Supplemental Materials for Michael P. Keane and Susan E. Feinberg, "Advances in Logistics and the Growth of Intra-Firm Trade: The Case of Canadian Affiliates of U.S. Multinationals, 1984-1995," *The Journal of Industrial Economics*, Vol. LV No. 4, December, 2007, pp. 571-632.

Appendix A: The Emerging Awareness of Japanese Manufacturing Superiority in the Early 1980's

As we noted in Section II, in the early 80s, U.S. MNCs became very interested in Japanese management techniques. This interest stemmed from the fact that, in the late 70s and early 80s, U.S. manufacturers across many industries suffered severe market share losses to Japanese manufacturers. If one reads the business press and management/industrial engineering literatures of the early 80s, one sees that three main structural causes for these market share losses are emphasized:

First, in many cases, Japanese manufacturers were more efficient in the sense that they produced higher quality goods (i.e., fewer defects) at lower unit costs than U.S. manufacturers. For example, the far greater efficiency of Japanese auto manufacturers was documented in a report by former Chrysler director of manufacturing engineering James Harbour to a meeting on Big 3 executives in Fall 1980. This report was initially kept secret, but it leaked out in late '81 and early '82 and was widely publicized.[1] Even Henry Ford II said "… we built lousy quality cars."[2] But the price/quality advantage of Japanese manufactures was not limited to autos. In a famous article, Garvin (1983) compared U.S. and Japanese air conditioners, and concluded that those made by Japanese manufacturers had vastly lower defect rates.[3] Similarly, the National Academy of Sciences issued a report in 1983 concluding that computer numerically controlled machine tools produced in Japan were of superior quality to those produced in the U.S..[4]

Second, the Japanese manufacturers generally had lower inventories and shorter product cycles (i.e., the time from ordering of parts, based on final demand forecasts, to delivery of finished goods to consumers). For instance, the Financial Times (June 4, 1982, p. 16, "High Stock Levels – Not the Answer to Volatile Demand") reported that "Few western companies are good at managing the flow of materials and products through their factories," and quoted a Booz Allen Hamilton study as finding that "Out of a sample of 900 major European and U.S.

---

[1] See, e.g., Business Week, Sept. 14, 1981, p. 92, "Japan's Edge in Auto Costs," The Washington Post, Oct. 11, 1981, p. G1, "The Japanese Advantage," The New York Times, Feb. 27, 1982, Section 2, p. 29, "Autos: Studying the Japanese," The New York Times, March 25, 1983, Section A. p. 1, "Just in Time System Cuts Japan's Auto Costs," The Washington Post, Nov. 6, 1983, p. G1, "Detroit Turns a Deaf Ear to What Consumers are Saying."
[2] The New York Times, Feb. 16, 1983, Section D, p.1, "Why GM Needs Toyota."
[3] See The Financial Times, Oct., 17, 1983, Section I, p. I, "A Shocking Indictment of American Mediocrity."
[4] See The Financial Times, April 7, 1983, Section I, p. 18, "The Bitter Struggle with Japan."

manufacturers -- all chosen because they were supposedly successfully managed in this context -- only 72 were found to have stock turns which compared with the Japanese."[5]

Third, many Japanese manufacturers had much shorter product development cycles, meaning they could develop new varieties of differentiated products much more quickly. Hence, they could offer many more varieties, tailored to a wider range of consumer tastes. Furthermore, the Japanese did this without suffering loss of economies of scale, and they had fewer start up manufacturing problems when they introduced new products.[6] For instance, Clark, Fujimoto and Chew (1987) reported that Japanese auto manufacturers could develop a new model in a year less time than the American producers, using project teams of half the size, and that return to normal quality after startup was about a year for the American firms and little over a month for the Japanese.

Appendix B: Increased Intra-Firm Flows of Intermediates in the Chemical Industry

As we discussed in Section VI, the chemical industry was rationalized on a North American basis in the 80s and 90s, with the Canadian plants tending to focus on commodity chemicals while the U.S. plants produced more downstream products (i.e., plastics). This pattern clearly helps explain the increase in intra-firm trade in the form of increased imports of these commodity chemicals from Canada to the U.S. (as the capacity placed in Alberta far exceeds total Canadian demand), as well as increased imports of specialty plastics into Canada.[7]

Notably, as reported in Canadian Chemical News (April 16, 1984, p. 21, "Canadian Chemicals See Rising Demand") the wave of new "world scale" petrochemical plants that came on line in Alberta beginning in 1984 were planned in the late 70s early 80s. The original motivation for these massive investments was the high price of crude oil in the late 70s, which favored the use of natural gas based feedstocks (methane and ethane). Subsequent investments were encouraged by rapidly growing demand for polymers, as we have described. Clearly, these developments were not driven by the FTA induced tariff reductions.

---

[5] The sample contained 550 Japanese manufacturers across a range of industries.

[6] Another common theme is that consumers were becoming more "sophisticated," and that their demand for quality and variety was increasing over time (see, e.g., Hayes and Jaikumar (1988)). Of course, this assertion makes perfect sense if consumers were becoming wealthier and if quality and variety are normal goods.

[7] While the commodity chemical industry in Alberta expanded dramatically in the 80s and 90s, the chemical industry in Ontario and Quebec, which suffered from outdated plants that were below "world scale," struggled to survive. These plants did survive only to the extent that they managed to convert to production of "niche products" (i.e. specialty plastics). See Statistics Canada, "Canadian Synthetic Resins Industry," at strategis.ic.gc.ca. For example, DuPont Canada has been a highly innovative firm since the 50s, and is well known for the development of the SCLAIR@ process for production of linear low density polyethylene (LLDPE). It is one of the few producers of engineering resins in Canada. During our sample period, it also invented the "milk in bags" technology.

Having described the impact of increasing demand for polymers in general, we now describe some specific examples where this led to increased intra-firm trade. Joe Pilaro, a former Mobil executive interviewed as part of this study, indicated that most intra-firm petrochemical imports from Canada (by volume) are polyethylene (PE), ethylene glycol and propylene, which are intermediate commodity chemicals. It is cost efficient to manufacture polyethylene and ethylene glycol from ethylene made near the source of the ethane feedstock in Alberta. The polyethylene is then used as an intermediate to make plastics (e.g., PE is often used to make packaging films), while the ethylene glycol is used to make automotive anti-freeze, as well as polyester. In our data, we cannot distinguish intra-firm importation of polyethylene, ethylene glycol, and propylene from Canada for use in further processing vs. its sale to third parties through the U.S. parents' distribution system. But Pilaro indicated that, at least for the firms like Dow that primarily sell commodity chemicals, most imported PE would be sold to U.S. third parties through the parent's distribution system.[8] Only a small fraction is needed for the production of plastics and other specialty products by the parent firms. However, firms like Dow and DuPont did use imported ethylene glycol for further processing to produce anti-freeze, as well as for sale to third parties.

The situation is different for propylene. According to McCann and Associates (2000), there is little polymerization capacity for converting propylene to polypropylene (PP)[9] in Alberta, and the propylene produced by Dow in Alberta is indeed shipped to U.S. gulf coast facilities by rail for further processing (see p. 13-14).[10] Interestingly, the report states that demand for PP grew at 6% annually during the 90s, due to the rapidly growing range of products that can be made from polypropylene using metallocene catalysis. In contrast, demand for polyethylene based polymers grew only 3 to 4% annually during the 90s. The report states that "over the past decade, there has been a shift in propylene … from the 'unwanted child' of ethylene and refining production to a feed stock for a variety of chemicals and resins with strong growth." Thus, increased demand for polymers did lead to increased imports of propylene into the U.S. in general, and to increased shipments of propylene from Dow's Alberta facilities to its

---

[8] Even here, we would argue that significant value is added through distribution, so that the imports from Canada would be legitimately be classified as intermediates. For instance, in the 80s and 90s many customers began to require just-in-time delivery and extensive on site support. [We will discuss this important point in some detail below]. Specific customers may require commodity chemicals produced to certain specifications, e.g., levels of trace contaminants, which may vary depending on delivery mode, or require services like blending or pelletization. Part of what the parent sells, along with the PE, are its proprietary technologies for processing it. It should also be remembered that, for chemicals, safety in delivery is a key part of the product.

[9] Note: low density PP is used for injection molding and fibre/filament applications, while high density PP is also used for blow molding. PP resins are widely used in auto, appliance and equipment parts, since they are strong yet easily molded. Low density PP is highly stretchable, making it useful for fibres and filaments.

[10] This is still the case today. See Chemical and Engineering News (January 10, 2005, p. 19, "Canada").

Gulf Coast facilities in particular.[11] Similar comments could be made regarding polystyrene, for which there was no productive capacity in Alberta either (see Harry Blair Consultants (2000)).

Another important development was the investment by Chevron, which, in 1992, started production at a world scale Methyl Tertiary Butyl Ether (MTBE), plant near Edmonton. MTBE is an emissions reducing gasoline additive, mandated in California and in a number of U.S. cities by the Clean Air Act Amendments of 1990, as well as by stricter California regulations.[12] The Edmonton location was chosen because of the low cost availability of the butane and methanol feedstocks.[13] The entire output of the plant was shipped (by pipeline) to Chevron refineries in California for blending into gasoline. The scale of this plant was truly massive, as it supplied a large fraction of the MTBE for gas sold in California and the whole western U.S.. Thus, a specific technical factor (low feedstock costs in Alberta) combined with an exogenous event (environmental regulations) to cause a substantial increase of intra-firm trade in intermediates.[14]

Appendix C: More on Westinghouse, United Technologies and GE

In Section VII we emphasized how the Canadian affiliates of Westinghouse, UTC and GE were restructured in the 80s and 90s. Here, we present more details on the behavior of the parent companies during this period.

Westinghouse was already in deep trouble in the early to mid 70s, so its restructuring efforts began earlier than many other firms we have examined. Indeed, Westinghouse started to engage in massive restructuring to reduce over-capacity in the late 70s. This effort included setting up a "productivity and quality center" in Pittsburgh in 1979 to study Japanese manufacturing methods and learn to apply them. A 1983 article in Business Week quoted Thomas Murrin, president of the Energy & Advanced Technology Group, as saying: "we have

---

[11] After polypropylene, the next major "first step" derivative from propylene is cumene. This in turn, is used to make polycarbonate, which is used, e.g., to make compact discs, and to make nylon and epoxy (used to make adhesives and coatings). McCann and Associates (2000, p. 32) note that were no cumene producing facilities in Canada by the mid-90s, with Dow having closed its plant in Burnaby, BC several years earlier. Thus, increasing demand for cumene based products provides another reason for increased shipments of propylene from Canada to the U.S.

[12] See PR Newswire (April 5, 1991, "Chevron USA Obtains Components for Gasoline") and Canada NewsWire (April 7, 1992, "Alberta Envirofuels Inc. Announces Commencement of Production"). Note that Alberta Envirofuels is 50% owned by Chevron.

[13] See The Financial Post (December 30, 1991, p. 16, "Petrochemicals Industry Starts to Find Some Reason for Optimism").

[14] Beginning in 1998, evidence appeared that MBTE leaks into groundwater, leading eventually to a ban on use of the additive, and conversion of the MBTE plant to other uses. See The National Post (Nov. 24, 1998, p. C9, "Gas Additives Controversy Fuels Change"). This led to a ban on use of MBTE in 2003, and Alberta lost $340 million in exports – see Alberta Economic Development (2003), p. 6. To put this in perspective, in 2000 Alberta's total petrochemical shipments were roughly $7.1 billion – see City of Edmonton (2000).

sent more study teams to Japan than any other American company. We are doing to the Japanese what they have done to us for 20 or 30 years."[15]

Like CGE, Westinghouse Canada had already "rationalized" its operations by the early 80s. For instance, it had world mandates for many products like steam and gas turbines and airport lighting regulators by the early 80s (op. cit.). And, according to Defense & Foreign Affairs (September, 1984, p. 29, "Canada on the Brink of a New Era"):

> "Many Canadian communications and electronics firms can trace their beginnings to branch outlets or local production facilities set up by foreign giants, but many such companies … have a commendable research, development, and sales record. … the country's defense electronics technology is successfully competing with large foreign and often multi-national corporations. … Westinghouse Canada Ltd., of Hamilton, Ontario, produces not only powerful sonar systems, but also a range of smaller sonars which have found their way into the "export frigate" market of several foreign shipbuilders."

The Financial Post (March 11, 1988, p. 9, "Study Outlines Steps Taken to Benefit From Free Trade") describes how Westinghouse Canada had been adopting lean production methods in order to be competitive globally:

> "D. Gary Hysop, vice-president, quality and strategic resources, told the meeting free trade would not have a significant impact on his company's strategy because it is already in place. For 10 years, the company has assumed what it calls a "zero tariff environment." "We haven't permitted strategic positions to be developed either by hiding behind tariff walls, or jumping off them," he said. The company has undergone a decade of enlightenment on productivity and quality, embracing concepts like zero defects, single-minute set-up changes, one-man multi-machine operations, and small lot production. "We've prepared for global trade," Hysop said."

Westinghouse Canada was a very early adopter of advanced logistics management practices to reduce inventory.[16] As with CGE, Westinghouse Canada pursued a strategy of innovation, enhanced manufacturing efficiency and emphasis on higher value added products in order to survive in an environment where the parent suffered from excess capacity, and this strategy was in place even before our sample began. As a result, its exports as a share of total output grew from 5% in the late 70s to 36% in 1988.[17]

United Technologies (UTC) is a good example of a firm that delayed adoption of JIT until the early 90s. Given its heavy dependence on defense contracting and commercial aviation, UTC did not face overcapacity problems in the 80s. However, UTC was severely impacted by high oil prices and declining military spending in 1990-91.[18] As a result, they began to

---

[15] See Business Week, December 5, 1983, p. 12, "Operation Turnaround."
[16] See The Financial Post, April 6, 1985, p. 34, "Industries Line up to Use Bar Coding."
[17] See The Financial Post, March 13, 1989, p. 6, "Products Mandates for Branch Plants May Hurt, Not Help."
[18] UTC also provides a nice example of the sort of integrated production process that leads to bilateral intra-firm trade. Hamilton Standard in Farmington, CT provides engine control systems for some of PWC's small engines, and

vigorously adopt the JIT system in 1991-92.[19] UTC's 1991 Annual Report noted that, following record profits in 3 of the past 4 years, the firm had lost a billion dollars in 1991, and states:

> "Given the rapidly changing circumstances, it became clear last summer that we needed to thoroughly reexamine the size, scope and practices of all our businesses. We recognized that we had *excess manufacturing capacity throughout the corporation* that needed to be addressed more aggressively. And we recognized the need to accelerate our response to the rapidly changing business environment through quality and productivity improvements ranging from product design to engineering and manufacturing.
>
> We have begun a transformation of UTC more profound-and more-potent-than any single event in the corporation's history. I want to emphasize that this is not just the kind of restructuring where the workforce is cut and some plants are closed. This is a comprehensive program – a culmination of the changes we have effected over the last year-that will fundamentally change the way we operate. The revamped United Technologies that will emerge as a result of these changes will be a far different company-leaner, tougher minded, more competitive.
>
> Worldwide, we will close or consolidate more than 100 facilities …" (emphasis added)

UTC's 1992 Annual Report makes clear that UTC was in fact pursuing Toyota's JIT or "lean" production system, and they use the terminology of that system explicitly:

> "What is taking place throughout the corporation today is a *continuous improvement process* that already has given us up to 40 percent manufacturing space reductions in some of our plants, along with a doubling or tripling of inventory turns, and productivity gains of 20 percent or more.
>
> Continuous improvement, *inventory control* and *integrated product development* are driving operating costs down and enhancing returns. *Kaizen, kanban, JIT,* zero defects, rapid prototyping, *reduced cycle times*. United Technologies has been adopting these productivity initiatives in the workplace as an integral part of restructuring in order to improve its design, engineering and production processes and gain a cost advantage in the marketplace.
>
> Carrier has been at the forefront of UTC's process changes. Through the application of continuous improvement methods, the company has been eliminating specialized shops within its facilities and is *moving away from batch processing to what is known as lean production* and integrated flow lines. As a result, assembly lines for its heating and air conditioning products are being radically reconfigured and shortened, with empowered employees grouped in teams, and parts and tools positioned close to where they are needed most.
>
> By applying these productivity improvements to specific manufacturing processes, Carrier has been able to cut floor space requirements by one-third, work-force levels by 20 percent, and work-in-process inventory by more than one-half for those processes since 1988….
>
> … across the corporation … a major training program for employees at various plant locations was begun in 1992. The program consists of a two-week session at each facility to introduce concepts such as *lean production and the kanban method* of replenishing parts on the assembly line. …
>
> At Sikorsky, the implementation of process changes on its helicopter production lines, coupled with a new *computerized parts tracking and distribution system, has driven inventory down* by more than 40 percent, or approximately $425 million, since 1988. … Sikorsky also has cut its production lead times significantly by utilizing lean manufacturing methods …
>
> The use of flow lines, lean production techniques and other process improvements has freed up sufficient floor space at Pratt[&Whitney] locations to make it possible for the company to consolidate its manufacturing activities and close a 525,000-square-foot plant in Southington, Connecticut." (emphasis added).

PWC's small engines power some of Sikorsky's helicopters. Both the control systems and the engines are also sold as final goods to unaffiliated third parties.

[19] As we noted in Section VII, UTC's Canadian affiliate, Pratt & Whitney Canada, began to adopt lean production methods four years earlier than the parent (in 1987 at its Halifax plant).

It is rather remarkable that, despite the long-term decline in military demand, UTC returned to strong profitability by the mid-90s. According UTC's 1996 annual report, "Escalating operating profit to sales ratios and strong and improving cash flows have made UTC near best in class in shareowner value creation among peer companies over the last two years.… lean manufacturing … is the force that has reduced our domestic employment from 108,000 at the end of 1990 to 70,000 last year, and driven our profitability accordingly."

We have less to add regarding GE, because its adoption of JIT methods largely originated with the Canadian affiliate, so it is already well described in Sections VII and VIII. For instance, the Bromont, Que. airfoils plant opened in 1983 was GE's first experiment in Japanese management techniques, and JIT methods were adopted in 1990s at the Canadian appliance affiliate CAMCO, and later extended throughout GE. It is interesting how this appears to be reflected in the aggregate inventory figures for the appliance industry reported in Figure 2.

It is worth adding however, that GE, like Ford, IBM, Dow, and many others, also made a major effort to achieve global standardization of parts through use of CE. According to GE's 1994 Annual Report:

> "… part standardization disciplines … [are] becoming key to the rapid new product introduction successes in our Appliances and Power Systems businesses, where product introduction cycle times have been cut by more than half. Today's global environment, with its virtually real-time information exchanges, demands that an institution embrace speed. …
>
> We are going to de-complicate everything we do and make at GE. … Our engineers will use less-convoluted processes, and fewer parts, to produce designs whose elegance will be measured by their simplicity; and that simplicity will improve their quality, their cost and their speed in reaching the marketplace."

As we have described, this increased standardization of components is important for implementing JIT, and it is a common factor driving increased intra-firm trade in intermediates in many firms we examined.

Appendix D: The Case of Whirlpool

Whirlpool is a rare case of an MNC that "rationalized" North American operations after the FTA. Whirlpool is the world's largest producer of major appliances, and its Canadian affiliate is Inglis. In 1989-90, a refrigerator plant in Port Credit, ONT and a dishwasher plant in Toronto were shut down. Then, Inglis was assigned to specialize in the production of compact (i.e., "apartment-sized") clothes dryers and trash compactors for all of North America. The trash compactor production was transferred from a plant in Kentucky, which then specialized in making only vacuum cleaners. The Toronto Star (Sept. 20, 1990, p. G3, "Inglis to Build Products for all North America") attributed this reorganization to the FTA.

The problem with this story is that, upon closer investigation, the restructuring appears to have had little to do with tariff reductions. According to Appliance (June 1991, 48:6, p. W83, "The Consolidation Story: By Restructuring its Production Facilities, the Company Positions Itself to Compete Effectively and Aggressively in the '90s"), the changes at Inglis were just a small part of a massive restructuring by Whirlpool in the early 90s. The restructuring involved rationalization of Whirlpool's operations within the U.S. as well. For example, plants in Kentucky stopped making dishwashers, and all dishwasher production was concentrated in one plant in Findlay, OH. Production of built-in cooking products ceased in Findlay, and was concentrated in Oxford, MS. Production of ice makers ceased in Danville, KY, and shifted to a refrigeration plant in Fort Smith, AR. Refrigerator production was rationalized, with production of all side-by-side models focused in Fort Smith, and of all top and bottom mount models in Evansville, IN. Refrigerator production in Mexico was also shut down and shifted to Evansville.

In announcing the restructuring in Jan. 1991, CEO David Whitwam indicated that it was motivated by "federally mandated energy and CFC standards that will require substantial investments, and … pressures on margins for … the industry due largely to excess capacity problems and relatively flat market growth." And VP of operations and planning Jerry Weinstein was quoted as saying "… producing one product in one plant … has improved our facility utilization, which is basically a way of improving our fixed cost." Obviously, Whirlpool wanted to have fewer refrigerator plants so it could spread out the overhead cost of meeting new federal CFC standards over larger production runs. Tariffs are never mentioned as a factor in the decision.[20] Thus, the Inglis reorganization, while it happened to occur after the FTA, actually appears to be a good example of how tariffs play a small role in these decisions.

Appendix E: JIT and U.S. Auto Firm's Investments in Mexico

Business Week (March 16, 1992, p. 98, "Detroit South") argues that Mexico has country specific advantages for JIT implementation, and argues that this was the key reason for U.S. auto firms' investments in Mexico. The article notes that U.S. auto firms began a large wave of investment in Mexico starting with Ford's Hermasillo assembly plant in 1986 – several years prior to NAFTA. The article argues that the reason was response to Japanese competition and the recognition that Mexican workers, due to their youth and lack of prior manufacturing experience, were better able to adapt to the JIT production system than American workers. Some excerpts from the article are worth noting:

[20] Incidentally, locating trash compactor production in Canada made sense, since, according to the Toronto Star report, a growing number of Canadian localities were charging households for the number of trash bags they put out.

"… How did Mexico become "a must" in autos? A startling discovery clinched its status. Mexican auto workers, it seems, not only are dirt cheap but can also deliver quality. In Detroit's view, Mexico's young work force adapts more quickly to new industrial regimes than entrenched workers in the Rust Belt. The workers in GM's Ramos Arizpe plant, for example, quickly mastered Japanese-style manufacturing techniques to become GM's No. 1 plant, setting company-wide quality records. … Detroit's courtship with Mexico started in earnest in the late 1960s, when the auto makers opened up low-wage assembly plants, known as maquiladoras, on the south side of the U. S.-Mexican border. For $4 or $5 a day, Mexican workers threaded wires into cables and stitched upholstery. … By the mid-1980s, Detroit needed more than maquiladoras. The Japanese were setting up their own plants in America's rural Midwest, where they found young, nonunion workers. Detroit would answer this challenge with transplants of its own – in Mexico.

Ford started the trend. Working with their partners at Mazda Motor Corp., Ford executives settled on the desert cattle town of Hermosillo, a five-hour drive from Tucson. There, they found what they were looking for -- lots of young, educated workers with no auto experience. Once they were trained to build cars the new, leaner way, these youthful cowhands and clerks would form a new generation of Mexican auto workers, the Detroiters surmised. Ford sent workers to Spain and Japan for training and began building a $ 500 million clone of a Mazda plant.

By late 1987, the new plant was pumping out Mazdas disguised as Mercury Tracers and shipping them to California. The cars were cheap. But they also had to match Japanese quality, and surprisingly, they did. Within two years, Hermosillo was winning quality awards. Researchers at Massachusetts Institute of Technology proclaimed Hermosillo a trendsetter and profiled it in a book, The Machine that Changed the World.

… the quality fervor at GM's Ramos Arizpe plants, some 1,000 miles east of Hermosillo, borders on the religious. … In five years, Ramos Arizpe has become GM's top plant. Graphs covering the bulletin boards remind the Mexicans that they are outscoring their U. S. and Canadian counterparts in Oklahoma City and Ste. Therese, Quebec. … GM's success in Mexico is a testament to labor-intensive manufacturing. … Unlike Ford's automated Hermosillo factory, Ramos Arizpe has only one robot, in the paint section."

Notice that, under the "maquiladora" system, the automakers were already operating in a low tariff environment prior to 1986.[21] Thus, as in the Canadian case, the wave of investment that began in 1986, and the accompanying increase in intra-firm trade, cannot be explained by tariff reductions. Rather, it resulted from a desire to adopt the JIT production system in response to Japanese competition and. Thus, the idea that JIT can be a motivator for increased intra-firm trade is not limited to the U.S.-Canada context.

Appendix References

Alberta Economic Development (2003). *Alberta Business Outlook, 2003-2004*. Policy and Economic Analysis Division.

City of Edmonton (2000). *Long-term Economic Impact of Resource Development for Edmonton*. Report prepared by Economic Consulting, The Conference Board of Canada and Diane Lougheed Keefe Consulting Inc.

Clark, Kim B., W. Bruce Chew and Takahiro Fujimoto (1987). Product Development in the World Auto Industry. *Brookings Papers on Economic Activity*. Special Issue on Microeconomics, p. 729-781.

Garvin, David (1983). Quality on the Line, *Harvard Business Review*, 61:5 (Sept/Oct.), p. 64-75.

[21] The maquiladora program allowed the duty-free import of components into Mexico, which are assembled and re-exported, with duty paid on re-entry into the US only on the added value.

Harry Blair Consultants (2000). Alberta Polystyrene Production Options. Report Prepared for the Alberta Department of Economic Development.

Hayes, Robert H. and R. Jaikumar (1988). Manufacturing’s Crisis: New Technologies, Obsolete Organizations. *Harvard Business Review*, 66:5 (Sept./Oct.), p. 77-85.

T.J. McCann and Associates (2000). Alberta Propylene Upgrading Prospects. Report prepared for the Alberta Department of Economic Development.