PRODUCER BEHAVIOUR: CANADIAN MAN-MADE FIBRE; 1950-1968

PRODUCER BEHAVIOUR IN THE CANADIAN MAN-MADE FIBRE AND YARN INDUSTRY

1950-1968

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ABSTRACT

This thesis examines the behaviour of Canadian producers of primary man-made fibre and yarn. Production technology, patents and market size are found to produce a foreign owned, oligopolistic, primary industry. Canadian tariffs and quotas on textile imports create the secondary industry that purchases the primary products. Major changes in primary producer price, production, product introduction, and investment behaviour follow changes in the intensity of import competition at secondary manufacturing levels. The observed behaviour of primary producers appears to subsidize secondary producers in times of increased import pressure and tax secondary producer earnings in times of reduced import pressure. This behaviour of primary producers, and their sensitivity to secondary import pressures, have implications for both the allocation of benefits of Canadian primary production and the design of public policy to influence producer behaviour.

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by

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CHAPTER I

INTRODUCTION

The purpose of this thesis is to examine the Canadian primary man-made fibre and yarn industry to illustrate and assess the main factors responsible for industry structure and producer behaviour. Foreign ownership, technology, patents, the structure of the market and the nature and intensity of import competition emerge as key factors. A framework for the analysis of an individual producer is developed to assist in illustrating and analyzing the impact of these factors on producer behaviour. Observations on industry structure, producer behaviour and foreign ownership are then considered within the context of the Watkins Report.[1] Finally, implications for public policy of the observed relationships are considered in as much as some factors are directly or indirectly subject to policy control.

[1] Foreign Ownership and the Structure of Canadian Industry, Report of the Task Force on the Structure of Canadian Industry, (Ottawa, 1968), henceforth referred to as the Watkins Report.

The contribution of this thesis to original knowledge occurs at several levels. In the broadest sense, the contribution arises from the analysis of the Canadian primary man-made fibre and yarn industry, in economic terms, for the first time. Within this analysis the thesis develops and illustrates the use of an analytical framework consistent with the characteristics of this industry but amenable to more general applications. It examines the relationship between a foreign owned oligopolistic primary industry and a competitive domestically owned secondary industry. It illustrates the implications of these differing industry structures for the allocation of producer benefits from tariff changes or other changes in the intensity of import competition. Finally, the analysis provides an opportunity to examine the findings of the Watkins Report on the basis of the behaviour of one foreign owned industry and producers in that industry.

Several key relationships within the Canadian man-made fibre and yarn industry are developed, illustrated and assessed. The first of these is the relationship between technology, foreign ownership and patents on the one hand and industry structure on the other. The technology employed in the Canadian industry was both developed and patented by man-made

fibre and yarn producers in the United States and the United Kingdom. This gave those foreign firms who initially developed the technology and acquired Canadian patents on that technology an advantage in original entry into the Canadian industry.[2] The patent rights held by the original entrants established an insurmountable barrier to subsequent entry and competition. Even after the expiry of the original patents, the established position of the original entrants, the small size of the Canadian market relative to the minimum efficient scale of plant, precluded further entry in every case except nylon production. Thus foreign development of technology and patents resulted in a foreign owned, oligopolistic Canadian primary man-made fibre and yarn industry.

This relationship among ownership, technology, patents and industry structure has implications for the behaviour of primary producers. Not only have patents and technology provided barriers to competitive entry into the Canadian market,

[2] This advantage of foreign ownership and technology is noted in the Report of the Royal Commission on the Textile Industry (Ottawa, 1938), p.49 and repeats a pattern noted earlier in the United States by Markham in Competition in the Rayon Industry, (Cambridge, 1952), pp.14-20.

but also, they have virtually eliminated competition from imports of primary fibre and yarn. The result has been an isolation of the Canadian market from direct external competition and considerable independence for Canadian producers themselves as a result of product differentiation within the Canadian market.

A second key relationship developed and illustrated is the implications of the initial observations on technology and structure for the construction and use of a theoretical framework for the analysis of producer behaviour. Following suggestions made by Mrs. Robinson[3] the information available on production technology is used to construct hypothetical cost curves for a producer of primary fibre and yarn. Similarly, the information on industry structure and producer behaviour is employed for the construction of hypothetical revenue curves. The result is a framework which is employed along with information on market conditions, to illustrate, analyze and assess individual primary producer behaviour.

The selection of this framework from a number of alternatives was based largely on the correspondence between its treatment of technology and market characteristics and

[3] J. Robinson, Exercises in Economic Analysis, (London, 1965) pp.167-199.

the technology and market characteristics observed in the industry. In addition, the definition of cost and revenue functions appeared most compatible with empirical information available on the primary fibre and yarn producers. Similarly, the framework's approach to the various aspects of producer behaviour accorded well with both empirical observations and explanations given by spokesmen for several producers. The framework appears to combine simplicity and realism to yield useful interpretive powers.

The third relationship illustrated and examined is that observed between the competitive structure of the secondary man-made textile industry, its sensitivity to foreign competition and fluctuations in the markets faced by primary producers. Unlike the primary industry, barriers to entry into the secondary are low resulting in competitive structure and Canadian ownership. The industries are made up of a large number of producers none of whom controls a substantial proportion of the market and whose products are virtually perfect substitutes. As a result of Canadian ownership, secondary producers do not have the potential isolation from sources of import competition which the subsidiary status of primary producers appears to embody. Fluctuations in both

foreign and domestic textile markets thus cause fluctuations in the number and size of secondary producers which transmits changes in secondary market conditions into shifts in primary fibre and yarn demand.

The intensity of import competition in woven fabric and manufactured textile products emerges as the major factor determining conditions in the secondary industry and then the market demand for primary fibre and yarn. Unlike primary fibre and yarn producers, secondary and higher level producers are not shielded from direct import competition by either patent ownership or parent-subsidiary relationships with potential foreign competitors. The absence of patent protection apparently arises directly from an international agreement on the part of primary producers not to assert patent rights at higher production levels but instead to support secondary industry requests for tariff and quota protection.[4] Thus the secondary and higher stages of man-made textile production have developed and grown behind a wall of tariff and quota restrictions on import competition. Variations in the strength of this protection are transmitted through the competitive structure of the higher production stages to the markets for primary fibre and yarn.

[4] See Chapter 2, pp.48-49.

The significance of secondary import competition, and the competitive structure of the secondary industries is examined and illustrated in two ways. The first approach is an empirical examination of changes in import competition as reflected in price and volume data and a comparison of the timing and magnitude of these changes with empirical observations on primary producer behaviour. The second approach, which uses the analytical framework developed, illustrates both the significance of import competition and the interpretive power of the analytical framework, again based on empirical observations. With both approaches, the relationships noted above are illustrated, primary producer behaviour is illustrated and assessed, and observed differences in behaviour are considered.

The outcome of these illustrations and the accompanying analysis is a fairly complete picture of key factors responsible for structure, behaviour and changing producer positions in the Canadian primary man-made fibre and yarn industry. The industry emerges as a foreign owned oligopoly, with patent protection, engaged in the manufacture of a differentiated producers' good for sale to a tariff protected competitive secondary industry. The observations and analysis of structure, ownership and

behaviour in the primary industry are then considered within the context of the Watkins Report. The observed relationships between primary and secondary producers, the significance of foreign competition and the implications of foreign ownership are all considered in terms of their implications for public policy.

Perhaps the major finding of the analysis, and the one which has strongest implications for public policy, is the role of import competition at secondary levels as a determinant of primary producer behaviour. Changes in the degree of intensity of import competition in spinning and weaving arise during the 1950-1968 period from changes in foreign import supply prices, changes in domestic tariffs, and changes in the Canadian exchange rate. The competitive structure of the secondary industry transmits these changes in foreign competition directly to the demand for primary fibre and yarn. In spite of the market power of primary producers based on technology, foreign ownership and patent ownership, changes in foreign competition in the secondary industry produce rapid price, production and product development responses on the part of primary producers. Increased import competition in woven fabric is met by price reductions on the part of primary fibre and yarn producers

which in effect subsidize the secondary producers. By contrast, decreased import competition in woven fabric is quickly followed by increased primary fibre and yarn prices which tax the increased earnings in the secondary industry. Thus the value of the monopoly power of primary producers is reduced or expanded as the market for the domestic textile industry decreases or increases.

These findings on the behaviour of individual producers of man-made fibre and yarn in Canada have very definite implications for public policy. The Canadian primary fibre and yarn industry is a foreign owned, differentiated oligopoly. The market power of Canadian primary producers may however be constrained by public policy toward foreign competition in higher production stages of the man-made textile industry. Increased foreign competition at secondary manufacturing levels, arising for example through tariff reduction, may force primary producers to lower prices and expand product development activities to preserve existing markets and develop new growth areas. This lowering of prices and increased product development transfers some of the benefits of domestic production of man-made fibre and yarn from the foreign owners of Canadian producers to Canadian consumers. On the other hand, reductions

in foreign competition at secondary manufacturing levels through tariff increases or higher quota restrictions increases the scope for monopoly behaviour available to primary producers. Reductions in foreign competition allow primary producers to enjoy growing markets at the same time as they increase the prices of primary fibre and yarn. Depending on the aims of primary producers they may raise prices to reap all the benefits of increased protection, they may maintain prices and enjoy market growth or they may follow some combination of these policies. The essential point is that increases in protection for secondary manufacturing levels may result only in increased earnings for primary producers at the expense of final consumers.

In illustrating and assessing the above relationships, the thesis draws on data and information from a number of different sources. Basic data on production and producing capacity or primary producers were obtained from Textile Organon published by the Textile Economic Bureau Incorporated, New York, New York. This source provided aggregate data on production and capacity by product group but did not provide breakdowns, in every case, which would allow identification of individual producers. As a result, data for the individual

non-cellulosic producers, DuPont of Canada Ltd. and Millhaven Fibres Ltd., were estimated from the published aggregates using reports in financial journals and interviews with producer spokesmen as a guide. With these estimates, Textile Organon thus provided the basic production and capacity data for the primary producers.

Data on primary product prices and virtually all data on the secondary textile industries was drawn from Dominion Bureau of Statistics, Annual Census of Manufacturers series. Primary product prices were calculated from published information on cost of materials used in a range of industry classifications reporting use of man-made fibre and yarn by type of fibre and yarn. This provided the only available price series on primary products and the series appears to have the advantage of providing actual prices as opposed to list prices. Other data on the secondary industry, particularly the spinning and weaving industry, had to be calculated from data published in Synthetic Textile Mills (D.B.S. 34-208) to eliminate data on the primary industry which is included in this industry classification. This separation was performed on the basis of data published by size of establishment by eliminating in each case the largest establishments which are the primary producers. Further data on import prices and volumes were also obtained from Dominion Bureau of Statistics publications.

The collection of information on the technical aspects of production, on producer decision making, on the relationship among primary and secondary producers and on parent-subsidiary relationships presented some of the greatest difficulties. Several individuals and organizations deserve special thanks for the assistance they provided although some prefer to remain anonymous. The Canadian Textiles Institute was particularly helpful in the early stages of research. Discussions with officials there yielded considerable insight into industry views on foreign competition, patent protection and the relationships between primary and secondary producers. The library at the Institute willingly granted access to its collection of Textile Organon which proved to be a major source of data. In addition the Institute supplied copies of a number of studies of the Canadian industry which although they provided important and essential background information were confidential and could not be directly quoted or cited.

Another, and perhaps the most important source of information, was a series of interviews with management personnel of the primary producers. Although the initial response to correspondence directed to the companies concerned suggested enthusiasm to assist, only one company, DuPont of Canada,

granted a formal interview. That interview with Dr. R. J. Richardson, Manager, Textile Division helped to both confirm impressions gained from initial study of the data and suggested new viewpoints and factors for consideration. Even though the other companies subsequently declined to grant formal interviews, it was possible through personal contacts to arrange three other informal interviews which proved very useful. In these latter three cases, the individuals involved preferred to remain anonymous and although references are made to these interviews the requests for anonymity are respected. Nevertheless these interviews provided not only new and useful technical and operational material but they also confirmed the quality of information and data gathered from sources mentioned above.

On the basis of this data and information, the thesis illustrates and assesses the relationships previously outlined by following a number of distinct steps. Chapter 2 examines the Canadian primary fibre and yarn industry to illustrate and discuss the roles played by patent ownership, foreign ownership, and technology as determinants of industry structure. It also considers the implications of foreign ownership for the analysis of producer activity in terms of producer autonomy

and parent-subsidiary relationships. Using material obtained through interviews with executives of the companies involved an assessment is made of producer goals and the underlying basis of investment, price, production and product development behaviour. Thus Chapter 2 is aimed at defining and examining the main characteristics of the primary industry.

Chapter 3 uses the information of Chapter 2 in the construction of a framework for the analysis of individual producer behaviour. The technological information and producer outlooks presented in Chapter 2 are used to help establish the possible shapes of cost and revenue curves of a hypothetical firm. Development of the framework also takes account of the existence of foreign ownership and its implications for the definition and use of the framework.

Chapter 4 demonstrates the key role played by import competition in determining the market conditions facing primary producers. The structure of secondary manufacturing industry and the response of the secondary industry to changes in import competition are of major significance. When considered in terms of the framework of Chapter 3, the structure of the secondary industry illustrated in Chapter 4 becomes the vehicle transferring changes in import competition into shifts in primary product demand.

Chapter 5 combines the analysis and observation of the preceding chapters to illustrate the behaviour of individual primary producers. It considers investment, price, production and product development behaviour and discovers the relationship of primary producer response to secondary product import competition. Differences among primary producers' behaviour are also noted and relationships with differences in patent ownership and parent corporation nationality considered. The implications of these findings for public policy are also noted.

Chapter 6 examines the question of foreign ownership by considering the Canadian man-made fibre and yarn industry within the context of the Watkins Report. The costs of foreign ownership in this industry are discussed both in terms of the suggestions of the Watkins Report and on the basis of observations on the industry itself. Similarly the benefits of ownership are examined along with the distribution of these benefits as affected by primary producer behaviour. Differences between the approach of the Watkins Report and the findings of the thesis are then compared.

Chapter 7 summarizes the main findings of the thesis and further considers the qualitative aspects of individual producer behaviour and their implications for public policy.

CHAPTER 2

THE CANADIAN PRIMARY MAN-MADE FIBRE AND YARN INDUSTRY

Foreign ownership and patents appear to have been major determinants of the structure of the Canadian primary man-made fibre industry and of the technology employed by producers in that industry. All producers in the industry are owned and controlled by major world producers of man-made fibre and yarn domiciled in the United States or the United Kingdom. In every case, production in Canada originated from patent protection on the process used and although some of these patents expired before or during the period under consideration, new patents have been issued on subsequent process developments. The existence of patents combined with the nature of the product has resulted in a pattern of strong product differentiation based on both real product differences and the development of brand names or trade marks. This chapter introduces the Canadian primary man-made fibre and yarn producers and illustrates the roles played by

ownership and patents as determinants of industry structure, technology and inter-firm competition.

Primary Producers and Products

The Canadian primary man-made fibre and yarn industry is most accurately described as a differentiated oligopoly engaged in the manufacture of a producer good. During the 1950-1968 period the number of producers increased from three to thirteen.[1] In this same period, the number of products produced increased from three to seven but a basic pattern of unique producer-product relationship has been maintained. The small number of producers involved and the unique producer-product relationship justify the differentiated oligopoly classification of this industry.

The nature of the producer product relationship can be illustrated by the pattern of industry growth. In 1950 there were four man-made fibre and yarn producers in Canada. Courtauld's (Canada) Ltd. located in Cornwall, Ontario, was at that time, the only Canadian producer of viscose rayon filament yarn and staple fibre. Canadian Celanese Company

[1] See Table 1 in Appendix of Products and Producers and definitions of products included there. The products mentioned here are distinctly different on the basis of chemical composition and are defined in Textile Organon, (New York, June 1968), p.106.

Limited, with a plant located in Drummondville, Quebec, was the sole Canadian producer of acetate rayon yarn and staple fibre. The Canadian Chemical Company Limited of Edmonton, Alberta, produced triacetate rayon yarn and staple fibre. The Canadian Industries Ltd. plant at Kingston, Ontario, owned and operated by DuPont of Canada since 1953 was the fourth Canadian man-made fibre and yarn producer and specialized in the production of nylon (polyamide) yarn and staple fibre.[2] Each producer was clearly identified with the production of one distinct but competitive product.

The identification of one producer with one product persisted through the later expansion of the industry. In 1953 a fifth producer entered the Canadian man-made fibre market and introduced a fifth man-made fibre. This producer was Imperial Chemical Industries of Canada Ltd. which in 1954 became Canadian Industries Limited and the product was polyester yarn and staple fibre marketed under the brand name 'terylene'. In 1956 DuPont of Canada Ltd. completed the installation of capacity at Maitland, Ontario for the

[2] The descriptive material of this and subsequent paragraphs is based on material published in Textile Organon, June 1950-1968, The Report of the Tariff Board: Synthetic Textiles and Silk, (Ottawa, 1958), The Financial Post, Oct. 12, 1968 pp.0-9 and The Financial Post Corporation Service (Toronto, 1970).

production of acrylic staple fibre which was marketed under the brand name 'orlon'. With the exception of one product which will be discussed, four producers, Courtauld's, Canadian Celanese, DuPont and Canadian Industries, make up the Canadian man-made fibre and yarn industry.[3] Their products accounted for approximately ninety per cent of Canadian production in 1964.

The remainder of Canadian production is accounted for primarily by one product type which is produced by several different companies. This product has the generic name olefin and production in Canada appears to have been originated by three companies in 1960. Two producers of olefin are particularly important from the point of view of volume of production, the fibres division of Dow Chemical Company and Canadian Celanese Company. The former has recently been taken over by Grace Fibres Canada Limited. A number of smaller olefin producers continue to operate producing small quantities of mono-filament yarn as an input to their other manufacturing processes.[4]

[3] In 1963, Canadian Celanese Ltd. and Canadian Chemical Co. Ltd. were integrated as the Canadian Celanese Division of Chemcell Ltd. See Financial Post Corporation Service and pages 20 and 21 below.

[4] See Textile Organon, June 1968 p.107 for a complete list of Canadian olefin producers as of that date.

As has been pointed out, olefin manufacture accounts for a very small part of the total man-made fibre and yarn production and is frequently omitted from descriptions of the industry. As a result, the breakdown of the unique producer-product relationship on the basis of this one product does not significantly affect the general description of the Canadian industry up to 1963.

Beginning in 1963, there were several changes in the structure of the industry and producer-product relationships. Part of this change appears directly attributable to the expiry or pending expiry of major process patents.[5] In addition, two cases of reorganization and realignment of existing producers appeared without the establishment of new producers. The result of these changes was a modification of the original producer-product relationships introducing what appears to be a new pattern of competition.

The change in industry structure began in 1963 with the integration of Canadian Celanese Limited and Canadian Chemical Company Limited to form the Canadian Celanese Division

[5] The value and importance of patents are discussed in detail below.

of Chemcell Limited.[6] This integration reduced the number of major primary producers from five to four as both acetate and triacetate rayon were produced by the new company. Not only were the financial structures of the two original companies amalgamated, but production and sale of man-made fibre and yarn was also co-ordinated within one division of the new company. Commenting on the formation of the new company, the Chemcell Annual Report to Shareholders 1963, noted that the products of the original companies Canadian Celanese and Canadian Chemical (acetate and triacetate rayon respectively) were basically complementary rather than competitive. Integration and rationalization of production along with modification of some equipment would thus produce efficiency benefits and allow manufacture of raw materials for "Arnel" fibre which had previously been imported.[7]

Further and more extensive changes in industry structure followed expiry in 1964 of DuPont's steam spinning patent on nylon production. Until this time DuPont of Canada had been

[6] Prior to 1963 and integration with Canadian Celanese, Canadian Chemical operated independently producing triacetate yarns. Both companies however shared common parentage as Canadian Celanese had been organized by Celanese interests in Great Britain and the United States in 1927 and Canadian Chemical was organized by Celanese Corp. of America in 1950. See Report of the Royal Commission on the Textile Industry (Ottawa, 1938) pp.48-50 and The Financial Post Corporation Service (Toronto 1970).

[7] See Annual Report to Shareholders 1963, Chemcell (1963) Ltd. Montreal, Quebec, pp.1-2.

the only Canadian nylon producer and its market position was protected by patent. The expiry of this patent removed what had been an insurmountable barrier to entry into Canadian nylon production. It was followed by several new entries into nylon production and a further reorganization of existing producers which included entry into nylon production.

Of the four new entries into nylon production after 1964, the entry by Millhaven Fibres Ltd., the C.I.L. subsidiary which had previously produced only polyester yarn and fibre, appears to have been most significant. Unlike the other entries, Millhaven Fibres entered production of nylon 66, the same type of nylon produced by DuPont. The other three new producers concentrated on nylon 6, a product regarded as inferior to nylon 66 and limited largely to industrial and carpeting end uses. Thus although four new entries ultimately occurred, only Millhaven Fibres established facilities to produce a product directly competitive and clearly substitutable in DuPont's established markets.

Millhaven Fibres' competitive position relative to DuPont in nylon appears to have been a major factor determining the pattern of subsequent reorganization in the industry. Shortly after announcing the intention to produce nylon 66, Canadian Industries Ltd. in 1964 sold a forty per cent interest

in the previously wholly owned Millhaven Fibres, to Chemcell.[8] From Chemcell's viewpoint, this purchase gave the Canadian Celanese Fibres division of Chemcell a substantial interest in five of the seven major man-made fibres.[9] A new company, CEL-CIL Fibres Ltd. jointly owned by Chemcell and Canadian Industries Limited was formed to market the man-made fibres and yarns of both companies. While Millhaven Fibres and Canadian Celanese continued to operate independently the joint marketing operation was designed to accelerate the market development of man-made fibres and the fabrics made from them by Canadian textile manufacturers.[10]

The entry of Canadian Celanese into nylon production through acquisition of a part ownership in Millhaven Fibres Ltd. appears to have provided it with several advantages. Perhaps

[8] In announcing the purchase of a 40% interest in Millhaven the Chemcell Annual Report to Shareholders 1964 explained that the purchase was made to enter into the nylon and polyester production.

[9] Ibid., p.3. The five fibres were acetate, triacetate, polyester, nylon and olefin.

[10] Ibid., p.3.

the most important of these advantages was the access of Millhaven Fibres to established technology in nylon production through the Imperial Chemical Indsutries subsidiary British Nylon Spinners Ltd. Even though patent expiry removed the major legal barrier to entry into Canadian nylon production, the establishment of a competitive position in nylon 66 was dependent upon achieving a quality and consistency of the product similar to that achieved by DuPont. DuPont agreed to supply Millhaven with raw material inputs for nylon production but required Millhaven to draw up its own specifications for these inputs. Specifying inputs and entering nylon production depended on experience and developed technology making Millhaven's relations with British Nylon Spinners important to successful Canadian entry.[11]

There appear to have been at least two other advantages to the Millhaven-Celanese merger with regard to nylon production. It permitted both companies to enter nylon production in Canada without creating the pressure on the relatively small Canadian

[11] British Nylon Spinners Ltd. was a jointly owned Imperial Chemical Industries Ltd.-Courtauld's Ltd. subsidiary formed to exploit the British license to the E. I. DuPont nylon patent. In 1964 it became a division of the wholly owned Imperial Chemical Industries British subsidiary I.C.I. Fibres Ltd. See Canadian Industries Ltd. Annual Report to Shareholders 1964, Montreal, Quebec, 1964, p.4.

market that two new nylon 66 producers would have involved. In addition Canadian Celanese was able to offer a source of raw material for nylon production from Fibre Industries Inc. in the United States.[12] The joint entry thus provided independent sources of technical knowledge, and raw materials for the establishment of production which at least had better potential of approaching efficient scale of operation than two independent entries.

The purchase of an interest in Millhaven Fibres Ltd. by Chemcell Ltd. was the second stage in a wider reorganization and realignment of producers within the Canadian man-made fibre industry. The first stage mentioned above was the integration of Canadian Celanese and Canadian Chemical as divisions of Chemcell. A third stage appeared in 1968 when Canadian Celanese assumed operating control of Millhaven Fibres Ltd. and began integration of Millhaven Fibre production of polyester and nylon with previous Celanese production of acetate, triacetate and olefin.[13] Canadian Celanese Division of Chemcell thus

[12] Fibre Industries Inc. is jointly owned by Celanese Corp. of the U.S. and Imperial Chemical Industries of the U.K. See Textile Organon June 1966.

[13] See Financial Post, October 12, 1968, pp.0-9.

became the Canadian counter-part of the joint Imperial Chemical Industries--Celanese Corporation United States man-made fibre and yarn producer, Fibre Industries Incorporated. Integration was extended beyond the manufacturing stage in Canada as the previously formed Cel-Cil Fibres Ltd. marketed Canadian production using brand names developed in the United States replacing the original Millhaven Fibres and I.C.I. brand "terylene" for polyester with the Celanese brand "fortrel". The net result of these changes was the emergence of two large man-made fibre producers in Canada, Chemcell and DuPont, producing a range of products with overlapping end uses.

It thus appears on the basis of recent developments that the Canadian man-made fibre and yarn industry will be dominated by two large diversified producers in the 1970's. The Canadian Celanese division of Chemcell Ltd. will be one of these producers engaged in the manufacture of the range of products noted above. The second producer will be DuPont of Canada Ltd., which with the completion of plant facilities in Morrisburg, Ontario, will have capacity for the production of nylon, polyester, acrylic and spandex fibres and yarn.[14]

[14] See The Financial Post, July 26, 1969, p.16. DuPont appears to be the only producer with intentions to enter polyester production after the expiry of Millhaven Fibres' patent rights in 1970.

The future dominance of the industry by these two producers will be further enhanced by the recently announced intention of Courtauld's (Canada) Ltd. to stop production of viscose rayon filament yarns. This would leave two large producers competing directly in the two major man-made fibres and yarns, nylon and polyester.

While these later developments in the industry extend beyond the scope of this thesis, they do not appear to impair the significance of its main findings. The thesis is primarily concerned with the 1950-1966 period and the implications of ownership, technology, patents and import competition at secondary manufacturing stages, for primary industry structure and producer behaviour. The later developments reinforce the observed structural and ownership characteristics of the industry. While the role of major original process patents declines after 1964, new processes are continually being patented as variations of existing fibres are developed.[15] The period after 1964 also provides insights into the possible future patterns of behaviour and competition in the industry.

[15] DuPont has recently announced the development of a new variety of nylon "Quiana". See Arthur D. Little Associates. The Man-Made Fibre Industry 1967-1972 (Boston 1968) and The Financial Post, Jan. 3, 1970.

The thesis is concerned with four major man-made fibre and yarn producers and four major products. The producers were Canadian Celanese, Courtauld's (Canada) Ltd., DuPont of Canada Ltd., and Canadian Industries' Millhaven Fibres Ltd. The major products produced by these companies were, respectively, acetate rayon, viscose rayon, nylon, and polyester. Other producers and products in the industry will be included in the analysis from time to time in as much as they shed some light on the behaviour or performance of these major producers.[16]

Foreign Ownership of Primary Producers

Every major primary producer in the Canadian man-made fibre and yarn industry is foreign owned and controlled. The general pattern of ownership has already been indicated by the names of the companies identified but it is discussed in more detail here. The reason for foreign ownership appears to be in the advantage held by foreign corporations in surmounting the initial barriers to entry into the industry. Once operations have been established in the Canadian economy, the relationships between Canadian subsidiaries and foreign parent corporation

[16] A complete list of producers, products and dates of entry appears in the Appendix on Producers and Products.

and the inter-relationships among parent corporations have implications for behaviour of Canadian producers. The underlying basis for foreign ownership and its implications for behaviour are discussed below.[17]

Although all four major Canadian producers are foreign controlled there is some variation in the nature and extent of ownership and control. Courtauld's Canada Ltd. for example, is a wholly owned subsidiary of Courtauld's Ltd. of the United Kingdom. Subsequent entry of Courtauld's into nylon production in 1964 also involved the creation of a second wholly owned subsidiary Courtauld's (Canada) Synthetic Fibres Ltd. Spokesmen for other producers in the industry regard the Courtauld's operations as the least autonomous of Canadian man-made fibre and yarn producers.[18] They suggest that to a large extent both decision making and product development work take place within the British Courtauld group. Because of its wholly owned subsidiary status, the Canadian operation is not required to

[17] The discussion concentrates on the four main producers identified at the end of the preceding section. Data on all producers are included in Table II of the Appendix on Producers and Products.

[18] Interviews with official from Millhaven Fibres Ltd., December 17, 1968 and R. S. Richardson of DuPont of Canada Ltd. January 13, 1969.

make public disclosures of information regarding its operations and would not even acknowledge receipt of correspondence directed to it.[19] The parent company in Courtauld's case appears to favour very close control of subsidiary operations.

By way of contrast, Canadian Celanese had both the lowest level of foreign ownership and the greatest autonomy of Canadian primary man-made fibre and yarn producers. Canadian Celanese, Division of Chemcell is fifty-seven per cent owned by Celanese Corporation of the United States. Interviews with executives of both Celanese and DuPont of Canada indicated that relative to other Canadian fibre and yarn producers Celanese enjoyed the highest level of independence in decision making. This independence is further indicated by the nature of research performed by the Canadian operation which has been responsible for the development of important new products.[20]

[19] The difficulties encountered in acquiring any information about Canadian Courtauld's operation reinforce the suggestion of the Watkins Report with regard to mandatory public disclosure. See Foreign Ownership and the Structure of Canadian Industry, (Ottawa 1968).

[20] One important example of their product development activity is development by Canadian Celanese of the new carpet fibre 'propylon' and the subsequent installation of carpet making capacity to produce carpets of this and other types. See Textile World, August 1968 "Canadian Celanese Carpets".

The subsequent acquisition of part ownership and responsibility for the operation of MillhavenFibres Ltd. was accompanied by an extension of the Canadian Celanese methods of management into two new products, polyester and nylon. Millhaven Fibres itself had previously enjoyed a considerable degree of autonomy particularly in product development,[21] in spite of a seventy three per cent interest held in the company by Imperial Chemical Industries Limited of the United Kingdom. Like its United States counterpart, Fibre Industries Inc., the Celanese-Millhaven operation directs operations and product development to filling the national market. Both companies still share a common source of raw materials supplies and joint marketing efforts.

The fourth major Canadian man-made fibre and yarn producer occupies an intermediate position in terms of the extent of foreign ownership and the degree of autonomy. DuPont of Canada is seventy five per cent owned by E. I. DuPont de Nemours and Company of the United States with the remaining twenty five per cent of capital stock publicly held. DuPont's Canadian

[21] Millhaven Fibres pioneered research in both polyester-cotton blend fabrics and polyester tire cord. See Annual Report to Shareholders, Canadian Industries Ltd., Montreal, Quebec, 1963, p.8 and 1965 p.11.

operations appear to be based almost entirely on producing and marketing in Canada products developed through research in the United States. Research activities carried out in Canada are directed primarily at problems peculiar to the Canadian market and its relatively small scale. Major decisions on production, products and capacity appear to originate in the parent company in the United States.[22] Operating decisions, allocating of capacity and formulation of at least some development projects appear, on the other hand, to be local responsibilities combined with local customer relations and market development. DuPont is thus an example of what may be considered a typical foreign owned Canadian producer exercising local decision powers within the broader framework of an international corporation structure.[23]

[22] Spokesmen for DuPont of Canada were very quick to claim independence from parental control. It is of note that these claims were the source of considerable amusement for spokesmen from other producers who chide their DuPont colleagues for their lack of independence. Product similarities, focus of research on local market rather than new product development, and the nationality of senior executives are cited as indicators of a deeper level of parental control.

[23] See A. E. Safarian, Foreign Ownership of Canadian Industry, (Toronto 1966), Chap. 3, pp.50-102, esp. pp.74-78.

The foreign ownership of Canadian primary man-made fibre and yarn producers appears to result in part from the barriers to entry into the industry.[24] In the case of original entry based on new man-made fibre the overall barrier to entry arises primarily from what have been termed scale economies in this context.[25] These scale economies take account of both the absolute capital requirements of entry and the size of the local market relative to minimum efficient plant scale. The advantages of foreign corporations in overcoming these barriers to entry have arisen from foreign development of production techniques, the absolute size of foreign corporations relative to Canadian markets and foreign ownership of patents on the products and processes involved. The relative magnitude of foreign operations may be viewed as the source of finance for entry while patents and production techniques provide entrants with protection from new competition.[26] Foreign corporations

[24] The term 'barriers to entry' is used here in the sense developed by J. S. Bain, Barriers to New Competition, (Cambridge, 1956).

[25] Ibid., pp.55-56. Patent rights may be regarded as an inducement to initial entry which provide a barrier to subsequent competitive entry.

[26] Patents and developed production techniques are viewed as sources of both product differentiation barriers and absolute cost advantage barriers to entry. See Bain, Barriers to New Competition, pp.114-171.

have thus possessed both the means to overcome initial entry barriers and the means to protect their interests by creating barriers to subsequent competition.

Absolute capital requirements have been cited as a barrier to entry into rayon and synthetic textile industries in other studies. Markham in his study of the United States rayon industry considered the absolute magnitude of capital requirements for entry at minimum efficient scale as a barrier to entry.[27] This view of the American industry is reaffirmed by Bain and extended to include not only rayon but also synthetic fibre and yarns.[28] Neither Bain nor Markham, however, gives an absolute figure for initial capital requirements for entry although they suggest instead that a plant minimum efficient scale would have an annual capacity of approximately 50-75 million pounds of fibre and yarn. In terms of absolute cost of entry into the industry in the United Kingdom and Canada this would appear to indicate an initial capital requirement

[27] J. Markham, Competition in the Rayon Industry (Cambridge 1952), pp.42-58.

[28] J. S. Bain, Barriers to New Competition, pp.72, 80 and 241.

of 75 to 150 million dollars.[29] As in the United States and in the United Kingdom the magnitude of capital requirements for entry in Canada give large international corporations an advantage in entry.

The barriers to entry created by economies of scale are particularly important to the Canadian industry. At the time each of the producers entered the Canadian market, the estimated market for its product was substantially smaller than the size required for minimum cost production. Producers were thus not able to enter with plants of minimum efficient scale by United States or United Kingdom standards. Initial entry was undertaken at substantially reduced scales which are cited by producers as a major reason for higher per unit production costs in Canada.[30] Although subsequent growth of

[29] In the U.K. it has been estimated that the capital required to establish new capacity is in the order of £1 for 1 lb. of annual capacity. See D. P. O'Brien's "Patent Protection and Competition in Polyamide and Polyester Fibre Manufacture", Journal of Industrial Economics, XII, No. 3 (June, 1968). The most recently announced entry into the Canadian industry involves in excess of $40 million for capacity of less than 30 million pounds of yarn. See The Financial Post, July 26, 1969, p.16.

[30] Both Bain, Barriers to New Competition and Markham, Competition in the Rayon Industry estimate that unit costs rise by 8% for production at half optimal scale and 25% for quarter optimal scale. A cost disadvantage of this magnitude is also estimated in the submission of one Canadian producer to the Tariff Board in 1957. See Report of the Tariff Board, Synthetic Textile and Silk, (Ottawa, 1958), pp.61-63.

the original entrants has to some extent eliminated this cost disadvantage, spokesmen in the industry suggest that the original exclusive market rights granted by patents were essential for initial 'high-cost' entry.

The variations in foreign ownership and control noted above may now be viewed as variations in approach to the peculiar problems of the small Canadian market. The Courtauld's approach appears to have been least concerned with possible peculiarities of the Canadian industry.[31] The company appears to have imported technology used in larger scale operations and accepted the penalties of small scale. Celanese, on the other hand, appears to have attempted to adapt to Canadian circumstances both in terms of operating techniques and product development. As later discussions will indicate, although Courtauld's and Celanese products are of approximately the same age, Celanese has been able to maintain and expand markets while Courtauld's markets have declined and production has been

[31] This and subsequent observations on individual producer approaches to operation in Canada are based on previously noted differences in patterns of ownership, on interviews with spokesmen for three of the producers, the author's experience as an employee of two of the producers, and statements made by the companies in their Annual Reports to Shareholders.

discontinued in two major lines. The experience of Millhaven Fibres under Canadian Industries Ltd. control closely resembles that of Courtauld's. The Millhaven Fibre operation did succeed in developing new products in the Canadian market but markets did not appear to grow. Under the recent direction and control of Celanese, Millhaven Fibres has been by contrast the fastest growing Canadian man-made fibre producer.[32] DuPont of Canada again appears in an intermediate position in terms of its approach to the Canadian market. It has attempted an adaptation of basic American developments to the Canadian framework. It is of note here that based on the observed experience of DuPont, Celanese and in later years Millhaven Fibres, the greater flexibility of United States approach to subsidiary operations combined with overlapping United States marketing efforts has resulted in more progressive and successful Canadian operations.

These observed variations in the approach of producers to management and control of Canadian facilities raise the question of whether or not Canadian man-made fibre producers

[32] One executive closely associated with the realignment of Celanese and Millhaven Fibres attributed the change in Millhaven's fortunes to the change in approach to management accompanying the Celanese takeover of responsibility for operations. He stressed the difference between U.S. (Celanese) and U.K. (C.I.L.) approach to decision making.

can be treated as firms. This question centres in part on the definition of the concept of a firm. If the firm is defined as an economic unit able to and responsible for determining its own actions within a range of activities then there appears to be considerable scope in the degree to which producers may be treated as firms. The existence of a firm in other words requires the existence of at least some entrepreneurial function within the economic unit observed.[33] The preceding observations then suggest that the range of independence in decision making or the nature of the entrepreneurial function varies among Canadian primary fibre and yarn producers but all appear responsible for at least some decisions. The greater the range of decision making responsibility, the more nearly an individual producer approaches the concept of the firm as defined.

On this basis, the classification of primary producers as firms might be made as follows. In the case of Canadian Celanese and the current operation of Millhaven Fibres the range of decision making is widest and includes price, production,

[33] See R. H. Coase "The Nature of the Firm", Economica, New Series IV (1937), pp.386-405, reprinted in Readings in Price Theory, G. J. Stigler and K. E. Boulding (eds.), (Homewood 1952), pp.331-351, esp. p.339.

investment, marketing and some product development. The breadth of the entrepreneurial function suggests that Celanese can be treated as a firm. By contrast it is difficult to justify treating Courtauld's (Canada) Ltd. as a firm. From previous observations the Canadian operation appears to be a dependent branch of the parent company in both product development and investment decision making. DuPont of Canada, and Millhaven Fibres prior to integration with Celanese, both may be treated as firms in a qualified way. DuPont demonstrated independence in terms of short run decisions on production, prices and adaptation of techniques to the Canadian market. Long run planning and product development require at least the approval of the parent company if they do not in fact originate with the parent. Millhaven Fibres Ltd. appeared to operate with this same relationship to its parent, I.C.I., prior to acquisition of interest by Celanese. These differences are important from the point of view of the later illustrations or producer behaviour presented in Chapter 5.

The Role of Patents in the Canadian Man-Made Fibre and Yarn Industry

Patents have played a major role in shaping the industry structure and the behaviour of firms in Canadian man-made fibre

and yarn. The producer-product relationships and patterns of foreign ownership are formalized by the ownerships of patent rights. Each of the four major producers in the Canadian industry originally entered with exclusive patent rights to one major product. These patent rights provided the basis for subsequent inter-firm patterns of competition and defined the relative positions of Canadian and foreign producers in world markets. The nature of patent rights in Canadian man-made fibres and the assertion of these rights by producers are discussed below to illustrate their implications for industry structure and firm behaviour.

As a prelude to that discussion consider the nature and scope of patent rights. In the broadest sense, a patent grants to its holder the exclusive right of making, constructing, using and vending to others to be used, the invention for which the patent is granted, for a term of seventeen years from the date of its grant.[34] The invention which is the subject matter of the patent is in turn defined as any new and useful art, process, machine, manufacture or composition of matter. The

[34] See H. G. Fox, Digest of Canadian Patent Law (Toronto, 1957) esp. pp.89-124. There is however the overriding consideration here that no patent will be permitted to preclude free manufacture or sale of articles for human food or medical purposes. p.16.

exclusive rights conferred by a Canadian Patent are limited territorially to Canada and since the rights cover manufacture, use and sale, they exclude the importation of articles made abroad by a process patented in Canada.[35] Thus the holder of Canadian patent rights is potentially shielded from both domestic and foreign competition at all levels of manufacture.[36]

The strength of the protection or the magnitude of the barrier to competition created by a patent depends on the subject matter of the invention involved. If for example the patentee has a new process for arriving at old results only the particular process is protected and other persons may use other processes to obtain the same result. On the other hand, where the patentee has a process for obtaining a new result or a new product not previously known, his patent is a pioneer or master patent and protects against the use of any process for arriving at the new result.[37] The Canadian man-made fibre

[35] See Fox, Digest of Canadian Patent Law, p.124, and H. G. Fox, Canadian Patent Law and Practice, fourth edition (Toronto, 1969), p.9.

[36] Spokesmen for firms in the industry confirm that patent rights to fibre and yarn extend to the higher production stages of spinning and weaving.

[37] H. G. Fox, Canadian Patent Law and Practice, p.41.

and yarn industry provides examples of both types of patents but it is the latter pioneer or master patent which has had the greater impact on industry structure and firm behaviour.

Once a patent has been granted, the original patentee has a wide range of choice with regard to the exercise of his rights. In the simplest case, the patentee may set up operations and work the patented invention himself.[38] On the other hand, the patentee may elect to grant a licence or licences to persons or firms willing to work the invention. The terms of such licences may be very narrow as to geographical location, duration of privilege, use of process product and payment of royalties. In the more normal case, patent rights appear to be granted for one national market thus limiting potential export markets of licencees.[39] The patentee thus has the power to determine the distribution of rights both within and between countries and potential producers.

[38] It is important to note here that failure to work the patented invention or importation of the patented article or goods produced by the patented process, to the detriment of home manufacture are both grounds for patent abuse. Once patent abuse is established the patentee may be ordered to grant licences or his patent may be revoked. See Fox, Digest of Canadian Patent Law, pp.169-176.

[39] See Fox, Canadian Patent Law and Practice, pp.90-103.

The Canadian man-made textile industry from 1950-1968 provides examples of several types of patent arrangements and reflects their impacts. In 1950, the Canadian Industries Limited plant at Kingston, Ontario produced nylon yarn and staple fibre under Canadian patent rights to the E. I. DuPont de Nemours steam spinning process. The patent on the steam spinning process was not the pioneer or master patent on polyamide (nylon) yarn in the sense defined above but the yarn and fibre produced by the process was sufficiently unique to produce the same result.[40] The rights to the steam spinning patent thus provided a national monopoly in nylon production until expiry of the patent in 1964. This monopoly was exploited by E. I. DuPont de Nemours and Imperial Chemical Industries Ltd. through their jointly owned subsidiary Canadian Industries Limited until 1954. After 1954 DuPont of Canada Limited enjoyed the patent rights and operated the Kingston works following the separation of the joint foreign interests of E. I. DuPont de Nemours and Imperial Chemical Industries Ltd. under a United States court order.[41]

[40] The DuPont steam spinning process for nylon is patented in Canada, the United States and Great Britain. In each of these countries the patent has proved sufficiently strong and defensible to provide a monopoly position to the holder or licencee. See D. P. O'Brien, "Patent Protection and Competition", pp.224-227.

[41] See Financial Post, Dec. 14, 1968, p.26.

Just as the DuPont steam spinning patent granted a monopoly in the production of nylon, the pioneer patent resulted in a similar monopoly in polyester. In 1954, Canadian Industries Limited, owned and controlled by Imperial Chemical Industries Ltd., received exclusive rights to the Calico Printers Canadian patent on polyester yarn and staple fibre.[42] This Calico Printers patent was a pioneer patent covering both the polymer or raw material input and the basic spinning process required for the production of the new product polyester yarn and fibre. The rights to this patent gave Canadian Industries Limited the exclusive privilege of manufacturing, using and selling to others to be used, polyester yarn and staple fibre until 1970. It thus created a second monopoly in the Canadian man-made fibre industry based on patent rights.

The monopoly position provided by patents on nylon and polyester production processes repeat an earlier pattern in man-made fibre production produced by patents on rayon. While the impact of patents on the original structure of the rayon industry occurred in the United States rather than Canada, subsequent establishment of rayon production in Canada was closely related. The United States rights to the original

[42] See O'Brien, "Patent Production and Competition", p.232.

Cross and Bevan patent on rayon production by the viscose process were held by Courtauld's Ltd. of the United Kingdom until 1918.[43] Courtauld's wholly owned subsidiary American Viscose Corp. enjoyed a monopoly on viscose rayon under the combined protection of the Cross and Bevan patent rights, and the Topham spinning pot patent rights. Ownership of these patent rights, the development of additional patented special processes and the technical knowledge gained in production under patents provided a basis for the subsequent entry of Courtauld's into Canadian viscose rayon production in 1925.[44] Patent rights and technical experience combined with the small size of the Canadian market gave Courtauld's (Canada) Ltd. a monpoly position which persists even today.

The entry of Celanese Corp. into the Canadian manufacture of acetate rayon followed a similar pattern. Celanese Corporation (formerly British Cellulose and Manufacturing Co.) was formed in the United States in 1919. Under the Dreyfus patents, Celanese was the sole producer of acetate rayon in

[43] See J. Markham, Competition in the Rayon Industry, pp.8-9 and 22-24.

[44] This entry also repeats the pattern observed by Markham in the United States where the rayon industry was dominated by European firms until 1935. Ibid., p.7.

the United States until 1929. Again the experience gained through production under patents and the development of new patented processes on certain aspects of production gave Celanese a dominant position in the U.S. market. This position in the U.S. market also provided the basis for entry into the Canadian market in 1930.[45] Once again the small size of the Canadian market and the technical experience and patent rights of Celanese resulted in a monopolistic position in the Canadian production of acetate. Thus patents played an important role in the entry and subsequent market position of all four major Canadian man-made fibre and yarn producers by providing the basis for monopolies either from the pioneer patents or from production experience and special process patents.

Patents have implications beyond these initial structural patterns observed in the industry. The international allocations of patent rights among the parent corporations of Canadian producers, for example, establishes a relationship which may be

[45] Markham Competition in the Rayon Industry has pointed out and O'Brien "Patents and Competition" has confirmed that the cost of entry into man-made fibre combined with the technical knowledge required has favoured entry by large established chemical or fibre producers with a sufficient pool of funds and knowledge to overcome start up and market development costs.

reflected in the behaviour of Canadian producers. In the case of the E. I. DuPont de Nemours and Co. patent on the steam spinning process for nylon, the British rights were granted exclusively under licences to the joint Courtauld's and Imperial Chemical Industries Ltd. subsidiary British Nylon Spinners.[46] As noted above these same patent rights to Canada were initially exercised by the joint DuPont-I.C.I. Canadian subsidiary Canadian Industries Limited until 1954. Even with the formal separation of the Canadian interests of the three companies involved, they maintain connections on an international level.

These connections on an international level also existed through the allocation of rights to the Calico Printers patent on polyester. In Canada, exclusive rights to polyester production and sale were granted by licence to the Imperial Chemical Industries Ltd. subsidiary Canadian Industries Limited. In the United Kingdom, similar national rights were granted to I.C.I. Fibres Ltd. a subsidiary of Imperial Chemical Industries Ltd. The rights to polyester production in the United States

[46] See O'Brien, "Patents and Competition", p.225.

were licenced to E. I. DuPont de Nemours and Company. This polyester patent thus provided further common ground among the parents of Canadian producers.[47]

There is really no direct evidence that relationships among parent corporations affect the behaviour of Canadian producers of man-made fibre and yarn. The pattern of ownership and the producer-product relationships previously noted do however admit this possibility. In considering the likely impacts of patent expiries on competition in man-made fibres in the United Kingdom the international relationships among the major producers has been suggested as one reason why prices, market shares and imports may not change significantly.[48] Similar implications may be drawn in the Canadian industry.

There is one area of patent use where agreement among world producers of man-made fibre and yarn is admitted.[49] Under the terms of patents and patent rights previously noted,

[47] At least one spokesman for the industry suggested that this relationship through patents extend much further than original and basic products and involved a continual swapping of patent rights in the course of product developments.

[48] See O'Brien, "Patents and Competition", pp.229-234.

[49] The existence of this agreement was discovered during an interview with one company executive and subsequently confirmed in interviews with other executives.

the exclusive rights granted by patents cover production use and sale of goods or articles manufactured by the patented process. Patent rights are thus sufficiently broad to protect producers of fibre and yarn not only from direct import competition but also from import competition at higher production stages. Through patents, the primary fibre and yarn producers could provide complete and insurmountable protection from foreign competition to their domestic spinning and weaving customers. By general agreement among the producers involved, on an international level, patent rights beyond the primary fibre and yarn stage are not asserted.

The non-assertion of patent rights is one factor contributing to a competitive secondary industry producing spun yarn and woven fabrics. Relatively low barriers to entry also result from low capital requirements, flexibility of technology, lack of product differentiation and the willingness of primary producers to provide technical assistance. The existence of patent rights beyond the primary manufacturing stage would have protected the domestic secondary producers from both foreign and domestic competition. The non-assertion of patent rights, combined with the absence of other barriers to entry, has resulted in a competitive secondary industry protected

from foreign competition by tariffs and quotas. It is of note that the longevity of tariff and quota restrictions appears to exceed that of patent restrictions.[50]

In terms of the primary industry itself, the non-assertion policy appears to define clearly the pattern of direct inter-producer competition. Starting from the base of original patent rights, primary producers compete directly with one another through product development and differentiation.[51] The magnitude and variety of developments involved in this competition is documented by the granting of special process

[50] In commenting on this pattern of non-assertion of patent rights, and the interpretation of Fox, Canadian Patent Law, which is used here to explain it, Mr. W. H. James of the firm Fetherstonhaugh & Co. offered a further important explanation. He points out that while the assertion of rights granted by a master or basic patent such as the Calico Printers patent on polyester is fairly easy, the assertion of rights of subsequent process patents tends to be both costly and uncertain given the legal processes involved. These costs, uncertainties and the relatively short life span of the rights established should tend to make tariff and quota restrictions attractive alternatives.

[51] This pattern or type of competition is also noted in the United Kingdom. See O'Brien "Patents and Competition", p.226.

patents.[52] These special processes and their effects on final yarn and fibre characteristics form the basis for subsequent product differentiation and the development of brand names. The role of non-assertion in the development of this pattern of competition is perhaps best illustrated by the sales effort directed toward differentiating final consumer goods by fibre content rather than different types of weaves, knits or other secondary manufacturing process. These aspects of competition among primary producers are discussed more fully in the next section.

Industry Structure and Competition

Inter-producer competition in the Canadian man-made fibre and yarn industry takes the form of new product and new product end use developments. This form of competition arises in part from the foreign owned oligopolistic structure of the industry and in part from the nature of technology employed in the industry.

[52] Examination of the Canadian Patent Office Record for any one year from 1920 to the present gives an idea of the product development activity involved. In virtually every year there are records of in excess of two dozen process patents granted on man-made fibre and yarn processes.

The nature and inter-relationship of technology and industry structure are discussed below and related to patterns of competition observed among producers.

One of the most noticeable side effects of patents in the industry is the uniformity of technology among producers of fibre and yarn in different countries. The founding of the Canadian man-made fibre and yarn industry was based on viscose rayon technology imported by Courtauld's (Canada) Ltd. from its United States and United Kingdom operations. This pattern of technology importation also accompanied the subsequent entry into the Canadian industry of Canadian Celanese Ltd., DuPont of Canada Ltd. and Canadian Industries Ltd. although the product differed in each case. Subsequent process and product developments either in Canada or in foreign countries were simultaneously patented in a number of countries under the provisions of the International Patent Convention.[53] This widespread patenting produced a diffusion of techniques among countries and combined with patent trading agreements helped to maintain a uniform technology, internationally, among producers

[53] Under the terms of the Convention an applicant for a patent in a member country is given priority in terms of date of application over other applicants in other member countries giving reciprocal privileges. See H. G. Fox, Canadian Patent Law and Practice, pp.7-8.

of the same product, say, nylon or polyester. The technology employed in the production of man-made fibre and yarn in Canada is thus the same as that used in the United States and the United Kingdom.[54]

There are a number of similarities among the production methods used to produce the four major products viscose rayon, acetate rayon, nylon and polyester. In each case multistage continuous processes require twenty-four hour a day, seven days a week, plant operations. While the stages of production differ in detail among the products, each product requires that all stages be operated in succession to convert raw material into the finished product. This involves three basic steps, namely the chemical preparation of raw materials, the combined chemical-mechanical conversion of raw material into yarn or fibre, and the subsequent mechanical and chemical treatment of the fibre and yarn such as washing, bleaching, drawing, twisting and so forth.[55] The final stage is packaging for shipment in accordance with the specification of customers.

[54] This raises the question which is beyond the scope of the present study of the appropriateness of this technology to the Canadian economy.

[55] A brief description of processes is presented in the Appendix on Producers and products based on descriptions presented in Markham Competition in the Rayon Industry, pp.9-13; J. Airov, The Location of the Synthetic Fibre Industry, (Cambridge, 1963), Chap. 5 and S. Hollander, The Sources of Increased Efficiency, (Cambridge, 1965), Chap. 3.

The similarities in the production processes produce roughly similar technological and cost structures among the potential competitors. Each production process is described by the respective industry spokesman as capital intensive. This capital intensity creates high fixed costs of production with the result that plants are designed on the basis of expected market to be operated at approximately eighty per cent of installed capacity in order that costs may be covered by prices obtainable. To further explain this situation, one industry spokesman pointed out that the production of any final product necessitated operation and staffing of all production stages and even minimum staff would permit full capacity production in some stages. In other words, current technology involves high fixed costs of capital and equipment and high start-up costs but variable costs rise very slowly as capacity utilization is approached.

Industry spokesmen refer to this cost structure when explaining the pattern of competition and price policies. In the short run, price variation is regarded as the key to maintaining adequate levels of utilization. When demand conditions are weak, price reductions in the form of discounts from published list prices,[56] are used to try and maintain

[56] This has been particularly apparent in recent years after patent expiry in nylon, high discounts in nylon prices were in effect. See Arthur D. Little Associates, The Man-made Fibre Industry. For further comment of this price behaviour see p.83 below and Chapter 3, p.83.

production levels. Conversely when demand is high and there is pressure on capacity there have been increases in list prices or at least elimination of existing discounts. The necessity of maintaining high levels of utilization of plant is thus regarded as the major factor determining the magnitude and direction of short period price adjustments.

Aside from these relatively small variations aimed at adjusting plant utilization levels, the most common form of price policy appears to be price matching.[57] Industry spokesmen talk in terms of price levels on non-cellulosic yarns and cellulosic yarns. They appear to operate on the basis of a given price relationship among fibres and yarns according to type. This impression is supported by empirical evidence on prices which shows a sharp differential between cellulosic and non-cellulosic prices but close correspondence among prices within each group.[58] The base of this price structure appears to be prices of the natural fibres cotton and wool

[57] This type of policy is also observed in the United Kingdom. See D. P. O'Brien, "Patents and Competition", p.226.

[58] See Appendix on Producers and Products, Table 2.5.

and the competition between natural and man-made fibres.[59] Within each product group the prices move together while the spread between groups is sufficiently large to eliminate direct price competition. While ruling out price competition among products, spokesmen for the Canadian producers maintain that the industry is highly competitive. In speaking of competition they refer to market expansion through the development of new end uses for existing products and the development of new products. In many cases the development of new end uses refers to the displacement of natural fibres, cotton and wool, in existing textile products. On the other hand, the expansion of man-made fibre uses and product types has resulted in an increasing number of common end uses where man-made fibres and yarns compete directly with one another. The basis of this competition is the different characteristics of the final product containing man-made fibre and yarn.[60]

[59] This natural fibre--man-made fibre relationship is noted by Markham, Competition in the Rayon Industry, in discussing factors affecting rayon prices.

[60] These characteristics include durability, strength, ease of care, etc. and in some areas price as well as characteristics is significant.

This form of inter-product competition has two additional aspects which have assumed increasing importance. The development of a new product or a new end use for an existing product must be accompanied by a programme of introduction to potential users. Producers thus maintain an active technical service department to assist customers in overcoming early use problems. This technical service is accompanied by a marketing campaign to persuade retailers and manufacturers at higher levels that products incorporating the new fibre or yarn are worth supporting. In the case of a new application of an existing fibre this marketing effort is also directed to informing customers of the potential advantages. The final step in the programme of introduction is the development of a fibre brand name which can be used in the final market to differentiate consumer products by primary fibre content.

In the period since 1964, product differentiation and the development of brand names have become increasingly widespread. At the outset product differentiation was based on different generic fibre types identified by the names nylon, terylene (polyester) and rayon. After 1964, however, the entry of several nylon producers created a situation in which

producers wanted to distinguish their products from those of rivals. This was accomplished in part through a wider use of brand names in nylon such as "DuPont nylon', 'Carana', and 'Unel' applied to DuPont, Millhaven Fibres and Union Carbide nylon respectively. New types of products were also promoted under brand names beginning about this time as for example DuPont's 'Antron' and 'Cantrece' nylon yarns. This brand name differentiation can be expected to increase as the patent on polyester expires and new products are continually developed.[61]

In summary, technology, and industry structure may be viewed as establishing constraints within which inter-product competition occurs. The similarity of technology among producers and the resulting similarity in cost structures force all producers to strive to establish plants which will be appropriate to the size of markets and the levels of prices expected in the near future. The oligopolistic structure of the industry produces a considerable degree of inter-dependence among producers, which combined with the common need to maintain high levels of utilization of plant, rules out the

[61] The latest example is the introduction of the DuPont fibre 'Qiana'. See The Financial Post, January 3, 1970, p.9.

possibility of one producer substantially changing his market position through price competition. Price policy thus plays a short run role of permitting small alterations in the level of plant utilization through variations in secondary producer raw material inventories, while longer run competitive product developments are undertaken.[62] As a result producers appear to compete with one another by introducing new products and developing new applications within an existing price structure.

The development of man-made yarn for automotive tires provides one of the clearest examples of competition within the industry. The natural fibre cotton was the original source of yarn for woven tire cord fabric used to reinforce pneumatic tire casings. Cotton dominated the tire cord market until the middle 1940's when rayon producers within the United States developed a high-tenacity rayon specifically for tire cord applications. Based primarily on the greater strength and shock resistance of rayon the tire industry undertook a rapid conversion to this man-made product with the result that by the early 1950's virtually all tires had rayon cord construction.

[62] The role of secondary producers' raw material inventories and their contribution to the short period prices elasticity of demand for primary fibre and yarn is noted by Arthur D. Little Associates, Man-Made Fibre Industry, and discussed in more detail in Chapter 4.

This replacement of a natural fibre appears to be a common first step in product development in the man-made fibre industry.

The dominance of rayon as a tire cord lasted only until the advantages of nylon were demonstrated. In the late 1950's nylon began to assume increasing importance in the replacement tire market, based on greater heat and impact resistance. Nylon had a drawback as a tire cord however, because of its unfortunate tendency to stiffen when cooling or sitting in one position for a period of time. This characteristic resulted in temporary 'flat-spotting' of tires which produced 'morning thump' when the car was first driven. 'Flat-spotting' prevented nylon from displacing rayon in the new car market with the result that until the 1970 model year rayon held the new car tire market with nylon dominating the replacement market.[63]

Another stage in tire cord development began in the early 1960's with polyester tire cord. Polyester tire cord combines the smooth running advantages of rayon with equal or greater heat and impact resistance than nylon. In addition

[63] 'Flat-spotting' of nylon tires produced extensive research and development efforts by DuPont to eliminate this characteristic none of which has proved entirely successful.

it is claimed that polyester has greater dimensional stability under stress than nylon which reduces tire distortion at speed and thus increases mileage. On the basis of its apparently superior characteristics polyester tire cord not only managed to partially displace nylon in the replacement market but also managed to entirely displace rayon in the new car tire market for 1970.

Given the unique producer-product relationship noted previously tire cord developments provide an example of the impact of product developments on producer positions. While rayon dominated the tire cord market, Courtauld's of Canada Ltd. was the sole Canadian rayon tire cord producer. Through the development of nylon as a tire cord, DuPont of Canada was able to enter the tire cord market and on the basis of the replacement tire market displaced Courtauld's as the largest Canadian tire cord producer. Courtauld's and DuPont continued to compete in the tire cord market by promoting the relative virtues of their respective products until the development of polyester tire cord by Millhaven Fibres Ltd.[64] In recognition

[64] Polyester tire cord is an example of product development by a Canadian company. Development of polyester was instigated and carried to completion by Millhaven Fibres Ltd. working in conjunction with large tire manufacturers in the United States. See Canadian Industires Ltd., Annual Report to Shareholders 1965, Montreal, Quebec, p.11.

of the superiority of polyester as a tire cord, Courtauld's withdrew completely from tire cord production and DuPont announced plans for the construction of a polyester tire cord plant to begin operations after patent expiry in 1970.[65]

The tire cord case is only one example of the pattern of competition which appears in the industry. Similar cases could be drawn from the carpet industry, the wearing apparel industry, rope and twine industry, and others. In general the pattern appears to repeat itself with first one man-made fibre competing with or displacing a natural fibre or yarn. Other man-made fibres then appear to enter the industry to produce patterns of competition not only between man-made and natural fibres but also among man-made fibres. It is from this competition that the absolute and relative positions of producers in the industry appear to change.[66]

[65] See The Financial Post, July 26, 1969, p.16.

[66] See Appendix on Producers and Products, Table 2.4.

This is a type of competition which might be anticipated in a differentiated oligopoly on the basis of developed theory.[67] Recognizing their inter-dependence with rivals, producers in the Canadian man-made fibre and yarn industry reject price variation as an effective method of competing with rivals or altering market position. The price matching behaviour of rivals in response to initial price changes effectively neutralizes price competition. Product development and product differentiation thus become the main methods available for individual producers to expand or preserve markets. This form of competition, has over a period of years, resulted in considerable overlapping of product end uses where small variations in product characteristics become increasingly important. Brand name product differentiation has become more significant as a result, the characteristics of different fibres in the same end use have become more and more similar until ultimately only fibre price will be the distinguishing factor and thus the basis of inter-fibre competition.[68]

[67] Earliest statements originate with Chamberlin, The Theory of Monopolistic Competition, (Cambridge, 1942). Further theoretical elaborations which also appear applicable are developed in O'Brien, "Patents and Competition" and Fellner, Competition Among the Few, (New York, 1949).

[68] A similar pattern of industry development and competition is proposed by D. C. Mueller and J. E. Tilton in "Research and Development Costs as a Barrier to Entry", Canadian Journal of Economics, II, No. 4, (Nov. 1969), pp.570-579.

CHAPTER 3

A FRAMEWORK FOR THE ANALYSIS OF INDIVIDUAL PRODUCER BEHAVIOUR

The structural and technological information on the Canadian man-made fibre and yarn industry, presented in the preceding chapter, provides a basis for an examination of the cost and demand factors in the industry. Chapter 2 also provides some insights into the degree of individual producer autonomy and the nature of inter-producer competition. This material will now be used to select and develop a theoretical framework to assist in the examination, illustration and assessment of the behaviour of individual producers in this industry.

The foreign ownership of plants in the Canadian man-made fibre and yarn industry raises conceptual problems for the selection and development of a model. Canadian firms are subsidiaries of larger United States or United Kingdom producers and operate with varying degrees of independence. While this relationship with foreign parent corporations may determine

the nature of technology employed, its most serious implications arise in terms of the goals of Canadian producer activity. As a part of an international corporation, the Canadian operation may direct its activities toward achieving the aims of the parent corporation even at the expense of its own profits. In such circumstances it may be very difficult if not impossible to select an appropriate theoretical goal applicable to all individual producers in the Canadian industry.

This approach to the problem of foreign ownership and producer autonomy may be unduly pessimistic. With some variations, Canadian producers appear to receive two basic things from their parents.[1] The first of these is developed technology and production methods combined perhaps with varying amounts of technical assistance, all of which may be regarded as plant.

[1] See the discussion of parent-subsidiary relationship and the observations on subsidiary activities noted in Chapter 2, p. 29. The relationship between parent and subsidiary discussed here has been observed in a wider range of Canadian industry as noted by A. E. Safarian, Foreign Ownership of Canadian Industry, (Toronto, 1966), esp. pp.75, 104-106 and p.139. More recently R. E. Caves has provided a more general development of the pattern and relationships among parent and subsidiary in international corporations which lends support to the type of relationship described here. See "International Corporation: The Industrial Economics of Foreign Investment", Economica, (N.S. Vol. 38, 1971), pp.1-27, esp. pp.1-11.

The second is the right to employ this plant to produce a range of products, a right which frequently includes patent and trade mark rights and thus helps determine a market. The operation of this given plant and the development of this market may then become the responsibility of the subsidiary Canadian producer. Such operation gives the producer responsibility for the range of short run decision making required to employ the given plant effectively in the given market. The parent corporation may thus permit the subsidiary to determine its actions within a defined range of activities consistent with the goals of the parent.

A relationship of this type between parent and subsidiary allows considerable scope for both parental control and subsidiary responsibility. The parent corporation has effective control of the range of activities of the subsidiary and may or may not exert control over the magnitude of these activities. Control over the magnitude or scale of subsidiary operation may be exercised through parental policies toward subsidiary investment activities. There is room here for considerable variation in the type of approach taken by the parent ranging from direct formulation of subsidiary investment plans to virtually automatic approval of subsidiary investment plans.

The areas open for subsidiary investment may be still controlled by parental definition of the range of activities or products permitted, The parent is thus able to control the size of the subsidiary, its growth plans and by the same line of reasoning, its research and product development activities.

The profitability, in an accounting sense, of the subsidiary is also within the control of the parent through this same framework. Having allotted the subsidiary a range of activity, the parent may affect the potential profitability of that activity through the prices charged the subsidiary for inputs. The most obvious case arises when the subsidiary operates on raw materials supplied by the parent company at prices subject to parental control. Even without direct sales from parent to subsidiary, the information and patent rights supplied by parent may require payments of royalties or fees to the parent at levels the parent can specify. These royalty payments and raw materials purchases thus provide a vehicle by which the parent can affect the distribution of earnings among parent and subsidiaries. Of course whether or not such a conscious attempt is made to affect the distribution of profits depends on the goals of the parent corporation.

This type of parent-subsidiary relationship grants the subsidiary responsibility for operation within a defined technology and market. The subsidiary may be given control of price and output policies and responsibility for the efficient operation of the given plant. Depending on parental policy, the subsidiary may also be given responsibility for product and market development within the product range specified by the parent. On an even wider scale, the subsidiary may be encouraged to develop product and market plans which will permit subsidiary growth either within given product lines or including new product lines. The important point is that the parent corporation can control the nature of subsidiary activity in this way without the need to supervise all the activities of the subsidiary.

The parent-subsidiary relationship in the Canadian man-made fibre and yarn industry appears to conform to that just outlined. As noted in the preceding chapter, Canadian producers are granted rights to the production of some of the parent corporation's products using the techniques developed and patented by the parent corporations.[2] All of these Canadian producers are given the responsibility for price and production

[2] See Chapter 2 (pp. 39-46).

decisions concerning the operation of Canadian facilities. Furthermore at least two of the four major Canadian producers actively engage in research and development directed toward the development of new products and end uses and have developed significant new products.[3] All but one Canadian producer also claim responsibility for at least the formulation of capacity expansion plans although admitting that final approval must come from the parent. The Canadian producers thus appear to have wide responsibility for operation within the framework established by their parents.

For purposes of examining price production and investment behaviour it thus appears possible to regard Canadian producers as firms. Canadian producers are not firms in the broadest sense in that some aspects of decision making are beyond their responsibilities. But Canadian producers do appear as firms in the sense that they have responsibility for formulating price production and perhaps investment policies within the Canadian market in pursuit of their own objectives.[4]

[3] Examples of these new products are polyester-cotton fabric blends and polyester tire cord both originally developed by Millhaven Fibres Ltd. and 'propylon' carpet developed by Canadian Celanese Ltd.

[4] Treating Canadian producers as firms in this sense avoids temporarily the normative questions about the distribution of earnings of a subsidiary since this distribution is independent of the actual behaviour of the subsidiary. Furthermore, this treatment is consistent with the definition of a firm used in Chapter 2, pp.37-38.

The selection of an assumed objective of individual firm behaviour is the focal point of a theory of the firm. The literature on the theory of the firm and the theory of oligopoly provides several alternatives for the assumption of the objective of the behaviour of the firm.[5] The advantages and disadvantages of various approaches have been discussed in this literature and need not be repeated here. The current problem is instead to select an objective of firm behaviour which conforms most closely to the expressed aims and observable behaviour of firms in the Canadian man-made fibre and yarn industry. On this basis it is assumed that the goal of any one of the firms involved is to survive, economically and, when compatible with both parental relations and survival, to grow.[6]

The choice of survival and perhaps growth as the assumed objective of firm behaviour permits the employment of the framework for analysis constructed by Mrs. Robinson.[7] This framework

[5] For a summary of these alternatives see F. Machlup, "Theories of the Firm: Marginalist Behavioral, Mangerial", American Economic Review, Vol. 57, (1967), pp.1-33 or Simon, H. A. "New Developments in the Theory of the Firm", American Economic Review, Vol. 52, (1962), pp.1-15.

[6] See Joan Robinson, Exercises in Economic Analysis, (London, 1965), pp.70-79 and Part Four, pp.167-200.

[7] Ibid.

appears to have three major advantages for dealing with the price production and investment behaviour of firms in the Canadian man-made fibre and yarn industry. First it deals with the position of firms in terms of theoretical concepts which correspond to empirical information available. Second, the predictions and explanations of behaviour anticipated for the theoretical framework, resemble the actual responses which industry spokesmen suggest to given situations. Third, both time and uncertainty or expectations are an integral part of the framework reducing or eliminating many problems associated with the concept of equilibrium. The model thus combines convenience and reality while maintaining analytical power.

The analytical framework developed around the goal of survival and growth[8] focuses on the short period position of the firm. The short period may be defined as that time interval in which plant and its capacity are taken as given. The position of the firm within any short period, in terms of costs and revenues both reflects past behaviour and provides

[8] For purposes of simplicity it is assumed that firms in the Canadian man-made fibre and yarn industry do consider growth as a goal although direction of growth may be restricted to products specified in a general sense by the parent corporations.

an important basis for current and near future behaviour. The life of the firm is thus viewed as a continuum of consecutive short periods linked together by both expectations and actions which cover several consecutive periods.

In the short period it is possible to distinguish two types of costs namely fixed costs and variable costs. These costs regarded as fixed relate to the necessity of recovering, over several short periods, capital presently employed in the form of buildings, machinery and other fixed assets. Over and above the cost of the capital equipment is the necessity to earn a return on that capital sufficient to retain it in the firm in the face of alternative employments. In other words current operations are expected to make a contribution to both depreciation and profits. If the firm is to survive as an economic entity over an indefinite number of future short periods it must be able to at least recover the value of its invested capital through its revenues over a number of short periods.

In addition to profit and depreciation there are other costs which may be regarded as fixed in the short period. In the man-made fibre and yarn industry marketing costs and product development costs are important for developing and

maintaining demand for products. These marketing and product development costs are assumed to be fixed in the short period and thus independent of the level of output in that period. Such an assumption does not appear unreasonable for the firms considered here since sales campaigns, technical assistance to customers and research projects extend beyond the short period. It must be admitted however that some of these activities may be terminated on short notice but the general approach of firms appears to be the adoption of a continuous program of product promotion, research and development.

Furthermore, in the man-made fibre and yarn industry these progrmmes are the main forms of competition both within and external to the domestic industry. To survive the firm must attempt to secure and maintain a market for its production based primarily on product characteristics and quality. The firm must also develop new lines of production to offset any decline in the marketability of its current products as a result of the development activities of its rivals. On the other hand to offset the fluctuations in demand the firm may regard selling expenses as indispensible in terms of establishing consumer loyalty while product development continually

broadens the market by increasing the number of potential end uses for the product.[9] Where rival firms in the industry operate through developing product applications or where foreign rivals achieve cost advantages in producing established products a continuing programme of sales promotion and product research and development become vital to the maintenance of a firm's market and thus its survival.

If the firm's goal includes not just survival but also growth, fixed costs of research and development become even more important.[10] Resources must be committed to programmes designed to produce both new product forms and new product applications in an attempt to achieve a net increase in the market. In order for the firms to grow these programmes must produce results which more than offset any declines in current product uses. These development programmes in the man-made fibre and yarn industry, have a longevity which clearly exceeds

[9] For a more detailed discussion of the allocation of research and development funds which lends support to the assumption that they are fixed costs in the short period see E. Mansfield, The Economics of Technological Change, (New York, 1968), Chap. III.

[10] In addition to the technological economies which appear to exist in the Canadian industry as noted in Chapter II, p.35 there are a range of additional potential inducements to growth as outlined by E. Penrose, The Theory of the Growth of the Firm (New York, 1959).

the short period as defined above and thus may be treated as fixed costs in the short period concept of the firm.[11]

Operation of the plant in the short period also involves costs directly associated to the level of output. These variables or prime costs include labour, fuel, electricity or power costs and cost involved in assembling materials and organizing production. The sum of these variable costs increases with increasing rates of output, perhaps slowly at first but more rapidly as the level of plant utilization increases. The technology employed in production and the behaviour of prime costs are important for the definition of capacity of the given plant in the short period. The technology of man-made fibre and yarn production indicates a particular shape of short period variable cost curve. Continuous process multi-stage technology which requires simultaneous operations of all stages introduces a considerable lumpiness into variable cost in the form of high 'start-up' costs.[12] After initial start-up costs,

[11] The development of polyester tire cord for example appears to have required approximately ten years.

[12] See the description of production processes in Appendix on Producers and Products.

variable costs increase very slowly as output increases and there may be a considerable range of constant marginal costs. This behaviour of total variable costs results in average variable costs which fall rapidly with increasing output towards a minimum in the range of 80%-100% of absolute physical capacity. Beyond this minimum average variable cost rises and the total variable cost curve is for all practical purposes vertical as physical output cannot be expanded even through incurring additional variable costs. This pattern of costs conforms to the description of costs given by industry spokesmen.[13] They maintain that fixed costs and starting costs are so large that unless production is equal to about eighty per cent of plant capacity average cost is higher than the price that they can expect to obtain for the product, under normal circumstances.

The preceding discussion of the cost position of an individual firm in the short period may be condensed into a diagram. In Figure 1, money flows per period are measured on the vertical axis. The distance OG on the vertical axis represents fixed costs of production as discussed above.

[13] J. Markham finds a similar cost structure in the United States rayon industry. See Competition in the Rayon Industry, (Cambridge, 1952). Further supporting descriptions of technology and cost appear in J. Airov, The Location of the Synthetic-Fiber Industry, (Cambridge, 1959), Chap. 5 and S. Hollander, The Sources of Increased Efficiency, (Cambridge, 1968), Chaps. 3 & 5.

This includes that proportion of depreciation, selling expenses, research and development costs and some contribution to profit imputed to the period. Being independent of output, fixed costs are represented by the horizontal line at G. The distance GH on the vertical axis represents the 'start-up' part of variable costs arising from the necessity of operating all stages of production simultaneously to produce any output. From H the variable cost curve rises slowly to the right up to the rated physical capacity of the existing plant. Beyond this capacity the variable cost curve is vertical.

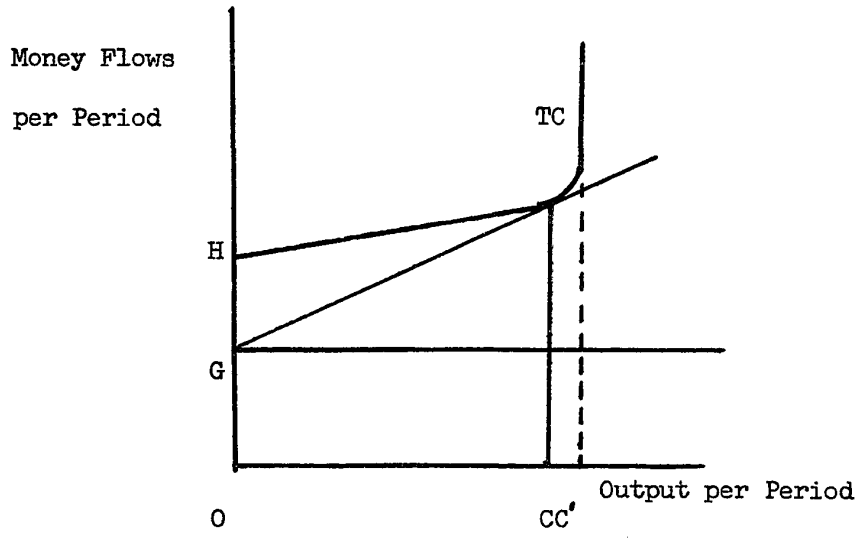


Figure 1

There may be a difference between the absolute level of physical plant capacity and the level of capacity as defined by the behaviour of average variable cost. The shape of the total cost curve may be such that average variable cost declines to a minimum at some output such as OC in Figure 1. This output OC might then be defined as a "capacity" output in terms of minimum average variable cost. Some scope still remains for increasing output up to C' but at the expense of increasing marginal cost. Output OC' remains as the absolute physical limit of plant capacity as the total cost curve is vertical. In the Canadian man-made fibre and yarn industry, it appears that cost may be such that little or no difference exists between capacities defined in these ways. Marginal cost may be constant and average cost declining up to the point of absolute physical capacity or OC' in Figure 1.

This short period representation of the cost position of the firm contains elements of both past behaviour and expectations of the future. The physical plant and equipment existing in the current period are the results of past investment activity and planning. The plant was designed and constructed to provide a production capacity expected to be appropriate to market conditions. It is thus a physical

manifestation of the firm's past expectations that the market circumstances over the life of the plant will permit operation at levels of utilization which justify the investment. At the same time, the portion of fixed cost assigned to the current short period reflects in part the firm's expectations of the useful life of the current plant. Based on estimates or expectations of future market and technical conditions the firm must select levels of amortization and profits for each period, which appear as fixed costs, that will ensure both recovery of, and a satisfactory rate of return on, capital.

In order to survive the firm attempts, on the basis of its expectations and experience, to adjust capacity to future markets and to adjust markets through selling and product development expenditures. This capacity adjustment is constrained on the upper limit by the fear of excess capacity which involves cost penalties of inefficient operation, thus endangering the goal of survival. At the lower limit, however, the firm's goal of growth provides a spur to capacity expansion to the limit of market opportunities. Even though failure to fully exploit market growth opportunities because of inadequate production capacity may result in high rates of profit on investment it may also endanger survival by attracting

the entry of rival producers. These are factors which will be discussed more fully in terms of investment behaviour.

The profit element contained in fixed costs indicates the firm's view of its market position and the price it can charge for its output. In addition to considering the expected future life of the plant the firm must take account of the reactions of its rivals, potential rivals and public authorities to its rate of earnings. In an industry such as man-made fibre and yarn with significant product differentiation and barriers to entry the firm has considerable independence in forming its views of normal rate of return. The firm may be regarded as selecting a rate most compatible with its goals of survival on the one hand and growth on the other when capital must be retained, profits may provide the finance for growth but prices required for high levels of earnings may reduce future growth prospects. The rate of profit regarded as normal, the capital cost of plant, and the expected life of the plant determinethe elements in plant fixed costs for a short period that are to provide over its expected life for the profitable recovery of these capital costs.

A complete picture of the short period position of the firm requires consideration of the revenue or market demand

situation as well as the cost structure. The revenue situation or the nature of the demand faced by the firm in the short period reflects the impacts of industry structure, the nature of the market faced by the firm and to some extent the results of the firms selling activities. In a manner similar to that already used to illustrate the short period cost structure, the revenue or market demand situation of the firm may be illustrated by means of an expected proceeds curve. This expected proceeds curve shows what the firm believes would be its total receipts in prevailing conditions if nothing were altered except product price.

The slope of the expected proceeds curve reflects in part the firm's assessment of the responses of its rivals to its price policies. In the Canadian man-made fibre and yarn industry producers appear to believe that in the very short period demand is elastic with regard to prices. They indicate that price variation is a widely used instrument for adjusting current demand to desired levels of plant utilization. In the case of price reductions, however, a programme of discounts is used without alteration of published list prices in the belief that rivals will immediately match list price reductions.

A spokesman for DuPont of Canada pointed out that his company has discontinued the issuing of list prices as a result of recent price cutting activities of foreign producers.[14] Producers thus believe in short-run price elasticity of demand when price variations are either unofficial or secret and not part of an announced policy of list price reductions.

There are other possibilities to be noted when considering the shape of the expected proceeds curve. The belief on the part of producers in this industry that rivals will match list price reductions or announced price reductions but will not necessarily follow price increases suggests a kinked demand curve.[15] There appears to be a further belief on the part of nylon and polyester producers that large price reductions would produce considerable substitution of these non-cellulosic yarns and fibres for the cellulosics viscose and acetate. This would imply perhaps a second kink in the

[14] Interview with Dr. Richardson, Manager, Textile Division, DuPont of Canada Ltd., Jan. 12, 1961. This is however, a development that followed patent expiry and foreign competition in nylon was severe as noted previously in Chapter 2.

[15] See Hall, R. L., and Hitch, C. J.,"Price Theory and Business Behaviour", Oxford Economic Papers No. 2 (1939), pp.12-45 and P.M. Sweezy, "Demand under conditions of Oligopoly", Journal of Political Economy, Vol. XLVII (1939), pp.568-583.

demand curve with a sharp increase in elasticity below a certain price. The price level at this second kink is considered too low, given existing cost conditions to make operations in that range feasible. As a result of the possibilities of these kinks and based on observations of producer behaviour it appears that the relevant demand curve may be the one with discount (unmatched) prices not list prices.

An individual producer's estimate or selection of the 'normal' price for his product is constrained by the price structure existing on the market. In the case of primary textile yarns there is a very definite price structure based on natural fibre prices. This structure appears to have three tiers namely the price of natural fibre, then a higher range of prices for the man-made cellulosics viscose and acetate, and finally a still higher price range for the non-cellulosics nylon and polyester.[16] To produce and sell in this market the firm must compete with other primary products on the basis of both price and product characteristics in a number of established end uses. This established price structure then places the firm in the

[16] See price data presented in Appendix Table 2.5 and Chapter 2, pp. 54-55.

position not of setting prices to cover costs but of finding products which can be produced at costs which make existing prices profitable.[17]

Product prices in the Canadian man-made fibre industry appear to correspond to this description. Individual producers operate on the basis of a list price for their product; a price which conforms to the structure just described and may be viewed as the "normal" price. Price reactions to market demand conditions then take the form of discounts on this list price. These discounts may be general, and available to all customers or apply only on volume purchases or to other special classes of customers. In the latter cases, the price observed is the weighted average of the discounted prices. This type of price policy appears to be effective in maintaining levels of plant utilization in the industry since secondary manufacturers are willing to pursue a speculative raw material inventory policy in primary fibre and yarn.[18]

[17] See J. Robinson, Exercises in Economic Analysis, p.183.

[18] See Arthur D. Little Associates. The Man-Made Fibre and Yarn Industry 1967-72 (Boston, 1968). Secondary manufacturers were found to be actively engaged in manipulating their holdings of primary fibre and yarn inventories in response to primary producer price discount introductions. Increased discounts produced rising inventories while the removal of discounts resulted in drawing down inventories. Spokesmen for Canadian primary producers believe that Canadian secondary textile manufacturers pursue a similar 'speculative' raw material inventory policy with notable success.

The revenue position of the firm may then be represented diagramatically by an expected proceeds curve such as that presented in Figure 2. This curve shows what the firm believes would be its total receipts in prevailing conditions if nothing were altered except product price. It may thus be regarded, for present purposes, as the total revenue curve corresponding to the demand curve for the product based on one list price and a series of discounts on that price. For any expected proceeds curve such as in Figure 2, the price at which a particular level of output can be sold is given by the slope of a line joining the origin to the point in the curve directly above that output. In Figure 2, for example, output OA would be sold at a price given by the slope of OP. While it is theoretically possible to define the expected proceeds curve for a range of prices from zero to some very high level and thus construct a curve rising from the origin to some maximum which corresponds to the point of unitary elasticity on a smooth individual curve and then falling, it is unlikely that the firm is concerned with prices other than those close to the existing price. Thus the demand or market situation faced by the individual firm may be considered in terms of the position of that section of the expected proceeds curve in the range of output close to but preceding the unitary elasticity region.

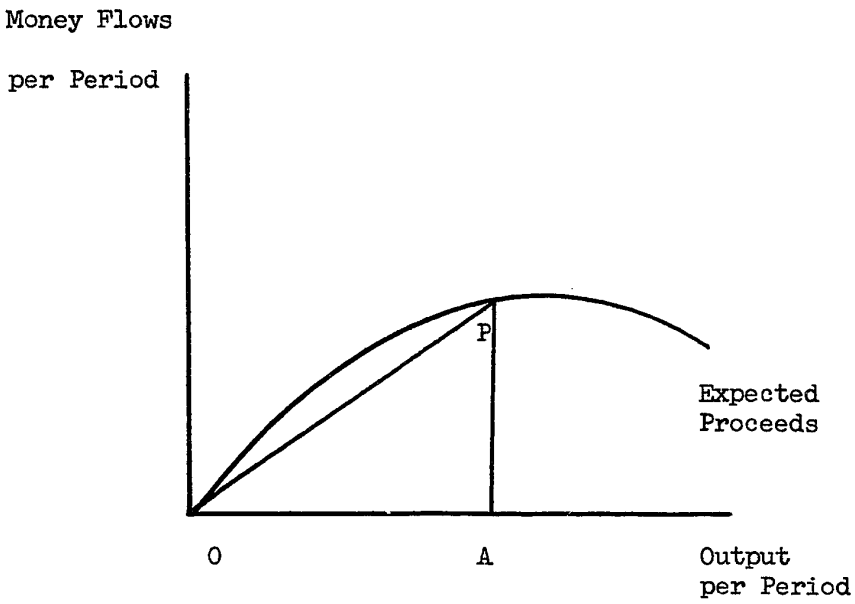


Figure 2

The height and position of the expected proceeds curve relative to the firm's total cost curve in the short period is the key to firm behaviour. As mentioned earlier the short period total cost curve and the plant capacity indicated are the results of the firm behaviour based on expectations of what markets in this period and the remaining life of the plant will be like. The position of the expected proceeds curve is the result of the forces operating in the market for

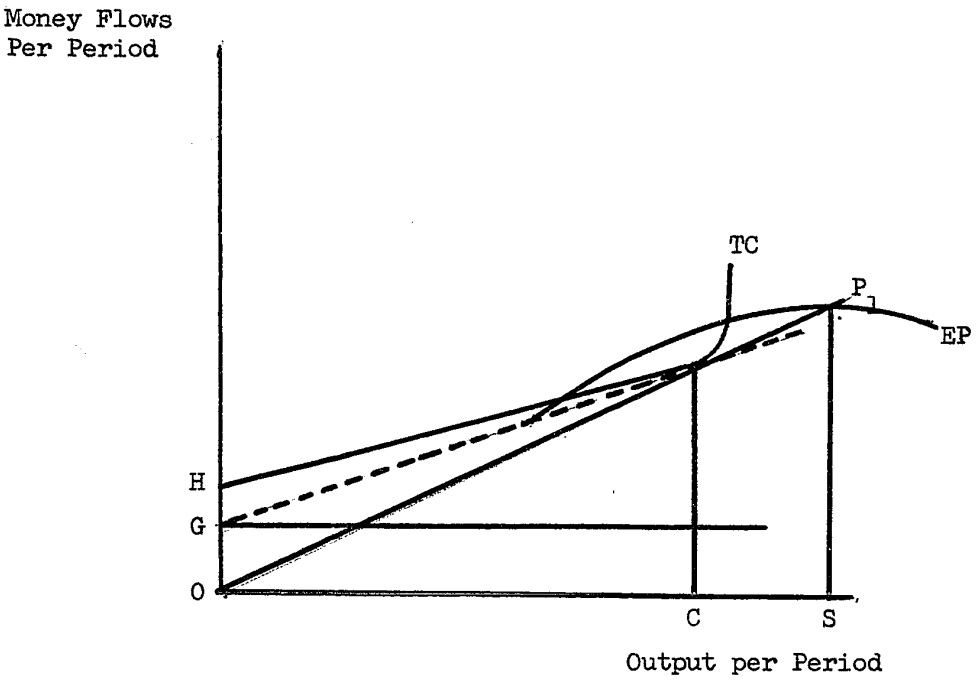
the firm's product and this position is thus beyond the immediate short period control of the firm.[19] The factors which operate in the market for the firm's product to determine the position of the short period expected proceeds curve provide the main explanation of a firm's price and production in that period and they also affect the firm's view of investment possibilities.

Illustrations of the firm's reactions to different short period possibilities may now be constructed and examined. Consider first the possibility that market forces in the current short period have produced a level of demand for the firm's product which exceeds the firm's previous expectations. The firm's expectations of market conditions in the current short period have resulted in the plant represented by the total cost curve constructed as described above. This total cost curve by its shape specifies the capacity of the plant, a level of production which the firm expects will be appropriate to market conditions. The curve also specifies the firm's

[19] The expected proceeds curve in any one short period may still reflect the impacts of the past product development and selling programmes but it is assumed that the short period does not permit time for alterations in these policies to affect current short period expected proceeds

views of the prices it must charge for this output in order to cover total costs including normal profits.

Figure 3



Referring to Figure 3, where the short period cost position (TC) and price (i.e., slope of P_1) is indicated, the expected proceeds curve may now be added. In this illustration demand exceeds previous expectations and the expected proceeds curve (EP) lies above the total cost curve (TC) as indicated. At the price

which the firm expected to be appropriate for operation at capacity (i.e., slope of P_1), short period sales (OS_1) would exceed plant capacity (OC_1). This leads to the question of how the firm will react to this short period situation.[20]

There are a number of alternative courses of action open to the firm. Perhaps the most obvious response to a level of sales which exceeds short period capacity would be to raise short period prices to the extent necessary to limit sales to output capacity. A rise in prices may be attractive from the point of view of enhanced earnings but there is an accompanying danger of reducing future market prospects and growth potential. Extending delivery dates and attempting to accelerate capacity expansion, are alternatives to short period price increases which may be feasible. On the other hand, a firm may have close ties with plants in other markets which provide a short term source of import supply to fill immediate demand.

The choice of any one or a combination of these alternatives is closely related to the firm's goals and expectations. A situation in which market demand exceeds expectations makes

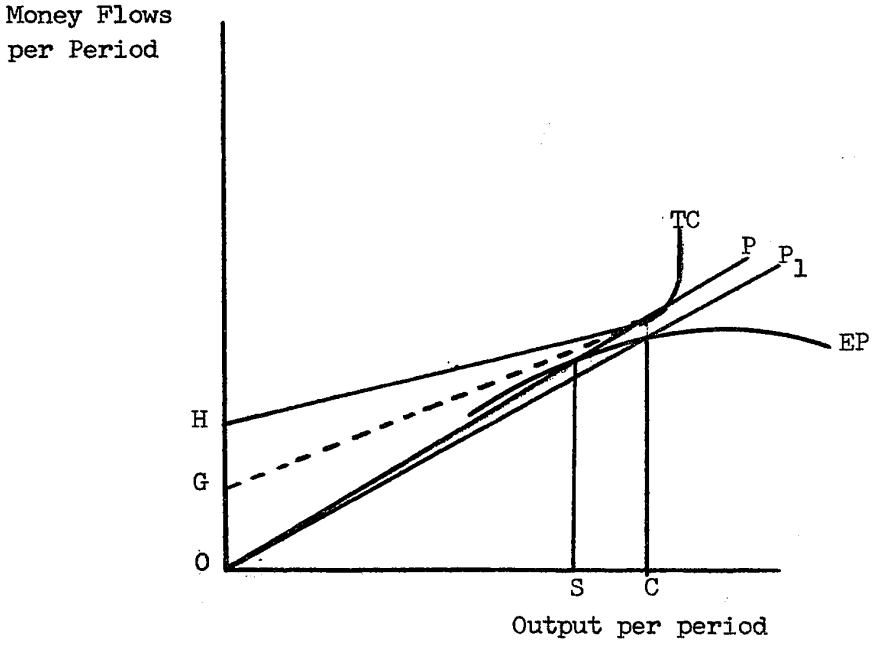
[20] This short period position of the firm may be referred to as a seller's market. See J. Robinson, Exercises in Economic Analysis, pp.193-196.

the goal of survival easier to attain. At the same time, the response of the firm to the market situation may or may not assist the firm in its attempts to grow. If the firm, on the basis of current observation and past experience, expects the current high levels of demand to persist into future short periods it has room for growth. At the same time, however, these market conditions provide an attraction to rival producers, an invitation to new investment and the possibility of future excess capacity. In terms of both survival and growth through future short periods the firm's best course of action appears to be capacity expansion when buoyant markets are expected to persist. Until capacity expansion can be effected short term measures must control excess demand.

A second possible market situation in the short period may be illustrated on the assumption that market demand falls short of expectation. This short period situation is illustrated in Figure 4. The cost curves of the firm are reproduced on the basis of the analysis leading up to Figure 1 and indicate the normal capacity of the plant (OC) and the firm's view of normal price (OP). The expected proceeds curve in the illustration falls below the total cost curve on the basis of the assumption that market expectations are not

realized. The question of the firm's reactions to this short period illustration may now be considered.

Figure 4



Price adjustment once again appears as the most obvious reaction to a market situation which differs from expectations. In this case sales at the normal price would be (OS), considerably below the output corresponding to normal level of utilization. The introduction of price discounts

in this circumstance would reduce price toward (OP^1), the price that would minimize losses (or the vertical distance between TC and EP). Price reduction might be accompanied by additional actions aimed at offsetting the contraction of demand such as increased selling activities.

The combination of policies or action undertaken in response to unexpected low market demand is again related to the firm's expectations. On the basis of its experience the firm may be able to assess the reasons for the low levels of demand and assess future possibilities. If the situation is judged to be very temporary the firm may wish to do nothing and continue production at normal levels of utilization while accumulating inventories. A market decline judged to be of a more permanent nature may induce expanded selling activities and acceleration of product development to offset the potential effects on future activities. In the extreme, when the firm sees the decline in demand as an irreversible loss of markets it must consider contraction of capacity and perhaps withdrawal from the market in a manner which permits the quickest possible recovery of capital costs.

It is essential to stress that the market situations discussed here are only illustrations of the possibilities.

The relative positions of cost and expected proceeds curves in any one short period depend on the operation of competitive forces. The firm is viewed as having a life which spans an indefinite number of short periods. In an attempt to survive and grow the firm makes decisions on the basis of its expectations of future markets. There are, simultaneously, forces beyond the control of the firm operating in the market which may produce results equivalent to or very different from the firm's expectations. The examples presented above are just two possibilities used to illustrate the operation of the framework in explaining firm behaviour.

In addition to providing possible explanations for price and production behaviour the framework also provides an explanation of investment behaviour. Investment is one of the main activities of the firm which through its alteration of a stock of durable capital goods, generates continuity in the firm's experience. The time required to bring investment plans from formulation to completion also means that the situation in future periods is affected by present actions. Net investments may produce growth, decline or stability depending on its sign and magnitude but in any case it is a response to expectations formed on the basis of past experience and current circumstances.

Net investment arises as a result of the interaction of competitive forces and the firm's goal of survival and growth. On the basis of experience gained from operation through a number and variety of previous short period circumstances the firm develops an understanding of factors affecting its operation in the market. This experience and understanding in turn provides a basis for assessing current short period circumstances and forming expectations about future developments. In order to survive and grow, the firm must also adjust capacity to take advantage of expected new opportunities and product applications. Even though spurred by the goal of growth, the firm must avoid as far as possible the installation of excess capacity which would impair earning power. Competition in the market produces the fear of excess capacity on the one hand and the fear of losing markets or growth opportunities on the other, as constraints on investment behaviour.

The earlier illustration of possible short period market situations can also be used to consider the explanation of investment behaviour derived from the framework developed above. The first possibility, a market situation in which demand exceeds expectations, provides an illustration of factors which may lead to positive net investment. If on the

basis of its past experience and market research the firm expects that a level of demand in excess of current capacity will persist or expand, there is strong impetus to expand capacity. In fact failure to expand capacity given this situation violates the firm's goal of growth and may attract competition which even impairs the chances of survival. Thus potential competition coupled with expectations based on past experience provide the basis for undertaking capacity expansion in pursuit of the goals of survival and growth.

Moreover, the existence of short period demand in excess of normal capacity and the expectation that it may persist for some time facilitates capacity expansion. In such a market the firm is able to operate at high levels of utilization and perhaps raise prices to provide increased returns. This puts the firm in a position to earn extra profits which themselves provide sources of investment finance. If internal finance is not sufficient, the market situation enables the firm to raise funds externally with greater ease as a result of its apparent prospects. The excess short period demand may provide both the incentive and the means for positive net investment.

It is important to stress the key role played by expectations in explaining net investment behaviour. Even with

a short period excess demand situation, whether or not the firm undertakes positive net investment depends on its expectation of future developments.[21] A current excess of demand may be viewed on the basis of experience as a very temporary phenomenon which is expected to disappear. Positive net investment might then produce excess capacity in future periods and impair chances of survival. Thus it is essential to look behind the observed demand, inquire into its causes and assess the likelihood of its persistence. The investment decision rests finally on this assessment.

The second illustration previously considered, that of unexpectedly low levels of short period demand may suggest negative net investment. The failure of short period demand to permit operation of the plant at efficient levels of capacity and normal levels of earnings threatens the firm's goal of survival. Assuming again that the firm expects these

[21] The behaviour of Canada Cement in the early post-war period provides an illustration of the role of expectation on investment behaviour. Canada Cement expected the excess demand situation at that time to be temporary and thus imported cement to fill customer orders rather than expand capacity. The demand conditions persisted however and attracted substantial entry into the cement industry. See H. D. Eastman and S. Stykolt, The Tariff and Competition in Canada, (Toronto, 1967), pp.149-170, esp. p.162.

low levels of demand to persist, contraction of capacity and rationalization at smaller scale of production will result. The firm must undertake such a contraction if it is to continue operations and achieve levels of earnings which permit recovery of capital funds. In the ideal situation the firm would anticipate market declines and reduce capacity at a rate which permitted full recovery of its investment. Survival could still be achieved by devoting recovered funds to new lines of production.

Once again, expectations play a key role. The short period decline in demand may be temporary and the firm may resist capacity contraction in the hope of future improvement. Alternatively the source of demand decline may arise from competition which the firm can counteract by increased selling activities and product development. The fear of excess capacity and its threat to survival may provide the motive for negative net investment while the firm's expectations may overshadow the immediate market situation.

The investment activity of the firm is something which arises from the interaction of competitive forces, the firm's goals and the firm's expectations. The time factor contained in net investment behaviour provides an important part of the continuity actually observed in firm behaviour. The implementation of

investment decisions takes time and a completed project affects the position of the firm over a period of time. Expectations also enter into this continuity but neither investment behaviour nor the model itself carry any restriction about the accuracy of expectations. On the contrary, deviations of experience from expectations provides an important part of the explanation of price and production behaviour. In the end, however, it is through net investment that the firm attempts to adjust its position in the market in pursuit of the goals of survival and growth.

It may finally be noted that the approach to explaining investment developed above differs from much of current investment theory in concept. It does not, however, appear to contradict the findings of past empirical studies.[22] In the example of short period excess demand, from which net investment may be expected, either an 'accelerator', or an 'expected profits' investment hypothesis would find empirical support. Furthermore,

[22] See D. W. Jorgenson and C. D. Siebert "Theories of Corporate Investment Behaviour", American Economic Review, Vol. 58, (1968),pp.681-712.

an hypothesis which relates investment directly to the level and availability of internal finance is also compatible. The present approach appears in addition to have the advantage of focusing attention on the significance of the competitive process and expectations while providing a vital link between the short run experiences and responses of the firm and the observed longer run behaviour pattern.

Application of the Framework to the Canadian Man-Made Fibre and Yarn Producers

The framework has been constructed to reflect the observed characteristics of a producer in the man-made fibre and yarn industry. The cost curves, are defined on the basis of technology and technical relationships which exist in the industry. The elements contained in fixed cost are viewed as reflecting a firm's market power and hence profit expectations, its research, product development and selling expenses. Payments to parent corporations for patent rights and technical know-how may also be included. The revenue or expected proceeds curve is defined on the basis of price variations that a producer may consider using to alter short period sales and his estimate of the short period demand curve facing him. Inter-relationships

between costs and expected proceeds then emerge as major factors affecting firm price, production and investment behaviour.

In terms of this framework, the relative positions of individual producer cost and expected revenue curves provide the basis for analysis of producer behaviour. The position of the cost curve, which in itself indicates past expectations of the firm and current views of normal profit and amortization levels is empirically determined by published figures on producing capacity. By contrast, the nature and position of the expected proceeds curve reflects the outcome of a variety of forces operating in the markets of industries which purchase man-made fibre and yarn. An analysis of these industries which purchase primary man-made fibre and yarn is thus essential in order to determine both the relative position of the expected proceeds curve and factors which produce changes in that relative position over time. The next chapter undertakes that analysis.

In concluding the general outline of the framework can be summarized. The technological and some part of market structural information of Chapter 2 is embodied in the short period cost curve of the firm. This market structure and the

price behaviour of firms also permits description of the shape of an expected proceeds curve representing market demand in the short period. The firm attempts to survive and grow and in so doing reacts to the relative position of the short period cost and revenue curves. This relative position in combination with the firm's expectations and in line with its objectives, produce a pattern of net investment by the firm. When applied to the Canadian man-made fibre and yarn industry, data on firm's capacity specifies the position of the cost curve in the model while the position of the revenue curve is left largely to market forces. Analysis of industries providing the market establishes the location of the revenue curve and isolates factors responsible for its position and changes in that position. Chapter 4 analyzes the market industry to isolate demand factors which in Chapter 5 are superimposed on cost factors to illustrate and assess firm behaviour.

CHAPTER 4

THE MARKET FOR CANADIAN MAN-MADE FIBRE AND YARN

Canadian secondary textile industries, operating under tariff protection, provide the market necessary for the existence of the primary industry.[1] The secondary industries produce fabric woven from man-made yarns and yarn spun from man-made fibres. The competitive structure of these secondary industries appears to make them very responsive to changes in import competition arising from changes in tariffs, exchange rates or foreign supply prices. As a result, import competition is transmitted through the secondary industries to the market for primary fibre and yarn. Thus the intensity of fabric import competition emerges as a major determinant of the size and nature of the market for Canadian primary man-made fibre and yarn.

Data on the use of man-made fibre and yarn indicate two secondary industries are major consumers.[2] The industry

[1] A list of the most important class of secondary producers and a schedule of tariff rates are presented in Appendix Tables 4.1 and 4.2.

[2] See Appendix Tables 4.3 and 4.4.

defined by the Dominion Bureau of Statistics as Synthetic Textile Mills[3] accounts for approximately seventy per cent of observed textile yarn and staple fibre use. Considering industrial filament yarn (tire yarn) in addition to textile yarns, Cotton Textile Mills use virtually all industrial yarn. These two industries combined, Cotton Textile Mills and Synthetic Textile Mills, account for eighty to ninety per cent of observed use of all man-made filament yarns.

The market for the Canadian primary man-made fibre and yarn industry is provided by these secondary manufacturing industries. Firms in the Synthetic Textile industry produce some yarn spun from man-made staple fibre, but their major products are dress fabrics, lingerie fabrics, lining fabrics, neckwear fabrics, pile fabrics and upholstery, drapery and slip cover fabrics.[4] The man-made yarn used by Cotton Textile Mills was almost entirely viscose and nylon tire cord yarn for weaving into tire cord fabric. In addition, Cotton Textile Mills use some man-made staple fibres which are blended with natural fibres for the production of woven textile fabrics. Demand for man-made fibre and yarn is thus derived from the demand for

[3] See Standard Industrial Classification Manual (12-501), Dominion Bureau of Statistics (Ottawa, 1960).

[4] See Synthetic Textile Mills (34-208), Dominion Bureau of Statistics (Ottawa, (annual)).

textile and tire cord fabrics woven in Canada from man-made fibres and yarns.

The demand for fabrics woven from man-made fibres and yarns appears to be closely related to the level of income or economic activity in the economy. This relationship has been noted in other studies of the textile industries particularly with regard to cotton textile fabrics.[5] Evidence of the relationship of demand to income in the Canadian man-made textile market is found through a comparison of domestic fabric production plus imports with per capita personal income.[6] Shipments of domestic fabric plus imported fabric show patterns of variation over the 1950-1966 period which are closely associated with patterns of variation in income levels. As might be anticipated, however, this relationship does not extend to tire cord fabric production by Cotton Textile Mills. Demand in this latter industry is more closely associated with levels of domestic automobile production.[7]

[5] See J. Buckman and M. Gainsbrugh, Economics of the Cotton Textile Industry, (New York, 1946), Chap. 3, pp.47-76.

[6] See Appendix Table 4.5.

[7] See Appendix Table 4.6.

While demand in the market for textile fabric appears closely related to income levels, domestic producers face competition from imports. Beginning about 1952 there was a sharp increase in import penetration into the Canadian man-made textile fabric market followed by a steady growth in imports and a declining domestic share of the market until 1959.[8] This change in import penetration can be attributed largely to depressed levels of demand in world textile markets which produced sharp declines in foreign supply prices of woven fabrics.[9] Textile demand following the Second World War combined with the demands of the Korean War effort and produced record levels of activity in the textile industry. As these demand declined, textile producers, particularly in the United States, were faced with excess capacity and turned to foreign markets as an outlet for their production. The results of this foreign competition are apparent from the sharp jump in imports to the Canadian market.

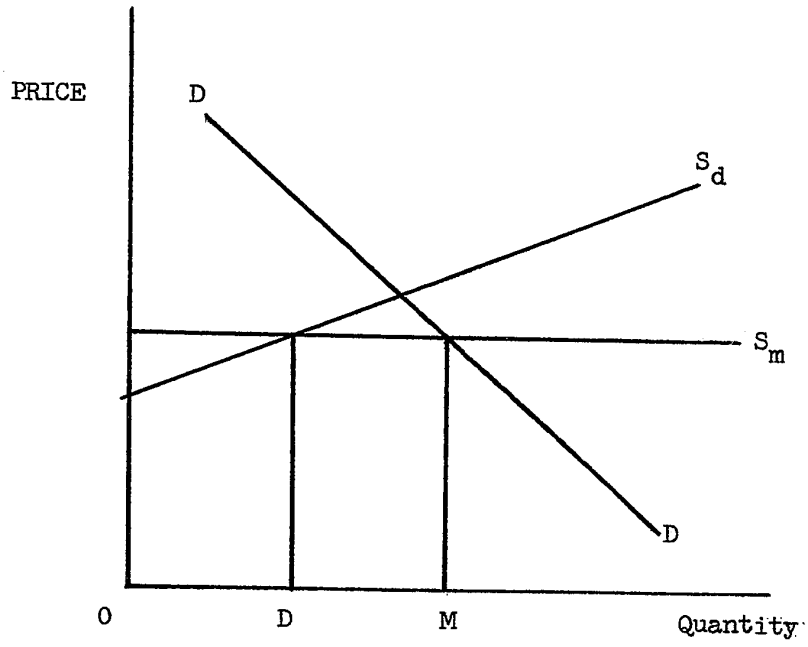
[8] See Appendix Table 4.7.

[9] These market conditions are noted in explaining changes in the performance of the domestic industry in Synthetic Textile (and Silk), Dominion Bureau of Statistics (Ottawa, 1952, 1953, 1954) and appear in price series for imported fabric presented as Appendix Table 4.8. The impact on the profitability of secondary manufacturers is illustrated by the data in Table 4.8(a).

The demand for Canadian produced fabric woven from man-made fibre and yarn thus depends on both the level of income and the nature of import competition. The price of imported fabric, including tariff may be viewed as establishing a ceiling on the price of domestically produced fabrics. Domestic producers are able to supply the domestic market to the extent that their price matches or falls below the import price plus tariffs. Changes in import prices, tariff rates or exchange rates, however, by changing the level of the 'ceiling' price established by imports alter the level of demand faced by the domestic weaving industry.

The market position of the domestic industry can be illustrated diagramatically. Figure 4·1 presents a static supply and demand representation of the market. The demand for fabric woven from man-made fibre and yarn is represented by DD. The supply of fabric domestic producers would be willing to place on the market is represented by Sd. The supply of imported fabric in the Canadian market is assumed to be perfectly elastic at the foreign price plus tariff respresented by the line Sm. In this illustration, domestic producers supply OD of the domestic market with the additional supply DM coming from imports. In terms of this diagram, changes in import competition may be viewed as vertical shifts in Sm and the impacts on demand for domestic output may be anticipated.

Figure 4.1



The technology and structure of the Synthetic Textile Mills industry appear to make it very sensitive to changes in the level of foreign competition. The production of woven fabric involves the use of machinery and equipment which is readily adaptable to a variety of fibre and yarn inputs. In fact the development of staple fibre products by primary man-made fibre producers was undertaken to provide a product which could be used on existing natural fibre spinning and weaving equipment.

In addition to the adaptability of technology, the absence of significant barriers to entry also make the synthetic textile fabric industry responsive to market changes. Unlike the primary industry, the secondary fabric industry is free of the barriers to entry created by capital requirements and product differentiation. Neither the initial capital requirement for entry nor the size of an efficient fabric producing plant relative to the size of the market create barriers to entry of the magnitude noted in the primary industry.[10] Furthermore, the agreement of primary producers not to assert patent rights beyond the fibre and yarn level eliminates a major potential barrier to entry into the secondary industry.[11] Combined with the apparent flexibility of technology, the absence of barriers to new entry results in a secondary industry with a competitive structure.

[10] See Chapter 2, pp. 33-36. In Synthetic Textile Mills in 1960 the estimated median plant size among secondary producers produced $1.43 million of woven fabric or 1.84 million linear yards. These production levels represented less than 2% of the total productionby secondary manufacturing establishments in that year. See Appendix Tables 4.9 and 4.10.

[11] Ibid., pp. 48-50.

The ease of entry into the secondary industry and its resultant competitive structure has important implications for the demand for primary fibre and yarn. In terms of the earlier analysis of the impacts of import competition on domestic producers, entry or withdrawal of domestic producers is one of the main factors affecting the position of the short period supply of domestic fabric. The easier it is to enter the domestic man-made fabric industry and the greater the adaptability of equipment to either man-made or natural fibre inputs, the more elastic will be the supply of domestically woven fabric over a number of short periods. This elasticity of domestic supply in turn determines the magnitude of the impact of a given change in foreign competition on the market share of domestic producers. Alterations in the market share available to domestic producers by inducing either entry or withdrawal of secondary producers produce shifts in the demand for primary fibre and yarn from one short period to the next.

A hypothetical example may serve to better illustrate this relationship. Assume an increase in tariffs on imports of woven fabric raises the domestic price of these imports. The rise in the price of competing imports permits domestic producers to increase both their prices and their sales, at

least in the short period. The rise in the price which may be charged for domestically produced fabric creates the opportunity for increased earnings by existing fabric producers in the short period and, inasmuch as it may be expected to persist, induces an expansion of existing producers and entry of new producers. Since the demand for primary fibre and yarn input to woven fabric may be viewed as the sum of the demands of individual fabric producers the expansion of the secondary or fabric industry produces rightward shifts in the demand for primary fibre and yarn from short period to short period.

The data on the industry producing woven fabric from man-made fibre and yarn illustrate the patterns of adjustment to changes in foreign competition.[12] In the first years of the 1950-1960 period the fall in the price of imported fabric was followed by a decline in domestic production, and a decline in the price of domestically woven fabric. The persistence of relatively low import prices was accompanied by a decline in the number of producers and plants in the domestic fabric industry and continued low price relative to 1950-1952 levels. With the reappearance of growth in the fabric market, the

[12] See Appendix Table 4.8 and 4.11.

domestic industry once again began to expand in 1958 even though the impacts of tariff changes in 1960 are not apparent in the imported fabric price data. This expansion of the domestic industry was accelerated by the exchange rate change and temporary restrictions on imports in 1962. Both these events are reflected in the rise of imported and domestically woven fabric prices.

There is evidence however of a more intricate pattern of adjustment to foreign competition in the woven fabric industry. Interviews with spokesmen for primary producers and officials at the Canadian Textiles Institute on the nature and performance of secondary producers provide initial insight. They suggest that following extremely depressed levels of production in 1954 the weaving industry embarked on a significant programme of 'reorganization and rationalization'. Part of this programme is apparent from previous references made to declines in the number of plants and producers. Equally important however is expansion in the median plant size in the industry based on both value and quantity of production. This increase in plant size was apparently accompanied by an alteration in product lines in an attempt to concentrate in areas of lower import competition.[13] These later adjustments

[13] Data on median plant size is presented in Appendix Table 4.12. A meaningful and consistent product classification does not appear in the Census of Manufactures data on Synthetic Textile Mills.

may have offset to some extent the impacts of fabric import competition on primary fibre and yarn demand.

The pattern of behaviour in the domestic industry after 1958 is also attributed to the reorganization and restructuring of the 1954-1958 period. Weavers of the fabric of man-made fibre and yarn, as a result of increased efficiency achieved through larger plant scale, were apparently able to share with imports in the resumption of market growth. Industry spokesmen suggested that even before actual tariff changes the domestic producers had established themselves in the market to an extent that permitted them to maintain their share of the growing market. At the same time, although not reflected in import prices, recovery was occurring in the United States market thereby reducing some of the pressure from foreign fabric producers.

The impacts of foreign competition at the fabric level of production thus appear to be transmitted to primary markets through structural changes in the secondary industry. On the one hand, the contraction in the number of firms in the 1952-1957 period under import pressure would appear to reduce demand for primary fibre and yarn. However the reduction in the firm numbers was accompanied by an expansion in the median size

of fabric plants and a shift in product type by primary fibre and yarn content. The resolution of these adjustment processes appears to have produced a level of man-made filament yarn use which was only slightly below the 1952 level while the use of staple fibre continued to grow, through the 1950-1960 period.[14] After 1958, the expansion of the market for woven fabric was transmitted to the market for primary fibre and yarn by both an expansion in median size and in numbers of woven fabric producing establishments.

The tire fabric production by Cotton Yarn and Cloth Mills provides an interesting contrast to the primary product demand arising from textile fabric production. As noted previously, tire fabric production has not faced the magnitude or intensity of import competition experienced in textile fabric markets. Production of tire cord fabric instead appears to be closely related to levels of automobile production and fluctuations in observed man-made tire cord use correspond closely to these production patterns. Tire cord fabric has thus provided a market for primary man-made yarn more stable than the textile fabric market where both income and import changes create disturbances.

[14] See Appendix Table 4.1 and 4.2.

The stability of the tire cord yarn market may provide another illustration of the effect of ownership and industry structure on market experience. Like the primary industry, the tire fabric producing industry may be described as a foreign owned oligopoly with the exception of one producer Dominion Textile Co. Ltd. The other three tire cord fabric producers , Dominion Rubber Company Ltd., Firestone Tire and Rubber Co. Ltd. and Goodyear Tire and Rubber Co. Ltd. are subsidiaries of United States tire manufacturers. Furthermore, the vertical integration of these producers from tire cord fabric weaving to tire production means that they produce tire cord fabric largely for their own use. The subsidiary status of the Canadian producers results in a relationship with potential import suppliers of tire cord fabric similar to that noted with regard to import suppliers of primary man-made fibre and yarn.[15] Thus, in effect, Canadian tire manufacturers control their own domestic supplies of woven tire cord fabric and their subsidiary status shields their tire cord weaving operations from import competition. The outcome of these relationships is a market for Canadian man-made tire cord yarn insulated from import pressures and thus more stable than the textile fibre and yarn market.

[15] See Chapter 2, p.48.

This stability observed in the tire cord market tends to reinforce the significance of market fluctuations in the textile yarn and fibre end uses. The development of tire cord has provided a stable and growing market for a part of man-made yarn production. But there are still large fluctuations in demand and markets faced by primary producers. The source of these fluctuations is the textile yarn and fabric market where competition is not diverted by foreign ownership, product differentiation or vertical integration. Fluctuations in market conditions for primary man-made fibre and yarn can then be traced to developments in textile fabric markets.

The existence and operation of the Canadian Textiles Institute illustrates the significance of foreign competition in the man-made textile markets. This trade organization was organized in 1934 under the name Primary Textile Institute for the purpose of promoting and maintaining the interests of the primary textile industries in Canada. The wool, silk, cotton and rayon industries were to be, and are still, served by the Institute through both collection of data on industry operations and provision of a vehicle for co-operation with the government on matters regarding customs, tariff and trade

regulations.[16] The Institute's concern with import competition and tariff protection was noted in the 1938 Royal Commission Report which said, "like most trade associations in this country and in other countries where there is a protective tariff, the Institute is concerned to secure and to preserve for its members the greatest possible measure of protection."[17] The Institute's efforts in this direction in more recent times are apparent from its submission of briefs to the Tariff Board in 1958, prior to GATT negotiations in 1964 and on the matter of quotas on Japanese imports in 1968.

Aside from their joint support of the Canadian Textiles Institute Canadian primary and secondary man-made textile producers co-operate on less formal and more technical levels. The primary producers operate continuing research programmes designed to help customers solve problems in the secondary manufacturing stages. Primary and secondary producers are in constant consultation over potential development of primary products and the changing demands for secondary products. Many of the more general problems and solutions raised through

[16] See Report of the Royal Commission on the Textile Industry, (Ottawa, 1938), pp.136-145.

[17] Ibid., p.136.

individual consultations are subsequently published in the Canadian Textile Journal[18] thus facilitating the spread of knowledge through all levels of the industry.

There are several other areas of possible consultation and discussion between primary and secondary man-made textile producers. There is no evidence that these topics arise although both the Canadian Textile Institute and less formal marketing contacts provide a potential forum. Such questions as primary producer patent policy, particularly 'non-assertion' at secondary levels, may well provide grounds for dispute. Beyond the patent issue, questions may arise about producer behaviour following tariff increases or quota restriction and the effect of that behaviour on both primary and secondary producer profits. The manner in which these questions are approached by the producer concerned, if in fact they are considered, is not evident from the information available or from discussions with industry and Institute

[18] The Canadian Textile Journal is a monthly publication of the Canadian Textile Journal Publishing Co. Ltd., Montreal.

spokesmen.[19]

The analysis and discussion of the market for man-made fibre and yarn has to this point centered on identifying and explaining fluctuations in aggregate fibre and yarn demand. Within this pattern of aggregate demand however are the demand patterns faced by individual producers of man-made fibre and yarn. This variation in demand patterns among primary producers appears to arise from both changes in the product mix of secondary producers and competition among primary fibres and yarns. As noted previously this change in product mix on the part of secondary producers is part of the response to changes in import pressure. The competition among primary producers which modifies the pressure of foreign competition on their markets may be both a response to market pressure from fabric import competition and a part of a broader programme of product development pursued by those producers.

[19] It is interesting to note the following passage from the 1938 Royal Commission Report: "A great deal of evidence both oral and written was adduced showing the activities of the Primary Textile Institute in attempting to regulate, or restrict, competition among its members. These activities may be classified under three general heads: (a) the exchange of statistics of production, deliveries, stock on hand, machinery installed etc. (b) the arrangement of agreements as to prices (c) the definition of "fair trade" practices and the arrangement of agreements to maintain such practices." Report of the Royal Commission on the Textile Industry, 1938, p.138.

It is impossible to isolate these various elements but the patterns of fibre and yarn use observed reflect the outcome of primary producer response to import competition at higher production stages and inter-primary product competition. The patterns of consumption of specific primary fibre and yarns in Synthetic Textile Mills and Cotton Yarn and Cloth Mills are presented in Tables 4.1 and 4.2 As the description of the primary fibre and yarn industry in Chapter 2 indicated there is a unique relationship between products and producers. On this basis, the data on use of viscose rayon yarn and staple, for example, reflect the market demand faced by one primary producer namely Courtauld's (Canada) Limited. Similarly, the use of acetate rayon reflects the demand faced by Canadian Celanese Ltd., the use of nylon yarn and staple and acrylic staple reflects the market for the products of DuPont of Canada and the use of polyester yarn and staple reflects the market conditions faced by Millhaven Fibres Ltd. (C.I.L.)

These patterns of yarn use illustrate three distinct events which altered the market for Canadian primary man-made fibre and yarn. These events were in two cases the direct result of changes in the intensity of foreign fabric competition in the Canadian market. The expiry of DuPont's patent on nylon

Table 4.1

Man-Made Filament Yarn Used in Synthetic Textile Mills and Cotton Yarn and Cloth Mills by Type of Yarn 1950-1966

(Millions of Pounds)

Year	Synthetic Textile Mills				Cotton Yarn and Cloth Mills	
	Viscose Rayon	Acetate Rayon	Nylon	Polyester	Viscose Rayon(a)	Nylon (a)
1950	6.4	5.5	0.8	-	-	-
1951	6.5	5.9	1.4	-	16.0	-
1952	5.9	5.7	1.8	-	18.5	0.4
1953	6.7	6.1	1.6	-	25.2	0.5
1954	4.5	3.8	1.6	-	23.5	1.3
1955	4.4	6.3	2.5	-	26.3	2.1
1956	4.5	5.2	2.0	-	27.9	3.8
1957	3.2	6.1	2.9	-	23.2	5.4
1958	2.9	7.5	2.5	0.5	19.8	5.6
1959	2.7	9.1	5.6	0.9	24.7	6.8
1960	3.1	9.2	5.1	1.1	19.6	7.8
1961	2.3	11.9	7.3	1.3	16.7	11.5
1962	2.9	13.5	9.8	1.0	14.0	14.1
1963	3.1	13.9	11.3	1.4	14.3	16.3
1964	4.7	7.2	12.0	1.2	14.7	19.4
1965	5.6	14.7	13.6	1.9	12.5	20.6
1966	5.5	14.7	16.3	4.5	7.8	19.2

Sources: Dominion Bureau of Statistics, Ottawa, Annual Census of Manufacturers, entitled Synthetic Textile Mills, (34-208) and Cotton Yarn and Cloth Mills (34-205).

Note (a): The viscose rayon and nylon filament yarn used in Cotton Yarn and Cloth Mills is virtually all tire cord yarn used to produce woven tire cord fabric.

Table 4.2

Man-Made Staple Fibre Used in Synthetic Textile Mills by Type of Staple Fibre 1950-1966

(Millions of Pounds)

Year	Viscose Rayon Staple	Nylon Staple	Polyester Staple	Acrylic Staple
1950	12.9	-	-	-
1951	14.4	-	-	-
1952	14.2	1.0	-	-
1953	16.5	0.7	-	-
1954	17.7	0.4	-	-
1955	20.9	-	-	-
1956	20.4	-	-	-
1957	17.1	0.3	-	-
1958	18.9	-	-	2.4
1959	18.9	0.3	-	2.8
1960	14.8	0.4	-	2.4
1961	17.0	0.9	-	2.6
1962	21.6	1.0	1.1	3.9
1963	23.3	1.6	1.6	3.6
1964	24.3	2.0	2.2	4.9
1965	22.1	2.3	3.0	6.8
1966	23.9	3.3	2.2	8.6

Source: Dominion Bureau of Statistics, Annual Census of Manufacturers, Synthetic Textile Mills (34-208) annual. Ottawa, 1950-1966.

provided the third development affecting the market, but in that case through both internal change and direct foreign competition. Movements observed in the data on yarn use contain both elements of adjustment to these three developments and adjustment to the underlying nature and behaviour of total domestic demand for textile fabrics. The task is now to consider the market conditions faced by individual primary producers.

Although the prices of imported woven fabric dropped sharply in 1952 and 1953[20] the impact of this increased import competition did not appear in primary product use until 1954.[21] Even then, as the data of Tables 4.1 and 4.2 indicate, the effect of increased fabric imports differed among primary products. The use of Courtauld's viscose rayon yarn appeared to be most affected and declined steadily after 1953. Viscose staple fibre use, on the other hand expanded from 1952 to 1956. In spite of a brief set-back in product use in 1953, both Canadian Celanese and DuPont experienced increases in demand for acetate rayon and nylon respectively. In this period DuPont

[20] See Appendix Table 4.8.

[21] The implication of these observations are considered in more detail in Chapter 5.

also entered the tire cord market in competition with Courtauld's. Thus of the four producers operating in 1953 only Courtauld's faced a continuing decline in product use following increased fabric import competition.

The significance of increased import competition in 1953 primary product markets was enhanced by developments in the domestic fabric market at that time. As noted previously, the total demand for domestically produced plus imported fabric began to decline in 1952,[22] and the share of the market supplied by domestic producers declined as well. This combination of events increased the magnitude of the contraction of the demand for domestically produced fabric and thus for domestic primary fibre and yarn. The data in Tables 4.1 and 4.2 suggest that the heaviest burden of this market contraction fell on Courtauld's viscose yarn and persisted until 1959.[23]

The events and developments of 1952-1953 established a trend in the market for fabric and primary fibre and yarn that extended to 1958 and 1960. This was a period of depressed

[22] See Appendix Table 4.5.

[23] Explanations of the distribution of the burden of this market contraction and subsequent market developments are considered in Chapter 5 below.

market conditions and continuing import pressures, but individual primary producers were affected differently. As noted Courtauld's faced declining textile yarn markets and this decline spread to viscose staple fibre markets. For DuPont however, markets for nylon yarn, staple and tire yarn expanded. Similarly Canadian Celanese, after one year of sharp decline in the use of acetate rayon, experienced relatively steady levels of demand and expansion after 1958. In this same period, the Canadian Industries Ltd. plant at Millhaven entered the primary industry with the production of polyester yarn and staple fibre. DuPont, as well, introduced a new product acrylic staple fibre at its Maitland, Ontario plant. Thus by 1960 each primary producer with the exception of Courtauld's was enjoying growth in markets.

While markets for and use of primary fibre and yarn were beginning to expand on the basis of internal market growth, public policy changes in 1960 and 1962 augmented this trend. The internal growth of the domestic market coincided with an expansion in income and economic activity in Canada. Domestic fabric producers were able to acquire an increasing share of this growing market as a result of increased tariff protection in 1960 and exchange rate devaluation

in 1962. These policy changes which reduced the pressure of import competition at a time of domestic market expansion are reflected in the sharp increases in primary fibre and yarn use which may be noted in Tables 4.1 and 4.2.

The expansion of domestic fabric production and primary fibre and yarn demand spread to all primary producers in the years after 1962. This produced even higher rates of growth in the use of acetate, nylon and polyester yarns produced by Celanese, DuPont and Canadian Industries Limited respectively. Even Courtauld's enjoyed a revival in the demand for viscose rayon yarn and viscose staple fibre, products which previously had suffered prolonged market declines. Only in the tire cord market was the continuing decline of a product use observed as DuPont's nylon tire cord continued to displace Courtauld's viscose rayon as the leading tire cord yarn. With this single exception of viscose tire yarn, the demand for all primary man-made fibres and yarns expanded from 1960-1966.

In the midst of this period of growth and expansion DuPont's patent on the production of nylon in Canada expired. The expiry of the patent market the beginning of a number of developments within the primary industry which produced sharp

changes in primary producer market positions and inter-relationships.[24] Direct competition from nylon yarn imported from European producers produced sharp drops in domestic nylon prices. In addition to removing a major barrier to import competition, the patent expiry removed a major barrier to domestic competition from Canadian nylon producers. Several new producers entered the industry, the most important of which was the jointly owned Canadian Industries-Celanese subsidiary Millhaven Fibres Limited which installed capacity to produce nylon 66 in direct competition with DuPont of Canada. The combined outcome of these developments is reflected in the sharp increase in nylon and polyester yarn used in Synthetic Textile Mills after 1964, when the use of other primary yarns remained constant.[25] In summary, the demand for man-made fibres and yarns in Canada depends on secondary fabric producer responses to the combined outcome of fabric import pressure and domestic market conditions.

[24] These developments are described in detail in Chapter 2, pp.20-27.

[25] These developments and a more detailed discussion of firm behaviour are considered in Chapter 5 below.

The competitive structure of the secondary textile industry makes it sensitive to changes in market conditions arising from the above developments. This sensitivity in turn, observed in changes in firm numbers and sizes, transmits the effects of secondary market developments to demand for primary fibres and yarns. In the 1950-1966 period, changes in the intensity of fabric import competition were particularly significant as they coincided with and reinforced domestic market developments. Since 1966, fabric import competition appears to have retained this significance and become a major determinant of domestic market conditions.

The demand for the products of individual primary producers arises from a more complex pattern of adjustment. It contains elements of both secondary industry response to foreign competition and primary producer response to alterations in the market position of their products. The coincidence of domestic market decline and increased fabric import competition for example, produced not only a decline in total use of primary fibre and yarn but also a shift towards greater use of nylon relative to the rayons. Changes in total consumption of primary yarns and changes in relative positions also appeared after the reduction of import competition in

1960-1962. The observations on the secondary industry made in this chapter illustrate its importance and the importance of foreign competition as determinants of demand for primary fibre and yarn. The next chapter illustrates the behaviour of primary producers themselves.

CHAPTER 5

OBSERVATIONS ON FIRM BEHAVIOUR AND PERFORMANCE

Foreign ownership, patents, the nature of secondary market industries and the pressures of import competition have emerged in the preceding chapters as key factors affecting Canadian primary man-made fibre and yarn producers. The present chapter now draws from data avilable for the industry, examples of how the above factors through their influence on Canadian industry structure, technology and markets are reflected in individual producer behaviour. No attempt is made to deal exhaustively with the available data.[1] The task is instead to isolate key observations on the behaviour of individual producers which both illustrate responses to specific market conditions and explain in part the observed changes in the market position of individual producers. The

[1] Initial attempts at analysis of individual producer behaviour were based on trend calculations and a comparison of trends and trend deviations. This approach appeared to further confuse the patterns of observations rather than to isolate or emphasize the different aspects of individual producer response. As a result, the present approach to analysis was selected to emphasize the factors which appear most significant in determining producer behaviour.

body of data from which examples are drawn is presented as the Appendix to Chapter 5.

The selection of illustrations is based on relationships observed and discussed in preceding chapters, organized with the Robinsonian framework of Chapter 3. The influence of foreign ownership, technology and patents is assumed to be primarily a determinant of industry structure as discussed in Chapter 2. The secondary market transmits influences of foreign competition to the demand for primary fibres and yarns through variations in the number and size of secondary producers. Inasmuch as there appears to be increasing substitutability among different primary fibres and yarns within the period considered, all producers in the primary industry face broadly similar market conditions. The examples selected are thus also intended to illustrate the behaviour responses of different producers supplying roughly the same market and the way the positions of individual producers have been affected by these responses.

While the observed behaviour of producers involves price, production, investment and new product introduction components, it is possible to observe differences in each of these aspects and their combined results. In the illustrations

selected, the timing of the different behaviour responses facilitates comparison. Responses to changing market circumstances appear first in price and production series and are in some but not all cases followed by investment and product introductions. The differences among producers in these latter two aspects appear related in turn to ownership, product and patent positions as will be discussed. It was these differences among producer response in terms of all the above factors that appeared to be responsible for changing producer positions in the market.

The illustrations selected are centred on three distinct developments in the industry. Two of these developments are exogenous namely an increase in foreign competition at secondary market levels and a reduction in this same competition arising from public policy. The third market event is endogenous to the primary industry in the form of the expiry of a major patent. These events are also distinct in time occurring in the 1952-1953 and 1960-1962 periods and the year 1964 respectively. Individual producer response to each of these events will be considered, illustrated and compared to demonstrate the influence of ownership, patents, the nature of the market and foreign competition on individual producer behaviour. The relationships between individual

producer responses and changing producer positions in the industry will also be emphasized.

The change in the supply price of imported fabric and its effect on production and primary yarn use in the spinning and weaving industry, as discussed in Chapter 4, marked the beginning of the increased intensity of foreign competition. This increased competition first appeared in the imported fabric price data in 1952, and reached its peak in 1953. The price of primary products reflects the increase in foreign competition in 1953 as the price of every product but nylon yarn dropped in that year and nylon yarn followed in 1954.[2] Thus the three primary producers, Courtauld's, Celanese, and DuPont, operating in 1953-1954 responded initially to the decline in markets by reducing primary fibre and yarn prices.

Several factors appear to explain why the initial response of producers, as a group, was a change in product prices as opposed to the production change which might be expected in an oligopoly situation. The earlier discussions of cost conditions faced by primary producers suggest that

[2] See Appendix Table 5.1.

in times of market pressure, producers will try to operate close to normal capacity accepting whatever price they can obtain.[3] Over and above these nominal cost constraints, producers in the primary industry were already operating with considerable excess capacity at the time that market pressures from fabric imports developed.[4] Further reductions in utilization of plant would have involved additional cost penalties. There thus appeared to be little option but to attempt to maintain or increase production levels through price reductions.

Following the initial price reductions in 1953-1954, differing patterns of behaviour appeared among primary producers. Courtauld's reversed its initial price reductions, raising the price of viscose rayon yarns in 1954 and again in 1955. This different behaviour appears to have arisen from the realization that viscose yarn was an old and perhaps fully developed product but one which still had unique properties particularly suited to textile and home furnishings end uses.[5] The action

[3] See Chapter 2, pp.54-55 and Chapter 3, pp.80-84.

[4] See Appendix Table 5.6.

[5] Viscose had previously faced declining markets throughout the world prior to Korean War demands, see Textile Organon, (New York, January 1958).

of Courtauld's can then be viewed as a program of reduction in production and capacity in its viscose yarn operations aimed at concentrating on demands in areas where viscose was particularly suited. As a result, Courtauld's price behaviour after 1953 appears in direct contrast to that of the other primary producers.

The differences in primary producer behaviour after the initial price response provide examples that illustrate differences in product age, patent position and parent subsidiary relationships. The Courtauld's price behaviour just noted is the first illustration of these differences and differences in product age in particular. In contrast to Courtauld's, Celanese continued to reduce the price of acetate yarn as the pressure of foreign competition continued, and this behaviour in itself may explain a large part of changes in use of viscose and acetate yarns noted earlier in Chapter 4.[6] Changing relative prices of viscose and acetate yarns in favour of acetate permitted Celanese to expand production and capacity after 1954 to supply a growing market. The use of viscose yarn experienced a concurrent decline.

[6] See Chapter 4, Table 1, pp. 120-121. As noted here the mix of fabric imports by yarn content may also be significant in explaining the experience of individual primary producers. It is possible that the behaviour of both Courtauld's and Celanese was the correct response to the circumstances given the different products, etc.

DuPont responded to the continuing pressure of foreign competition in the nylon market in a manner similar to that noted for Celanese with regard to the acetate yarn. The price of nylon yarn continued to fall after the initial decline noted in 1954. Nylon was at this time a new product to consumer textile markets and its development potential was far from fully realized.[7] Price reductions plus a continued development of nylon end uses may thus have combined in this period to permit the use and production of nylon to grow in spite of stagnation in the secondary industry. But DuPont's experience in nylon differed from that of Celanese with respect

[7] In the present discussion and in subsequent illustrations of behavior the differences noted and related to product age appear important in explaining different experiences. It is not the intention, however, to suggest that newness per se is always indicative of potential for expansion. In the case of nylon for example, it was a more recent development than viscose or acetate but in addition it had demonstrated marketability and development potential. Polyester, on the other hand, was an even more recent development, and, particularly in Canada, it took several years for its development potential and particular suitabilities to be discovered. The significance of product age then appears to include demonstrated development potential, a potential which producers may only have expected at the time but which is obvious in retrospect.

to acetate even though behaviour of the two producers appeared very similar. DuPont's production did not decline following increased foreign competition whereas Celanese production did, initially in 1953 and 1954 although growth resumed in 1955. This difference in experience may again rest on the newness of nylon in the primary yarn market relative to the age of acetate rayon and the uniqueness of nylon's characteristics.

It is difficult in this period to find any concrete evidence of product developments except to note the changing patterns of product end uses.[8] The significance of Synthetic Textile Mills as a market for primary yarn dropped sharply after 1953 with declines in both absolute quantity and relative share of yarn used. To a considerable extent this decline in textile yarn use was offset by increased tire cord or industrial yarn use. This development of tire cord end uses is the only illustration of product development available in this period and it must be stressed that tire cord was not a Canadian development.

[8] See Appendix Table 4.1.

The introduction and growth of tire cord production is perhaps a good illustration of the influence of parent-subsidiary relationships on individual producer behaviour. Particularly in the case of nylon tire cord which was not produced in Canada prior to 1953, the parent company provided its subsidiary with a new and developed product in a time of local market depression. In Courtauld's case, viscose rayon tire cord was in production in 1950 but production and capacity for production jumped markedly ahead following increased import competition in textile yarn markets. Thus the introduction and expanded production of this relatively new product may be viewed as a part of producer response to increased textile fabric import competition. This sort of response in turn provides an illustration of the possible influence of parent corporations on Canadian primary subsidiaries through providing product lines in times of market pressure.

Finally, the market circumstances and producer behaviour arising from the increased foreign competition provide two observations or illustrations of the role played by patents.

Only two products enjoyed strong patent protection in 1952 namely nylon and polyester, and polyester was not produced at that time. In the case of nylon, imports of fabric containing nylon produced direct pressure in the Canadian market for nylon yarn. This pressure was permitted, in spite of potential patent protection at fabric level by the policy of 'non-assertion' followed by DuPont[9]. It is conceivable that fabric imports with nylon content would have been greater in the absence of DuPont's patent protection. The more important observation, however, appears to be that DuPont did not exercise full patent rights to exclude fabric import completely but instead adjusted price, production and ultimately investment behaviour in response to market adjustments induced by import competition. In the case of polyester, protection of the patents held by Canadian Industries Ltd. made it necessary to enter production in 1954-1955, a time of general primary market depression.[10]

9 See Chapter 2, pp.48-51.

10 From another point of view, the behaviour both of DuPont and C.I.L. in this period may have been correct. Import competition appears to have been strongest in viscose and acetate fabric thus perhaps increasing the opportunity for successful marketing of nylon and polyester in the secondary industry.

Combining the above behaviour responses for each primary producer illustrates differences which mark the beginning of a change in relative producer positions. Courtauld's although initially reducing prices in viscose yarn shortly abandoned that policy reducing viscose yarn capacity and production and shifting emphasis to staple fibre and tire cord production. Celanese persisted with price reductions and this policy combined with Courtauld's behaviour permitted the expansion of production and capacity for acetate yarn. DuPont followed a policy similar to Celanese in terms of price reductions but added a new product line in tire cord, the combined effects of which were to permit steady uninterrupted growth of production and capacity. Canadian Industries Limited was forced to enter the market under threat of loss of patent rights. The net result of these behaviour patterns was that DuPont and C.I.L. began to grow relative to Courtauld's in all product lines. Celanese began to displace Courtauld's in textile yarn but Courtauld's remained the largest producer in terms of absolute production of all products.[11]

[11] These changes in relative producer positions would probably have occurred without the change in foreign fabric competition simply on the basis of differences in product ages and states of development. The effect of increased import competition would then appear to have been to acelerate these changes by altering the prospects of individual producers more rapidly than undisturbed domestic market development might have done.

To summarize the illustrations of the effect of increased foreign competition on the behaviour of primary producers the patterns of behaviour may be viewed in terms of the framework developed in Chapter 3. Within this framework, the increased fabric import competition, transmitted through the responses of secondary producers, would appear as a backward and downward shift of individual primary producer expected proceeds curves. The behaviour responses of individual producers may then be treated as arising from their expectations of the possible persistence of such a market situation relative to their own products. This approach in addition to summarizing the observations on behaviour will illustrate the use of the Robinsonian framework for the analysis of producer behaviour.

Differences among producers from this point of view could be expected from differences in both the extent of the downward shift of the expected proceeds curves and the expected duration of market conditions producing the shifts. In Courtauld's case for example, the extent of the shift may be greatest as a result of both product age and the apparent composition of fabric imports by fibre content.[12] Furthermore,

[12] See Chapter 4, p.111-113.

the experience of both Courtauld's and producers of viscose in other countries in terms of declining markets prior to the Korean War, may be viewed as generating pessimism about future market prospects. Then the apparent failure of Courtauld's price reductions to offset declines in textile product use in 1953 and 1954 may have prompted a decision to reduce viscose yarn production. This type of argument receives support from the observed rise in viscose yarn prices in 1955 and the subsequent reduction of production and capacity.

It is possible to pursue this same type of analysis with regard to the behaviour of Celanese and DuPont. In both these cases it might then be argued that the producers viewed the downward shift in their expected curves as temporary and were thus optimistic about future market developments. In Celanese's case this optimism might well be justified on the basis of Courtauld's behaviour, the resulting relative decline in acetate yarn prices and the extent of substitutability between acetate and viscose yarn. In DuPont's case, the newness of nylon in virtually all end uses and its as yet undeveloped potential end use applications would provide grounds for optimism. DuPont and Celanese

in any case succeeded in offsetting some of the initial market decline through price reduction as the use of nylon and acetate in Synthetic Textile Mills expanded. DuPont was able to further enhance its prospects by importing the technology for a new product form and use, namely tire cord, from its foreign parent. In both cases persistence with an initial policy of price reduction ultimately resulted in DuPont and Celanese achieving growing markets, and expanding capacity as a result. Product development and parent-subsidiary relationships played a role in this development.

The effect of increased fabric import competition was to establish a number of distinct trends in primary producer behaviour. Courtauld's, expecting continuing declines in viscose textile yarns markets and lacking other Canadian or parent developed new end use applications began to reduce viscose textile yarn production and capacity, switching emphasis to staple fibre and tire cord, as noted earlier. Celanese in contrast continued to promote use of acetate rayon yarns by price policy, was able to offset initial contractions in acetate use and then pursued a policy of continuing price reductions while expanding capacity to meet increasing demand. While DuPont did not actually experience

a decline in product use, growth temporarily disappeared leading to both price reductions and introduction of new parent developed products and applications which together produced the highest rate of growth in the primary industry albeit from a small initial production level. Finally, Canadian Industries Limited entered the primary industry with the production of polyester fibre and yarn but data on price, production and use is not available. Thus individual primary producer responses to the increased fabric import competition produced new trends in all aspects of producer behaviour which appear to persistuntil about 1960.[13]

The overlapping of a number of exogenous market developments in the years 1958-1962 provided another set of illustrations of individual producer behaviour. Beginning in 1958 the domestic demand for fabric woven from man-made fibre and yarn began to grow and previous developments in the spinning and weaving industry permitted growth in the domestic share of this growing market.[14] These conditions

[13] See Appendix Tables 5.1, 5.2, 5.3 and Appendix Charts 5.1, 5.2 and 5.3.

[14] See Chapter 4, pp.111-113.

began to reduce the previous pressure of fabric import competition on primary producers perhaps enhancing the effect of subsequent events. These events took the form of an increase in tariff protection for secondary producers in 1960 and the devaluation of the Canadian exchange rate in 1962. In combination these events produced a reversal of previous declines in the domestic woven fabric industry which is reflected in both expanded fabric production and expanded primary yarn use as discussed in Chapter 4.

The responses of individual primary producers to these market developments provides another series of illustrations of producer behaviour. This behaviour illustrates the significance of foreign competition in secondary markets as a determinant of primary producer behaviour. But the observations go beyond this to provide new examples of the effects of ownership, patents and the beginnings of product differentiation. In this case producer behaviour is observed in a time of market growth and perhaps buoyant expectations but the differences in behaviour provide further insight into changing positions in the industry.

As in the previous case, the first observed producer reaction to the changed market circumstances appeared in

product prices. In this instance, however, considerable differences in producer behaviour were noticeable from the outset as not all producers pursue similar initial price responses. The data on average product prices in all end uses shows a sharp upward deviation from previous trends in the case of all Courtauld's and Celanese products and the nylon and polyester staple fibre of DuPont and Canadian Industries Ltd. respectively. The price of nylon and polyester yarns however continued to decline and did not break this trend until 1961. The initial responses of producers thus did appear in product prices but the timing of these responses and their magnitude varied among producers.

This price behaviour, and differences among producers were more apparent in the prices of primary products used in fabric mills.[15] The change in market occurred mainly in fabric markets and the major price movements might therefore be expected in that area. Observations here show a sharp break in the previous downward trends in the price of DuPont's nylon yarns and rising nylon yarn prices follow.

[15] See Appendix Charts 5.1, 5.2, 5.3.

This same sort of price behaviour appeared in Celanese acetate yarn and Courtauld's viscose yarn but acetate yarn prices appeared to resume their downward trend after 1959. The price of Courtauld's viscose yarn fluctuated widely after 1958. Including the later behaviour of Canadian Industries Ltd. in these observations two producers namely DuPont and Canadian Industries Ltd. raised primary product prices, Celanese with the exception of initial response continued to reduce prices while Courtauld's price behaviour showed no definite pattern.

These differences in individual producer behaviour appeared in other aspects of behaviour and may again illustrate the role of product age and patents as determinants of producer behaviour. Courtauld's appears to have been content, in spite of market improvement, to continue with its policy of reducing viscose yarn production and capacity. Celanese on the other hand, sharply increased production of both acetate staple and yarn in 1959 and further production increases followed. Similarly, production increases in nylon and polyester fibre and yarn came from DuPont and Canadian Industries Ltd. respectively. Thus Courtauld's appeared convinced that viscose yarn markets were declining, Celanese continued

to succeed in expanding acetate markets while DuPont and Canadian Industries, the only producers with patent protection, were able to both raise prices and continue to expand production.

The expansion of the domestic market and producer response in terms of price and production was followed by an expansion of capacity by two producers which accents the previously observed trends in changing producer market positions. Both DuPont and Celanese undertook net investment to expand capacity for nylon and acetate fibres and yarns respectively, in spite of the difference in their price behaviour. By contrast, Courtauld's reduced capacity in every line of viscose fibre and yarn production. Canadian Industries Ltd., Millhaven Fibres was the only producer who did not alter capacity in this period but appears instead to have permitted market expansion to raise levels of plant utilization. Thus DuPont and Celanese emerge in 1962 with expanding capacity while the decline of Courtauld's in the market had spread to all product lines and Canadian Industries Ltd. continued to operate with the same level of capacity as installed on entry in 1955.

These observations on behaviour once again provide illustrations of the roles played by ownership and patents in effecting producer behaviour. In this case, it is perhaps of note that the two American owned Canadian primary producers both managed to grow during the previous period of market depression and this rate of growth increased sharply from 1958-1962. One of the two British owned primary producers, Courtauld's, extended its earlier policy of contraction in textile yarns to all lines of production in spite of much improved general primary market conditions. The second British owned firm Canadian Industries Ltd. was still attempting to employ original plant to desired levels of utilization and thus did not appear to grow during the period. There thus appeared to be some relationship between parent nationality and the growth of Canadian subsidiary primary fibre and yarn producers.

There appear to be two ways in which ownership and particularly parent nationality may affect Canadian primary producer performance. The first of these effects has been noted in the previous illustration and appears again in this instance, namely, role of the parent corporation in providing new product lines. In the earlier case DuPont of Canada

acquired a new product tire cord from the parent corporation. In this instance, while many minor end use developments may have been imported, another new product was introduced to the Canadian market namely acrylic staple fibres with brand name 'orlon'. Aside from this type of direct parental contribution to Canadian production, the sales activities and marketing campaigns of the American parent corporation may spill over to benefit Canadian subsidiaries.[16] Both Canadian producers and their American parent corporations take advantage of this marketing economy by introducing and selling products in the Canadian market under the same brand names as used in the United States. Similar attempts by Canadian Industries Ltd. to market polyester under the British brand name 'terylene' were noticeably less effective.

Producer behaviour between 1958 and 1962 also illustrates a further aspect of the role of patents. Both DuPont and Canadian Industries held exclusive patent rights to the production and sale of nylon and polyester respectively in this period.

[16] See pp. 159-160 below.

Both producers raised product prices as demand expanded in textile fabric markets. The other two producers, without patent protection continued with year to year price reductions albeit at a slower rate than in the previous periods of market depression. In the case of DuPont, the rise in product prices was particularly significant since it coincided with an expansion of capacity which in terms of previous discussions on production technology should have yielded cost economies. DuPont in fact managed to achieve rising profits throughout this period reaching record profit levels in 1964.[17] Thus while patents did not eliminate the effects of import competition in the 1952-1955 period of market pressure, they appear to have played a significant role in affecting producer behaviour and performance in this later period of market growth.

Observations on market change and producer behaviour from 1958-1962 can again be viewed and summarized within the Robinsonian framework of Chapter 3. The resumption of domestic fabric market growth was transmitted to the demand for primary products through expansion of the secondary industry. This

[17] See the Financial Post, Dec. 14, 1968, p.26.

secondary industry growth may in turn be viewed as producing upward and righward shifts in the expected proceeds curves of individual primary producers. There was in this case, however, a more noticeable difference among producers in the extent of market changes or in other words in the extent of the shift in expected proceeds.

Immediate producer response to market expansion again illustrates the effectiveness of the Robinsonian construction in explaining producer behaviour. The market change produces an immediate break in the preceding pattern of price behaviour and is quickly followed by expansion of production in three of four cases. Subsequent behaviour particularly investment behaviour must take account of product age, ownership and patents as they may affect the future position of the producer in the market.

The pessimistic outlook of Courtauld's with regard to the future of viscose rayon yarns did not appear to be altered by the revival of the domestic fabric market. On the contrary, this pessimism appeared to spread to staple fibre and tire cord products and may again be explained by product age. Courtauld's continued to differ from the other producers in most aspects of behaviour, and reduced capacity in all

product lines as if expecting declines in viscose product markets in spite of generally favourable market conditions.

There was in this behaviour of Courtauld's an illustration of direct competition among Canadian primary producers. As noted earlier, in the 1952-1955 period Courtauld's appeared to lose textile yarn markets to Celanese, perhaps because of failure to compete on a price basis in a time of market pressure, or perhaps through acceptance of the market position of viscose textile yarns. The 1958-1962 period provided a second illustration of direct competition, this time in the tire cord market. Once again Courtauld's appeared to lose out, to DuPont, in tire cord but in this case different product characteristics or more specifically the superior characteristics of nylon tire cord emerged as the deciding factor. These experiences in competition with other primary producers could hardly help but generate pessimism on the part of Courtauld's about the future of viscose under any market condition.

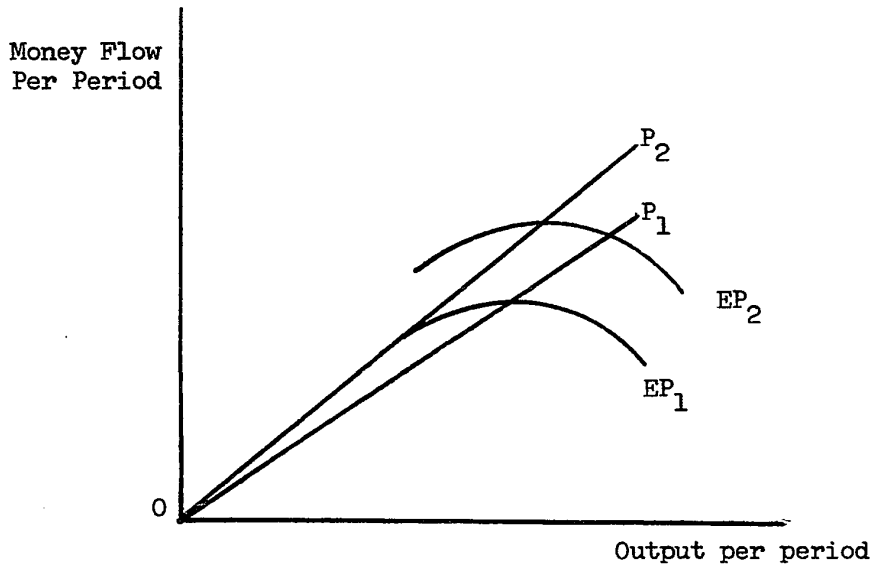
In light of their successes in both the textile and tire cord markets, DuPont and Celanese appeared justifiably optimistic when market growth resumed. If the initial revival of market growth may be viewed as an upward shift in expected

proceeds curve, this optimism suggests expectations of further upward shifts in the near future. Both DuPont and Celanese expanded capacity as if anticipating such developments. As noted above, both held the further advantage of American marketing efforts and product promotion based on brand names and applications developed by their parent corporations. DuPont held an additional advantage in the form of strong patent protection.

The Robinsonian framework also provides a perhaps more detailed explanation of the role played by the patent in explaining DuPont and Canadian Industries price behaviour. In the case of DuPont in particular, previous price reductions in the face of earlier market pressure may have resulted in short period operation very close to the point of unitary elasticity of demand, or the peak of the expected proceeds curve. An upward and righward shift in expected proceeds in these circumstances with price unchanged, would place operations in the inelastic portion of the curve. A continuum of such shifts in contingous short periods would then necessitate the observed rise in price to avoid

operations in the inelastic portion of the demand curve.[18] The patent on nylon granting exclusive market rights combined with the uniqueness of nylon's characteristics in end use applications would tend to generate the inelasticity of demand which is the basis of such behaviour.

[18] The situation described can be illustrated diagramatically as shown here. Assume following the period of previous market pressure DuPont had ended up operating in terms of the intersection



of EP_1 and P_1 (EP_1 is the expected proceeds curve as defined in Chapter 3, pp.81-86 and P_1 is the price line). The sharp improvement in the market in 1961 could then be represented by the shift to EP_2. However, on the basis of EP_2, P_1 represents a price which lies in the inelastic portion of the demand curve. Thus expectations of increased revenues suggest an increase in price to P_2. The argument for raising price in response to market improvement is essentially the converse of the introduction of discounts in times of market weakness. In DuPont's case the risk of attracting rival entry was reduced by the patent position.

As in the case of producer responses to import competition in 1952, the responses to market growth and reduced import pressure from 1958-1962 established definite trends in producer behaviour. Courtauld's continued to reduce capacity and production of textile yarns and extended this policy of capacity reduction to all lines of production. Celanese, continued with a policy of price reduction for acetate yarn and expanded capacity and production to meet growing demand. DuPont, having almost displaced Celanese as the second largest producer on the basis of previous behaviour further expanded capacity and added an additional product line. This resulted in combined capacities in all products of forty-four million pounds compared to Courtauld's sixty-three million pounds, Celanese, fifty-one million pounds and Canadian Industries fourteen million pounds.[19] DuPont thus accounted for over twenty-five per cent of industry capacity in 1962 as compared to just over ten per cent in 1950 and approximately twelve per cent in 1954. More important perhaps is the fact that DuPont emerged from the 1958-1962 period as the fastest growing producer while Courtauld's was declining, Canadian Industries was stationary and Celanese was growing slowly.

[19] See Appendix Tables 5.3 and 5.4.

These patterns of behaviour and the market circumstances on which they were based continued until 1964. In that year, the expiry of DuPont's patent rights to nylon production initiated a change in behaviour on the part of all producers that sharply altered the structure of the industry. The immediate effect of patent expiry appeared in the prices of both nylon and polyester yarns. Patent expiry removed an insurmountable barrier to direct foreign competition in nylon yarns and fibres and was accompanied by a sharp rise in imports from European sources. At the same time the previous patent barrier to entry into domestic nylon production disappeared and Canadian Industries Ltd. announced plans to enter domestic nylon production in direct competition with DuPont.[20] These immediate reactions illustrate the strength of the role played by the nylon patent in determining both industry structure and individual producer behaviour.

There was a marked difference among producers in terms of price behaviour following the expiry of the nylon patent.

[20] Several other firms announced intentions to and did enter nylon production but they concentrated on nylon 6 a product regarded as inferior to nylon 66 produced by DuPont and planned by CIL. The firms producing nylon 6 are Courtauld's (Canada) Synthetic Fibres Ltd., Union Carbide Ltd., Firestone Tire and Rubber Co. Ltd.

DuPont was of course most directly affected by resultant nylon import competition and nylon prices in all end uses dropped sharply in 1965 and 1966. Although Canadian Industries Ltd. continued to enjoy patent protection in polyester yarns, they reduced the price of polyester as nylon prices fell. This observation illustrates the degree of competitiveness which had developed between these products and the resulting interdependence of the producers. Price for viscose and acetate rayons, produced by Courtauld's and Celanese respectively, also declined in some end uses but the magnitude of the decline was much less. The net results of these price changes was a sharp drop in the prices of the non-cellulosics nylon and polyester relative to the prices of the cellulosics acetate and viscose.

This change in price structure appeared to have an immediate effect on production and a more durable effect on producer expectations as reflected in investment. The annual increases in production of viscose and acetate products continued the pattern established prior to 1964 until 1965 when production growth disappeared. By contrast, production of nylon and polyester jumped sharply ahead following price declines in 1965 and by 1967 production of nylon and polyester

yarns was almost double the 1963 level.[21] Subsequent producer capacity changes reflected their expectations that these patterns of differential growth would persist. Celanese began to reduce acetate yarns and staple capacity in 1965 and continued these reductions in subsequent years. Courtauld's, after reversing its initial pattern of withdrawal from viscose yarns in 1963, ultimately returned to this policy and discontinued production of all viscose yarns in 1969. These responses thus ultimately accelerated the changes in relative producer position in the industry as DuPont and Canadian Industries Ltd. undertook rapid capacity expansion.

The combined influences of changing relative producer positions and the expiry of the patent barrier to nylon production led to a further change in industry structure. As discussed in detail in Chapter 2, Canadian Celanese division of Chemcell Limited, acquired part ownership in Canadian Industries Limited's Millhaven Fibres and subsequently assumed

[21] These observations also tend to support the earlier contention that the demand curve faced by nylon and polyester producers may have a double kink see Chapter 3, pp. 82-83 Direct nylon import competition appeared to push domestic nylon prices down to a level which produced considerable substitution from rayon and acetate to nylon and polyester. The potential for these substitutions had existed previously but the price range required to achieve it was regarded as too low given existing cost conditions to permit profitable operation.

operating control of Millhaven Fibres Ltd.[22] This structural change effectively reduced the number of major independent primary producers from four to three while substituting American control for previous British control of polyester fibre and yarn production.

The behaviour of Millhaven Fibres under the joint ownership of CIL and Celanese provides a striking illustration of the effect of American ownership on producer performance. Prior to 1964 Millhaven Fibres had been a CIL subsidiary producing polyester yarn and fibre under the ICI brand name 'terylene'. As estimates of producing capacity and data on polyester yarn use tend to indicate, Millhaven experienced difficulty in achieving growing markets or in fact even employing initial capacity at high levels of utilization. Following 1964, however, the rapid growth in demand for polyester had led to a tripling of fibre capacity and more than doubling yarn capacity. This sharp change in behaviour coincided with the change in the structure of ownership to include American interest from Celanese Corp.

[22] See Chapter 2, pp.20-26, esp. p.25.

The acquisition of an interest by Celanese in Millhaven Fibres appears to have had two results. The first of these was a change in the outlook and methods of management which integrated Millhaven production with Canadian Celanese production and management methods.[23] The second change and the more noticeable one to external observers arose from the integration of the marketing efforts of Millhaven Fibres and Canadian Celanese under the jointly owned subsidiary CEL-CIL Fibres Ltd. This produced a sharp change in marketing involving the abandonment of the previous 'terylene' brand name and the promotion of polyester in the Canadian market under the Celanese United States brand "Fortrel". Following the introduction of marketing campaigns using the brand in both Canada and the United States the use of polyester in Canada jumped sharply ahead and Millhaven began a programme of rapid capacity expansion.

This performance by Millhaven Fibres considered along with previous observations on DuPont, further illustrates the possible advantage to Canadian primary producers of United

[23] A spokesman connected with Millhaven both before and after the union with Celanese considered this aspect of change particularly significant.

States ownership. In DuPont's case, the Canadian subsidiary appeared to benefit in each of the market situations observed, from access to parent firm product developments and brand names. When Millhaven Fibres moved to a similar position with part American ownership and access to brand names developed and promoted in the United States, its performance changed noticeably. If only in terms of spill-over of United States marketing efforts, American ownership appears to confer important advantages on Canadian producers.

The outcome of these many developments following expiry of the DuPont patent on nylon appears to have been a new pattern of inter-producer competition. This competition was based on the production of similar products by both DuPont and Millhaven Fibres along with entry of a number of other producers into nylon production. Brand names appeared much more important in differentiating products of competitive producers. These brand names were extended into finished product areas where sales promotion of consumer textile products on the basis of brand name fibre content increased noticeably. Sales campaigns, combined with the previously noted decline in nylon and polyester prices made DuPont and

Millhaven Fibres the fastest growing Canadian producers. DuPont moved into the position of largest Canadian producer by 1968. By this time the joint operation of Celanese and Millhaven Fibres involved a capacity less than DuPont's but greater than Courtauld's. Furthermore, Courtauld's appeared to have returned to the programme of withdrawal from viscose yarn production as capacity was again being reduced. Thus DuPont and Millhaven Fibres--Celanese emerge as the two major Canadian primary fibre and yarn producers competing over an increasing range of products largely on the basis of product differentiation and brand name promotion.

From these illustrations it appears possible to make a number of generalizations about the factors affecting Canadian primary man-made fibre and yarn producers. Perhaps the most noticeable of these factors, in that it affects all producers in similar way, is import competition at secondary manufacturing levels. In spite of differences in product age, parent nationality and patent position, all producers were affected by and responded to changes in import pressure. The differences among producers in terms of both their response to market conditions and the success of their responses

relative to the goals of survival and growth appear in turn related to ownership, product age and patents. These different behaviour patterns and variations in their success explain a considerable part of the observed changes in producer positions in the market. Finally, the observations made in the course of the illustrations indicated the analytical power of the Robinsonian framework of Chapter 3 to interpret and analyze individual producer response.

The differences observed in producer behaviour and performance suggest advantages in United States as opposed to British ownership. In each case, the behaviour of United States owned DuPont of Canada and Canadian Celanese, was more successful in offsetting market pressure and realizing the potentials of market growth. This success appeared to arise from access to parent developed products on the one hand and the benefits of United States advertising or sales promotion campaigns on the other. Neither Courtauld's nor Canadian Industries, both British owned, appeared to receive these benefits from their parent corporations and both were noticeably less successful in their response to changing market circumstances. Thus United States ownership and the benefits it embodies played a role in explaining the differences observed in individual producer performance.

Further differences in producer behaviour appear to be explained by patent positions. Those differences are not striking in the first illustration when DuPont's behaviour did not differ from that of Celanese or Courtauld's even though DuPont had potential patent protection from fabric import competition. In fact patent law in that period resulted in the entry of Canadian Industries Ltd. into polyester production to protect its patent position. The observations in the 1958-1962 period provided perhaps conflicting evidence, when DuPont appeared to reap the benefits of market expansion but C.I.L. with similar patent protection did not. The role of patent protection in general is thus difficult to assess beyond noting the apparently greater degree of independence exercised by DuPont in price and production policy from 1958-1964 as compared to the behaviour of other producers and the disappearance of this independence after 1964.

The combined influences of ownership, patents and differences in product ages and states of development on producer behaviour appear to explain a large part of observed changes in relative producer positions. These changes were accelerated by the market pressure arising from fabric import competition in 1952-1953 which initiated the market shift

from viscose rayon to other primary products. This shift permitted DuPont and Canadian Celanese in particular to expand through price reductions and new product developments. But continuing change in this direction appeared to be delayed by patent positions which blocked the entry of competing nylon and polyester producers and at least potentially reduced the expansion of nylon and polyester use. This delay ended in 1964 with both direct nylon import competition and competitive domestic entry following expiry of DuPont's patent. The expiry of the nylon patent, the pending expiry of the polyester patent and the advanced age and market position of acetate all appear to underly the changes in industry structure from one of four producers with four distinct products to an industry of two large producers with similar products.

CHAPTER 6

THE CANADIAN PRIMARY MAN-MADE FIBRE AND YARN INDUSTRY IN THE CONTEXT OF THE WATKINS REPORT[1]

The analysis of the Watkins Report isolates six major issues raised by foreign ownership and control of Canadian economic activity. The Canadian primary man-made fibre and yarn industry is predominantly foreign owned and each producer is controlled by foreign owners. It thus provides an opportunity to examine the questions raised by the Watkins Report in terms of observations on one industry and firms within that industry.

The major issues raised by the Watkins Report[2] can be outlined briefly prior to more detailed consideration below. The first issue concerns the benefits and costs of foreign owned firms from the point of view of the host country, Canada in this case. In assessing these potential

[1] See Foreign Ownership and the Structure of Canadian Industry, (Ottawa, 1968).

[2] Ibid., p.355.

The Canadian primary man-made fibre and yarn industry, is only one of many foreign-owned and controlled industries but has uniqwe characteristics which must be taken into account. In particular this industry presents a case of foreign ownership, embodying technology, establishing plant to supply the domestic market created by tariff protection and further protected by exclusive patent rights.[3] The man-made fibre and yarn industry is thus distinct from many other foreign owned firms in primary industries which are established to supply raw material inputs to higher stages of manufacture in the parent corporation. This distinction is important as it explains the constraints on firms in the man-made fibre industry that may limit both the range of activities open to firms and the market in which these activities may be pursued.

The major significance of foreign ownership rests on these constraints which subsidiary status imposes on Canadian producers. As a part of a wider international

[3] The discussion of the implication for patents is postponed until the latter part of this chapter since patents per se do not appear as a major determinant of the ownership of the Canadian industry but instead determine which of many potential entrants in fact originally established various lines of production in Canada.

corporate structure, Canadian producers are intended to serve the Canadian market. Other national markets and even regional markets in the United States are served by similar subsidiaries of the same corporations with very few exceptions. Foreign ownership thus limits Canadian producers to the Canadian market precluding at least the possibility of producing at efficient levels of output by exporting.

Orientation toward the domestic market means the benefits of the Canadian man-made fibre and yarn industry do not include substantial export earnings. Those benefits which do exist occur largely as a result of employment of Canadian labour. This employment generates income and this is income earned in an industry that is substituting domestic production for imports. In addition to income, this employment provides training of production, supervisory and research personnel in a technology developed by the parent corporations, Other potential benefits[4] to Canadian from the primary man-made fibre and yarn industry may exist in terms of the availability of products in Canada and the price of these products.

[4] See Foreign Ownership and the Structure of Canadian Industry, pp.65-120, especially pp.66-67.

discussion of Chapter 2 that they would probably exist with the exception of dividend payments even with Canadian ownership of the primary man-made fibre and yarn products.[6]

In the case of the Canadian man-made fibre and yarn industry more significant costs of foreign ownership appear to arise from the relative inefficiency of Canadian producers. To put this case bluntly, Canadian tariff policy has fostered the existence of relatively inefficient, by world standards, secondary textile industry and thus created a Canadian market for primary fibre and yarn. Foreign man-made textile producers, working within the protection afforded by the International Patent Convention, have chosen to establish foreign owned Canadian primary man-made fibre and yarn producers to supply this Canadian market. The production facilities established in Canada were, however, considerably below minimum efficient scale and the costs of Canadian production were in the order of 10 per cent to 20 per cent above costs in the United States.[7]

[6] An important question which arises here and is discussed in more detail later in this chapter (see pp.186-187) concerns the possibility that without foreign ownership, the Canadian primary man-made fibre and yarn industry would not exist.

[7] See Chapter 2 above, pp.35-36.

This inefficiency not only creates costs in the primary industry but even with competition in that industry these costs are passed along to the secondary industry, impairing the ability of the secondary industry to compete with imports.[8]

The significant cost of foreign ownership in the case of man-made textiles thus appears to arise from the ability of foreign corporations to isolate the Canadian market from external sources of supply and ensure the survival of inefficient foreign owned Canadian producers. This cost exists even if the Canadian primary producers do not pursue policies aimed at reaping monopoly returns. The situation is analogous to the existence of industrial control which would foster the production of raw cotton in Canada to supply tariff protected Canadian secondary cotton textile industries. Even without imperfections in competition within the domestic primary industry the higher production costs of the primary industry are passed on and compounded through higher production stages to appear in the price of final products.

[8] As Mrs. Robinson has pointed out cost inefficiencies at early stages of production are compounded up through later stages and have larger effects on selling prices than cost inefficiencies at higher stages of production. See Exercises in Economic Analysis, (New York, 1965), p.181.

It might, however, be argued that these costs of inefficient scale are not directly attributable to foreign ownership but would exist even if a similar Canadian owned industry were established under tariff protection. While this may be true in certain industries, the preceding observations on industry structure, producer behaviour and the role played by foreign ownership suggest otherwise in the case of primary man-made fibre and yarn. In the first instance, the industry would probably not exist in Canada except under foreign ownership and the embodied technology and industrial know-how.[9] Furthermore, foreign ownership by parent corporations which are the dominant producers in other countries has limited the potential of Canadian producers to the Canadian market thus excluding the possibility of achieving efficient scale through exports. Thus in the case of primary man-made fibre and yarn the cost of scale inefficiencies may be attributed to foreign ownership which initially established the Canadian industry and fragmented

[9] It is of note in this regard that there is no Canadian owned or controlled primary producer of man-made fibre and yarn in Canada and none entered the industry after patent expiry in 1964. This follows a pattern established earlier in the United States where Markham suggests foreign ownership was essential to the establishment of the primary man-made fibre industry. See Competition in the Rayon Industry, pp.8-9.

the North American and North Atlantic markets permitting the Canadian industry to survive but forcing it to operate at scales tied to the Canadian market.

The cost of inefficient Canadian production plus whatever balance of payments cost may exist should then be compared to the benefits of income and employment to arrive at an initial assessment of net benefit derived from the foreign owned Canadian primary man-made fibre and yarn industry. These are of course difficult costs to quantify and it appears that the costs of inefficiency are the only ones clearly attributable to foreign ownership. However the price of primary fibre and yarn in Canada is at best a very dubious indicator since it contains elements of individual producer behaviour and a comparison between countries would only compound this behavioural content. An alternative attempt to estimate these costs on the basis of relative prices of final products not only compounds previous errors from behaviour but also incorporates costs of inefficiencies at higher production stages. Perhaps the most useful observation in this context is to note that in the absence of foreign ownership and the resultant control of supplies of primary fibre to the Canadian market, the Canadian primary industry would

probably not exist. Foreign ownership and market control sufficiently raise the returns available in the Canadian market to make Canadian production a profitable alternative to exporting from the parent corporation production.[10] This production generates Canadian employment and income but at the cost of adding an amount in excess of ten per cent to the price of Canadian produced final textile products containing man-made primary fibres and yarns.[11]

Even if the factors of employment and income generation arising from the existence of the primary fibre and yarn industry in Canada yield a net benefit after considering the above costs, the distribution of this net

[10] The argument could be extended to say that even if failure to produce in Canada meant possible loss of Canadian patent rights, Canadian production would not be undertaken unless the profitability of that production was expected to exceed the profitability of exporting from the parent corporation. R. E. Caves' argument that direct investment "tends broadly to equalize the rate of return on (equity) capital throughout a given industry in all countries where production actually takes place" lends support to the above argument. See R. E. Caves, "International Corporations: The Industrial Economics of Foreign Investment", Ecnomica, N.S. Vol. 38, (1971) pp.1-2 and p.7 on licensing.

[11] This ten per cent addition is at best a very conservative estimate when considered in the light of the fact that final prices of Canadian produced final textile items may be as much as twice the price of comparable imported items according to the Canadian Textile Institute.

benefit is still a question. Depending on the market power possessed by individual producers and the exercise of this power, such a benefit may accrue to foreign owners through profits or domestic consumers through lower prices. In this case in particular, when the foreign owned industry is a primary industry, the price policies and behaviour of producers also affects employment and income at higher production stages. The Watkins Report lays considerable stress on the need for policy to insure competitiveness in the foreign owned industry and it is in this light the previous behavioural patterns in man-made fibres may now be viewed.[12]

In this context, the most significant observations on behaviour are those related to foreign competition at the secondary manufacturing level. Increased foreign competition as noted previously had the effect of reducing the size of the Canadian market available to domestic producers of woven fabric and spun yarn thus reducing the domestic market for primary fibre and yarn. Conversely reductions in foreign competition permitted substantial

[12] See Foreign Ownership and the Structure of Canadian Industry, pp.65-110.

growth in the Canadian markets. These variations in Canadian market circumstances produced different patterns of individual producer behaviour and inter-producer competition. Different patterns of behaviour and competition in turn imply different distributions of the benefits of Canadian production of primary man-made fibre and yarn.

The observed behaviour of primary producers after the increase in foreign competition in 1952 illustrates one part of this contention. Increased secondary import competition was followed by sharp and continuing reductions in the prices charged by primary fibre and yarn producers. These price reductions also introduced further competition among primary producers by changing the size of the previous price differential between cellulosic and non-cellulosic yarns. The result was the introduction of new products to the Canadian market, lower prices for primary yarn inputs to higher stages of textile manufacture and at least the tendency to shift the distribution of benefits of the Canadian industry away from profits or earnings of foreign ownership in the direction of maintaining Canadian employment in the secondary industry and increasing real income in Canada.

Thus increased foreign competition even at secondary manufacturing levels may be effective in ensuring competitive behaviour in the primary industry and the diffusion of the benefits of that industry.

This argument is further supported by subsequent observations on behaviour when foreign competition is reduced. The market expansion and lack of import competition following tariff increases and exchange rate devaluation in 1960-1962 reduced the pressure on primary producers. As a result they were able to increase prices in spite of substantial increases in their scales of operations and competition among producers appeared to decline. These observations have the opposite implications to those noted above. Reduced foreign competition created market situations which permitted primary producers to pursue policies that increased their own earnings substantially.[13] Thus the potential benefits of the Canadian industry were absorbed by both primary and secondary producers through increased costs of both inputs to higher production and final consumer goods.

[13] See Chapter 5, pp. 143-55 above. The reduction in foreign competition benefitted both primary and secondary industries as evidenced by the expansion of both industries. The behaviour of primary producers appeared to be a major factor determining the distribution of the benefit between primary and secondary industries. The net result was that both benefitted at the expense of Canadian consumers.

These observations have very definite implications for the public policy suggestions of the Watkins report. The Report recommends policy to ensure competitive behaviour in foreign owned industries. In the Canadian primary man-made textile industry, foreign competition or import pressure appears to generate the necessary climate for competition among primary producers. Even when patents and ownership protect primary producers from direct import pressure import competition at secondary and higher manufacturing levels appears to be effective. Public policy should thus be aimed at maintaining a level of import competition in man-made textiles such that the benefits of scale economies and product innovations are passed on to secondary and higher manufacturing levels to ultimately accrue to Canadian consumers.[14]

These policy conclusions must however be qualified on the basis of another issue raised by the Watkins report namely the availability of information. In the case of the primary man-made fibre and yarn industry in Canada data acquisition encounters three main obstacles. The first of these obstacles

[14] This might indeed be viewed as the aim of recent textile policies introduced by the government in 1970. See The Globe and Mail, Toronto, Oct. 9, 1970.

arises from the wholly owned subsidiary Courtauld's (Canada) Ltd. which publishes no financial report in Canada, appears reluctant to make disclosures or comments to the press or other media and ignored correspondence directed to it. The absence of a Courtauld's financial report is not in itself very significant since the second obstacle encountered in data collection is the aggregative nature of company reports which precludes identification of activity uniquely related to primary fibre and yarn production. The third and final obstacle is deliberately created by the Dominion Bureau of Statistics through the classification of both primary and secondary man-made textile industries into one industrial group and the refusal to disclose information on any sub-group within the industry classification. In spite of these obstacles, it was possible to assemble the data referred to in earlier chapters by drawing extensively on primary industry data published in the United States and selecting data on secondary industries from Dominion Bureau of Statistics publications.

Nevertheless there is a considerable gap in the data in the areas of particular significance for an assessment of behaviour and benefit of a foreign owned industry. Data are not available on employment, cost of raw material inputs,

cost of fuel and electricity, capital expenditures, research and development, or value of shipments. This makes it virtually impossible to make accurate assessments of productivity and profitability for the primary industry as a group let alone for individual producers. Nor is it possible to estimate with accuracy producer responses to changing input costs such as alterations in labour to capital employed following new wage agreements. Similarly, estimates of the behaviour of costs relative to plant size or the nature of cost economies can not be made. These data problems make it very difficult to assess the benefit which might be derived from the foreign owned primary industry.

In other areas there is a lack of data and information necessary for a qualitative assessment of either subsidiary-parent corporation relationships or actual, relative to potential, profitability of the subsidiary. Data on the nature and magnitude of transactions in goods and services between parent and subsidiary are not available. Nor is there information on the nature of research and development expenditures of the subsidiary relative to its access to parent research and development programmes. The absence of such data makes it difficult to assess the extent to which parent

corporations attempt to determine the distribution of the profits between parent and subsidiary operations. Thus it is not possible to determine if behaviour of the international corporation enhances the potential benefits to Canadians by allocating profits to Canadian subsidiaries and subjecting them to Canadian taxation or vice versa.

These data problems could be eliminated by the implementation of two recommendations. The first of these recommendations applies particularly to the Canadian primary man-made fibre and yarn industry and the industrial classification system employed by the Dominion Bureau of Statistics. While it may have been necessary until 1954 to combine primary and secondary producers in a single group for reasons of confidentiality in data publication this need disappeared in 1954. Since that year there have always been more than four primary producers, a large enough group to prevent identification of a single producer. Separation of the primary industry from the secondary industry would have permitted estimation of consistent series on productivity, profitability, capital expenditures and other useful measures noted above, as well as comparison of these measures between primary and secondary manufacturing levels. Thus it may be recommended that the

Dominion Bureau of Statistics follow a policy of continual industrial classification review with an aim to providing breakdowns between primary and secondary industries as early as is consistent with maintaining individual establishment confidentiality. This recommendation is particularly relevant to the Synthetic Textile Industries classification and might be expected to apply to a number of other industries.

The second recommendation concerning disclosure of information is made by the Watkins report and may be repeated here with specific reference to primary man-made fibre and yarn producers. There are two essential areas where information is needed namely disclosure by wholly owned foreign subsidiaries and disclosure on parent-subsidiary transactions. In the primary man-made fibre and yarn industry, Courtauld's (Canada) Ltd. is a wholly owned subsidiary and thus does not issue even financial reports.[15] Even though the other three major primary producers do issue Canadian annual reports, the aggregation of material in these reports over a range of activities and a range of transactions renders the data of little value for analysis. There thus appears

[15] Financial or annual reports would be particularly useful in Courtauld's case since the activities of the Canadian company are almost entirely yarn and fibre production.

to be a necessity to require not just annual public disclosure but also to define the degree of detail of disclosures so that the range of corporate activities and transactions can be analyzed and assessed.

In spite of these data limitations, it was possible to make a number of relevant observations on the Canadian primary man-made fibre and yarn industry and attempt an assessment of the industry within the framework of the Watkins report. While there are benefits to the existence of this primary industry in Canada in terms of employment, income and perhaps technology, it appears that these benefits may be overshadowed by costs of inefficient scale. The costs of scale themselves appear directly attributable to the power of the foreign parent corporations to isolate the Canadian market and Canadian producers from import supplies and export markets respectively. With this isolation and the relatively small size of the Canadian market, Canadian producers automatically acquired substantial market power and thus the potential for earning above normal returns in spite of scale inefficiences. Public policy does however appear capable of affecting the extent to which market power can be exercised by altering the degree or intensity of import competition at higher production stages.

Thus it appears that if there is a potential net benefit available to Canadians from the foreign owned primary textile industry, it would be most widely diffused if policy maintains a level of import pressure on primary producers which prevents their exercising monopolistic powers.[16]

Although these conclusions are reached within the framework of the analysis of the Watkins Report they differ rather sharply from the Report's conclusions. On one hand, the Watkins Report considers the most serious cost of foreign ownership and control to arise from the intrusion of United States law and policy into Canada [17] But in the Canadian primary man-made textile industry, ownership is both British and American and the most important cost appears to be inefficiency. Although data are not currently available

[16] Such a policy would undoubtedly involve some sacrifices in the secondary industry but the experience of one 1952-1958 period suggests that behaviour in the primary industry and structural change in the secondary industry would both limit the magnitude of this sacrifice and enhance the benefits transferred to Canadian consumers. See Chapter 4, pp. 111-113 and Appendix Tables 4.11 and 4.12.

[17] See Foreign Ownership and the Structure of Canadian Industry, pp.360-361.

this is a cost which could be quantified by comparing the costs of Canadian relative to American production, assessing the impacts of these higher costs on employment and output at secondary and higher manufacturing stages and considering the cumulative impact on final product prices. It is conceivable that these costs more than outweigh the employment-income benefits of Canadian primary textile production. Perhaps more importantly these costs of inefficiency are more amenable to quantification and less susceptible to inflation or deflation by appeals to economic nationalism or continentalism. In the case of the Canadian primary textile industry public policies which ensure efficiency through competition at all production levels would reduce or eliminate the costs of the domestic primary industry, improve the competitive position of the secondary industry[18] and perhaps coincidentally eliminate the costs attributed to extraterritoriality.

A more significant difference in conclusion, however, arises in terms of alternatives to foreign ownership in the primary man-made fibre and yarn industry. The Watkins Report

[18] These changes are illustrated by the behaviour of primary producers facing direct import competition after 1964 and by the behaviour of secondary producers from 1955-1962. See Chapter 5, pp.156-158; Chapter 4, pp.118-126.

assumes that Canadian ownership is an alternative to foreign ownership; an alternative which would substantially reduce the net costs of having the industry in Canada. In other words, it is assumed the industry would exist in Canada in any case and ownership is the only point of debate. But the examination of the Canadian industry indicates that without foreign ownership the industry would probably not exist. The present existence of the Canadian industry depends on the isolation of the Canadian market that international producers of man-made fibre and yarn can create. Achieving a similar isolation through trade barriers to foster Canadian ownership would increase the cost of Canadian production and destroy present access to technology, research and marketing. Such a change in supply conditions might well destroy the secondary industry and thus any market for primary products. The alternatives appear to be either Canadian production under foreign ownership, or importation, but not production by Canadian owned producers.

The Implications of Patents

The discussion of and conclusions regarding foreign ownership of the Canadian primary man-made fibre and yarn industry have thus far purposefully avoided the question of patents. This separation was deliberately undertaken in an

attempt to emphasize the different implications of ownership on the one hand and patents on the other. The implications and conclusions regarding ownership can stand independently as patent pwnership itself has not been the factor determining the ownership of Canadian producers.[19] Patents have instead been determinants of domestic industry structure and barriers to direct import competition. As a result, patents are significant in terms of domestic producer behaviour and public policy aimed at altering that behaviour.

In the case of primary textiles in particular, patent rights and Canadian adherence to the International Patent Convention appear to have operated contrary to the interests of Canadians. Through the International Convention, foreign corporations have automatically been granted exclusive rights to Canadian production, use and sale of specific primary man-made fibres and yarns. These rights have given foreign corporations a firm and legal basis for isolating the Canadian

[19] After the expiry of DuPont's patent in 1964, four new nylon producers entered the Canadian industry none of which had patent production but all were foreign owned. See Chapter 2, p.22; Chapter 5, p.156.

market from external competition while at the same time excluding Canadian producers from export markets. Two previous observations on individual producer behaviour suggest that patents may force entry into the industry at very small scales and provide sufficient market power that subsequent economies of expanding scale generate increased profits rather than reduced prices.[20] Thus Canadian patents rights acquired through the International Patent Convention give formal approval to the establishment of an isolated and inefficient foreign owned Canadian primary textile industry.

But the implications for Canada of the International Patent Convention are much broader than this even in the case of man-made fibre and yarn. Through its operations, the Convention enabled a small number of producers to begin with a basic patent position and develop from that what is essentially a monopoly on technology and industrial knowledge in a particular line of production in all member countries. Even though the initial patents expired, the corporations which held these rights managed to develop and protect with subsequent process

[20] See Chapter 5, pp. 138 and 150 on the entry of Canadian Industries Ltd. into polyester production and the price behaviour of DuPont of Canada Ltd.

patents an insurmountable technological advantage in the industry. The result of this pattern of development is that whether entry into the Canadian market occurred before or after patent expiry, there was a definite and limited number of foreign producers who had the technology necessary for entry. Subsidiary Canadian producers could thus be established in the knowledge that the main sources of direct external competition were the parent corporations of these subsidiaries.

This situation and market structure is compounded by Canadian adherence to the International Patent Convention. As an adherent to the Convention, Canada automatically granted patent rights to Canadian primary yarn production and subsequent developments. These rights themselves automatically excluded Canadian secondary producers from the most efficient sources of primary fibre and yarn supply and forced their dependence on domestic production. Thus the combined effect of the Convention and Canadian adherence to it is to produce an international oligopoly in the primary industry which has sufficient market power to establish isolated national oligopolies.

The Canadian primary man-made fibre and yarn industry thus provides a case of foreign ownership which may be related to the analysis of the Watkins Report but not to its conclusions. The major costs of this foreign owned industry appear to arise from its inefficiency relative to world standards. This inefficiency is sheltered from external competition by the duplication of the ownership of major international producers in the ownership of Canadian producers. The international parent corporations in turn have been able to both establish an international oligopoly in primary production and duplicate it in Canada through the operation of the International Patent Convention. Inefficiency fostered and sheltered by the ability of foreign owners to isolate the Canadian market thus emerges as the major cost of foreign ownership, not the extraterritorialities or loss of sovereignty stressed by the Watkins Report.

CHAPTER 7

SUMMARY AND POLICY CONCLUSIONS OF THIS STUDY

The body of the thesis has attempted to illustrate, analyze and discuss in some detail the key relationships, outlined in the Introduction, which appear to explain a large part of the structural characteristics and behaviour of the Canadian primary man-made fibre and yarn industry over the period 1950-1968. In this Chapter, the purpose is to draw together the significant characteristics of the industry, its markets, and producer behaviour, and consider the implications of these observations for public policy.

The Canadian man-made fibre and yarn industry is a foreign owned oligopoly engaged in the manufacture of a differentiated producers' good. In 1966, the four major producers in the industry, Courtauld's, DuPont, Chemcell and Millhaven Fibres (C.I.L.) accounted for over 93 per cent of installed capacity. Although patents played some role in

[1] See Appendix Table 5.3 and Textile Organon, June, 1966.

limiting original entry into the industry, the main factor limiting the number of producers has been an economic one. The nature of the long run cost curve, and the size of the Canadian market are such that no one producer has been able to achieve the most efficient scale of operation as discussed in Chapter 2.

As well as contributing to oligopolistic structure, the nature of technology in the industry also appears to provide the major explanation of foreign ownership in the Canadian industry. The initial complexity of production technology combined with rates of progress in that technology favour established producers with both experience and research facilities. The nationality of entrants into the Canadian production of fibre and yarn has thus tended to parallel the experience of other countries, particularly the United States where the industry was initially founded by experienced foreign producers. Whereas in the United States subsequent market growth permitted the entry of additional producers in the same product line, leading ultimately to considerable domestic ownership, growth in the Canadian market has not matched expansion in minimum efficient plant scale and original foreign entrants have thus remained dominant. Even

the most recent entrants to the Canadian market have been subsidiaries of established foreign producers with the advantages of production experience and parental research facilities.

The influence of patents on industry structure has been observed in two main ways. In the case of initial entry into the production of one man-made fibre or yarn in Canada the entrant has held either basic patent rights or a wide technological advantage from parental ownership of basic patent rights. The original allocation of patent rights thus determined the original entrants to the Canadian industry and their lines of production. Beyond this influence on limiting original entry, basic patents and subsequent process patents both limited Canadian producers to the Canadian market and protected them, in that market, from direct import competition. Patents combined with subsidiary status have thus operated to limit the scale of Canadian production to the Canadian market and to isolate Canadian producers from direct import competition. Within the Canadian market, patents have operated to define the product ranges of the individual producers thus defining, at least initially, patterns of inter-producer competition.

The industry which provides the major market for the products of the primary fibre and yarn producers is markedly different in structure. This secondary textile industry uses primary fibre and yarn to produce spun yarns and woven fabrics. Neither technology nor market size nor patents create significant barriers to entry into the secondary industry with the result that its structure is competitive. No single producer controls a substantial proportion of total output and the products are not differentiated. Moreover, the absence of patent protection, or foreign subsidiary status for secondary producers results in an openness in the secondary industry to import competition and fluctuations in the world textile markets. Thus the oligopolistic foreign owned primary industry sells to a Canadian owned competitive secondary industry.

The significance of these differing industry structures arises from their implications for primary producer behaviour. In the primary market itself, oligopolistic structure with strong product differentiation and isolation from direct import competition should yield considerable producer independence or monopoly power. However, the extent to which primary producers can exercise this independence appears closely

related to the size, and variation in the size, of the market for Canadian produced secondary textile products. Given some total market in Canada for these secondary textile products, the demand for Canadian produced secondary textile products, or the share of the domestic market available to domestic producers, is very sensitive to the pressure of fabric import competition. The pressure of import competition in secondary fabric markets thus places constraints on the exercise of monopoly power by primary producers and changes in secondary import competition produce changes in primary producer behaviour.

These relationships can be illustrated in more detail using a comparative statics example. Assume at a point in time, domestic secondary producers enjoy a certain share of the domestic market and face competition from a virtually perfectly elastic foreign supply of fabric imports. Canadian primary producers then compete among themselves to supply the primary fibre and yarn inputs to this domestic fabric production. Primary producer competitive behaviour must then take into account not only domestic rivalry in terms of product characteristics and perhaps price but also the competitive characteristics of primary fibres contained in imports and the price of imported fabric relative to domestic

fabric production costs. Canadian primary producers are thus constrained in the price they can charge for their own unique domestic product by their influence on costs in the secondary industry. They are further inspired to continue development of domestic products to match or surpass developments embodied in woven fabric imports. Failure to recognize this pressure carries the threat of loss of markets not to rival Canadian primary producers but to foreign woven fabric producers.

Beyond the constraints on primary producer behaviour arising from a steady level of import pressure, a change in import pressure in fabric markets changes the constraints and thus primary producer behaviour. An increase in import competition, for example, a drop in the foreign supply price of woven fabric, threatens the domestic share of the domestic market. If this pressure continues, the secondary industry adjusts through both a decline in the numbers of secondary producers and perhaps a shift in secondary producer product mix. Primary producers thus quickly notice a decline in their markets and, spurred by the potential cost penalties of reduced plant utilization, reduce primary product prices (through the offering of price discounts). In these circumstances

Canadian primary producers may go further and draw on parental product developments to help preserve their markets and enhance the competitive position of secondary producers. Both these actions by primary producers assist secondary producers in meeting import competition through reducing secondary producer costs and altering their product mixes. Perhaps equally important, the change in fabric import competition increases competition among primary producers as they attempt to at least maintain their markets through acquisition of a larger share of the now reduced domestic market.

A decline in woven fabric import competition appears to produce the opposite responses on the part of primary producers. In effect, the reduced import pressure and eased market conditions in secondary industries create more scope for primary producer monopoly behaviour. The constraints on price behaviour are raised permitting primary producers a wider range of choice between present earnings through price increases and market growth through maintaining prices as the secondary industry expands. Similarly, the pressures for product development or the importation of parental product developments is reduced. Competitive pressures of course

do not disappear either among rival primary producers or between domestic and foreign fabric producers but primary producers find both survival and growth easier to achieve and enjoy increased independence in selecting policies to pursue these ends.

These relationships as described here are of course generalized and oversimplified. In the observations and illustrations of Chapter 5 considerable differences were noted in individual producer behaviour. But the generalization and simplification used here is intended to emphasize the basic patterns of behaviour noted. Differences among primary producers are to a large extent differences in the magnitude of responses not the direction. The explanation of this difference appears to lie in differences in product ages, states of development and patent positions. Some further differences appear as minor variations about the general pattern of response and the relationships summarized above.

The observed significance of fabric import competition as a determinant of primary producer behaviour has a number of policy implications. These implications arise in general welfare terms concerning the costs and benefits of Canadian primary man-made fibre and yarn production. Given the foreign

ownership of the primary industry, further policy implications arise in the context of the earlier Watkins Report discussions of Chapter 6. These policy issues are explored briefly.

Perhaps the central policy question and one which is not really an issue here, is whether or not Canadian industrial policy favours the existence in Canada of a primary man-made fibre and yarn industry. The answer to this question appears to be affirmative. The questions that then remain revolve around the costs and benefits of this industry to the Canadian public.

With the foreign subsidiary status of Canadian primary producers, and to some extent their patent positions, they do not require significant direct protection from import competition. In order for the primary industry to survive domestically, however, it must have protection in the secondary textile market. The same factors which relieve the primary industry from direct foreign competition exclude it from substantial participation in export markets. The policy problem is then to design protection in secondary textile markets which is sufficient to ensure the survival of the primary industry while at the same time limiting the scope available for significant monopoly behaviour.

A successful policy of this type, however, involves treading a very fine line, a line perhaps too fine for traditional trade policy. While more protection than is necessary ensures survival and growth of both primary and secondary industries it does so at the expense of the Canadian consumer. The cost to the consumer from excessive protection may furthermore be inflated by monopoly behaviour by primary producers which raises secondary industry and final product costs and retards product development. Inadequate protection on the other hand creates costs of unemployment and short run idle capacity in both industries but may benefit consumers through lower prices, reduced monopoly behaviour and increased product development. Achieving and maintaining appropriate level of secondary industry protection may thus require combination of flexible tariff and quota restrictions tied to some indicator of primary producer earnings.

On the policy questions surrounding foreign ownership of the Canadian primary man-made fibre and yarn industry very similar recommendations apply. If Canadian industrial policy favours the existence of the primary industry, historical experience and the size of the Canadian market suggest foreign ownership as the least cost access to Canadian production.

The question then becomes one of minimizing the costs of that ownership and securing the widest benefits for Canadians. Once again trade policies which maintain competitive pressure on primary producers through secondary markets emerge as the solution. Such policies will not alleviate the costs of small scale Canadian production but they may eliminate additional costs in the forms of monopoly returns in the primary industry at the expense of both secondary industry employment and higher prices to Canadian consumers.

Appendix on Producers and Products

The purpose of this appendix is three fold. First it is concerned with the definition of the products described as man-made fibres and yarns. Second it presents a brief description of the nature of processes used in the production of man-made fibres and yarns. Third it presents in tables some of the main descriptive material and data related to the Canadian production of man-made fibre and yarn.

The definitions of man-made fibres and yarns presented here and used throughout the thesis are those developed by the Textile Economics Bureau Inc. in the United States and generally used throughout the industry.[1] A man-made fibre is defined as "one that is extruded from a spinning orifice, is collected in an orderly fashion, and is usually used in the textile industry."[2] On the basis of chemical composition there are two major groups of man-made fibres. One group, cellulosic fibres are manufactured from natural polymers as for example rayon and acetate fibres. Fibres in the second group are made from synthetic polymers as for example nylon (polyamide), polyester and acrylic fibres.

1 "Man-Made Fibre Nomenclature", Textile Organon, Vol. 28 (August 1957), p.114.

2 Ibid.

The term man-made fibre refers to both these groups and distinctions between the groups are made using the terminology 'cellulosic fibres' (rayon and acetate) and 'non-cellulosic fibres' (nylon and polyester, etc.)

The products of man-made fibre production have two basic physical forms namely yarn and staple fibre.[3] Man-made yarn refers to continuous filament yarn which consists of a number of fine continuous filaments running parallel and twisted as a group. Man-made staple fibre is by contrast discontinuous filaments less than twelve inches in length and comparable in physical form to the natural fibres cotton and wool. This staple fibre is made by cutting up continuous filament yarns into the lengths specified by customers who buy the fibre in bales for the manufacture of spun yarn.

In the Canadian man-made fibre and yarn industry fibres are marketed in both forms with the exception of one produced only in staple fibre form. Nylon, polyester, rayon and acetate are all produced and sold in both yarn and staple fibre forms. Acrylic (e.g., orlon) fibre is sold only in staple fibre form.

[3] Textile Organon, Vol. 39 (June 1968) p.106.

Both continuous filament yarn and staple fibre are raw materials to the textile industry. Continuous filament yarn is a raw yarn because it has to be thrown and uptwisted before it can be used in weaving or knitting. The 'throwing' process involves combining two or more threads of continuous yarn to form one yarn of heavier weight. These threads are twisted together to the extent required for the intended end use.[4] This required further processing is undertaken by secondary producers who purchase the raw yarn from the primary manufacturers.

Similarly, staple fibre is primary or raw fibre. In this case spinners who have equipment for processing raw cotton or wool can spin man-made staple fibre cut to lengths suitable for their machinery. The raw fibre is received by the spinning industry in bales of compressed fibre. These bales are opened, the fibres fluffed up and mechanically blended with fibre from other bales or with natural fibre. The raw man-made fibre or the blend of raw man-made and natural fibre can then be spun into yarn just as natural fibre would be spun.[5]

[4] H. R. Mauersberger (ed.), American Handbook of Synthetic Textile, (New York, 1952), p.479.

[5] Ibid., pp.411-416.

Man-Made Fibre and Yarn Production Processes[6]

There appear to be two basic types of production processes used in the production of man-made fibre and yarn. The major differences noted occur between the process for cellulosic fibres (rayon and acetate) and non-cellulosic fibres (nylon, polyester, etc.). Within each of these major fibre groups, production processes differ only in detail. Thus for purposes of illustration the process used in the manufacture of nylon (polyamide) and that for viscose rayon were described.

The manufacture of nylon may be described in a number of steps. The chemical inputs (see Table 2.2 below) are combined and treated to produce the nylon salt which is then polymerized in autoclaves. The polymer then passes, as a white syrupy ribbon from the autoclave onto a casting wheel to be cooled and hardened by sprays of water and air. The solidified ribbon of polymer is then mechanically cut into nylon flake, blended and moved to hoppers over the spinning machines. Nylon yarn is spun from this nylon flake by the melt spinning process.

6 The description of processes presented here is based on two sources, J. Airov, The Location of the Synthetic Fibre Industry, (Cambridge, 1963), Chap. 5, pp.62-66 and S. Hollander, The Sources of Increased Efficiency, (Cambridge, 1965), Chap. 3, pp.28-47.

The melt spinning processes involve forcing the remelted polymer flake through a spinner and treating and collecting the filaments on the other side. The spinneret in the nylon process is a round disc perforated by tiny orifices whose size and number determine the filament size and count in the yarn produced. In melt spinning, this spinneret is hot. The viscous filaments passing down through the orifices enter a cooling chimney where an airblast both maintains their physical separation and accelerates solidification. On leaving this cooling chimney the solidified filaments are gathered into yarn, humidified with steam, and lubricated for other operations. The yarn is then wound in undrawn, untwisted form on bobbins.

Processing the yarn after the spinning stage depends on the form in which it will be sold to customers. Filament yarn moves on its bobbins from the spinning area to the draw-twist area to be converted to low-twist yarn. Machinery in the draw-twist area takes the yarn from the bobbins, stretches it to approximately four times its original length and winds it on a pirns or bobbins imparting one or two twists per inch. The extent of drawing and twisting depends on intended yarn use and machinery is adjustable for the purpose. The drawn and twisted yarn is the raw yarn sold to customers.

The manufacture of nylon staple fibre bypasses the draw-twist phase. Bobbins from the spinning area are mounted on large racks and yarns from large numbers of bobbins are collected into a rope of parallel continuous filaments. The rope is then drawn, crimped mechanically, set by steam and cut to the length desired by the customer. The resulting mass of fluffy short fibres comparable to natural fibre is pressed into large bales for shipment to customers.

Viscose rayon production involves several steps which are similar to those of nylon production but differ in some details. The first stage involves preparation of the viscose solution. This solution is prepared basically by dissolving sheets of cellulose, derived from wood pulp, in a caustic soda solution. These sheets of cellulose are shredded, dissolved, blended, filtered and de-aerated to produce a thick yellow syrupy viscose solution. The viscose solution is then pumped through pipes to the spinning room.

Viscose rayon is spun by the wet spinning process. The viscose solution is forced through tiny orifices in a small thimble-like spinneret. The spinneret is submerged in a warm, acidic spinning bath. The liquid viscose streams emerging from the spinneret are reconverted to solid cellulose filaments

upon contact with the acid bath. These filaments are then collected into a thread of rayon yarn.

The threads of rayon emerging from the spinning bath are collected in one of two manners. In the spinning pot method, the thread is drawn over a revolving wheel just above the bath, passed upward to a second revolving wheel about eye-level and then guided down through a glass funnel into a spinning cylindrical pot or "box". Differences in the speed of rotation of the revolving wheels draw the yarn, while passage through the funnel to the centre of the spinning pot imparts a twist. The spinning process with the pot method of collection produces a "cake" of drawn and twisted rayon yarn. The alternative "bobbin" method of collection collects the filaments in parallel from the spinneret onto the bobbin without twist or draw. The production of staple fibre usually involves this second method of collection followed by processing similar to that described for nylon staple.

From these descriptions of production processes it is possible to define more clearly the notion of plant capacity. In the rayon industry in particular the capacity of the plant is defined in terms of the number of spinnerets installed in

the spinning room.[7] This definition appears to be based on the fact that the number of spinnerets is the limiting factor in production. When all spinnerets are operating, larger output is possible only through installation of more spinneret positions. A similar definition can be used for nylon plant capacity.

Adjustments in plant capacity in both cases then require adjustments in the number of spinnerets. In the case of rayon production, the number of spinnerets can be varied by changing the number of spinning machines with 120 spinnerets per machine. There is thus an initial constraint on capacity expansion imposed by the availability of space in the spinning room. If space exists capacity can be quickly expanded through machine installations until available space is exhausted. Further expansions require additions to buildings and thus longer waiting periods.[8] Similar conditions appear to be reasonable in describing nylon production capacity.

The remainder of this appendix presents information and data in tabular form.

[7] Hollander, Sources of Increased Efficiency, p.31.

[8] When the author was employed in the spinning room of Courtauld's (Canada) Ltd. during the summer of 1964 the spinning room was approximately one-third utilized. Permanent employees with considerable seniority remarked that in the past many more machines had been operating but that the room was never completely filled.

APPENDIX TABLE 2.1

Principal Canadian Man-Made Fibre and Yarn Producers, Plants, Products and Dates of Entry

Producer	Plant Location	Products	Dates of Entry
Courtauld's (Canada) Ltd.	Cornwall, Ont.	Rayon (Viscose) Yarn	1925-
		Rayon (Viscose) Staple	1949-
	Cornwall, Ont.	Nylon 6	1965-
Canadian Celanese Division of Chemcell Ltd.[1]	Drummondville, Que.	Acetate Rayon Yarn & Staple	1930-
	Edmonton, Alta.	Triacetate Rayon Yarn and Staple	1947-
DuPont of Canada	Kingston, Ont.	Nylon 66 Yarn	1942-
		Staple	1948-
	Maitland, Ont.	Acrylic Staple	1957-
		Spandex Staple	1966-
Millhaven Fibres Ltd.	Millhaven, Ont.	Polyester Yarn	1955-
		Staple	1955-
		Nylon 66 Yarn and Staple	1965-
Grace Fibres Ltd.	Brantford, Ont.	Olefin-monofilament	1962-
	Richmond, Que.	Saran-Yarn and Mono-Filament	1954-
Fibreglas Canada Ltd.	Guelph, Ont.	Textile Glass Fibre	pre 1950-
Union Carbide of Canada	Arnprior, Ont.	Nylon 6	1966-
Firestone Textiles Ltd.	Woodstock, Ont.	Nylon 6	1967-

Source: Textile Organon and Canadian Textiles Institute.

Note: A number of small producers of olefin are not included. The first five producers listed above accounted for well over 90% of output in 1964.

[1] Chemcell in 1963 purchased Canadian Celanese Ltd. and integrated fibre and yarn production under one division named Canadian Celanese.

APPENDIX TABLE 2.2

Man-Made Fibre Generic Names, Chemical Inputs and Major End Uses

Fibre Type and Generic Name	Raw Material Inputs	Major End Uses
Cellulosic Fibre		
Acetate and Triacetate	Cellulose pulp, Acetic acid Anhydride, Sulphuric acid, Acetone	Apparel, Home Furnishings, Carpets, Knitwear
Viscose (Rayon)	Woodpulp, Carbon Bi-Sulphide, Sulphuric acid, Caustic Soda	Apparel, Home Furnishings, Carpets, Tires, Industrial, Pharmaceutical
Non-Cellulosic Fibre		
Acrylic	Acrylonitrate	Apparel, Home Furnishings, Carpets
Nylon	Petroleum Cyclohexane, Ammonia, Adiptic acid	Apparel, Home Furnishings, Carpets, Rope, Nets, Tires
Polyester	Dimethyl Tetraphthalmate, Ethylene glycol	Apparel, Home Furnishings, Carpets, Stuffed Goods, Thread, Tires

Sources: Textile Organon, (New York), June 1968, p.106 and The Canadian Textiles Institute.

APPENDIX TABLE 2.3

Percentage Distribution of Products Among Major End Uses 1967

Products	Major End Uses				
	Men's & Boys' Apparel	Women's & Child's Apparel	Home Furnish-ings	Indust-rial	Other
Acetate:Yarn	1	46	16	1	36
Staple		75			25
Viscose:Yarn	3	11	11	48	27
Staple	12	14	50	5	9
Acrylic Staple	12	30	47	2	9
Nylon:Yarn	7	23	25	36	9
Staple	12	17	51	7	13
Polyester:Yarn	6	34	17	38	5
Staple	44	31	21	1	3

Source: Arthur D. Little Assoc., The Synthetic Fibre Industry 1967-1972, (Boston, 1968).

APPENDIX TABLE 2.4

Production and Percentage Share in Total Production of Man-Made Fibres and Yarns by Type 1950-1967
(Millions of Pounds and Per Cent)

Part I Staple Fibre and Tow

Year	Viscose Staple		Acetate Staple		Non-cellulosic Staple		Total Staple Production
	Production	% Share	Production	% Share	Production	% Share	
1950	11	66.6	4	24.2	1.5	9.2	16.5
1951	12	64.2	5	26.8	1.7	9.0	18.7
1952	17	66.7	6	23.6	2.5	9.7	25.5
1953	15	65.3	5	21.8	3.0	12.9	23.0
1954	22	75.8	4	13.8	3.0	10.4	29.0
1955	28	82.4	3	8.8	3.0	8.0	34.0
1956	26	80.5	3	9.3	3.3	10.2	32.3
1957	24	71.4	4	11.9	5.7	16.7	33.7
1958	22	69.5	4	12.6	5.6	17.9	31.6
1959	28	58.8	11	23.1	8.6	18.1	47.6
1960	23	51.5	9	20.2	12.7	28.3	44.7
1961	23	51.2	11	24.5	10.9	24.3	44.9
1962	32	57.0	10	17.8	14.2	25.2	56.2
1963	37	58.6	10	15.8	16.2	25.6	63.2
1964	41	56.5	14	19.3	17.6	24.2	72.6
1965	43	55.9	13	16.9	20.9	27.2	76.9
1966	42	54.6	10	12.7	26.6	32.7	78.6
1967	43	54.8	11	14.0	24.4	31.2	78.4

Source: Textile Organon (New York), June 1968 and January 1966.

APPENDIX TABLE 2.4

Part II Filament Yarn

(Millions of Pounds and Per Cent)

Year	Viscose Yarn		Acetate Yarn		Non-Cellulosic Yarn		Total Yarn
	Production	% Share	Production	% Share	Production	% Share	Production
1950	21	50.5	17	41.0	3.5	8.5	41.5
1951	22	49.5	18	40.5	4.5	10.0	44.5
1952	21	47.0	18	40.4	5.6	12.6	44.6
1953	28	54.5	16	31.3	7.4	14.2	51.4
1954	30	56.5	14	26.3	9.2	17.2	53.2
1955	33	57.5	15	26.2	9.3	16.3	57.3
1956	32	54.4	16	27.2	10.7	18.4	58.7
1957	29	47.6	17	27.9	14.8	24.5	60.8
1958	22	38.2	18	31.3	17.6	30.5	57.6
1959	26	38.2	21	30.9	21.0	30.9	68.0
1960	22	32.4	21	30.9	24.7	36.6	67.7
1961	18	25.1	22	30.6	31.7	44.3	71.7
1962	23	28.0	23	28.0	36.2	44.0	82.2
1963	24	26.4	25	27.5	41.8	46.1	90.8
1964	24	22.9	32	30.6	48.5	46.5	104.5
1965	26	21.3	33	27.0	62.9	51.7	121.9
1966	18	14.8	31	25.5	72.6	59.7	121.6
1967	11	9.0	31	25.4	80.7	65.6	122.7

Source: See Appendix Table 2.4, Part I.

APPENDIX TABLE 2.5

Prices of Primary Fibres and Yarns
by Type of Fibre or Yarn 1950-1966

(Dollars per Pound)

Year	Raw Cotton	Raw Wool	Cellu-losic Staple	Non-Cell. Staple	Acetate Yarn	Viscose Yarn	Nylon Yarn	Polyester Yarn
1950	0.355	-	0.354	1.91	0.950	0.893	3.21	-
1951	0.450	-	0.439	1.97	1.00	0.806	3.02	-
1952	0.402	1.17	0.438	1.97	0.960	0.946	2.92	-
1953	0.358	1.36	0.386	1.83	0.922	0.804	2.90	-
1954	0.349	1.32	0.364	1.47	0.866	0.813	2.49	-
1955	0.350	1.12	0.342	1.39	0.855	0.876	2.19	-
1956	0.295	1.16	0.337	1.17	0.840	0.906	2.31	-
1957	0.256	1.26	0.358	1.20	0.820	0.884	1.92	-
1958	0.273	0.96	0.379	1.25	0.749	0.901	1.77	1.54
1959	0.256	1.05	0.355	1.21	0.787	0.902	1.80	1.54
1960	0.248	1.08	0.371	1.15	0.725	0.870	1.73	1.54
1961	0.267	1.17	0.378	1.05	0.710	0.895	1.88	1.87
1962	0.294	1.21	0.330	1.03	0.730	0.950	1.86	1.64
1963	0.290	1.39	0.320	1.20	0.685	0.844	1.85	1.84
1964	0.286	1.25	0.345	1.03	0.974	0.837	1.94	2.00
1965	0.290	0.92	0.354	1.02	0.676	0.786	1.60	1.82
1966	0.281	0.95	0.354	0.97	0.640	0.804	1.42	1.10

Source: Calculated from Dominion Bureau of Statistics, Annual Census of Manufacturers entitled: Narrow Fabric Mills (34-207), Synthetic Textile Mills (34-208), Wool Mills (34-209), Hosiery and Knitting Mills (34-215).

Appendix to Chapter 4

APPENDIX TABLE 4.1

Secondary Manufacturers in the Synthetic Textile Mills Industry Classifications 1965 by Province

Name	Plant Locations
NOVA SCOTIA	
(Formex of Canada Div.) Huyck Canada Ltd.	656 Park St., Kentville
QUEBEC	
Associated Textiles of Canada Ltd.	2177 Masson St., Montreal St. Martin St., Louiseville
Bruck Mills Ltd.	Depot St., Cowansville 100 Woodward Ave., Sherbrooke 130 Gregoire St., St. Johns
Canadian Celanese Ltd.	Coaticook
Canadian Celanese Ltd.	Drummondville
Collins and Aikman of Canada Ltd.	Farnham
Consolidated Textiles Ltd.	949 Archambault, Joliette St. Hyacinthe
Dionne Spinning Mills Co.	St. George West
Domil Ltd.	Sherbrooke 4790 St. Ambrose St., Montreal
Doric Textile Mills Ltd.	300 St. Louis, St. Johns
Dufresne Yarns Ltd.	Grandmère
Duplan Textile Ltd.	33 - 4th St., Montmagny
Grand'mère Mills Ltd.	Grand'mère
Hafner Fabrics of Canada Ltd.	Racine St., Granby
Iberville Drapery Mills Ltd.	Iberville
Krinklon Ltd.	Grand'mère
La Salle Blanket Co. Ltd.	Montmagny
Malibu Fabrics Canada Ltd.	353 Richmond St., Montreal
Mantex Ltd.	201 St. Louis, St. Jean
Martin, J.B. Co. Ltd.	445 St. James St., St. Jean
Montreal Throwing Co. Ltd.	Rigaud

Appendix Table 4.1 (Continued)

Moose River Mills Ltd.	Acton Vale
Rayonese Textile Co. Ltd.	680 Mgr. Dubois, St. Jerome
Robinson Textiles Ltd.	25A Monk St., Longueil
Rose-Tex Mills Ltd.	416 St. Luc, Magog
Sauquoit Industries Ltd.	185 St. Hubert, Granby
Templon Spinning Mills Ltd.	St. Henri & LaFerrè Srs. Drummondville
Textiles Pirenix Ltée.	St. Hyacinthe
Thor Mills Ltd.	110 Robinson St., Granby
Walnut Products Corp.	Franham
Yarntex Corporation Ltd.	550 Beaumont Ave., Montreal
Zephyr Textiles Ltd.	Ormstown

ONTARIO

Barrday Ltd.	51 Rose St., Galt
Bay Mills Ltd.	St. Catherines
	Fourth St., Midland
Collins & Aikman of Canada Ltd.	500 Ontario St., Stratford
Dobbie Industries Ltd.	104 Water St., N., Galt
Dominion Silk Mills Ltd.	2 Mark St., Toronto
Galtex Co. Ltd.	Galt
Granatstein, M. & Sons Ltd.	488 Wellington St., W., Toronto
LaFrance Textiles Ltd.	611 Dundas St., Woodstock
Lancaster Weaving Mills Ltd.	130 Birch St., Kitchener
Lincoln Fabrics Ltd.	St. Catharines
Pikon Fabrics	Dunnville
Polytex Industries Ltd.	120 Eglinton Ave., E., Toronto
Riverside Yarns Ltd.	15 Melville St., Galt
Rontex Ltd.	35 Water St., Galt
Square C Textiles Ltd.	Alexandria

Source: Synthetic Textile Mills, 1965, Dominion Bureau of Statistics, Ottawa, November 1967.

1960 Item No.	1960 Item Description	1960 Tariff Rates			Pre 1960 Item Nos.	Pre 1960 Tariff Rates		
		BP	MFN	GEN		BP	MFN	GEN
56205-1 56206-1	Woven fabrics wholly or in part of man made fibres or filaments or of glass fibres, not containing wool or hair, not including fabric 50% by weight silk				561	27 1/2%	40%	45%
	(a) Exceeding 12 in. width	22 1/2%	30%	45%	567c	Free	30%	45%
	(b) Not exceeding 12 in. width	25%	27 1/2%	55%	567d	Free	Free	45%
56210-1	Woven fabrics with cut pile wholly or in part of man made fibres or filaments or glass fibres or filaments, not containing wool or hair	20%	30%	45%	560c	17 1/2%	32 1/2%	35%
56215-1	Woven fabrics with lino-edged strips, not less than 40 in. in width, wholly or man made fibres or filaments imported in unfinished condition by manufacturers of metallic ribbons for manufacturers of such ribbons	Free	5%	45%	561b	Free	5%	45%
56220-1	Umbrella covering fabrics, impregnated or not	Free	Free	Free	802b	Free	10%	20%
56225-1	Woven Fabrics wholly or in park silk or man made fibres or filaments imported in lengths not less than 5 yards by							

APPENDIX TABLE 4.3

Use of Man Made Filament Yarn in Secondary Industries 1950-1966 and Share by Industry in Total Observed Use (Millions of lbs. and %)

Year	Synthetic Textile Mills		Narrow Fabric Mills		Hosiery & Knitting Mills		Carpet & Mat Industries		Cotton Textile Mills (a)		Total Observed Consumption	
	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%
1950	12.7	69.0	1.3	7.1	4.4	23.9	-	-	-	-	18.4	100.0
1951	13.8	38.7	1.3	3.7	4.6	12.9	-	-	16.0	44.7	35.7	100.0
1952	13.5	34.4	1.4	4.7	5.4	13.8	-	-	18.9	47.1	39.2	100.0
1953	14.4	31.2	1.3	2.6	4.9	10.6	-	-	25.7	55.6	46.3	100.0
1954	9.9	24.1	1.4	3.3	5.1	12.4	-	-	24.8	60.2	41.2	100.0
1955	13.2	27.9	1.5	3.1	4.2	8.9	-	-	28.4	60.1	47.3	100.0
1956	11.7	23.5	1.3	2.6	5.2	10.4	-	-	31.7	63.5	49.9	100.0
1957	12.2	23.9	2.2	5.5	5.9	11.6	2.1	3.9	28.6	55.1	51.0	100.0
1958	13.5	26.5	2.5	4.3	6.7	13.1	2.7	5.3	25.4	50.0	50.8	100.0
1959	18.3	30.3	2.2	3.9	6.8	11.3	1.4	2.3	31.5	52.2	60.2	100.0
1960	18.6	34.0	2.2	4.0	5.7	10.4	2.2	4.2	25.9	47.4	54.6	100.0
1961	22.8	35.6	2.4	4.0	7.1	11.1	3.2	5.0	28.2	44.3	63.7	100.0
1962	27.2	38.6	3.6	5.2	8.2	11.6	3.3	4.7	28.1	39.9	70.4	100.0
1963	29.6	37.5	4.3	5.4	10.1	12.8	4.5	5.7	30.6	38.6	79.1	100.0
1964	24.9	31.6	4.8	5.9	9.8	12.4	5.3	6.7	34.1	43.4	78.9	100.0
1965	35.6	38.9	5.7	6.1	11.1	12.1	6.2	6.8	33.1	36.1	91.7	100.0
1966	41.0	42.6	6.5	6.8	14.3	14.9	7.3	7.6	27.0	28.1	96.1	100.0

Sources: Dominion Bureau of Statistics, Ottawa. Annual Census of Manufacturers, entitled Synthetic Textile Mills (34-208), Narrow Fabric Mills (34-207), Hosiery and Knitting Mills (34-215), Carpet, Mat and Rug Industry (34-221) and Cotton Yarn and Cloth Mills (34-205).

Note (a): The man-made filament yarn consumed by firms classified to Cotton Yarns and Cloth Mills is predominantly tire cord used to produce woven tire cord fabric.

APPENDIX TABLE 4.4

Use of Man Made Staple Fibre in Secondary Industries and Per Cent Share by Industry in Total Observed Use 1950-1966 (Millions of lbs. and %)

Year	Synthetic Textile Mills		Hosiery & Knitting Mills		Wool Mills		Cotton Yarn & Cloth Mills		Total Observed Consumption	
	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%	Lbs.	%
1950	12.9	75.0	-	-	4.3	25.0	-	-	17.2	100.0
1951	14.4	61.0	0.2	0.9	6.0	25.4	3.0	12.7	23.6	100.0
1952	15.2	55.9	0.4	1.8	5.5	20.2	6.1	22.1	27.2	100.0
1953	17.2	60.7	0.5	1.8	5.8	20.5	4.8	17.0	28.3	100.0
1954	18.1	66.3	0.5	1.8	4.7	17.2	4.0	14.7	27.3	100.0
1955	20.9	63.4	0.3	0.9	5.1	15.4	6.7	20.3	33.0	100.0
1956	20.4	61.5	0.3	0.9	5.8	17.4	6.7	20.2	33.2	100.0
1957	17.4	58.4	0.4	1.4	5.3	17.7	6.7	22.5	29.8	100.0
1958	21.3	65.5	0.4	1.2	4.6	14.2	6.2	19.1	32.5	100.0
1959	22.1	68.0	0.3	0.8	5.4	16.7	4.7	14.5	32.5	100.0
1960	17.6	68.8	1.0	3.9	4.8	18.7	2.2	8.6	25.6	100.0
1961	20.6	70.5	1.4	4.9	5.5	18.8	1.7	5.8	29.2	100.0
1962	27.6	75.5	1.3	3.3	6.0	16.5	1.7	4.7	36.5	100.0
1963	30.1	75.0	1.1	2.9	6.8	16.9	2.1	5.2	40.1	100.0
1964	33.3	73.5	1.5	3.2	8.6	18.9	2.0	4.4	45.4	100.0
1965	34.2	70.1	1.7	3.5	10.0	20.6	2.8	5.8	48.7	100.0
1966	38.0	68.9	1.9	3.4	12.3	22.3	3.0	5.4	55.2	100.0

Sources: Dominion Bureau of Statistics, Ottawa, Annual Census of Manufacturers entitled: Synthetic Textile Mills (34-208), Hosiery and Knitting Mills (34-215), Wool Mills (34-209), Cotton Yarn and Cloth Mills (34-205).

APPENDIX TABLE 4.5

Total Domestic Supply of Fabric Woven from Man Made Fibre and Yarn and Constant Dollar Personal Income per Person 1950-1966

Year	Domestic Production in Millions of Dollars	Imports Millions of Dollars	Total Supply Millions of Dollars	Personal Income per Person (a) 1949 Dollars
1950	87.5	6.3	93.8	949
1951	88.2	9.9	98.1	988
1952	77.4	18.3	95.7	1009
1953	72.1	20.7	92.8	1025
1954	57.2	20.1	77.3	977
1955	63.8	23.9	87.7	1024
1956	64.4	24.5	88.9	1065
1957	61.4	26.6	88.0	1075
1958	58.9	28.2	87.1	1091
1959	71.9	28.4	100.3	1101
1960	74.4	29.0	103.4	1125
1961	87.0	31.0	118.0	1132
1962	98.5	35.8	134.3	1190
1963	117.1	41.4	158.5	1235
1964	135.8	45.7	181.5	1271
1965	147.0	53.2	200.2	1355
1966	157.8	54.7	212.5	1425

Sources: Domestic Production and Imports, Table 4.6
Personal Income per Person: National Accounts Income and Expenditure, D.B.S., Ottawa.

Note (a): Personal Income per person was converted to constant 1949 dollar values using the Implicit Price Index for Personal Expenditure on Consumer Goods and Services in National Accounts, op. cit., Production, Imports and Supply are in current dollars since movements in the consumer price index do not accurately reflect price changes in these items.

APPENDIX TABLE 4.6

Domestic Supply of Tire Cord Fabric Woven from Man Made Yarn and Canadian Automobile Production 1950-1966

Year	Domestic Production Millions of lbs.	Imports Millions of lbs.	Total Supply Millions of lbs.	Automobile Production No.
1950	-	-	-	389,334
1951	31.7	1.8	33.5	415,420
1952	27.0	0.9	27.9	433,145
1953	29.2	0.8	30.0	480,322
1954	27.0	0.6	27.6	356.645
1955	30.9	0.7	31.6	453.040
1956	32.4	2.9	35.3	467,469
1957	27.9	0.3	28.2	405.536
1958	24.6	1.0	25.6	354.490
1959	29.0	1.8	30.8	363,926
1960	23.0	1.6	24.6	348,753
1961	25.0	1.2	26.2	251,807
1962	26.8	0.3	27.1	423,965
1963	29.8	1.6	31.4	539,932
1964	32.5	2.7	35.2	448,079
1965	33.1	2.9	36.0	705,417
1965	27.0	6.8	33.8	683,278

Sources: Tire Cord Production and Imports from Table 4.9
Automobile Production 1950-1960. General Review Manufacturing Industries of Canada, D.B.S., Ottawa (31-201) (annual), 1961-1966, Products Shipped by Canadian Manufacturers, D.B.S., Ottawa (annual) (31-211).

APPENDIX TABLE 4.7

Market Supply of Textile Fabric Woven from Man Made Fibre and Yarn, By Value, Canada 1950-1966 (Millions of dollars)

Year	Domestic Production	Net Imports	Total Supply	Domestic Share of Market %
1950	87.5	6.3	93.8	93.4
1951	88.2	9.9	98.1	90.0
1952	77.4	18.3	95.7	80.9
1953	72.1	20.7	92.8	77.9
1954	57.2	20.1	77.3	74.1
1955	63.8	23.9	87.7	72.7
1956	64.4	24.5	88.9	72.5
1957	61.4	26.6	88.0	69.9
1958	58.9	28.2	87.1	67.6
1959	71.9	28.4	100.3	71.8
1960	74.4	29.0	103.4	71.8
1961	87.0	31.0	118.0	73.7
1962	98.5	35.8	134.3	73.4
1963	117.1	41.4	158.5	74.0
1964	135.8	45.7	181.5	74.9
1965	147.0	53.2	200.2	73.5
1966	157.8	54.7	212.5	74.0

Sources: Domestic Production: Synthetic Textile Mills, D.B.S. Annual Census of Manufacturers.

Imports. Trade of Canada; Volume III Imports (annual), Dominion Bureau of Statistics, Ottawa.
Commodity Classes: 1950-1963, #3372 and 3484
1964-1966, 383-44, 375-19, 375-09, 375-39, 375-45, 375-99. 377-59, 377-65, 377-69, 377-75, and 377-79.

APPENDIX TABLE 4.8

Observed Average Price of Imported Fabrics Woven from Man Made Fibre and Yarn, 1950-1968 (dollars per pound)

Year	Imported Fabric Price
1950	2.48
1951	2.56
1952	2.05
1953	1.99
1954	2.18
1955	2.36
1956	2.33
1957	2.19
1958	2.08
1959	2.05
1960	2.10
1961	2.03
1962	2.10
1963	2.00
1964	2.10
1965	1.96
1966	1.98
1967	2.00
1968	2.10

Source: Calculated from data presented in Trade of Canada, Volume III, Imports (annual) Dominion Bureau of Statistics, Ottawa.
Commodity Classes: 1950-1963 - #3372
1964-1966 - #383-44, 375-19, 37509, 37539, 37779, 37767, 37545, 375-99 37759, 37765, 37775.

APPENDIX TABLE 4.8(a)

Estimated Gross Return on Operating Expenses for Secondary Producers as a Group[1], 1950-1967

Year	Total Operating Expenses[2] $ 000	Value of Total Shipments $ 000	Gross Revenues[3] $ 000	Per Cent Gross Return Operating Expenses %
1950	31,035	40,497	9,462	30.1
1951	31,926	42,512	10,586	33.2
1952	42,590	54,812	12.222	28.7
1953	42,343	48,910	6,567	15.5
1954	41,496	46,168	4,672	11.3
1955	37,392	44,442	7,050	18.9
1956	45,826	53,894	8.068	17.6
1957	48,781	54,467	5,686	11.7
1958	44,739	52,156	7,417	16.6
1959	52.131	61,408	9.277	17.8
1960	56.740	69,763	13,023	22.0
1961	80,406	101,348	20,942	26.0
1962	87,388	111,956	24,568	28.1
1963	110,246	142.342	32,096	29.1
1964	107,686	136,632	28,946	26.9
1965	120,137	148,824	28,687	23.9
1966	127,360	161,253	33,893	26.6
1967	160,261	200,842	40,631	25.4

Source: Dominion Bureau of Statistics, Ottawa. Annual Census of Manufacturers, Synthetic Textile Mills (34-208).

Notes:
1. Estimates are based on data published by size of establishment through exclusion of group containing largest establishments. Estimates are for 'gross return' as no information is available on depreciation or capital cost.
2. Total operating expenses are sum of wages and salaries, fuel and electricity and cost of materials used.
3. Gross Revenue = Value of Shipments Minus Total Operating Expenses

APPENDIX TABLE 4.9

Canadian Market Supply of Tire Cord Fabric Woven from Man Made Yarn by Quantity 1950-1966 (Millions of pounds)

Year	Domestic Production	Imports	Total Supply	Domestic Share of Market %
1950	-	-	-	-
1951	31.7	1.8	33.5	94.5
1952	27.0	0.9	27.9	93.4
1953	29.2	0.8	30.0	97.5
1954	27.0	0.6	27.6	97.4
1955	30.9	0.7	31.6	97.9
1956	32.4	2.9	35.3	91.6
1957	27.9	0.3	28.2	99.0
1958	24.6	1.0	25.6	95.4
1959	29.0	1.8	30.8	94.2
1960	23.0	1.6	24.6	93.5
1961	25.0	1.2	26.2	95.5
1962	26.8	0.3	27.1	98.6
1963	29.8	1.6	31.4	95.0
1964	32.5	2.7	35.2	92.6
1965	33.1	2.9	36.0	92.0
1966	27.0	6.8	33.8	80.0

Sources: Domestic Production - Cotton Textile Mills, Dominion Bureau of Statistics, Ottawa, Annual Census of Manufacturers (34-205)
Imports: Trade of Canada, Volume III, (annual) Dominion Bureau of Statistics, Ottawa.
Commodity Classes 1950-1963 #3489
1964-1966 #381-49

APPENDIX TABLE 4.10

Canadian Market Supply of Tire Cord Fabric Woven from Man Made Yarn, by Value 1950-1966 (Millions of Dollars)

Year	Domestic Production	Imports	Total Supply	Domestic Share of Market %
1950	-	-	-	-
1951	25.8	1.5	27.3	94.5
1952	21.8	0.9	22.7	96.0
1953	23.1	1.1	24.2	95.7
1954	22.3	0.7	23.0	97.3
1955	25.8	0.9	26.7	96.5
1956	27.4	2.4	29.8	91.8
1957	24.5	0.4	24.9	98.5
1958	22.9	0.9	23.8	96.7
1959	27.2	1.7	28.9	94.0
1960	20.7	1.5	22.2	93.2
1961	22.7	1.2	23.9	95.2
1962	25.0	0.3	25.3	98.8
1963	27.9	1.8	29.7	94.0
1964	31.1	2.5	33.6	92.5
1965	30.9	2.9	33.8	91.6
1966	25.6	5.9	31.5	84.0

Sources: See Table 4.7

APPENDIX TABLE 4.11

Producers, Plants and Production of Synthetic Textile Mills
1950-1966

Year	Number of Producers (a)	Number of Plants (b)	Quantity of Production (Mill. lin.yds.)	Value of Production (Mill.$)	Average Price of Production $/lin.yd.
1950	39	43	119.3	87.5	0.73
1951	39	42	115.3	88.2	0.77
1952	39	44	101.1	77.4	0.77
1953	40	43	99.7	72.1	0.73
1954	37	40	82.4	57.2	0.70
1955	37	41	96.9	63.8	0.66
1956	36	39	96.1	64.4	0.67
1957	32	35	86.5	61.4	0.71
1958	35	40	89.1	58.9	0.66
1959	35	39	94.9	71.9	0.76
1960	36	43	95.1	74.4	0.78
1961	-	49	104.9	87.0	0.83
1962	43	54	110.5	98.5	0.89
1963	42	53	125.5	117.1	0.93
1964	43	53	134.6	135.8	1.01
1965	47	57	149.1	147.0	0.99
1966	57	68	174.9	157.8	0.90

Sources: Synthetic Textile Mills, D.B.S., Annual Census of Manufacturers, D.B.S., Ottawa.

Notes: (a) Number of producers is derived from the list of establishments classified to the industry by excluding primary producers and counting only independent establishments.

(b) Number of plants is derived by subtracting number of primary producers' plants from number of establishments.

APPENDIX TABLE 4.12

Median Plant Size by Value and Quantity of Production: Synthetic Textile Mills 1950-1966

Year	Average Price of Production ($/lin.yd.)	Median Plant Size by Value of Prod. (a) (000)$	Median Plant Size by Quantity Prod.(b) (000 lin.yds.)
1950	0.73	906	1240
1951	0.77	1222	1590
1952	0.77	850	1105
1953	0.73	825	1130
1954	0.70	625	893
1955	0.66	866	1312
1956	0.67	875	1310
1957	0.71	841	1185
1958	0.66	950	1440
1959	0.76	1100	1450
1960	0.78	1434	1843
1961	0.83	1815	2190
1962	0.89	1740	1960
1963	0.93	2355	2530
1964	1.01	2585	2560
1965	0.99	2040	2060
1966	0.90	1875	2080

Source: Synthetic Textile Mills, D.B.S., Annual Census of Manufacturers, D.B.S., Ottawa.

Notes: (a) Median plant size by value of production is calculated after excluding primary establishments from largest size group of establishments.

(b) Median plant size by quantity of production is calculated from median size by value of production and average price of production.

Appendix to Chapter 5

APPENDIX TABLE 5.1

Estimated Average Product Prices by Product and Producer
Canadian Man Made Fibre and Yarn Industry 1950-1966
(Dollars per lb.)

Year	Viscose and Acetate Staple Fibre (1)	Celanese Acetate Yarn	Courtauld's Reg. Ten. Viscose Yarn	Non-Cellulosic Staple (2)	Non-Cellulosic Yarn (2)
1950	0.354	0.950	0.893	1.91	3.86
1951	0.439	1.00	0.896	1.97	3.93
1952	0.438	0.960	0.946	1.97	3.81
1953	0.386	0.922	0.804	1.83	3.90
1954	0.364	0.866	0.813	1.47	3.54
1955	0.342	0.855	0.876	1.39	3.32
1956	0.337	0.840	0.906	1.17	3.30
1957	0.358	0.820	0.884	1.20	2.92
1958	0.379	0.749	0.901	1.25	2.77
1959	0.355	0.787	0.902	1.21	2.46
1960	0.371	0.725	0.870	1.15	2.30
1961	0.378	0.710	0.895	1.05	2.37
1962	0.330	0.730	0.950	1.03	2.20
1963	0.320	0.685	0.844	1.20	2.10
1964	0.345	0.974	0.837	1.03	2.22
1965	0.354	0.676	0.786	1.02	1.97
1966	0.354	0.640	0.804	0.97	1.67

Source: Calculated from data published by the Dominion Bureau of Statistics in Annual Census of Manufacturers entitled: Narrow Fabric Mills (34-207), Synthetic Textile Mills (34-208), Wool Mills (34-209), Hosiery and Knitting Mills (34-215), Carpet Mat and Rug Industry (34-221).

Notes: (1) Data on viscose and acetate staple is given in an aggregate basis and cannot be separated to give individual price series. The series used here thus combines the behaviour of Canadian Celanese Ltd. and Courtauld's (Canada) Ltd.
(2) Includes the products nylon, acrylic and polyester produced by DuPont of Canada Ltd. and Millhaven Fibres (CIL), but excludes tire cord price.

APPENDIX TABLE 5.2

Annual Production of Canadian Man Made Fibre and Yarn Producers by Producer and Product 1950-1966
(Millions of Pounds)

Part I Cellulosic Fibre and Yarn Producers

	Canadian Celanese Acetate		Courtauld's (Canada) Viscose		
Year	Staple Fibre	Filament Yarn	Staple Fibre	Reg. Tenacity	High Tenacity
1950	4	17	11	13	8
1951	5	18	12	12	10
1952	6	18	17	7	14
1953	5	16	15	7	21
1954	4	14	22	7	23
1955	3	15	28	10	23
1956	3	16	26	9	23
1957	4	17	24	8	21
1958	4	18	22	6	16
1959	11	21	28	5	21
1960	9	21	23	4	18
1961	11	22	23	6	12
1962	10	23	32	7	16
1963	10	25	37	7	17
1964	14	32	41	8	16
1965	13	33	43	9	17
1966	10	31	42	9	9

Source: Textile Organon, Textile Economics Bureau Inc., New York, New York, June 1968 and June 1962.

APPENDIX TABLE 5.2

Annual Production of Canadian Man Made Fibre and Yarn 1950-1966
(Millions of Pounds)

Part II Non-Cellulosic Fibre and Yarn Production(a)

Year	Staple Fibre	Filament Yarn
1950	1.5	3.5
1951	1.7	4.5
1952	2.5	5.6
1953	3.0	7.4
1954	3.0	9.2
1955	3.0	9.3
1956	3.3	10.7
1957	5.7	14.8
1958	5.6	17.6
1959	8.6	21.0
1960	12.7	24.7
1961	10.9	31.7
1962	14.2	36.2
1963	16.2	41.8
1964	17.6	48.5
1965	20.9	62.9
1966	26.6	72.6
1967	24.4	80.7

Source: Textile Organon, Textile Economics Bureau Inc., New York, New York, June 1962 and June 1968.

Note (a): Production data is the combined production of all Canadian producers and thus includes the following producers and products:

1950-1967	DuPont of Canada Ltd., nylon staple and yarn
1955-1967	Canadian Industries Ltd., Millhaven Fibres, polyester (staple and yarn)
1957-1967	DuPont of Canada Ltd., Acrylic (staple fibre)
1965-1967	Courtauld's Synthetic Fibres Ltd., nylon (yarn)
	Union Carbide Canada Ltd., nylon (yarn and staple)
1966-1967	Millhaven Fibres Ltd., nylon (yarn)
	Firestone Textile Ltd., nylon (yarn)

APPENDIX TABLE 5.3

Annual Capacity of Canadian Man Made Fibre and Yarn Producers by Producer and Product 1950-1966 (Millions of Pounds)

Part I Cellulosic Fibre and Yarn Producers

	Canadian Celanese Acetate		Courtauld's (Canada) Viscose		
Year	Staple Fibre	Filament Yarn	Staple Fibre	Reg. Tenacity	High Tenacity
1950	10	20	20	14	10
1951	10	20	20	14	10
1952	10	20	20	14	14
1953	10	20	30	12	20
1954	10	20	30	12	23
1955	11	20	30	12	23
1956	16	23	30	12	24
1957	16	23	45	12	28
1958	16	23	45	12	28
1959	16	30	45	8	22
1960	16	30	45	8	22
1961	16	33	35	6	22
1962	16	35	35	6	22
1963	18	45	35	9	22
1964	18	47	35	9	22
1965	16	38	45	9	20
1966	15	38	45	10	20
1967	15	38	45	10	20
1968	13	34	45	9	10

Source: Textile Organon, Textile Economics Bureau Incorp., New York, New York, June Issue Annually 1950-1968.

APPENDIX TABLE 5.3

Annual Capacity of Canadian Man Made Fibre and Yarn Producers by Producer and Product 1950-1966 (Millions of Pounds)

Part II Non-Cellulosic Fibre and Yarn Producers (Estimated Distribution)

	DuPont of Canada Ltd.			Millhaven Fibres Ltd.	
Year	Nylon Staple Fibre	Nylon Filament Yarn	Acrylic Staple Fibre	Polyester Staple Fibre	Polyester Filament Yarn
1950	3.0	5.0	-	-	-
1951	3.0	5.0	-	-	-
1952	3.0	7.0	-	-	-
1953	3.0	10.0	-	-	-
1954	3.0	10.0	-	-	-
1955	3.0	10.0	-	2.0	12.0
1956	3.0	10.0	-	2.0	12.0
1957	6.0	10.0	-	2.0	12.0
1958	6.0	18.0	7.0	2.0	12.0
1959	6.0	18.0	7.0	2.0	12.0
1960	6.0	18.0	7.0	2.0	12.0
1961	9.0	18.0	7.0	2.0	12.0
1962	9.0	28.0	7.0	2.0	12.0
1963	9.0	32.0	7.0	6.0	12.0
1964	9.0	38.0	7.0	6.0	12.0
1965	12.0	48.0	15.0	12.0	12.0
1966	12.0	54.0	15.0	18.0	22.0
1967	12.0	60.0	15.0	18.0	27.0
1968	15.0	60.0	15.0	18.0	27.0

Source: Allocations of capacity among producers and products are estimates derived from interpolations between years in which outside sources note some level of capacity for one producer or product line.

Aggregate capacity is presented in Table 5.4 and provides the basic data prior to the above estimated distribution.

APPENDIX TABLE 5.4

Annual Combined Capacity of Canadian Man Made Non-Cellulosic Producers by Product from 1950-1968 (Millions of Pounds)
(Combined Capacity of DuPont of Canada and Millhaven Fibres 1950-1964)

Year	Staple Fibre	Filament Yarn
1950	3.0	5.0
1951	3.0	5.0
1952	3.0	7.0
1953	3.0	10.0
1954	3.0	10.0
1955	5.0	22.0
1956	5.0	22.0
1957	8.0	22.0
1958	15.0	30.0
1959	15.0	30.0
1960	15.0	30.0
1961	18.0	30.0
1962	18.0	40.0
1963	22.0	44.0
1964	22.0	50.0
1965	24.0	77.0
1966	33.0	96.0
1967	42.0	125.0
1968	48.0	120.5

Source: Textile Organon, Textile Economics Bureau Inc., New York, New York, June Issue annually 1950-1968.

APPENDIX TABLE 5.5

Observed Consumption of Canadian Man Made Fibre and Yarn in Secondary Industries by Type of Fibre or Yarn 1950-1966
(Millions of Pounds)

Part I Cellulosic Fibre and Yarn Products

	Canadian Celanese Acetate		Courtauld's (Canada) Viscose		
Year	Staple Fibre	Filament Yarn	Staple Fibre	Reg. Tenacity Yarn	High Tenacity Yarn
1950	5.9	5.5	10.5	7.6	-
1951	9.3	5.9	13.1	7.6	16.0
1952	8.7	5.7	15.9	8.8	18.5
1953	8.5	6.1	17.4	9.2	25.2
1954	4.6	3.8	20.6	6.6	23.5
1955	3.4	6.3	28.8	7.0	26.3
1956	3.6	5.2	28.1	7.0	27.9
1957	4.6	6.1	23.8	6.6	23.2
1958	5.2	7.5	23.3	6.4	19.8
1959	10.9	9.1	16.9	5.8	24.7
1960	7.5	9.2	11.8	5.9	19.6
1961	10.2	11.9	11.2	5.2	16.7
1962	8.1	13.5	17.9	7.3	14.0
1963	7.9	13.9	21.2	8.2	14.3
1964	10.5	7.2	20.2	10.5	14.7
1965	8.9	14.7	20.6	12.4	12.5
1966	7.5	14.7	24.8	13.9	7.8

Source: Dominion Bureau of Statistics, Ottawa, Canada, Annual Census of Manufacturers, 1950-1966 entitled: Cotton Yarn and Cloth Mills (34-205), Narrow Fabric Mills (34-207), Synthetic Textile Mills (34-208), Wool Mills (34-209), Hosiery and Knitting Mills (34-215), Carpet Mat and Rug Industry (34-221).

APPENDIX TABLE 5.5

Observed Consumption of Canadian Man Made Fibre and Yarn in Secondary Industries by Type of Fibre or Yarn 1950-1966 (Millions of Pounds)

Part II Non-Cellulosic Fibre and Yarn

Year	Staple Fibre	Filament Yarn
1950	0.8	3.4
1951	1.0	4.6
1952	2.5	6.1
1953	2.4	5.8
1954	2.1	7.3
1955	0.8	7.7
1956	1.6	9.8
1957	1.0	13.0
1958	4.0	14.4
1959	4.7	19.2
1960	6.3	19.2
1961	7.9	26.7
1962	10.5	32.3
1963	10.4	38.2
1964	14.7	41.3
1965	19.3	46.0
1966	22.0	52.4

Source: Dominion Bureau of Statistics, Ottawa, Canada, Annual Census of Manufactures 1950-1966 entitled: Cotton Yarn and Cloth Mills (34-205), Narrow Fabric Mills (34-207), Synthetic Textile Mills (34-208), Wool Mills (34-209), Hosiery and Knitting Mills (34-215), Carpet Mat and Rug Industry (34-221).

APPENDIX TABLE 5.6

Annual Levels of Capacity Utilization in the Canadian Man Made Fibre and Yarn Industry by Producer and Product 1950 - 1966
(Per Cent)

Part I Cellulosic Fibre and Yarn Producers

	Canadian Celanese Limited		Courtauld's (Canada) Limited		
Year	Acetate Staple	Acetate Yarn	Viscose Staple	Vis.Reg. Ten. Yarn	Vis.Hi. Ten. Yarn
1950	40.0	85.0	55.0	92.7	80.0
1951	50.0	90.0	60.0	85.6	100.0
1952	60.0	90.0	85.0	50.0	100.0
1953	50.0	80.0	50.0	58.4	105.0
1954	40.0	70.0	73.2	58.4	100.0
1955	27.3	75.0	93.4	83.3	100.0
1956	18.8	69.5	86.7	75.0	95.7
1957	25.0	73.9	53.3	66.7	75.0
1958	25.0	78.3	48.6	50.0	57.2
1959	68.6	70.0	62.3	62.5	95.5
1960	56.3	70.0	51.0	50.0	81.6
1961	68.6	66.8	65.6	100.0	54.6
1962	62.5	65.9	91.4	116.9	72.6
1963	56.1	55.6	108.4	77.8	77.3
1964	77.6	68.2	117.1	89.0	72.6
1965	81.2	86.8	95.5	100.0	85.0
1966	76.9	81.5	93.4	90.0	45.0

Source: Calculated from data in Tables 5.1 and 5.3.

APPENDIX TABLE 5.6

Annual Levels of Capacity Utilization in the Canadian Man Made Fibre and Yarn Industry: By Producer and Product 1950-1966

Part II Non-Cellulosic Producers (a)
(Per Cent)

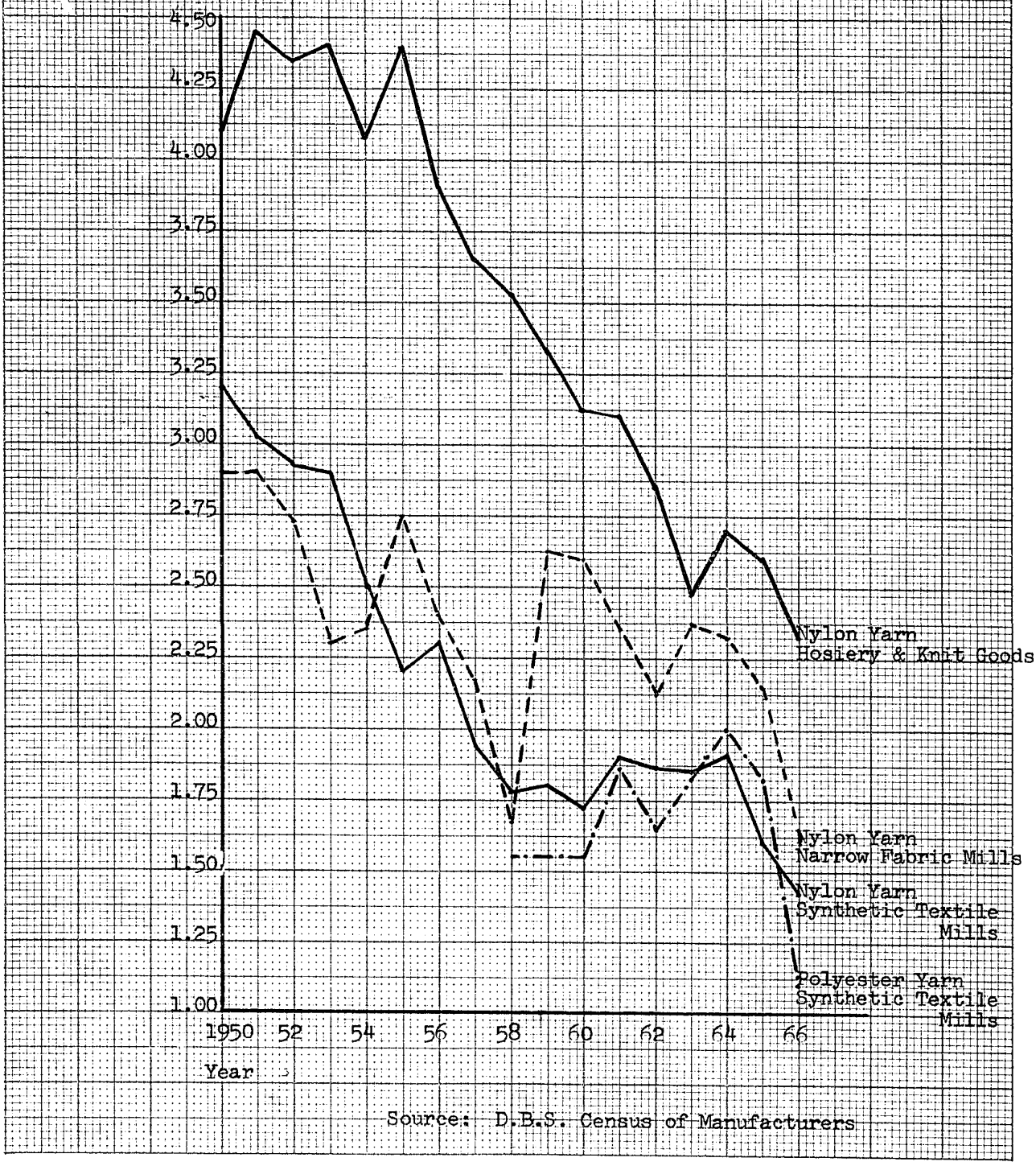
Year	Staple Fibre	Filament Yarn
1950	50.0	70.0
1951	56.6	90.0
1952	83.4	80.0
1953	100.0	74.0
1954	100.0	92.0
1955	60.0	42.3
1956	66.0	48.5
1957	71.1	67.2
1958	37.4	58.7
1959	57.5	70.0
1960	84.5	82.4
1961	60.6	105.5
1962	78.9	90.5
1963	73.5	95.2
1964	80.0	97.0
1965	87.0	81.6
1966	80.7	75.6

Source: Calculated from data in Tables 5.2 and 5.4.

Note (a): See Note (a) of Table 5.4.

APPENDIX CHART 5.1

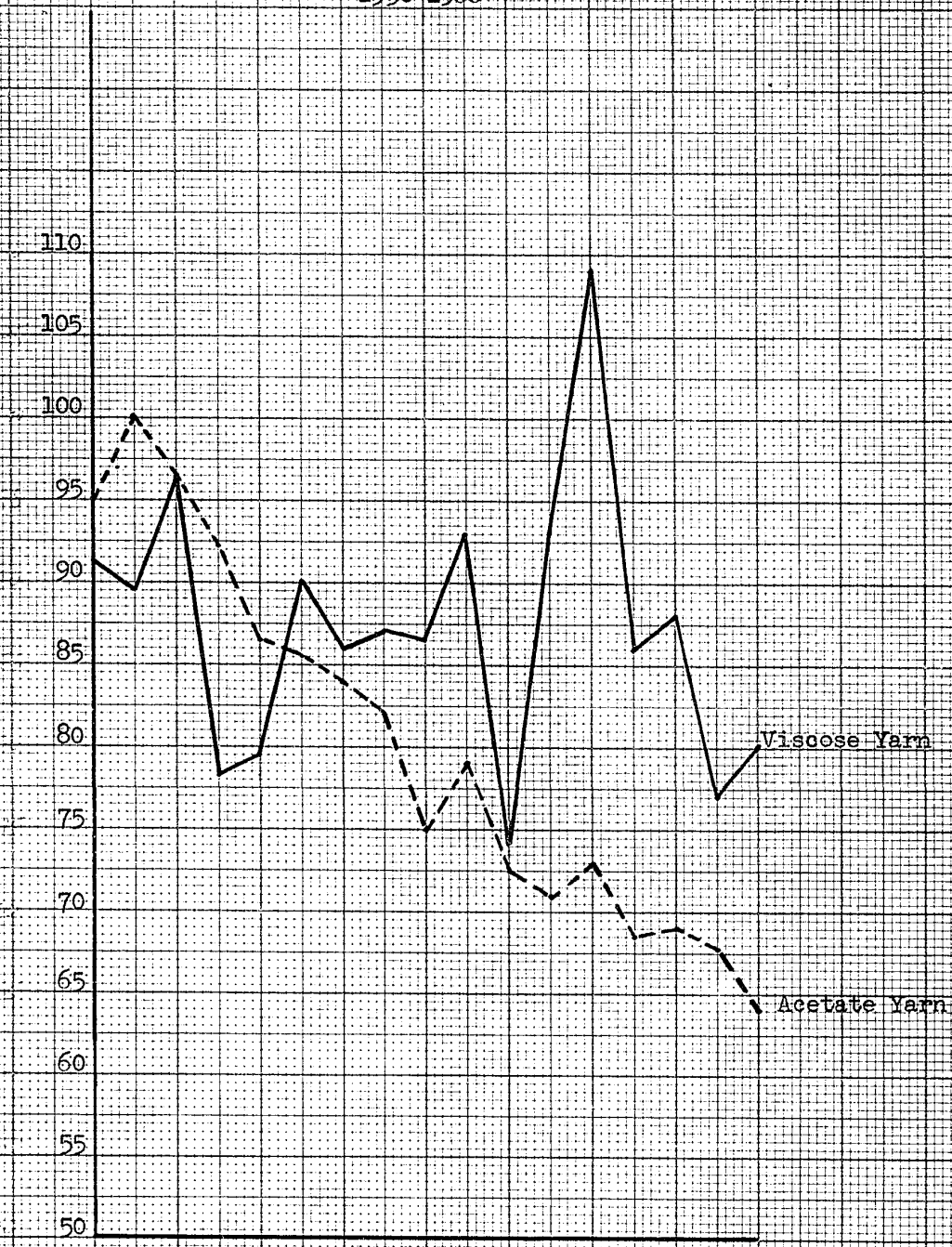
Observed Prices of Nylon and Polyester Yarns by Consuming Industry 1950-1966



Source: D.B.S. Census of Manufacturers

APPENDIX CHART 5.2

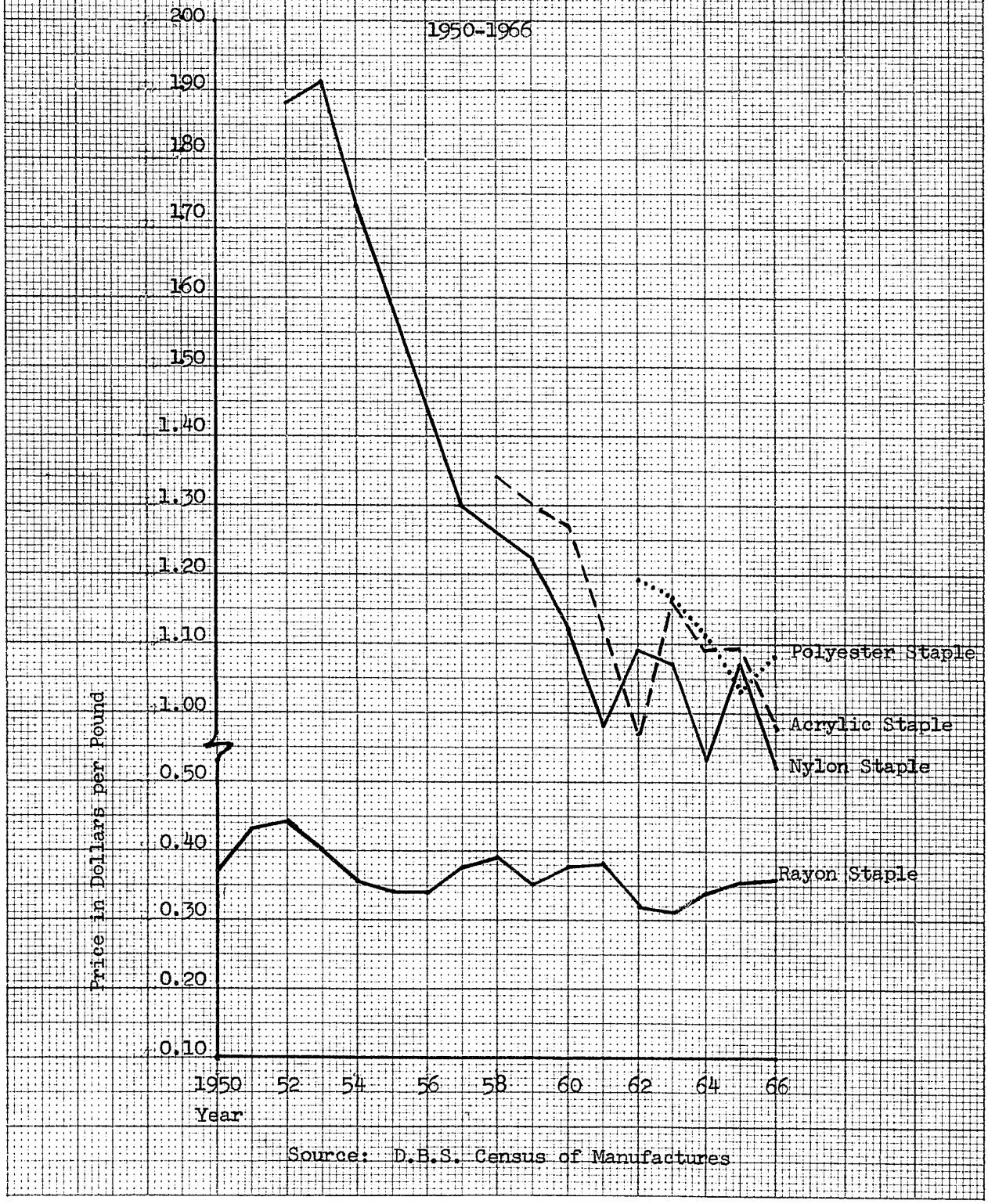
Observed Prices of Viscose and Acetate Yarns
Consumed by Synthetic Textile Mills
1950-1966



Source: D.B.S. Census of Manufactures

APPENDIX CHART 5.3

Observed Prices of Staple Fibres by Fibre Type in Synthetic Textile Mills 1950-1966



Source: D.B.S. Census of Manufactures

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