

January 1987

# Look at the Future: Canada and the United States in the Future World Economic Context--Can We Be Competitive, A

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## Recommended Citation

James D. Fleck, *Look at the Future: Canada and the United States in the Future World Economic Context--Can We Be Competitive, A*, 12 *Can.-U.S. L.J.* 345 (1987)  
Available at: <https://scholarlycommons.law.case.edu/cuslj/vol12/iss/41>

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## **A Look at the Future: Canada and the United States in the Future World Economic Context—Can We Be Competitive?**

*Dr. James D. Fleck\**

### **CAN WE BE COMPETITIVE?**

**M**y remarks this morning concern the competitiveness of the American and Canadian economies in the global environments that we see emerging over the next decade and beyond. I propose to put my remarks into a framework that takes account of the changes that are affecting the environment that firms in these two countries face. Issues of competitiveness can be looked at in terms of changes that are occurring in the trading system and the adjustments that need to be made in the industrial system in reaction to these changes. Thus, trade and adjustment is the context within which we will view competitiveness in North America.

It is indeed quite remarkable how much agreement can be reached about the general proposition that the world is undergoing a major process of economic restructuring, a process that amounts in effect to a revolution in the global economic order. What is even more remarkable is that underlying much of the structural change that is taking place is an unprecedented process of international coordination of the rules of conduct of business activity that crosses international boundaries. I refer to the apparently inexorable pressures for liberalization of trade rules and removal of trade barriers under the GATT. Despite endless debate, and against a continuous background of protectionist protest, the nations of the GATT have managed to establish a truly liberal trading system that has brought about that uniquely late-twentieth-century phenomenon known as the "global market"; a market where firms compete across national boundaries, apparently as easily as they once did across single cities and states.

Equally important, though less apparent to the casual observer, is the international integration of financial markets brought about by agreements among these same nations for coordination of systems to facilitate international payments and capital flows. In particular, the linkage between financial institutions for the electronic exchange of financial assets has created a global financial system of awesome capacity.

While it is apparently a simple matter to arrive at general agreement about the nature of global integration of trade and financial flows, it is paradoxically difficult to reach agreement about how nations and firms

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can learn to cope with their consequences. I refer, of course, to the pains of transition that result from the losses of market share of traditional businesses in the developed world and the consequent loss of jobs and the means of livelihood for the millions of workers employed by these businesses. Every national government in the developed world finds itself beleaguered by clamors for action by the displaced who claim that it is their right to be "protected" from the impacts of the forces of change. Reaching agreement at a national level about appropriate policies to cushion the injuries that result from such change appears difficult. Arriving at international agreement appears well nigh impossible.

It appears to me that debate on the problems of adjustment has come to be focused almost exclusively on public policy imperatives. The problem tends to get defined in terms of the solution — compensation schemes for trade-related injury, transition subsidies, Voluntary Marketing Arrangements, countervails, industrial renewal programs, and the like. Many of these solutions are mere "band-aids" that at best can buy a little time for true adjustment processes to take root and show results. More commonly, they tend to exacerbate the problem by temporarily relieving the pressures on selected groups at great social costs.

My proposition is that it is useful to shift the focus of our attention away from public policy solutions and onto the business policy issues of adjustment at the level of the firm. We need to gain a better understanding of how the individual business can define its own adjustment problem, an understanding of the strategies and course of action it can undertake to become a beneficiary rather than a victim of the forces of change, an understanding of what it takes for a business to survive and prosper in a global marketplace. Once we have reached some form of consensus about adjustment at the level of the firm, we can turn our attention back to the public policy issues of what governments and international bodies can do to create a climate within which these firm-level processes can work. By this process we can have some hope of avoiding the dangers of defining the problems of adjustment in terms of our favorite public policy solutions, and focus our attention instead on adjustment process as a business. I am confident that public policies which are developed from this course of reasoning stand a better chance of success in the long run because they will be more firmly grounded in the realities that confront the key actor in the adjustment process—the business firm.

I have chosen to direct my attention to the manufacturing sector, both because that is a sector where much of the adjustment problem exists and because it is a sector with which I have some familiarity. My argument will proceed in three stages. First, I propose to demonstrate that successful adjustment in the manufacturing sector must be accompanied by significant and continuous growth in output per worker. Next, I will direct our attention to the business policy issues of managing the growth in output per worker, with specific attention to the special problems of managing a productive organization that becomes increas-

ingly knowledge-intensive. During this part of my talk I intend to draw heavily on the experiences of my own firm, mainly because it is the organization that I know best. I have, however, endeavored to limit my remarks to issues which I believe have general applicability to manufacturing operations in the OECD countries. Last, I have some tentative suggestions about the public policy implications of these ideas. I offer these as propositions which you may wish to consider and debate, rather than as solutions to the problems of adjustment with which our governments are trying to cope.

Let me begin then with a description of the issues of adjustment in manufacturing in the OECD countries.

### ADJUSTMENT IN THE MANUFACTURING SECTOR

Considerable confusion exists about the role of manufacturing in the modern, high-level economies of the OECD countries. Manufacturing's share of Gross Domestic Product has been steadily declining in all the OECD countries, leading some observers to conclude that manufacturing itself is on the decline. Support for this viewpoint—the so-called deindustrialization of the developed economies—is buttressed by evidence of the growth of their imports of manufactured products from the NICs (Newly Industrializing Countries) and the rest of the Third World. The manufacture of traditional labor-intensive products is no longer viable in the OECD countries because of the high cost of labor. Unless they are protected by trade restrictions (tariffs, quotas, VMAs), such businesses will succumb to import competition. Initially, such competitors were located in the NICs - Hong Kong, South Korea, Taiwan, for example. Now, the NICs are under intense pressure from competition from Third World countries with even lower labor costs — Thailand and Sri Lanka, for example. As a consequence, the NICs are reducing their dependence on such industries and shifting into more capital and knowledge-intensive manufacturing. The resulting multi-tiered international division of labor in manufacturing has been likened to a "cascade" by Japanese industrial strategist, Miyohei Shinohara.

In those OECD economies which have successfully adapted to the new realities of global competition, manufacturing shipments continue to grow in real terms. In the United States, Japan, and West Germany, the long term trend in the real value of manufacturing output has continued to be healthy, although it has been subject to serious cyclical fluctuations. However, in these countries, the output of other sectors of the economy has grown even faster, so that manufacturing has lost a little ground in relative terms.

In other countries, such as the United Kingdom and Canada, where adaptation to the new global environment has not been as successful, manufacturing is down in both absolute and relative terms. Loss of output due to competition from low wage countries is not being sufficiently

counterbalanced by increases in output from the newer forms of manufacturing that are better suited for survival in economies with a high standard of living.

The decline of manufacturing output in Canada has been accompanied by an even larger loss of employment in manufacturing. Manufacturing accounts for a declining proportion of the workforce in Canada. This is a long term trend that has been occurring over the last three decades and will most likely continue into the future. Manufacturing accounts for a declining proportion of the civilian workforce in Canada and can no longer be regarded as the major sector for net new employment creation in the economy, a role that it fulfilled during the earlier decades of this century.

The combination of slow growth, in real output, with a decline in employment leads to impressive improvements in productivity. Shipments per employee have increased steadily in Canadian manufacturing. Continuation of this long term trend is vitally important for the survival of manufacturing industry in all the OECD countries. This is true both for the individual business as well as for the manufacturing sector as a whole. Several factors contribute towards this trend.

First, and most important, is the changing mix of output. As a consequence of the restructuring of the global organization of manufacturing activity described above, the production of traditional, labor-intensive products is being eliminated from the OECD countries. At the same time, new products and processes are being introduced. Relatively small net changes in total output (or employment) may actually mask the quite significant changes in both directions that lie just beneath the surface.

The second development that influences output per worker in the OECD countries is the increasing capital intensity of the production processes used in manufacturing. Obviously, when capital equipment replaces labor, output per worker will rise. Some of the most dramatic examples of this can be found in electronic assembly operations. These have traditionally been conducted as labor-intensive operations, and, as a consequence, tend to be located in low wage cost areas. Several North American and Japanese electronic assemblers, however, have chosen to build capital-intensive plants where large numbers of low-paid workers are replaced by production machinery which utilizes automated processes, robotics, and mechanical handling equipment. The IBM plants for assembling personal computers in Boca Raton and IBM's new printer plant in the United States are both showcase examples of successful capital-intensive facilities in what is traditionally regarded as a labor-intensive activity, as is the Ford electronics plant in Markham, Ontario. In the latter plant, automated systems with a handful of workers produce output equivalent to that turned out by thousands of workers in the Ford Electronics plant in Sao Paulo, Brazil. Both plants—the capital-intensive facility in Canada and the labor-intensive one in Brazil—are capable of manufacturing similar products. Both are roughly equivalent in total

costs of manufacture. However, they are very different in terms of their wage rates and their employment.

The North American plants have fewer workers, but each worker earns a very high wage, compared to counterparts in, say, Brazil or Mexico. Plants in the latter countries are staffed by large numbers of low-paid workers. Of even greater significance are differences in the proportion of blue-collar work to white-collar and professional work in these plants. The North American plants are knowledge-intensive — they require people who know how to put knowledge to work. They have need for large numbers of systems engineers, product designers, industrial engineers, scientists, and technicians. Some of these knowledge workers may not actually work at the plants themselves. Their work may be accomplished in laboratories, design offices, and other facilities remote from the plant where their work is used. In fact, some of these knowledge workers may be located in the plants of their customers.

In addition to the presence of large numbers of knowledge workers, these modern, information-intensive production organizations are also characterized by an increasing knowledge content in their blue-collar jobs. Workers on the production floor are required to exercise considerable technical skill in their jobs. In many ways, they are becoming more and more like knowledge workers as well. In estimating the proportion of information work in a production organization, we need to go beyond simple calculations of the ratio of knowledge workers to total workers. We need also to devise measures of the amount of knowledge work that blue-collar workers are required to perform.

#### MANAGEMENT DIMENSIONS OF ADJUSTMENT

Now that we have established that much of the focus of adjustment in North America, as well as in the economies of the other OECD countries, lies in the manufacturing sector, let us turn our attention to the management dimensions of the problems of adjustment in that sector. These are essentially the problems of business strategy for manufacturing firms. As Chairman and CEO of a medium-sized, but, growing manufacturing firm in North America, these issues occupy a major part of my time working with the general managers of the various operation divisions.

I have come to believe that the critical skill for the management of manufacturing activities in firms like mine will be the deployment of knowledge workers. These skills are very different from those which are essential for success in the traditional forms of manufacturing which are in such rapid decline in Canada and the United States, and indeed in all the other OECD countries as well. Traditional manufacturing is centered around the control of materials and machines and the supervision of the relatively low skilled labor required to process products through simple production systems. Traditional manufacturing management is

concerned with keeping costs low, keeping product moving out of the factory door and paying attention to the tangible tasks of inventory management, maintenance of production machinery, control of variable costs and the like. Most of the formal techniques for managing such traditional manufacturing facilities have been developed by the so-called management scientists or operations researchers who have studied work performed at individual work stations and large machines which require many workers to keep them running.

These traditional manufacturing management techniques are reasonably well understood. The skills needed to apply them are quite broadly available in our manufacturing companies. They are still needed and valuable in the new forms of manufacturing that will be necessary in the competitive environment that we will face in the remainder of the twentieth century and beyond.

These techniques, however, are by no means sufficient for success, or even for survival. In my firm, and in thousands of other manufacturing operations in North America and the OECD countries, we need four additional sets of skills.

First, we need the special skills required to manage capital-intensive production operations in a profitable manner. As I have shown, the trend towards increasing capital intensity is a major element in the effort to increase output per worker. The most demanding management task in a capital-intensive production system is the maintenance of high product quality. In a labor-intensive system, quality comes about largely because of skills of the workers. Highly skilled workers are necessary to produce high quality products, as anyone who has a weakness for hand-made Italian shoes or hand-tailored shirts knows.

In a capital-intensive operation, quality comes about from the skills of management and knowledge workers. It calls for the institution and operation of statistical quality control and quality circles; for the use of Taguchi experiments to optimize production processes; for the highly specialized monitoring of incoming materials and production machines; for the adoption of electronic process control and instrumentation that far exceed human capacities for measuring, touching, and gauging; for the use of infra-red and ultra-sonic sensing and the hundreds of other techniques that have emerged from the laboratories and are now finding their way on to the factory floor. Managing quality in these operations has become the job of grafting a knowledge-intensive, quality-conscious culture on our production systems.

Second, to take full advantage of the production capacity of these new capital-intensive production systems, we have to learn to manage the adoption of automation. High volume machines need high volume systems to feed materials, to manipulate materials in process, and to remove finished products. The adoption of automation is highly knowledge-intensive. It calls for skills in selection and installation of highly specialized equipment, skills in scheduling and inventory management,

knowledge of robotics, and the ability to integrate individual mechanical operations into an interdependent system through electronics.

Third, we need to recognize the impact of increasing capital-intensity on the cost structure of manufacturing. Whenever we convert a labor-intensive operation into a capital-intensive one, we move from a high variable, low fixed-cost structure, into one where a larger proportion of total costs are fixed. Making money in a high fixed-cost operation calls for special attention to capacity utilization. We can no longer rely on layoffs and shutdowns to cope with variations in demand. We have to keep the operation running at a high level of capacity to cover our fixed costs. This calls for the exercise of different skills in marketing and general management. It requires development of new costing systems to replace our traditional practices of treating costs as the sum of materials, labor, and an overhead burden which is assigned as a percentage of labor hours.

More than anything else, capacity utilization becomes a matter of integrating marketing and production. Our general managers and marketing managers have to work closely with our customers to integrate our production planning systems with theirs. We have to institute arrangements for our computer systems for production planning and materials control, and be linked directly with their computer systems for purchasing. More important, we have to understand and participate in their business strategy processes because we must develop our business strategies in harmony with their plans. These vertical systems for integrated strategy development will be an important element in the ability of North American industry to undertake the adjustments necessary for long term survival and prosperity. In the industries that my firm serves—the automotive, electronics and major appliances industries—such vertical systems for strategy development are already beginning to take shape.

Last, the most difficult management task in capital-intensive production operations is the maintenance of flexibility. Traditional capital-intensive North American plants are notoriously inflexible. They are optimized for high volume production of rigidly specified outputs. Not so our markets. Consumer preferences and tastes are volatile. Demand fluctuates. Our customers are changing their product mix. Their own markets are volatile and their needs are constantly changing. They are adopting just-in-time purchasing systems and flexible procurement practices. We cannot afford to allow our capital-intensive facilities to become inflexible.

Building flexibility into a capital-intensive production operation calls for a very high level of management skill, from the supervisor on the production floor, through middle management within and outside the factory, right up to the general managers themselves. Everyone must learn to become more responsive and more flexible. Everyone must be engaged in forward planning and anticipation. We need to understand



how to combine concerns for flexibility with the need to maintain high levels of capacity utilization. We cannot optimize one at the expense of the other. We have to learn to do both, and to do them well.

The second major area of concern in the development of knowledge workers involves the adoption of new technology. When we discuss technology in a forum such as this, we tend to focus our attention on the glamorous hi-tech industries—computers, bio-technology, exotic materials, aircraft, and the like. We speak of strategies and national policies to create and operate hi-tech businesses and the research and development activity necessary to sustain them. I feel that it is equally vital to concern ourselves about the adoption of technology by lo-tech and no-tech businesses. These businesses require technology strategies just as much as the hi-tech businesses. They need to pay organized attention to the new knowledge being created by our technological infrastructure. They need to develop competitive advantages through the adoption of new technologies, to keep up with technology development by their customers and their competitors and to remain alert to opportunities which arise from technology advances by their suppliers.

At a very minimum, technology strategies in non-hi-tech manufacturing must be concerned with two areas: materials technology and electronics.

Advances in materials technology offer opportunities for improvements in product quality and manufacturing costs. Managers of even the most mundane production operation can discover exciting opportunities for significant benefits from the use of engineered plastics, new metal alloys, process supplies, lubricants, and synthetic chemicals. While it is not necessary for these managers to learn the underlying technologies of these new materials, it is vital for them to be aware of the potential benefits of their use. They must learn to develop efficient systems for scanning the relevant technological environment, to institute practices for regular experimentation with new materials in their own operations and to develop skills in making decisions about the adoption of new materials technology.

Similarly, managers of non hi-tech businesses must learn to take full advantage of the ever-increasing opportunities for improving their operations through the use of electronics. Much of the new technology for using electronics in production operations is of an add-on nature. It is well adapted for incorporation into existing production machinery. One often does not have to wait until it is time to replace equipment before one adopts electronic means of controlling production operations. Just as the personal computer has revolutionized the office environment, it can be used to make significant improvements in all kinds of factory situations. Together with microprocessor-based electronic instrumentation, it can help the factory manager improve every aspect of even the most mundane production operation.

A major challenge for many manufacturing managers is the acquisi-

tion of computer literacy and a basic knowledge of the use of electronics in production. While the ubiquitous slide rule has been buried deep in the bottom of a pile of academic memorabilia, many manufacturing managers have not buried the slide rule mentality they strove so hard to acquire in engineering or technical school. They have not learned to trust computational processes they cannot see and heuristics they cannot touch. The processes of adjusting our production operations to the new knowledge intensive ways of working will be surely hampered by a lack of electronic literacy in manufacturing management.

### PRODUCT DEVELOPMENT

The third challenge for those engaged in managing knowledge-intensive manufacturing operations is in the area of product development. New products are the means whereby a dynamic firm constantly renews its operations. With the changes in the market environment described above, manufacturing firms in North America have to adopt aggressive strategies for new product development. The processes for designing and launching new products in a manufacturing environment that is both capital and knowledge-intensive are exceedingly complex. Managing such complexity calls for a high order of skill — skill in designing the product to meet the needs of the marketplace and yet remain compatible with the dominant production processes; skill in preserving flexibility and yet maintaining a high level of capacity utilization; skill in taking advantage of the latest developments in materials and production technology.

Successful new product development also requires intensive involvement with customers. Here, again, the vertical systems for strategy development come into play. In managing the new product development process, our general managers have to be sensitive to the problems and opportunities that come about from the need to coordinate strategy development with our customers. While in most cases, the strategies of our customers provide the leadership momentum for the new product development process, our general managers have to remain alert to opportunities for us to exercise leadership.

Let us turn now to the fourth and final area where the management of a knowledge intensive production organization differs from that of a traditional manufacturing operation — the need for systems integration.

The concept of systems integration as a separate and distinct management activity in a manufacturing operation owes its origin to the work of the aerospace companies and defense contractors. In building large sophisticated products such as spacecraft, commercial jetliners, or weapons that consisted of several subsystems, each of which was highly sophisticated in itself, these firms discovered that they needed to pay special attention to the problems of integrating the components so that the whole system functioned efficiently as a unit. Without deliberate attention to systems integration right from the earlier stages of design concep-

tualization through to the delivery to the customer and indeed beyond to post installation service and maintenance, it becomes obvious that the very complexity of the component subsystems and their underlying technologies threatened to turn the whole project into chaos. Thus was born the modern concept of systems integration as a separate and vital part of the management of large complex projects in high technology industries.

It is becoming increasingly necessary to learn to apply these concepts in the less esoteric world of non-hi-tech manufacturing. We have to recognize that our manufacturing operations are rapidly becoming complex systems composed of subsystems that are themselves becoming increasingly complex. We have, therefore, to learn to apply the techniques of systems integration that the aerospace and defense companies pioneered. We have to pay separate and distinct attention to the management of the systems integration process. This in turn calls for the development of managerial skills that were previously considered unnecessary in the traditional manufacturing establishment.

These four new priorities for management activity—operation of capital-intensive facilities, the adoption of technology, the continuous quest for new products, and the integration of complex systems—are the major areas of concern when one sets about changing a traditional manufacturing operation to successfully adapt to the new world of knowledge-intensive competition.

Let me now take a few moments to illustrate these ideas with a practical example drawn from my own industry. The traditional auto parts supplier focused his attention on keeping costs low, on following instructions from the automaker regarding the design of parts that he produced, and on servicing the needs of his customer in whatever manner the customer required. In practice this often meant that suppliers treated the purchasing managers as the primary customer, and provided whatever service the particular purchasing manager demanded.

This comfortable way of doing business became obsolete when the major automakers decided to convert from a high fixed-cost structure to one where a larger proportion of their costs became variable, a process that they have sometimes called reduction of their break-even levels. One major policy to accomplish the change in their cost structure was to shift towards the use of the Full Service Supplier. This involved transferring a large part of the fixed costs of parts design and engineering to the parts supplier. At the same time, the automakers were intent on keeping the lid on the costs of parts and even reducing them wherever possible.

The only way they had to convince suppliers to take on the responsibility for a large part of the fixed costs, without an increase in price, was to promise them substantially more volume. To accomplish this the automakers embarked upon a program of supplier consolidation — reducing the number of suppliers, and giving each one of the survivors a larger chunk of the business than it had before.

The full service supplier becomes part of the team. Strategies for this team must be developed in harmony with the other team members. This is what I mean by vertical strategy coordination. The parts supplier needs to be able to plan as far ahead into the future as the automaker if he is to perform his full service job well. He must be able to anticipate needs and move to set in place the plants, equipment, and systems to fulfill them. He needs to get involved in the design and manufacture of the components that he uses in making the parts that he supplies. He must also be in a position to provide leadership to the team when it comes to the adoption of new technologies and cost reduction.

To successfully implement this concept, a full service supplier must carry on activities ranging from research and development, to advanced engineering and design, to electronic distribution, just-in-time delivery, and post-manufacturing support. By comparing these activities with those of a traditional supplier it becomes quite obvious that the two businesses are as different as night and day. The new way of doing business is highly capital-intensive, requires skill in the adoption of new technology, and must continuously be involved in product development. Further, the complexity of the business demands that deliberate attention be paid to systems integration.

Finally, to remain competitive in the long run, the parts supplier must begin to work on development of a new generation of computer system for design and development. Not only must this new system be capable of supporting CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) activities, but it also must be capable of supporting the inter-organizational design coordination work that will be necessary to ensure that the full service concept is translated into practice. In my firm we are beginning to examine the use of the newer forms of Fifth Generation computers for some of these tasks.

### PUBLIC POLICY IMPLICATIONS

Let me now conclude with a few remarks about the public policy implications of what I have covered. First, it seems clear to me that public policy emphasis on downside adjustment— attempting to slow down or arrest the forces of change—rather than on upside adjustment— facilitating or even accelerating the change process—is both mistaken and unfortunate. The changes we are talking about are inevitable. The forces that are causing them are beyond the control of national governments and international organizations. No single government or even group of governments can do much good by basing adjustment policies on the hope that the progress in the world economy can somehow be stopped. Downside adjustment programs merely delay the adjustment process, create a false sense of security, and waste precious resources. It is only by focusing national energy and resources on the opportunities

and benefits of upside adjustment that our governments have a hope of making a positive contribution to the adjustment process.

It is indeed unfortunate that so much energy and attention is being focused on policies to prevent plant closures, which inevitably result in sustaining unhealthy, unviable businesses. Too much energy and attention is being focused on policies to provide a so-called "temporary" protection against the flood of low-cost imports, policies which frequently result in temporarily increased profits for the protected businesses which are then syphoned off into other enterprises. Too much is being focused on policies like subsidies, where the costs eventually fall on the taxpayers and consumer, countervailing duties, where the cost eventually falls on the consumer, while the benefits are garnered by inefficient managers and businesses.

It would be far better for governments to turn their attention to programs of upside adjustment, programs designed to facilitate the diffusion of knowledge and technology, programs whose net impact will be to accelerate change rather than resist it.

Second, I suggest that such upside adjustment must be directed primarily at human capital rather than physical or financial capital. Our governments, it seems to me, have a responsibility to pay much greater attention to programs designed to assist our workers and managers in acquiring the skills and training they will need to contribute towards the operation of knowledge-intensive production systems. Many of our workers and managers are woefully deficient in areas such as computer literacy. So much of the skill of the blue-collar workforce is in manual dexterity, and so little is in the ability to deal with numbers and ideas.

A large portion of the workforce has yet to accept the basic proposition that education should not cease when one leaves school, but should be a lifelong process. We need to encourage our workers to abandon the objective of a one-career working life and adopt, instead, the concept of a working life that can consist of three and four careers; and we need to help them in acquiring the new skills and new knowledge they will need for their second, third, and fourth careers.

Our governments must come to regard the adjustment process as one of renewing and enhancing the knowledge base of the workforce. We may need new forms of educational institutions to accomplish some of these changes. Our current system of schools, universities, technical institutes, and the like may be inadequate for a large part of this task. We may need institutions that take their educational programs into the factory, for, as we know so well, knowledge is eminently portable. We may need to direct some of the funds we now spend on industrial grants and subsidies and use them, instead, to provide long term subsidies to displaced workers who have lost their jobs because of plant shutdowns or productivity programs.

We all recognize that our governments come under intense political

pressures when adjustment problems occur. When a plant or a community is threatened, it is natural for people to turn to their government for help, and to exert whatever form of influence they have at their disposal. It is wise for us to recognize that governments have to do something about such problems, and perhaps more importantly, have to be seen as doing something. The institution of programs to provide assistance directly to the affected workers, and particularly to help them rebuild their human capital, can be offered as a substitute for the current approach of programs that are designed to help the businesses affected.

Third, our governments need to pay more attention to strategies for the diffusion of technology. Most national technology strategies are focussed almost exclusively on the glamorous business of hi-tech. Some of these resources would be better used in programs for the diffusion of technology to lo-tech and no-tech businesses. The benefits of technology enhancement for a business that has little or no advanced technology can be quite spectacular. Dollar for dollar, the subsidization of technology acquisition by non-hi-tech businesses is likely to provide significantly greater benefits than additional resources directed at hi-tech businesses which are already heavily subsidized, and this is due to the simple economic law of diminishing returns.

Finally, it would seem to me that programs of upside adjustment assistance of the sort that I have described should be treated somewhat differently under trade law than programs of downside adjustment assistance. One of the most unfortunate developments during recent years is the growth in the use of retaliatory and compensatory measures under trade laws. The substantial increase in the use of countervail in the United States is a case in point. It would be quite unfortunate if the use of these measures is extended to harass governments which are attempting to develop upside adjustment programs aimed at building human capital and accelerating the diffusion of technology. Our governments need to get together to define and circumscribe, in a careful and clear manner, those measures of upside adjustment assistance which we find mutually acceptable, and to distinguish them from downside adjustment programs which may remain subject to retaliation. International agreements of this nature can do much to encourage our governments to define the adjustment problem in terms of solutions which focus on upside adjustment rather than continue with solutions aimed at downside adjustment.

Canada and the United States can compete. But successful adjustment requires major increases in output per worker. Government policies can improve the environment but industry itself must make the necessary changes. The management of individual firms in the United States and Canada must remain competent in the traditional skills and at the same time must successfully embrace new priorities—operation of capital-intensive facilities, the adoption of technology, the continuous quest for new products, and the integration of complex systems— to suc-

cessfully adapt to the emerging world of knowledge-intensive competition.