be important to older people as a way of influencing the behaviour of potential heirs; see B. D. Bernheim, A. Shleifer and L. Summers, "The Strategic Bequest Motive," *Journal of Political Economy*, 93, 6 (December 1985):1045–76. Evidence on the overall importance of bequests as a motive for savings is mixed. B. D. Bernheim, in "How Strong Are Bequest Motives? Evidence Based Estimates of the Demand for Life Insurance and Annuities," *Journal of Political Economy*, 99, 5 (October 1991):899–927, finds that social security benefits raise life insurance holdings and depress private annuity holdings, and concludes that this implies a strong bequest motive. B. D. Bernheim and L. Levin, in "Social Security and Personal Saving: An Analysis of Expectations," *American Economic Review*, 79, 2 (May 1989):97–102, find that social security depresses personal savings roughly dollar for dollar for single individuals but not for married couples; this finding suggests that bequests to spouses may be the dominant factor.

37 Unexpected inflation reduces the real value of past corporate debts but also reduces the real value of tax deductions for depreciation. The result is often that the loss virtually cancels out the gain.

38 There is empirical evidence from the United States that the practice of bailing out domestic firms facing severe foreign competition reduces the returns for spending on innovation. See S. Lenway, R. Morck and B. Yeung, "Rent Seeking, Protection and Innovation in the American Steel Industry," *Economic Journal*, 106 (1996):410–21.

39 "Agglomeration" is closely related to the idea of "clustering" among R&D firms, and the empirical studies cited to support or debunk one theory are also used for the other (see note 31). The idea of agglomeration was initially proposed by A. Marshal in *Principles of Economics*, New York: MacMillan, 1985, Ch. 10.

40 See J. Sachs and A. Warner, "Economic Convergence and Economic Policies," NBER Working Paper 5039, 1995.

41 For example, in recent years, China has been the world's largest recipient of foreign direct investment; and in the last three years, FDI to developing countries has exceeded FDI to developed countries. This reverses a longstanding pattern of FDI flows mainly between developed countries, and it corresponds with the adoption by developing countries of new free market-oriented legal systems and public policies. Economists call profits of the sort discussed here "quasi-rents." They are profits that exceed costs but are temporary and disappear quickly.

42 For a review of the empirical literature, see A. Jaffe et al., "Environmental Regulations and International Competitiveness: What Does the Evidence Tell Us?", *Journal of Economic Literature*, 1996.

43 For a non-technical review of this paper, see *"Not so Absolutely Fabulous," The Economist*, 337, 7939 (November 4, 1995):86.

44 Statistics Canada, Publication 91-541-XPE, *Projections of Visible Minority Population Groups*.

45 The econometric evidence is incomplete. In "Technological Change and Retirement Decisions of Older Workers," *Journal of Labor Economics*, 11, 1 (Part 1, January 1993):162–83, A. Bartel and N. Sicherman present evidence of a positive correlation between rates of technical change and retraining across industries, but they also find that many older workers prefer early retirement to retraining. In "The Nonequivalence of High School Equivalents," *Journal of Labor Economics*, 11, 1 (Part 1, January 1993):1–47, S. Cameron and J. Heckman find that high school drop-outs with certified equivalency are statistically indistinguishable from other high school drop-outs in U.S. labour markets.

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