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# "the Effects Of Competition Policy Changes On International Trade And Export Flows: Canada Case Estimates"

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**THE EFFECTS OF COMPETITION POLICY CHANGES ON INTERNATIONAL  
TRADE AND EXPORT FLOWS: CANADA CASE ESTIMATES**

by

**RUBIN LUNIKU**

**DISSERTATION**

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

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## TABLE OF CONTENTS

List of Tables	iii
List of Figures	iv
List of Graphs	v
Chapter 1. Introduction	1
Chapter 2. Literature Review	10
Chapter 3. Research Design - Theoretical Model	30
Chapter 4. Historical Contexts of Competition Policy Changes and Deregulation in Canada, 1980 until mid-1990s	47
Chapter 5. Empirical Model, Data Analysis, Findings and Result Interpretation	58
5.1. <i>Empirical Model of Export</i>	58
5.2. <i>Result Interpretations</i>	69
Chapter 6. Concluding Remarks and Limitation of Study	78
Appendix:	88
References	99
Abstract	105
Autobiographical Statement	106

## LIST OF TABLES

Table 1: Export Equations Regression Result, Dependent Variable is the Industry's log of Export, OLS Estimates. ....	88
Table 2: Estimated Independent Variables (CR4, HHI, GDPHC, REER_ULC, and MKTSH) Elasticities of Export for Thirteen Canadian Industries. ....	89
Table 3: The Impact of the CR4 Movements to Export across Different Industries. ....	90
Table 4: Correlation Coefficients between the CR4 Index and the Number of Establishments for Fourteen (14) Canadian Industries during 1970/83 – 1997. ....	91
Table 5: Correlation Coefficients between the CR4 Index and other Independent Variables.....	92
Table 6: Conversion between SITC (Trade Data) and SIC codes (Industry Concentration Ratio Data) for Fourteen (14) Canadian Industries. ....	93

## LIST OF FIGURES

Figure1: Home-Country ZZ-PP Schedules, Krugman, P. (1979) Monopolistic Competition Model of Trade. ....	94
Figure 2: The Short and the Long-Run Home Market Equilibrium in a Monopolistic Competition Structure. ....	95

## LIST OF GRAPHS

Graph 1: The Trend for the Average CR4 Index of Fourteen Canadian Manufacturing Industries, 1970-1997. ....	96
Graph 2: The Trend for the Average CR4 Index of the Highly Concentrated Industries in Group One, 1970-1997. ....	97
Graph 3: The Trend for the Average CR4 Index of Moderately Concentrated Industries in Group Two, 1970-1997. ....	98

## **Chapter 1. Introduction**

The main purpose of this study is to investigate the role of competition policy on the country's exports. In particular, we estimate as to what extent are the country's export patterns and flows impacted by the adoption of a stricter competition policy. In addition, we test the hypothesis that procompetitive changes in competition policy, especially a stricter antitrust law and deregulation, have a causal and positive effect on the country's level of exports.

Competition issues, such as restrictive practices and the abuse of dominant position by the multinational and domestic firms, were observed during 1970s through 1990s. These competition concerns, resulting in market access barrier to foreign firms, negatively affect the expected benefits of trade liberalization. For this reason, in 1997, WTO established a working group to examine the relationship between competition and trade policies.

Recently, a growing number of countries (approximately 113) has adopted some competition laws or improved the existing ones, moving toward more active competition policies. In addition to complementing the trade liberalization benefits, another reason for this expansion is that competition policy is a crucial element for successful, market-oriented economic and regulatory reforms. Substantial privatizations and deregulation of the industrial sectors that occurred in most countries after 1990s required the adoption or improvement of their national competition laws.

In this study, the term "competition policy" refers to a broader meaning than just competition law (some studies refer to competition law as competition policy), and include instruments such as privatization and deregulation. These instruments are intended to restrict anticompetitive behavior and mega-mergers between competitors. Although each country

enforces the competition policy differently, its primary goal remains promoting and achieving greater economic efficiency through better resource allocation.

The multiple relationships between competition policy and trade received new attention by late 1970s and early 1980s given the developments of the monopolistic competition theory of trade. The literature analyzed these linkages, mainly from three distinct viewpoints. The first is the literature related to the effects of competition policy on trade. The second is the research dealing with the effects of trade policy on competition policy. The third is papers treating the possibility of harmonization or coordination of national competition policies.

The purpose of competition policy is to improve competition that leads to increase in the firm's efficiency and market's performance. The economic benefits of competition policy changes are mainly realized through lowering fixed entry costs. A lower entry cost will lead to higher entry level and, as a result, to a following 'positive firm selection' process that occurs within industries. Both channels lead to an increased number of firms and variety, lower price markups, higher static and dynamic efficiency, increased productivity, R&D intensity, and innovations.

Findings from the literature that investigate the multidirectional linkages between trade and competition policy consider some of the market performance indicators as trade determinants. Furthermore, they point out that the impact of competition policy on exports is transmitted through changes of these indicators. Partly related to this study are the findings of several empirical studies that show the positive effects of competition policy and deregulation on market performance and trade. It is through the lower fixed entry costs, and a 'positive firm selection' process that competition policy affects the market performance indicators, trade determinants, and, therefore, exports.



Supporting the idea that a rigorous competition policy would diminish the market incentives for innovation, Cohen and Levin (1989) show empirical evidence, which does not favor the argument that market concentration acts as a determinant for the innovation behavior of firms. Aghion *et al*, (2005) find the relationship between R&D intensity and market concentration to be an inverted U-shape, with R&D intensity increasing as competition intensifies, but tending to fall as the market power becomes either excessive or moderate.

In addition, Nicoletti and Scarpetta (2003), find a negative relationship between the product market regulation -PMR (a stronger PMR means a weaker product market competition) and the R&D intensity. The product market competition, subject to the competition policy, has a positive and robust effect on the firm's productivity growth. Empirical studies show that the dynamic competition between firms significantly affects industry productivity. This "creative destruction" reallocates productive inputs from less to the more efficient firms through entry and exit, and variations in the market shares.

Comparative case studies suggest that competition enhance productivity. Authors Comanor and Scherer (1995) compared the productivity in the U.S. petroleum-refining industry with that of the U.S. steel industry. They attributed the differences between the better performance of the Standard Oil Co and the poorer performance of the US Steel Corporation to the antitrust enforcement on the Standard Oil Co. In addition, Disney et al. (2000) find that the market competition significantly raises the productivity levels and its growth rates.

The effectiveness of competition policy on the total factor productivity has also been noted in Buccirosi et al. (2011). They find that "good" competition policy (where "good" means a competition policy that considers efficiency gains) has a positive and highly significant effect

on the total factor productivity growth. Furthermore, they conclude that competition policy is more effective in countries with superior legal institutions and judicial system.

In a firm-level study, Kahyarara G. (2004) finds a positive relationship between competition policy and the Tanzanian manufacturing exports, productivity, and the firm's investments. Ahn S. (2002) finds that product market competition positively impacts the productivity growth in the long run. As previously mentioned, competition policy also includes the deregulations in the service and economic sectors. Deregulation generally targets the industry's price and entry controls, which impede the market competition and create inefficient allocation of resources along with low productivity growth.

Several studies show that deregulation has a productivity-enhancing effect. Kwoka J. (1993) finds that competition for AT&T (1977-1987) and privatization for British Telecom (1984-87) accounted for 17% and 25% productivity increase respectively. A study by Olley and Pakes (1996), which investigated productivity changes in the Telecommunications Equipment Industry in U.S. during 1974-1987, finds that the effects of deregulation on productivity involve changes in firm dynamics through competitive selection via entry and exit.

The effects of competition law on price-cost markup, which is a trade determinant, are analyzed in an empirical study by Kee and Hoekman (2002). The authors find evidence that the existence or adoption of competition law positively affects the long-run equilibrium number of home firms, and thus, indirectly reduces industry markups. Moreover, their results show that the number of the domestic firms responds to fix entry costs. So, regardless of the approach or the proxy variables used for competition policy, the results of all cited studies point to a positive effect of competition policy on market performance indicators.

The current literature identifies two avenues, which show that competition policy has a direct impact on the international trade. First, changes in competition policy affect market access to domestic and foreign firms, due to the lower costs of entry. Second, competition policy affects many of industrial organization (hereafter IO) features, which are considered important trade determinants, by facilitating the entry and exit that lead to ‘positive firm selection’.

These IO features are market performance indicators and include the number of product varieties, price markups, and productivity. Additionally, specific to international trade are the transportation and communication costs. The effects of competition policy are the result of the combination of antitrust law actions and deregulation of transportation, banking, and finance sectors.

A natural link between competition policy and international trade is that the former may be used by countries to change domestic market’s access conditions in the same way as tariffs. In this aspect, a loose competition policy is considered as equivalent to a tariff. Furthermore, anti-competitive business practices in the domestic markets, which are subject to competition policy, can have a substantial impact on flows and the direction of international trade. This impact occurs through the restriction of foreign competitor's ability to access, operate, and compete effectively in export markets.

Since the interactions between competition policy and international trade are bidirectional, it means that the latter also affects the former. The effects of trade policies on competition policy are mainly reflected in the degree of the antitrust law enforcement regarding mergers. Although liberalized trade and tight competition policy are categorized as procompetitive, there are differences between the two policies. These differences are based on their impact as competitive discipline to the domestic markets. The empirical evidence supports

the “import - as - market - discipline” hypothesis, which considers the liberal trade policy as a substitute to a tight competition policy, especially in the intra-trade industries.

However, Levinsohn J. (1996) and Cadot, Grether, and de Melo (2000) point out that there are a number of arguments critical of this hypothesis. First, the imports do not affect the competition level in the non-tradable sectors such as domestic services and distribution, which represent a relatively large share of the country’s GDP. Second, the existence of anti-competitive practices in the non- tradable home sectors, such as the market foreclosures and vertical arrangements, is not subject to the liberalized trade policy. Thus, it limits the exporters’ access into the domestic markets.

Third, in monopolistic competition, import is not as efficient as competition policy in disciplining the domestic firm’s market power, because they compete in quality and other non-price dimensions. Fourth, in the presence of the relevant transportation costs, which increase the degree of product differentiation, a liberal trade policy will not be as effective as competition policy in enhancing markets’ competitiveness.

There are ample examples of the intertwined linkages between the two policies. One is the existence of a high degree of the domestic industry protection through import tariff in the chemical industry sector, in South Korea. Such tariff protection played an important role in the antitrust authority's decision to deny a horizontal merger in that industry. This high tariff limited the foreign firms’ access to that market. Another example is that of the VER-s on the import of Japanese autos in the U.S. market adopted in the early 1980s and terminated in 1994. This VER produced adverse effects on the firms’ strategic competition resulting in a more collusive pricing behavior in the industry.

In 1992, the anti-dumping suit from the U.S. home auto-makers against all foreign competitors did not become an international trade dispute given the antitrust authority's concerns regarding the limitation of the imported competition in U.S. market. Baldwin and Krugman (1988), show that a competition policy (IO) issue, resulting in import protection, impacted the pattern of global trade for 16K RAM product. As a result, the Japanese firms became substantial net exporters, mainly due to the market closure and not their international competitiveness.

In this study, we investigate one aspect of linkages between competition policy and trade, specifically "to what extent the procompetitive changes of competition policy, including a stricter antitrust law and deregulation, impact a country's export?" In particular, we answer this question by analyzing the effects of competition policy on exports for the Canadian manufacturing industries around 1986.

We use this theoretical framework, and the monopolistic competition model of trade to formulate this study's main hypothesis and to construct the empirical model of export. As we discussed earlier, a stricter competition policy would result in a lower fixed entry cost and positively influence the market performance. The monopolistic competition models of trade predict an increase in domestic firms and a higher level of a country's exports as the result of a stricter competition policy. Thus, we hypothesize that procompetitive changes in competition policy positively affect a country's level of exports.

We estimate a linear export regression in which competition policy variable, as measured by the industry's four-firm concentration ratio CR4 and HHI index, is directly included as an independent variable. We provide an empirical analysis of our hypothesis based on fourteen (14) Canadian manufacturing industries, using industry-level data over the period 1970-1997. We selected Canada as the case study because of substantial changes to its competition law, along

with deregulation in key service sectors around 1986. Furthermore, another factor was because of its liberalized trade policy.

To test our hypothesis, we chose the manufacturing sector because it operates in a monopolistic competition framework with relevant fixed entry and exit costs. Relatively high fixed costs are considered entry barriers, and, therefore, the consequences of competition policy changes on firm's competitiveness and international trade will be more significant than those in competitive sectors. This is also related with competition policy primarily affecting entry barriers and its costs.

In his paper Levinsohn, J. (1996) points out "if we ignore the interactions between competition policy and international trade, especially in imperfect markets, it may result in public policy consequences and misguided trade or competition policies." In this study, we provide empirical estimates of competition policy impact upon manufacturing exports for the case of Canada. These results are significant for a better understanding and valuation of the economic implications that arise from a change or introduction of the national competition policy. In addition, they serve to the policy and decision makers in formulating sound economic policies regarding this topic.

Furthermore, the literature suggests that there is limited empirical evidence regarding effects of competition policy on the firm's performance and export. This is because it is complicated to provide evidence of effectiveness of competition policy on export since there are other factors simultaneously impacting the trade determinants alongside the competition policy. In this aspect, our empirical results provide a contribution to the existing evidence of competition policy effectiveness on export.

Our major finding that a stricter competition policy generates positive and causal long-run effects in a country's export is in line with the prediction of the monopolistic competition model of trade. For our sample industries, we find that the effects of competition policy, as measured by the CR4 index, on export are positive and significant. We also find that the effects of competition policy on export are larger in the more concentrated industries than in competitive ones.

The rest of the study is organized as follows; In Chapter 2, we provide the linkages between competition policy and trade, and also the review on the literature related to these multiple interactions. These studies provide the basis for our empirical model and analysis. Chapter 3 deals with the description of research design regarding the monopolistic competition model of trade. We use this model to derive the theoretical predictions for our hypothesis.

In Chapter 4, we emphasize the reasons why Canada was chosen as the country-case in testing our hypothesis. We provide a brief historical context of the substantial competition law changes and deregulations that occurred in Canada around 1986. In Chapter 5, we specify and analyze an export equation model used to test our hypothesis on fourteen Canadian manufacturing industries for the period 1970-1997. Furthermore, we identify and describe model's independent variables, discuss data, findings and interpret the export equation regression estimates. In Chapter 6, we give our conclusions by mainly focusing on the estimated effects of competition policy on export.

## **Chapter 2. Literature Review**

The vast literature related to the interactions between competition and trade policies can be organized into three areas. First, literature regarding competition policy effect on trade and the monopolistic competition models of trade; second, literature that deals with the effects of trade on competition policy; and third studies that treat the possibility of harmonization of national competition policies.

2.1. The first section of the literature review includes studies on how changes in competition policy, including antitrust laws and deregulation, affect trade determinants and trade. In addition, this section contains a brief description of monopolistic competition theory of trade which we use to formulate our hypothesis. The effects of competition policy on trade volumes are transmitted through lowering of fixed entry costs. These entry costs are considered as the primary reason for market barriers to entry and exit.

The reduced fixed entry cost due to a stricter competition policy will facilitate entry and enhance market competition. As a result of lower fixed cost, the number of the home firm increases as predicted by monopolistic competition models of trade. This increased market competition leads to ‘positive firm selection’ process and improvement of market performance. Competition policy impacts export through market indicators and trade determinants such as the number of varieties, price markups, productivity, R&D and innovation.

Integration between industrial organization and international trade literature started with important studies by Krugman P. (1979, 1980), Brander, J.A. (1981), Helpman E. (1981), and continued later by Neary (2000), Melitz (2003) and other researchers. These studies adopted the Dixit and Stiglitz model (1977), (DS model hereafter). The DS model analyzed the issue of ‘whether the level of product diversity provided in a monopolistic competition market structure



would be socially optimal?’ It dealt with economies of scale in a monopolistic competition market structure from a tradeoff prospect of product quantity versus diversity.

Following there is a brief description of the DS model. It assumes a separable utility function between a numeraire good ( $x_o$ ) and differentiated products within industry ( $x_i$ ). Utility function is symmetric in varieties, which are similar but imperfect substitutes, within an industry or group industries. Utility function is convex, embodies the desirability of variety, and homothetic in its arguments.

Economies of scale are modeled by assuming that all products have an equal fixed and marginal cost, so firms are identical in production technology. In addition, each variety is produced by one firm only; all varieties have unit income elasticity, and the number of varieties ( $n$ ) is reasonably large and yet possible to be provided by the economy. The literature refers to these assumptions as the “DS model preferences.”

Krugman P. (1979, 1980) applied this model to international trade and pointed out that increasing return to scale, an IO feature of the economy, is a reason for trade of differentiated products between similar countries. Krugman argues that the free trade between two countries allows firms to produce a larger output and exploit economies of scale by expanding markets for domestic and foreign firms. Krugman’s monopolistic competition model of trade was one of the first complete models based on the economies of scale. The new trade theory explains the intra-industry trade between similar countries, with trade gains coming from the internal firm’s economies of scale and consumers’ benefits of a larger variety of products.

In his paper Neary (2000) presents a new application of the ‘Dixit-Stiglitz preferences’ (DS preferences as discussed above) to trade theory, showing how multinational corporations can emerge between countries that are similar in factor endowments. He recognizes the

unquestionable impact of the DS model and its applications in the modern trade theory. However, he addresses some limitations of the DS-based trade models regarding the assumptions of identical and atomistic firms, the non-perceived interdependence between firms, and free entry.

Recent monopolistic competition models of trade, Melitz (2003) and others later seemed to address some of the limitations of previous DS based models. These models embrace more realistic assumptions such as differences in firm's technologies and productivities. In these models, the only operative channel to obtain gains from trade is through an increase in product market competition. These gains come from a combination of increased product variety, lower markups, and higher efficiency through 'positive firm selection' process.

In this study, we use a different reasoning in regard to gains from the increased domestic market competition and its effects on firms' performance. The previously mentioned gains are mostly considered as a result of changes in competition laws and economic deregulation. In addition, consumers benefit these gains through international trade channels. We use Krugman's (1979) and Kikuchi's (2008) monopolistic competition models of trade as our theoretical framework to formulate this study's hypothesis. We present a detailed description of these models in Ch. 3.

The linkage between competition policy and exports occurs primarily through the reduction of fixed entry costs, which positively affect the number of domestic firms and varieties. Facilitated entry promotes competitive market structures leading to improved market performance. Papers written by Bliss (1996), Yano and Dei (2003), and Takahashi (2005) focus mainly on whether countries could use weak or protective competition policy, in order to promote exports, affect the trade balance, or improve national welfare.

In his paper, Bliss (1996) argues that competition policy can be used to promote export and that the type of policy intervention involved does depend on assumptions about the marginal cost. Krugman (1984) finds that in case of diminishing marginal costs "import protection is export promotion." In a model in which firms penetrate each-others' markets, tariff protection in the home market limits imports and increases domestic firm sales.

When this protection is coupled with a nonlinear (diminishing) firm's cost function, it will reduce the marginal cost as sales to home and foreign markets are related and jointly determined. As a result of tariff protection, the larger volume of home firm's sales associated with lower marginal cost makes the domestic firm more competitive in the foreign markets, therefore, promoting exports. Bliss argues that Krugman's conclusion of import protection leading to export promotion (which is illegal under GATT) cannot be applied to competition policy. This because there is not a competition policy that promotes exports by protecting home markets.

This ambiguity of the effects of weak competition policy on exports is the result of two conflicting forces at work. First, slack competition policy will result in fewer and larger home firms with economies of scale benefits to be exploited. Second, fewer producers, *ceteris paribus*, will result in lower levels of exports. Bliss argues that where there are constant marginal costs, any competition policy that increases the number of domestic firms promotes exports. This export expansion is realized through increases in home firms' sales and varieties in all markets, and also through lower prices. These lower prices will result in some firms exiting from those exporting markets.

Investigating the effects on the country's trade balance as a result of suppression of competition in non-tradable goods, Yano (2001) finds that results depend on the size of the

country, time-horizon, and the initial sign of country's trade balance. In the small-country case, suppressing competition on the non-tradable sector will create a short-term trade surplus followed by a long-term deficit (excess demand). The direct effects of suppressing domestic competition in the non-tradable sector is a contraction on that country's imports, therefore, creating a short-run trade surplus followed by a trade deficit in the long-run.

The non-tradable goods sector can raise prices and profits by selling less tradable goods, because of weaker competition. Depressing imports in the short-run creates an excess supply for tradable goods in the world markets. Because of the long-run adjustments of production, the supply of tradable is reduced even further in the long run. This will create excess demand for tradable goods in the long-run and, therefore, a trade deficit. The large-country case is important because suppression of domestic competition on non-tradable sector would affect world prices through excess supply and demand for tradable goods.

If the country's trade account is initially not balanced, the price changes cause redistribution of the real wealth between trading partners. Because of the long-run excess demand for tradable goods, prices will rise; thus, it will increase the real wealth of the country that to begin with is a net exporter (has a trade surplus) of those goods. This result implies that, for a trade surplus country, the suppression of the competition policy in the non-tradable sector may serve as a beggar - thy - neighbor policy, at the cost of the net importers. The opposite result is valid for the small-country case.

Authors Yano and Dei (2003) build a trade model that renders tractable the process in which imperfect competition in the country's downstream sector affects the rest of the world through international trade. This paper is similar to that of Yano (2001) that we discussed previously. Assuming that competition policy of the country is imposed on markets for non-

tradable goods, they analyze the effects of changes in competition policy in the downstream sector on country's terms of trade and international trade.

Their results are based on assumptions that leisure and final consumption are substitutes, and Marshall-Lerner condition is satisfied. They find that when a country's downstream sector shifts from an imperfect toward perfect competition with CRS technologies; country's consumer welfare and its trade volume rise. For a large country that starts from a perfect competition in the downstream sector, a slight suppression of competition would have a beggar-my-neighbor effect by improving its terms of trade.

In this case, suppression of competition in the downstream sector, by reducing trade, creates an excess supply of tradable goods in the world markets. As a result, prices for import-competing goods fall and the domestic country's terms of trade improve. Since the terms of trade improve, the home country's utility will increase at expense of the foreign country. The use of competition policy in this case resembles that of an optimal tariff policy.

A study by Takahashi (2005) focuses on effects of suppressing competition policy in the non-tradable sector to the terms of trade. He shows that the domestic competition policy can act as a substitute for tariff policy in increasing the country's welfare. He finds that, in the case of the real-world tariff levels, around 2%, the effects of the optimal competition policy on welfare levels are larger than the same effects from trade liberalization.

Papers by Nagaoka (1998) and Francois and Wooton (2010) emphasize the effects of domestic competition policy, or its absence, on trade patterns. Investigating the trade aspects of competition policy, Nagaoka (1998) analyses how private anticompetitive practices, can serve as trade barriers with international spillovers by reducing market access to foreign and home firms. He analyzes the effects of trade cartels, domestic cartels, mergers and vertical restraints, and

their international spillover through trade channels. In regard to voluntary export and import cartels, he concludes that they are clearly a beggar-my-neighbor policy and represent a negative international spillover of competition policy non-enforcement or non-existence.

Besides potential efficiency gains of mergers, he finds that the consolidated home firms with a higher market power will restrict sales in each market and thus, may end up anti-promoting home exports and promoting imports. Furthermore, use of vertical and territorial restraint by incumbent firms may affect international trade by constraining inter- and intra- brand competition. As such, they limit entry and growth of foreign and domestic producers.

The paper by Francois and Wooton (2010) examines how the degree of competition in services and distribution sectors can be an import barrier affecting goods trade. Their analytical model involves an imperfectly competitive domestic sector sourcing homogeneous goods from home and foreign firms. Imports, exports and domestic supply of goods are imperfectly elastic, meaning an increasing marginal cost of production. There is also a positive import tariff rate.

Products are supplied to consumers by domestic service and distribution sector modeled as Cournot oligopoly with a constant marginal cost. They assume ( $n$ ) identical distributing firms in the service markets. Service firms can restrict their trading and drive down producer's cost in supply markets and raise prices in the retail sector, due to their internal market power. Some propositions based on results from the profit maximization conditions of a representative firm ( $i$ ) in the service sector and importer- country's welfare is:

- The Cournot-Nash mark-up on imports is a decreasing function of import tariff;
- The Cournot-Nash mark-up on domestic shipments is independent of the import tariff;

Their empirical analysis is based on a reduced-form gravity equation of trade. It includes tariffs, distance and measures of the distribution sector competition for a cross-section sample of

22 OECD countries in 2001. They estimate a bilateral import equation, and use an index of barrier to entry, which includes in the road freight and retail distribution, to measure competition. They find that the international trade volumes are inversely related to the degree of market concentration in the domestic trade and distribution sector.

In addition, they find that the largest trade impact of a marginal change in competition policy in the service sectors will be observed in zero-tariff countries. Regarding market access and the exporter, they find that; the trade-volume effect of a tariff reduction is inversely related to the degree of competition in the domestic sector. So, movements toward greater domestic market power may nullify the benefits of a lower tariff rate in export markets. They estimate the negative impact of imperfect competition in the domestic retail sectors (for the EU case) to be on average 3.0-4.0 percent of the value of trade.

Even though this study's analytical and empirical approaches are different, our main result is closely related to theirs. We find that the country's export is inversely related to competition policy, while they reach a similar result by focusing more in the market for imports. Furthermore, we use a monopolistic competition model of trade and an export equation to estimate our analytical results on a country's manufacturing sector over 1970-1997. We do not focus specifically in competition level of the domestic service sector, by using the manufacturing sector's CR4 as a proxy for competition policy. In addition, we assume no transportation costs and no import tariffs.

Researchers Harris (1984), Krugman (1980), Broda and Weinstein (2006), and Vandebusch H. (2000), focus on how changes in competition policy, through lowering fixed entry cost, alter market structure. Fluctuations in market structure then lead to different firm's

conduct and performance, thereby affecting trade determinants like the number of product varieties and price markups.

Given that competition policy facilitates entry, it results in an increase in the number of varieties and consumer's utility. Based upon "love of variety" of the utility function, domestic and foreign consumers will benefit this larger pool of variety through international trade. So a stricter competition policy, through a higher number of varieties, will drive trade, including exports. Furthermore, facilitated entry makes domestic markets more competitive and induces firms to charge lower price markups, improving their efficiency. Both these factors will contribute to the increase of the country's exports.

In Harris model (1984), industry output, price and the average cost are jointly determined by the degree of economies of scale, free entry and pricing strategy. Prices depend on whether firms adopt monopolistic competition model pricing, or the collusive pricing behavior (Eastman-Stykolt hypothesis). A stricter competition policy makes the industry more competitive and pressure firms to change their conduct and set prices closer to the monopolistic competition than the collusive level. Furthermore, changes in price markups are considered an important source by which the benefits from scale economies are achieved. The price markup can fall either due to a less collusive pricing strategy between firms, because of a stricter antitrust law and deregulation, or due to trade liberalization.

In a monopolistic competition market structure, the low-fixed-cost industries usually (because it also depends on the pattern of marginal cost) tend to be relatively competitive. In contrast, the high-fixed-cost industries are fairly concentrated with a comparatively small number of firms. A stricter competition law and deregulation of the economic sectors, lowering fixed entry costs, will decrease the level of the average cost for any given level of firm's output.



One of the determinants of trade in Krugman's (1980) model is the number of product variety. Consumers like having a greater number of varieties available through imports, and it is considered a key source for gains from trade. The utility function used in Krugman's model exhibits 'love of variety', meaning that consumer's utility rises as the number of products increase, even if prices remain constant.

A recent empirical study by Broda and Weinstein (2006), which builds on Krugman's (1980) model, uses disaggregated U.S. import data to estimate consumers' benefits from the increased product variety during 1972-2001. They find that the number of available import varieties has increased three times in 30 years, 1972-2001. This increase has produced a large welfare gain to the U.S. consumers. Furthermore, they find that consumers are willing to pay up to 2.6 percent of their income to access the wider set of varieties available in 2001 rather than the set in 1972. These findings indicate that the gains from trade through an expanded product variety, as suggested by Krugman (1980), are important in reality.

Vandenbussche (2000) analyses the differences between trade and competition policy effects on domestic prices, wages, and employment when product and labor markets are imperfectly competitive. He finds that trade liberalization, and stricter competition policies increase the product market competition resulting in lower price markups and higher efficiencies. In addition, imported competition through trade has a bigger disciplining effect than competition policy on domestic wages.

Several empirical studies related to our topic deal with positive effects of competition policy and deregulation on market performance and trade determinants. Ahn (2002) finds that commodity market competition positively impacts productivity growth in the long-run. Furthermore, the positive competition policy effects are not only the short-run static efficiency

gains, but also the long-lasting effects on economic performance through innovations and ‘positive selection’ process. Cohen and Levin (1989) show empirical evidence that does not support the idea of market concentration serving as a determinant for the firm's innovation behavior.

Comparative case studies suggest that competition enhance productivity. Comanor and Scherer (1995) attributed the differences between the better performance of the Standard Oil Co. and the poorer performance of the US Steel Corporation to the use of antitrust enforcement on the Standard Oil Company. In addition, Disney et al. (2000) found that the market competition significantly raises the productivity levels and growth rates. We should emphasize though that firm’s productivity could also be affected by other factors not related to competition, like technological progress.

Another empirical study assessing the effectiveness of competition policy on total factor productivity, over 22 industries in 12 OECD countries, is that of Buccirossi et al., (2011). They find that “good” competition policy (“good” means a competition policy that considers efficiency gains) has a positive and highly significant effect on total factor productivity growth. Kahyarara (2004), using firm-level data, finds a positive relationship between competition policy and the Tanzanian manufacturing productivity, exports and firm’s investments. In addition, he finds that firm’s productivity increases on average by 50% after the introduction of competition policy.

Market regulation such as price and entry controls impedes the product market competition and generally creates inefficient allocation of resources. These inefficiencies result in lower productivity growth and technological improvement. Several studies show that the deregulation, or a decrease in regulation, has a productivity –enhancing effect. Kwoka (1993)

finds that competition for AT&T (1977-1987) and privatization for British Telecom (1984-87) accounted for 17% and 25% productivity growth respectively.

An empirical study by Kee and Hoekman (2003) analyzes the competition law effects on price markup, for a sample of 28 tradable goods industries, in 42 countries from 1981-1989. They find evidence that the existence or adoption of the competition law positively affects the long-run equilibrium number of the home firms, and thus, indirectly reduces the industry markups. Furthermore, their results show that the number of domestic firms responds to fix entry costs. They find that industries operating under competition law tend to have on average 7.2 percent more domestic firms than those operating without it.

2.2 The second segment of the literature review consists of papers analyzing the impact of trade on competition policy, especially regarding merger's policy and antitrust law enforcement. Studies by Harris (1984) and Cox and Harris (1985) analyze the effects of tariffs and protectionist trade policy on market access, performance, and economies of scale.

To quantify the cost of tariff protection in a small open economy, they incorporate IO features into an empirical general equilibrium trade model. These features were imperfect competition, economies of scale, entry barriers represented by the fixed costs, and product's differentiation. The IO view regarding tariff protection is that it restricts market access by reducing foreign competition. Thus, it promotes too many small-scale and inefficient domestic firms within an industry.

Furthermore, another issue related to tariff protection is possible facilitation of oligopoly coordination (i.e. collusive pricing behavior) by the protected firms, as in the hypothesis put forth by Eastman and Stykolt (1967). Researchers suggest that calculations of competitive neoclassical models (assuming CRS in production) regarding the cost of tariff protection are

quite minor compared to those of imperfect competition assumptions. These effects may become more accentuated in the case of a small open economy than in a large one.

Cox and Harris (1985) using the IO approach to international trade model estimated the cost of tariff protection for Canadian economy (equivalent to gains from free trade) in the mid-1970s to be about 8-10 percent of GNP. These results are considerably greater than the estimates of free trade benefits based on conventional neoclassical trade models with CRS assumptions that are in the range of 0.0-1.0 percent of GNP. Furthermore, it is through intra-industry rationalization that these benefits are achieved. These different estimates show that ignoring IO aspects of the economy may underestimate the effects of trade policy.

Studies by Krugman (1981a), Brander and Krugman (1983), Ross (1988), Pavcnik (2002), and Treffler (2004) deal with the impact of trade liberalization on domestic industry rationalization, price markup, and market performance. The question that trade liberalization will lead to industry rationalization was addressed theoretically by Krugman (1981a). He argues that inefficient firms will exit market, and the more efficient firms will increase their production achieving economies of scale. The proof to this industry rationalization effect comes from empirical studies on countries that experienced free –trade.

Studying this topic, Pavcnik (2002) uses plant-level data for eight Chilean manufacturing sectors during 1979-1986, right after Chile's massive trade liberalization of 1975-1979. She finds that about 35% of the 1979 existing plants exited the industry. Furthermore, exiting firms were the least efficient ones and that their exit contributed to industry's productivity gains.

Empirical study by Treffler (2004) uses also plant-level data on 213 four-digit SIC manufacturing industries during a 10-year period after 1988, to examine the short-run adjustment costs and the long-run benefits of Canada – U.S. free-trade agreement. He finds that the most

impacted import competing industries experienced a 12-percent employment loss. This reflected the fact that these industries were heavily protected and the least efficient. The export-oriented industries had insignificant employment loss, and the entire manufacturing industry lost 100,000 jobs or 5% of its employment.

Labor productivity within the manufacturing sector increased overall by six (6) percent. He also finds that rising labor productivity reflects technical efficiency gains. These gains came from, plants moving down the average cost curves with expansion of output at about 6-percent, and on import competing industries the exit or contraction of lower productivity plants. His main conclusion was, “Canada-U.S. free-trade agreement was associated with short-term substantial employment losses that were compensated by the long-term permanent gains in labor productivity.”

A study by Brander and Krugman (1983) addresses the case of trade in homogenous goods in the presence of transportation costs. The question they analyze is “whether international trade in this case would amount in unnecessary waste of resources equal to transportation costs?” They find that this two-way trade of homogenous goods will be worthy because it benefits competition between firms. Even in the case of homogeneous products, they find a reason for trade that of lower price markups.

Both IO and Trade literature consider dumping as a particular case of price discrimination in international markets. Dumping is both a trade and imperfect competition issue. The main insight comes from the existence of asymmetric market structures in different countries, as in Caves and Jones (1985). This asymmetry assumes a protected domestic market to imports (through tariffs) and home monopolist exporting. Due to different home and foreign

market structures, home firm sets a higher price in domestic but a competitive world price in export markets.

Ross (1988) investigates interactions between international trade and competition policy, especially on how exogenous changes in the level of tariff protection affect market performance. Benefits of a freer trade are substantial in case of IRS, imperfect competition, and if foreign firms are competitive while domestic ones are price takers. The question he answers is: “will the home price necessarily fall..., as tariffs are reduced or abolished leading to home welfare increase in case where either or both foreign and domestic firms were not perfect competitors?”

In the case of a dominant home oligopoly and applying different assumptions of the imperfect oligopoly model, he finds that the domestic price would rise as tariffs fall. These findings support the idea that when markets are imperfectly competitive, free trade alone may not necessarily bring substantial benefits to home consumers. Furthermore that liberalized trade is no substitute for an active competition policy. In imperfect markets or industries, a lower tariff level may be viewed as a complementary instrument in moving toward the ‘first best’ as the market outcome.

Studies by Richardson (1999), Horn and Levinsohn (2001), and Cadot, Grether and de Melo (2000) focus on interactions between liberalized trade and competition policy. In particular, they treat effects of trade on merger policy and the degree of antitrust law enforcement.

Horn and Levinsohn (2001) analyze interactions between merger policy, as an important aspect of competition policy, and trade liberalization. The level of industry concentration measured by each country’s number of firms captures merger policy. Their un-ambiguous conclusion is that “trade liberalization results in a stricter standard for competition policy, in

order to increase market share in export markets even though it might come at a cost of under-exploitation of economies of scale."

Richardson (1999) in a simple two-country model of trade and competition policy, producing homogeneous goods, examines the changes in the country's competition policy aiming to maximize national welfare, after trade liberalization. He assumes that governments choose the number of home firms, a proxy for competition policy, that compete in a Cournot oligopoly. He finds that Nash equilibrium number of firms shows that welfare of one country is a declining function of other country's number of firms. Therefore, each country would prefer for the other country to have fewer firms than them.

In their study, Cadot, Grether and de Melo (2000) discuss linkages between trade and competition policy by surveying the recent research on the topic. They analyze issues such as "substitution hypotheses," different incentives of national governments toward mergers, and the possibility of competition policy harmonization. Evidence from empirical literature seems to support the 'substitution hypotheses.' This result should be cautiously interpreted, as it applies mostly to the tradable goods sector and especially the intra-industry trade sectors. Product differentiation industries that compete in dimensions other than price are less affected by this disciplining.

2.3 The third segment of the literature review contains several studies focusing on the idea of harmonization or coordination of the national competition policies. The possibility and the effects of harmonization of competition policies are analyzed from the prospect of the interactions that exist between competition policy and trade. The purpose of competition policy coordination is to avoid distortions of and to further the recent gains from trade liberalization.

Bliss (1996) states “only recently have economists begun to take into account the fact that almost any national law affecting the production or consumption has consequences for international trade and competitiveness.” These consequences are minimal in perfect competition but are larger under more realistic market structures characterized by imperfect competition and economies of scale.

Because GATT does not address the important issues of different types of monopoly or cartel, lately the focus has shifted into the direction of harmonization of competition policies to create a level-playing-field. This is because the indirect trade barriers such as a natural monopoly, barriers to entry or retail network's restriction are all subject to national competition policies. Bliss argument is that a weak antitrust control mainly harms the nation allowing it and usually anti-promotes its exports.

Levinsohn (1994) provides a general classification of competition policies into five groups:

- Exceptionally lax (meaning minimal antitrust law and its enforcement) approaches in both domestic and export markets.
- Exceptionally strict competition policies in both markets (for example, example U.S.).
- ‘Rule-of- Reason’ approach for domestic markets, while a lax competition policy on export markets. The Rule - of - Reason means competition policy that considers firm’s efficiency versus consumer surplus loss, resulting from firm’s anticompetitive behavior.
- Rule-of-Reason in both markets (Canada’s competition policy became the Rule – of – Reason by amending the Competition Act in 1986).
- Strict competition policies in domestic markets, while exempting the exporting firms from competition policy.



Levinsohn points out “linkages between competition policy and international trade are very important to be ignored, and that further examination is needed.” He discusses several ways of harmonizing individual competition policies among trading countries. He indicates that “in a global economy, competition policy which once was considered a purely domestic issue has worldwide implications through trade channels.”

Cadot, Grether and de Melo (2000) in regard to government incentives in allowing horizontal mergers with cross-borders effects, find that it usually depends on the different objective functions of the national government. This means what weight governments place on domestic and foreign producers such as merging firms, industry’s fringe firms and on consumers. Very little progress has been achieved on harmonization of national competition policies, due to lack of a strong analytical arguments on this issue. An exception in this area is the European Union’s positive experience.

Meiklejohn (1999) argues that it could be desirable to have a multilateral agreement on competition policy to realize gains from trade liberalization by eliminating restrictive business practices. The idea of an international competition policy seems to be not feasible in the short – run but might be desirable in the long run from the viewpoint of maximizing the global welfare. In the short run, the cooperation between domestic antitrust authorities or harmonization of competition policies is more likely. They are already happening in the framework of bilateral or regional agreements such as US with EU, EU with EFTA, US with Canada, and within the EU members.

In his paper, Graham (2003) tries to find out the best way to deal with some worldwide competition problems arising due to international cartels. His answer is, to internationalize competition policy possibly through two alternatives. The first one is to have a formally

negotiated agreement on competition policy either within the WTO framework or outside of it. The second is having cooperative efforts by enforcement agencies in different countries.

For the moment, the second alternative seems more feasible, and it is actually effective in the case of U.S. and E.U. cooperation of enforcement agencies in regards with enforcement of competition law in both markets. In the U.S., since 1981, relatively fewer mergers and acquisitions have been challenged based on 'efficiency argument' stemming from the mergers. Antitrust authority's enforcement of competition laws with respect to mergers has been evolving lately by accepting mergers as the market outcome and not as anticompetitive practices.

Richardson (1999) focuses on the idea of competition policies being coordinated in order for global welfare to be maximized. He concludes that coordination will involve less competitive behavior than when such policies are not harmonized. Pitofsky (1999) addresses the development of procedural coordination on international antitrust, the concept of positive comity, and the prospect for global convergence of antitrust law.

Actually, approximately 113 countries have some type of competition law. About 83 of these laws took effect during the last two decades. This trend is likely to continue as more countries adopt competition laws and increase their enforcement in the future. Several countries have entered into either reciprocal or multilateral agreements to cooperate on competition policies and their enforcement. For example, U.S. has entered into bilateral agreements on procedural cooperation with Germany (1976), Australia (1982), EC (1991, 1998), Canada (1984 revised in 1995). Lately, the relations between E.U. and U.S. enforcement authorities have progressed toward a slow but steady convergence of review and mutual respect.

There is some recognition that absolute uniformity as far as the convergence of competition policies is impossible. However, some limited convergence could be practical and

achievable, especially with regards to anti-cartel enforcement among most countries. This aims to minimize the extent to which the divergence of each country's antitrust rule could harm international trade growth.

### **Chapter 3. Research Design - Theoretical Model**

In this chapter, we consider monopolistic competition models of trade by Krugman (1979, 1980), and Kikuchi et al. (2008), to investigate the effects of competition policy on exports. We focus on the impact that the domestic competition policy has on the number of home firms and industry's exports, through lowering fixed entry cost. Thus, in order to capture the effects of firm's technologies on exports, we analyze an asymmetric monopolistic competition model of trade. We start with Krugman's model (1979), and then extend our analysis by including firm's technical asymmetry regarding fixed cost.

The model format:

We use Krugman's (1979) monopolistic competition model of trade as a starting point because most of the fourteen (14) Canadian manufacturing industries selected to test our study's hypothesis operate in an imperfect market structure. The characteristics of monopolistic competition are a large number of firms that manufacture differentiated products and face fixed and variable costs. Furthermore, we use the results from an asymmetric monopolistic competition model of trade, Kikuchi *et al.* (2008) to analyze this study's main question.

We are interested in the number of firm variable, which is related to both competition policy and trade. Since this model assumes that each firm produces only one variety, the number of firms and/or varieties are used interchangeably. The number of firms or varieties is one of the trade determinants and also indicates the level of market or industry competition. This variable is subject to competition policy, especially antitrust law actions and deregulation, which affect entry barriers and, therefore, number of firms.

Our analysis is based on the premises that competition policy changes affect industry structure and performance through fixed entry costs and other barriers to entry. For example, the

adoption of a stricter competition policy contributes to a lower fixed entry cost which facilitates entry and positively impacts the number of firms. Due to this increase in competition, price markups will decrease resulting in similar gains to those of economies of scale. In this aspect, competition policy influences trade and exports through changes in market performance and trade determinants.

We use a two-step analysis; first, using the monopolistic competition model of trade, we establish the relationship between industry's fixed entry cost and the number of home firms. Second, we determine how, due to competition policy changes, the number of firm variations affects industry's and country's exports.

#### Model Assumptions:

We start with Krugman's model assumptions: Firms experience economies of scale in production (Increasing Returns to Scale technologies), and they operate in a monopolistic competition market structure, manufacturing differentiated products. Demand curve of each firm is downward sloping reflecting some market power of firms on prices, so price markup is positive  $(p - mc) > 0$ . Each firm produces one variety, and the number of firms or varieties ( $n$ ) is a finite and relatively large number. The economy can produce those varieties, and variety and/or firm -specific variables will be indexed by firm label ( $i$ ), for  $i = (1, \dots, n)$ . Consumer preferences are heterogeneous between and within countries, meaning that firms within a country will produce goods that are consumed domestically and abroad. All consumers have the same utility function.

Consumer's utility function is:

$$U = \sum_{i=1}^n V(C_i) \quad (1)$$

Where:  $C_i$  - is per-capita consumption of variety( $i$ ), and  $V' > 0$  and  $V'' < 0$  due to diminishing marginal utility of ( $C_i$ ). The model's utility function exhibits the 'love' of variety.

The budget constraint of representative consumer is;

$$\sum_{i=1}^n P_i C_i = W \quad (2)$$

Where,  $W$  - is the total income.

The choice variable for utility function maximization is  $C_i$ , so from the first order condition we get;

$$V'(C_i) = \lambda P_i \quad (3)$$

Where,  $\lambda$  - is the marginal utility of income. We can derive the price elasticity of demand for consumption of variety ( $i$ ) by totally differentiating the first-order condition in eq. 3;

$$V''(C_i) d C_i = d P_i \lambda \quad \text{and we have} \quad \frac{d C_i}{d P_i} = \frac{\lambda}{V''(C_i)} < 0 \quad (4)$$

Eq. 4 represents the slope of the demand curve for variety ( $i$ ). Using both equations 3 and 4, we can derive the elasticity of demand curve for variety ( $i$ ) as:

$$\varepsilon_i = - \frac{V'}{C_i V''} \quad (5)$$

Where;  $V'$  and  $V''$  depend on ( $C_i$ ), so the  $\varepsilon_i$  is a function of ( $C_i$ ) only.

A critical assumption of the model is that  $\frac{d\varepsilon(C_i)}{dC_i} < 0$ , meaning that the elasticity of per-capita consumption drops as per-capita consumption of that variety ( $C_i$ ) gets larger. Therefore, the demand for variety ( $i$ ) becomes less elastic as ( $C_i$ ) increases. Assuming that all consumers are identical, and that all varieties enter the utility function symmetrically, we have that ( $C_i$ ) =  $C$  for  $i = 1, \dots, n$ . Then we can write  $U = n V(c)$ , and the budget constraint becomes:  $npc = w$  leading to  $\rightarrow c = (\frac{w}{p})/n$ , and the utility function becomes;

$$U = n V \left( \frac{w}{n} \right) \quad (6)$$

We have that  $U'_n > 0$  and  $U'_w > 0$ , so utility increases as the number of varieties ( $n$ ) and real wage  $\left(\frac{w}{p}\right)$  rises.

Producer's side; all producers face same cost function (technology),

$$l_i = \alpha + \beta x_i \quad (7)$$

Where;

$l_i$  – is the labor unit required to produce  $x_i$  units of variety( $i$ ),

$\alpha$  – is the positive fixed cost; the assumption is  $\alpha > 0$  for increasing return to scale to exist.

$\beta$  – is the constant marginal cost.

We have just one factor of production, labor( $L$ ), and  $\alpha > 0, \beta > 0$ .

$L$  -is the number of individuals in the economy, each endowed with one unit of labor. Based on the above cost function we have the total cost of variety ( $i$ ) being:

$$TC(x_i) = w l_i = \alpha w + \beta w x_i$$

And average cost equaling;  $AC(x_i) = \frac{\alpha w}{x_i} + \beta w$  (8)

The average cost  $AC(x_i)$  decreases as  $(x_i)$  increases, because of  $\left(\frac{\alpha w}{x_i}\right)$  term and the marginal cost being constant. The model assumes that economy is in full employment, so the labor market equilibrium is given by;

$$L = \sum_{i=1}^n l_i = \sum_{i=1}^n (\alpha + \beta x_i) \quad (9)$$

Under autarky, we have that the output of  $(x_i)$  will equal the consumption of it, so we can write;

$$x_i = L C_i \quad (10)$$

Producers maximize their profits:  $\max \{ p_i x_i - w l_i \}$

In equilibrium two conditions need to be satisfied;

- 1- Profit maximization condition,  $MR=MC$ , from which we derive the PP (profit maximization) curve Fig.1.
- 2- The long-run zero profit condition, from which we derive the ZZ (zero profit) curve Fig.1. This condition reflects a monopolistic market structure of the industry, with firm's downward-sloping demand curves and the assumption of free entry and exit. Net entry will occur until profits are driven to zero, meaning ( $P = AC$ ).

From the first equilibrium condition, the PP curve is defined as;

$$\frac{p}{w} = \frac{\beta \varepsilon(c)}{\varepsilon(c)-1} \quad (11)$$

From the second equilibrium condition, we define the ZZ curve as;

$$\frac{p}{w} = \frac{\alpha}{x} + \beta \quad (12)$$

The equilibrium price and quantity of per-capita consumption  $[(p/w)^e, c^e]$  of each variety are determined by the intersection of the PP and ZZ curves, where both equilibrium conditions are satisfied. Under autarky, we have  $x_i = Lc_i$  and  $x_i^e = Lc_i^e$ . With labor ( $L$ ) considered fixed, we have that  $x_i$  is positively related to per-capita consumption  $C_i$ .

The equilibrium number of firms ( $n$ ) is given by;

Assuming full employment condition, from equation (9) we have;  $nl_i = L$  or  $n = L/l_i$

Substituting in eq. 9 for  $l_i = \alpha + \beta x_i^e$  we get  $n^e = \frac{L}{\alpha + \beta x^e}$  (13)

Since the model assumes that each firm produces only one variety, if the number of varieties ( $n$ ) decreases, it implies fewer firms in market and vice-versa. From equation 13 we have that a decrease in the fixed costs will result in a higher number of firms, since  $dn/da < 0$ . Now consider the case of free trade between home and foreign country (\* asterisk denoting



foreign country variables) with identical tastes and technologies and only one factor of production, labor ( $L, L^*$ ).

Using the symmetry conditions from the above model assumptions, we can characterize this two country model free trade equilibrium in a  $\{\frac{p}{w}, c\}$  space as; the price of each variety in both countries is the same; because of identical Home and Foreign firms' assumption, the equilibrium output per firm is the same in both countries,  $x^{e*} = x^e$ ; and that each country's equilibrium number of firms/varieties is determined respectively by their full-employment condition as:

$$n^e = \frac{L}{\alpha + \beta x^e} \quad \text{And} \quad n^{e*} = \frac{L^*}{\alpha + \beta x^{e*}} \quad (14)$$

Where;  $n^{e*}, L^*$  and  $x^{e*} = x^e$ , - are the equilibrium number of variety, labor force and output of each product in foreign country. With trade between two countries,  $(L + L^*)$  domestic and foreign consumers maximize their utility over  $(n + n^*)$  number of varieties.

Before introducing domestic competition policy change and its effects on variables of the monopolistic competition model of trade, we consider an asymmetric version of it. For our study, we consider the change in domestic competition policy an exogenous factor that affects the home firms' fixed cost variable. In this study, since changes in competition policy do influence firms' technologies through lower fixed cost, in analyzing its impact on exports, we discuss the case when  $\alpha \neq \alpha^*$ .

The Krugman's model assuming homogeneous firms (and not a multiple-industry framework) cannot be extended to the case when firms fixed costs are different across countries. For example, in case of two economies (countries) with firms' fixed costs such that  $\alpha < \alpha^*$ , in free-trade equilibrium, we would have a complete specialization with only home firms

producing. Therefore, all goods will be produced only in the Home country and would be no Foreign firms in the market.

For this reason and in function with our study's purpose, we adopt the extended analysis of the standard Krugman's monopolistic competition model of trade by Kikuchi *et al.* (2008). Their model includes multiple industry framework and allows for firms' technical heterogeneity across countries, in both fixed and marginal costs. We analyze the impact of changes in competition policy on patterns of trade and, therefore, on country's export using this multi-industry asymmetric monopolistic competition model of trade. Furthermore, the results we get from this analysis are relevant to our study. These results consist of each industry concentrated in a single country, except possibly one industry in which intra-industry trade occurs. Thus, the results of competition policy impact on the country's export using the Kikuchi model cannot be obtained under the assumption of technical homogeneity across firms.

In addition, we use this model's result to answer the main question in the study and analyze the effects of competition policy on domestic firms and country's exports. Here is a brief description of Kikuchi *et al.* (2008) model and their results. The notations are different from the previous (Krugman) model. There are two countries Home and Foreign, each endowed with  $(L)$  units of labor and the only source of income,  $w$ . There are  $M$  industries indexed by industry label  $i$  (for  $i = 1, \dots, M$ ). Consumers have Cobb-Douglas preferences. Each industry is modeled as a Dixit-Stiglitz (1977) monopolistically competitive industry indexed by  $i \in [0,1]$  so the quantity index of industry ( $i$ ) is:

$$X^i = \left( \sum_{k=1}^{n^i} (d_k^i)^\theta + \sum_{k^*=1}^{n^{*i}} (d_{k^*}^i)^\theta \right)^{1/\theta}, \quad \text{for } 0 < \theta < 1, \quad (15)$$

Where  $n^i$ , ( $n^{*i}$ ) is the number of products in industry ( $i$ ) in Home (Foreign),  $d_k^i$  ( $d_{k^*}^i$ ) is the quantity of product  $k$  ( $k^*$ ) in the Home market. Also  $\sigma \equiv \frac{1}{(1-\theta)} > 1$  is the elasticity of

substitution between every pair of differentiated products and  $\theta$  is a preference parameter. The industry price index is:

$$P^i = \left( \sum_{k=1}^{n^i} (p_k^i)^{\frac{\theta}{\theta-1}} + \sum_{k^*=1}^{n^{*i}} (p_{k^*}^i)^{\frac{\theta}{\theta-1}} \right)^{\frac{\theta-1}{\theta}}, \quad (16)$$

Where  $p_k^i$  ( $p_{k^*}^i$ ) is the price of the  $k$  ( $k^*$ )th differentiated product produced in industry ( $i$ ) in Home (Foreign). The total revenue at Home is ( $wL$ ) and is distributed equally among each industry due to the symmetric consumer preferences' assumption. From the utility function maximization problem, we get the following demand functions for Home consumers:

$$d_g^i = (p_g^i)^{\frac{1}{\theta-1}} \left[ \frac{wL}{M(P)^{\theta/(\theta-1)}} \right] \text{ where, } g = k, k^*. \quad (17)$$

Assuming that there is not trade cost, then the prices of each product in both countries are equal. So the demand functions for Foreign consumers are:

$$d_g^{*i} = (p_g^i)^{\frac{1}{\theta-1}} \left[ \frac{(w^*L^*)}{M(P)^{\theta/(\theta-1)}} \right] \text{ where, } g = k, k^*. \quad (18)$$

Every Home (Foreign) firm in industry ( $i$ ) has  $\alpha^i$  ( $\alpha^{*i}$ ) and  $\beta^i$  ( $\beta^{*i}$ ) units of labor as fixed and variable input (marginal cost). In addition, since the number of firms is very large, the elasticity of demand for each variety becomes  $\sigma > 1$ . In our sample of fourteen (14) Canadian manufacturing industries, the industry's average number of firms is 131, with a range that varies between 24-389 establishments. Therefore, monopolistic competitive firms price their products at a markup over marginal cost:

$$p_k^i = \frac{\sigma \beta^i w}{(\sigma-1)}, \quad \text{and} \quad p_{k^*}^i = \frac{\sigma \beta^{*i} w^*}{(\sigma-1)}. \quad (19)$$

Using these pricing equations (19) in equation (16), and substituting into demand functions for Home and Foreign consumers, we have the profit function of each Home (Foreign) firm. Hereafter the subscript ( $k$ ) is dropped for simplicity.

$$\pi^i = (p^i - \beta^i w) x - \alpha^i w = \frac{(1-\theta) \left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}}}{n^i \left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}} + n^{*i} \left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}}} \frac{wL + w^* L^*}{M} - \alpha^i w \quad (20)$$

$$\text{Similarly for each Foreign firm: } \pi^{*i} = \frac{(1-\theta) \left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}}}{n^i \left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}} + n^{*i} \left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}}} \frac{wL + w^* L^*}{M} - \alpha^{*i} w^* \quad (21)$$

They consider the specialization pattern of industry ( $i$ ) between two countries under the free trade, and zero transportation costs conditions. The free-trading equilibrium requires the profits in industry ( $i$ ) to be zero in each country. Thus, by setting each Home (Foreign) firm's profits equal to zero eq. 20 and 21, ( $\pi^i = \pi^{*i} = 0$ ), they determine if both countries' firms can co-exist, and if it is consistent with free trading equilibrium. The condition for industry ( $i$ ) Home and Foreign firms to co-exist is that each country's firms profits must be identical, so  $\pi^i = \pi^{*i}$  eq. (22). Substituting (20) and (21) into (22) they obtain,

$$\pi^i = \frac{\left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}} (\alpha^i w - \alpha^{*i} w^*)}{\left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}} - \left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}}} - \alpha^i w \quad (23) \quad \text{and} \quad \pi^{*i} = \frac{\left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}} (\alpha^i w - \alpha^{*i} w^*)}{\left(\frac{\beta^i w}{\theta}\right)^{\frac{\theta}{\theta-1}} - \left(\frac{\beta^{*i} w^*}{\theta}\right)^{\frac{\theta}{\theta-1}}} - \alpha^{*i} w^* \quad (24)$$

These two profit functions hold only if  $\pi^i = \pi^{*i}$ , and also from eq. (23) we see that profits are independent from the total number of firms. From equations (20) and (21), they derive the equilibrium number of firms in the case when only one country's firms exist:

$$n_{\{n^{*i}=0\}}^{iT} = \frac{(1-\theta)(wL + w^* L^*)}{M \alpha^i w} \quad (25) \quad \text{and} \quad n_{\{n^i=0\}}^{*iT} = \frac{(1-\theta)(wL + w^* L^*)}{M \alpha^{*i} w^*} \quad (26)$$

Here the superscript ( $T$ ) denotes a trading equilibrium value. Using results in eq. (25) and (26), they obtain the necessary condition for the co-existence of Home and Foreign firms in the industry ( $i$ ). They define a technology index for industry ( $i$ ) as:

$$A^i \equiv \left(\frac{\alpha^{*i}}{\alpha^i}\right)^{1-\theta} \left(\frac{\beta^{*i}}{\beta^i}\right)^\theta \quad (27)$$

The free-trade equilibrium means that profits in industry ( $i$ ) in each country should be zero, so  $(\pi^i = \pi^{*i} = 0)$ . From the above equations it can be shown that these conditions are satisfied only if the technology index ( $A^i$ ) is equal to the relative wage rate  $\omega = w/w^*$ . Their main results, which we are going to use in our analysis, are:

If  $A^i > \omega$ , then only home firms will produce the differentiated products in industry ( $i$ ).

So we have a complete specialization of industry ( $i$ ) in the Home country.

If  $A^i < \omega$ , then only foreign firms will produce industry ( $i$ ) products.

If  $A^i = \omega$ , then intra-industry trade occurs in industry ( $i$ ). This is the case when Home and Foreign firms co-exist and produce differentiated products in that industry.

As a proof that when  $A^i > \omega$  both countries' firms cannot co-exist, they show that if home firms profits are zero, then the foreign firms' profit will be negative if they enter the world market. On the other side, they show that for  $A^i > \omega$  case, the free trading equilibrium cannot be supported if only foreign firms are active in market. This because the Home firms profit is positive, and they have an incentive to enter the market. Therefore, in the free trading equilibrium when  $A^i > \omega$ , only home firms produce differentiated products in industry ( $i$ ). This proof is derived by substituting equations (25) and (26) into profit functions (20) and (21):

$$\pi_{\{n^i=n^{iT}, n^{*i}=0\}}^{*i} = \alpha^{*i} w^* \left[ \left( \frac{\omega}{A^i} \right)^{\frac{1}{1-\theta}} - 1 \right] < 0 \text{ if } A^i > \omega, 0 < \theta < 1 \text{ and,}$$

$$\pi_{\{n^i=0, n^{*i}=n^{*iT}\}}^i = \alpha^i w \left[ \left( \frac{A^i}{\omega} \right)^{\frac{1}{1-\theta}} - 1 \right] > 0 \text{ if } A^i > \omega, 0 < \theta < 1.$$

We use their results to conduct our analysis on the effects of competition policy changes, through lowering fixed cost, on the number of domestic firms. We keep the assumptions of free trade, zero transportation cost, and free entry and exit. We add the assumption that only the Home country changes its competition policy, while the foreign country does not. In addition, we

also assume that firms' variable input (marginal cost) is the same across countries. Firms are still considered symmetric within each country's industry ( $i$ ).

We perform our analysis based on changes in the trade specialization patterns caused by changes in the fixed cost of Home firms. We analyze the case when the home country adopts a stricter competition policy, implying a lower fixed entry cost for Home industries. Throughout this analysis, we attribute the lowered fixed costs to the changes in domestic competition policy. We start from an initial (*ex-ante*) and plausible position when both countries' firms co-exist in industry ( $i$ ). Then we see how changes in the home country fixed costs affect trade specialization patterns between two countries.

We conduct our analysis at the industry level by comparing two equilibriums in both countries corresponding to two time-periods before (*ex-ante*) and after (*ex-post*) changes in the domestic competition policy. Ex-post (new) equilibrium represents Kikuchi's model outcome in the home and foreign country after that domestic competition policy changes have occurred. Ex-ante and ex-post variables are marked with subscript zero and one, respectively. We start from,

$$A^i \equiv \left(\frac{\alpha^{*i}}{\alpha^i}\right)^{1-\theta} \left(\frac{\beta^{*i}}{\beta^i}\right)^\theta = \omega$$
, where  $\omega = w/w^*$  is the relative wage rate, which is the co-existence condition for both Home and foreign firms in industry ( $i$ ). Also from eq. (27) we can see that  $\frac{\partial A^i}{\partial \alpha^i} < 0$ , implying that a decrease in fixed cost in industry ( $i$ ) raises the technology index of that industry.

Based on our assumptions of equal marginal costs ( $\beta$ ) across countries in industry ( $i$ ) and that the Foreign country's competition policy remains unchanged, meaning that  $(\alpha^{*i})$  and  $(\omega)$  are constant, we have that a stricter domestic competition policy (lower  $\alpha^i$ ) will increase the industry ( $i$ ) technology index  $A^i$  since  $\frac{\partial A^i}{\partial \alpha^i} < 0$ . So we switch from the ex-ante co-existence

condition for Home and foreign firms  $A_0^i = \omega$ , to that of ex-post where  $A_1^i > \omega$ , implying that only home firms produce in industry ( $i$ ). So we have a complete specialization of industry ( $i$ ) toward the Home country, which implies a positive entry and a higher number of domestic firms to the world market.

Another possibility is if we started from the ex-ante condition of  $A^i < \omega$ , where only the Foreign firms produce industry ( $i$ ) products. Again, procompetitive changes in competition policy, lowering fixed cost  $\alpha^i$ , cause the  $A^i$  to increase. If the change in fixed costs is such that the technology index becomes equal to relative wages,  $A_1^i = \omega$ , then the Home firms will enter the world market by producing in industry ( $i$ ). Furthermore, they will co-exist with foreign firms in free trading equilibrium in that industry.

Since the model assumes many manufacturing industries and that competition policy generally affects all industries within a country, even though non-uniformly, we would expect similar results for the entire manufacturing sector. Assuming a hypothetical  $m$  industry in [1...  $M$ ], and if  $A^{m-1} > \omega > A^m$ , then the firms within industries 1 to ( $m-1$ ) are positioned in Home, while firms within industries [ $m$  to  $M$ ] are located in Foreign country. When  $A^i$  increases due to changes in domestic competition policy (lower  $\alpha^i$ ) the number of industries ( $m \rightarrow m'$ ) increases.

Thus, expanding the range [1...  $m'$ ] of industries where only home firms produce differentiated products. So this model's key result is that, when a country adopts a stricter competition policy, the number of industries in which only the Home firms produce the differentiated products is expanded. Therefore, the result is that the number of domestic relative to foreign firm increases. So determining the relationship between changes in domestic competition policy and the number of Home firms within a free-trade framework is the first step in our analysis.

After determining the model's prediction of competition policy on the number of domestic firms, the second step in our analysis is to relate the latter variable,  $n$ , with country's exports. Let  $n_{CP0}^e$  and  $n_{CP1}^e$ , be the equilibrium levels of domestic firms before and after competition policy changes. Let  $n^{e*}$  the number of foreign firms. Because the utility function in the model exhibits "love of variety,"  $U_n'' < 0$ , the individuals of both countries will maximize their utility over  $(n^e + n^{e*})$  of varieties. Thus, the increased diversity of imperfect substitutes drives gains from international trade, and therefore, drives exports.

To determine the trade effects due to an increase of domestic firms, we follow the analysis by Krugman (1980). In here we define the fraction that home and foreign individuals will spend on goods produced abroad. For the home consumers, the income fraction spent on imports is,  $n^*/(n + n^*)$  and for the foreign consumers, the income fraction spent on home exports is  $n/(n + n^*)$ . Denoting the latter term by  $X$ - home exports, we have the value of the home-country export share of the foreign country's income, measured in the wage units ( $L^*$ ), given by;  $X = L^* n / (n + n^*)$ . From this expression, we can determine the effects of changes in ( $n$ ) on home exports as:

$$\frac{\partial X}{\partial n} = \frac{L^* n^*}{(n+n^*)^2} > 0 \quad (28)$$

In eq. (28), variables ( $L^*$ ), ( $n^*$ ), and ( $n$ ) are all positive. So, we conclude that there is a positive relationship between home-country exports and the number of domestic firms. In addition, the above monopolistic competition models of trade determine how the changes in competition policy, through fixed entry cost, affect the equilibrium number of domestic firms. In our study, we attribute the variations in firms' fixed costs to the changes in competition policy. We explain these interactions in more details in Chapter 4, for the country case of Canada.



This study's hypothesis is derived from the prediction of the above model of trade (Kikuchi 2008) that procompetitive changes in competition policy have a positive effect on domestic firms, and, therefore, country's exports. The above analysis shows that a stricter national competition policy, lowering fixed entry costs, in the long-run leads to a higher number of domestic firms ( $n^e$ ), and a lower price markup of their varieties. Since  $U'_n > 0$  and  $U'_w > 0$ , where  $(w/p)$  is the real income, the increase in domestic varieties along with lower price markups benefits foreign consumers through international trade and contributes to higher home exports, eq. (28).

We estimate the hypothesis that due to a stricter competition policy, the number of domestic firm increases from  $(n_0^e)$  *Ex-ante* to  $(n_1^e)$  *Ex-post*,  $(n_1^e) > (n_0^e)$ , and it raises home-country's exports. We test it empirically at the industry level, using data for fourteen (14) Canadian manufacturing industries from 1970-1997. We choose this time period because of substantial changes that occurred in Canada's competition policy around 1986.

In chapter 5, we specify an empirical export model to examine the above hypothesis, in which industry's export is the dependent variable. The independent variables reflect elements of competition policy, trade determinants, and the demand for home exports. The model's main independent variable is the industry's CR4 four-firm concentration ratio index. In this study, we consider the market concentration measure of CR4 as the proxy to competition policy and its changes.

Both, the CR4 index and the number of firms are indicators of the industry's competition level. In addition, there is a high inverse correlation between the two implying that changes to the CR4 index would reflect those in the number of firms. In our sample industries, this

correlation coefficient on average is equal to -0.64. However, in our empirical model, we use the industry's CR4 index rather than the number of firms to represent competition policy.

Two are the reasons related to our study that we use the CR4 over the number of firms. First, we think that CR4 is a more accurate measurement of competition in monopolistic industries than the number of firms. This is because the CR4 index, in addition to the number of firms, reflects as well their market share. Second, the largest four firms included in the CR4 tend to contribute relatively a higher share of industry's exports than the smaller ones. Therefore, the industry's export movements might be more sensitive to the CR4 changes than those in the number of firms.

So, a stricter competition policy would result in a higher number of domestic firms, meaning a lower CR4 index level. Since the number of home firms is positively related to country's exports, we would expect a negative sign on the CR4 variable coefficient in our empirical model. In addition, theoretical and empirical literature (Krugman (1979, 1981a), Cox and Harris (1985), Pavcnik (2002), and Treffler (2004)), related to the monopolistic competition model of trade predicts and finds evidence for the domestic 'industry rationalization' trade effects.

It represents the negative trade liberalization effect on the number of domestic firms. Liberalized trade and stricter competition policies are both competition-enhancing policies; however, the literature predicts that the former tends to decrease while the latter increases the number of home firms. Furthermore, both policies will result in a 'positive firm selection' process within industries leading to more efficient long-term resource allocation.

This 'positive selection' occurs through the substitution of the less productive firms with, the more efficient, new or existing ones. During this study period, 1970-1997, Canada's trade

policy has been continuously liberalized either within GATT or WTO framework. However, a major change in its trade policy was the U.S.-Canada free-trade agreement in 1988, which was expanded later in NAFTA (1994).

Since U.S.-Canada-free-trade agreement of 1988 occurred along with competition policy changes, we believe that the observed variations in the concentration ratio values (CR4) of our sample reflect the net changes to the number of home firms from both policies. For the case of Canada, Treffler (2004) evaluates empirically the effects of trade liberalization on the domestic industry rationalization. He assesses the specific effects of the Canada-U.S.-free trade agreement, for the period 1988-1998, on the Canadian manufacturing sector.

He finds that, overall employment in the Canadian manufacturing sector fell by 5%, implying fewer domestic firms, compared to prior of the free trade. Furthermore, the short-run impact was higher in the import competing industries with about 12 percent employment loss. In contrast, in the export competing industries this loss was about 3 percent, but statistically insignificant. For the case of Canada, the empirical evidence supports the model's prediction of such a 'positive firm selection' process, due to trade liberalization, resulting in fewer domestic firms.

Our sample industries produce differentiated goods and are considered as intra-industry trade sectors competing with foreign firms in both markets. Furthermore, based on the inverse correlation between the industry's number of firms and its concentration ratio, we expect that a lower number of domestic firms, due to trade liberalization, will result in higher CR4 values, indicating a more concentrated domestic market.

Thus, we reasonably would expect that our estimated effects of a stricter competition policy on export, as measured by the CR4 index, for the entire study period would be smaller

than their real size. This is because of the increases in the CR4 and HHI indices caused by the U.S.-Canada-free trade agreement in 1988. In chapter five, we account for this difference by estimating and comparing the concentration ratio CR4 elasticity of export over 1970-1988 with that for the entire study period.

**Chapter 4. Historical Contexts of Competition Policy Changes and Deregulation in Canada, 1980 until mid -1990s.**

In estimating this study's hypothesis, we selected Canada for the case study because of the substantial changes in competition policy around 1986. Canada's competition policy became stricter by shifting from lax to the 'Rule of Reason'. The 'Rule of Reason' refers to competition policy which considers the gains in firm efficiency versus the consumer surplus loss, resulting from the firm's anticompetitive behavior. The term originally relates to U.S. Supreme Court decision in Standard Oil Co. ruling in 1911, which declared that only unreasonable attempt to monopolize violated the Sherman Antitrust Act. The lax or weak competition policy refers either to minimal antitrust laws or a lenient enforcement of these laws.

In this section, we present a brief historical context of changes in Canada's competition policy around 1986. Furthermore, we provide some possible reasons related to this study's topic as to; why Canada made changes to its competition law and policy, what might be Canada's purpose to promote export by such changes, and how changes in competition policy could enhance Canadian firm's access into exporting markets?

Several developments occurred in Canada during early 1980s until 1996, resulting in a rapid expansion of the role of competition policy. In 1986, there were amendments of the Competition Act (previously the Combines Investigation Act) which strengthened the antitrust legislation. The Competition Act enacted new provisions especially in sections of mergers and abuse of dominant position. The Competition Act replaced the ineffective criminal provision with that of civil reviewable matters in regard to mergers and dominant position (sections 78, and 92-100 of the R.S.C, 1985 c. C-34 Act). In addition, the inclusion of the banking sector and government-owned corporations (known as Crown) widened the scope of the Competition Act.

Following, there are some features of competition law of 1986 (hereafter referred as the Competition Act) related to this study. The beginning of Canada's competition policy date back in 1889, with the Combine Investigation Act mainly targeting price-fixing agreements. The law included only the criminal offense provisions until 1976; however, four reviewable civil matters were enacted later. Furthermore, the number of offenses has increased over time through continuous amendments of the Competition Act (the last one in March of 2010).

Different from the previous law, the Competition Act considers anticompetitive mergers and abuse of dominant power as a civil offense. Change of the offense type made this provision easier to prove and enforce based on the "balance of probabilities" rather than "beyond a reasonable doubt" standard of proof. These new provisions increased the number of cases and applications, mostly those of civil offenses, brought for court's prosecution or Competition Tribunal order by the Competition Bureau.

From 1980s, the Competition Bureau has emphasized voluntary compliance to the law while deterring to the maximum firm's behavior that leads to violations. In combination with voluntary compliance, The Competition Bureau has used the coercive law enforcement when necessary. Furthermore, the effectiveness of competition policy is related to the deterrence of violations, which increases as size of punishment and monetary fines gets larger. The average monetary fine of law violations increased over seven times from mid 1980s through 1995.

The Competition Bureau is responsible for the detections of the Competition Act violations. Next, it is The Department of Justice that decides whether criminal or civil proceedings are initiated. Conspiracy agreements such as price-fixing, supply and market's controls are still considered a criminal offense (section 45(1) of the Act) and punishable with prison or monetary fines. In contrast, the civil reviewable matters dealing with restrictive trade

and anticompetitive practices are punishable only with administrative monetary fines and are resolved within the Competition Tribunal.

The Competition Bureau actions against these anticompetitive practices are related to this study through their effect on market competition, access, and performance. Trade restrictions and anticompetitive practices included as Tribunal reviewable matters in sections 75-78 of the Act are; refusal to deal, price maintenance, exclusive dealing, tied selling, and vertical integration of suppliers. The provisions on anticompetitive mergers are included in sections 91-100 of the Act. The Competition Tribunal has the authority to order the prohibition of all these anticompetitive practices.

Furthermore, it is of interest to mention that the Tribunal's decision on mergers is not based solely on the evidence of concentration or market share. Applying the 'Rule of Reason', the Competition Tribunal also considers other factors such as the extent of foreign competition and definition of the relevant market. In addition, it considers the availability of substitutes, existence of barriers to entry, extent of market competition after the merger, and efficiency gains from mergers. Regarding the gains from mergers, the Act states "the Competition Tribunal will consider if they (mergers) result in a significant increase in the domestic exports, or a substitution of home products for imported ones."

The continuous deregulation in key service sectors such as Transportation, Energy, Telecommunication, and Banking, were major factors in expanding the role of competition policy. This deregulation consisted in the removal of industry-specific price and entry controls. In the late 1970s, around 29% of the Canadian economy was subject of direct economic regulation, i.e. government-imposed controls on price and output. By mid-1990s, these sectors

were substantially deregulated and subject to competitive market forces and the Competition Act.

This study is closely related to The Competition Act objectives that consider the expansion of opportunities for domestic firms to participate in world markets and ensure firms' equitable markets access. During this period, along with the amendments of the Competition Act in 1986, there was also a wave of deregulation in key Canadian economic sectors. As a result of these reforms, Canada's economic policy moved from government regulated industries toward the reliance on competitive processes.

These changes complemented substantial trade liberalization that occurred during the same period within GATT framework and U.S. - Canada FTA of 1989. Deregulation brought large benefits in terms of lower prices and greater access for users of these services in the affected sectors. A mix of factors such as technological progress, high cost of regulation, advocacy activities by the Competition Bureau, and competitive pressures created by proximity with U.S. economy contributed to these reforms. After removal of regulatory controls, an effective Competition Act is needed to prevent anticompetitive practices from eroding potential gains of the market and trade liberalization.

Given that we examine the effects of competition policy on Canadian manufacturing exports, it is of interest to discuss its market concentration prior to 1986. Then we consider possible changes to market's structure caused by a stricter competition policy around 1986. The authors Lipsey, Purvis and Steiner (1985), observed a higher concentration in Canadian manufacturing than in their U.S. counterparts. They point two main reasons; first, weak Canada's antitrust law, and second, the limited size of Canadian market.



Rutenberg (1988) studied Canadian firms' behavior in connection to its previous antitrust law (before 1986). He finds that dominant firms and oligopoly's market leader attempted to limit rivals' market share and entry by adopting "umbrella pricing" strategies. This "limit pricing" model (charging a price below the short-run profit maximization price to deter entry) resulted in constant market share and a stable number of rival firms.

These strategies presented entry barriers to potential new competitors and limited the possibility of small domestic firms for internal and external growth. This is a possible reason for the amendments in the Competition Act of 1986 aimed to ensure equitable opportunity for small and medium-size firms to participate and expand in the Canadian economy.

In his study, Shepherd (1982) estimates causes for the increased competition within the U.S. manufacturing sector during 1958-1980. The percentage of effectively competitive industries (industries with a CR4 < 40%) did increase from 55.9 percent in 1958 to 69 percent in 1980. He finds that main factors responsible for this increase in the competition were the antitrust actions, deregulation, intensified import competition, and the reduction of the importance of the economies of scale.

He quantifies the first three factors, with the antitrust actions having the largest influence accounting for between 23 and 57 percent of this rise. The increased import competition accounted for about 16 percent. In the 57% of antitrust actions' effect, he includes many industries affected by antitrust law and deregulation since most of the antitrust cases lead to deregulation, and it is difficult to separate between the two.

If these industries were to be excluded, then the antitrust law effect without deregulation is 23 percent. He did not estimate the effects of a reduction in the importance of economies of scale attributed to market size growth over time. Another factor, since Shepherd's study, has

been the advances in computer technology which likely have lowered the MES levels and increased the degree of competitiveness for many industries.

Thus, a stricter competition law and deregulation in Canada, during early 1980s-1997, represent attempts to improve efficiency of resource allocations in fairly competitive markets as well as in regulated economic sectors. As a result, these changes would directly contribute to the productivity and competitiveness of the affected firms, achieving the Competition Act objectives. We construct an empirical export model based on reasoning that changes in Canada's competition policy have resulted in a substantial rise of the domestic market competition, reflected in the four-firm concentration ratio index.

One of the reasons that Canada changed its competition policy, stated as objective of the Competition Act was "to expand opportunities for the domestic firms' participation in world markets.... ." The purpose of this study is to analyze this objective and also how competition policy achieves it by reducing artificial entry barriers and increasing market competitiveness. Changes in the Competition Act aimed mainly at weak competition policy and limited size of the domestic market, which contributed to high levels of concentration in Canadian industries. Adopting a stricter competition policy reduces market concentration and also static and dynamic inefficiencies associated with it. Thus, it results in an improvement of Canadian firms' competitiveness in the export markets.

In the late 1970s, an estimate of 29% of the Canadian economy was directly regulated through government-imposed price and/or output controls. The deregulation wave in key economic sectors that followed until mid-1995 provided some external economies of scale to Canadian firms. It also expanded the role of competition policy by lowering entry barriers and subjecting these sectors to the Competition Act. This new economic background required a

stronger role of competition law to prevent firms' anticompetitive behavior in deregulated sectors.

For this study, we consider how changes in competition law and substantial deregulation of key service sectors enhance Canadian firms access in exporting markets. This occurs through the impact of competition policy on market performance indicators, trade determinants, and transportation costs. Deregulation in four key sectors of the economy in conjunction with more effective Competition Act brought substantial benefits for all firms.

The benefits of easier access to the service sectors and lower production and distribution costs increase firm's competitiveness in international markets. The reduction of transportation and communication costs has greatly contributed to today's level of economic globalization. In addition, transportation cost is an important factor that determines international trade, besides tariff and non-tariff barriers. In the presence of relatively high transportation costs, countries tend to export products for which they have a large domestic market. However, when these costs are reduced, the country's exports tend to expand and also include larger varieties.

Furthermore, a limited firms' access to distribution channels along with high worldwide communication and transportation costs have a constraining effect on the international trade. Deregulation of trade supporting sectors, through reducing entry barriers, increases Canadian firms' access into domestic and exporting markets. We provide a brief description of key elements of deregulation that occurred in Canada's economic sectors during early 1980s until mid-1990s.

The Competition Bureau, Canada's competition authority, initiated most of the deregulation in transportation and telecommunication sectors. It was a total of 208 interventions over the period 1976-1996 (source; Annual Reports of the Director and Investigation and

Research, Competition Act, Canada, different years). About 65 percent of the interventions were in telecommunication and transportation sectors, with 79 and 56 interventions respectively. Deregulation of the Canadian transportation sector around mid-1980s consisted of removal of entry and pricing control for air, rail and trucking sectors.

Liberalization of the airline sector began with New Canadian Air Policy in 1984 and continued with the National Transportation Act, 1987. This Act contains competition enhancing changes like, entering into confidential contracts with shippers and giving them access to more than one railway, abolishment of the collective rate making, etc. Reforms in the trucking sector were implemented via the Motor Vehicle Transport Act, 1987. This Act promoted a national uniform market entry test and eliminated rate controls.

The telecommunication sector in Canada was tightly regulated until late 1970s. Deregulation of this sector started in 1982, through a series of the Canadian Radio-Television and Telecommunication Commission (CRTC) decisions regarding the terminal equipment and cellular service. Furthermore, deregulation of the Banking and Financial sector played an important role in the reduction of entrant's capital costs, which is a significant barrier to entry.

The Banking sector in Canada has been highly concentrated, with six largest banks accounting for more than 90 percent of banking system assets. This might have contributed to lower entry and higher concentration levels in the Canadian industries. This entry barrier puts new and relatively small firms into a cost disadvantage versus the incumbent ones since smaller firms usually pay a higher interest rate for funds than large firms.

In addition, the more concentrated is the local banking and financial sector, the wider is this interest differential spread because large firms, unlike the small ones, are also able to raise funds internationally. Deregulation of the banking and financial sector was carried through

several legislative amendments during 1980-1999. The 1980 revisions of the Bank Act allowed domestic banks to establish subsidiaries in various financial services, and international banks to establish subsidiaries in Canada. This led to many foreign banks entering directly Canadian market (by mid-1980s there were 50 banks).

These legislative changes in banking and financial system intended to increase competitiveness in that sector by allowing banks to compete effectively. This increased competition reduces the newcomer's cost disadvantage – a barrier to entry, facilitating entry of Canadian firms in domestic and international markets. In the Energy sector, deregulation occurred around 1985/1986 in the oil and natural-gas industry. It removed the export price and volume controls for the short-term contracts (1985). Additionally, in 1986, we have the removal of the minimum export price for the same industry.

The adoption of a stricter competition law contributed to a more competitive market structure of the Canadian economic sectors than previously, resulting in lower levels of industry concentration. Canadian industries prior to 1986 were highly concentrated in part due to weak competition policy. Orr (1974) studied the determinants of barriers to entry on a sample of 71 Canadian manufacturing industries. His results show that high industry concentration ratios, capital requirements, and advertising are significant barriers to entry.

Because the Competition Act reduces abuse of dominant position and inefficient mergers, alongside with deregulation, there were positive effects on the competitiveness of Canadian industries. This increased competition results in higher economic performance of domestic firms. Currently, firms' competition occurs on multiple dimensions like price, quality, variety and innovations. Therefore, firms that operate in a more competitive industry are in a better position to compete globally.

As the result of changes in competition policy, the more competitive the industry is the higher the productivity of domestic firms, thus their ability to compete internationally improves. This enhanced competitiveness is achieved through a larger number of firms, innovations, and lower price markups as the market concentration decreases. Furthermore, competition policy changes affect determinants of trade and all industry participants.

What would be Canada's purpose for export promotion through competition policy?

As we previously mentioned, one of the objectives of the Competition Act is "to expand opportunities for the domestic firms' participation in world markets... ." Therefore, changes in competition policy targeted responsible factors for high levels of concentration in Canadian industries. One of the factors was the limited size of the Canadian market. The combination of small domestic market and tariff protection restricted the growth of Canadian firms.

Since Canada is a small open economy, foreign trade is an important pillar to its economic growth. The fact that the share of imports and exports to Canada's GDP has increased, from 20% in 1977 to around 50% in 2010, (merchandise trade only, the source; World Bank) emphasizes this importance. An effective competition policy and its enforcement would add to the actual benefits derived from trade liberalization and economic deregulation, by further increasing the market's access and performance. For this reason, changes in competition policy targeted economic growth by expanding Canadian firm's opportunities to participate in export markets.

Around 75 percent of Canada's foreign trade is directed to and from a 10 times larger U.S. market. Furthermore, between Canada's largest trading partners are U.K, Germany, and Japan. Usually, larger trading partners' markets represent increased export opportunities, along with tougher competitiveness, relative to smaller partners.. Large markets may accommodate a

relatively greater number of below MES firms, therefore, leading to higher average productivity and lower prices.

Changes in Canada's competition policy around 1986, aimed to promote efficiency and adaptability of its economy. These changes provided domestic firms, through lower entry and network service's costs, with an opportunity to expand and compete successfully in foreign markets. Another characteristic of large markets (export markets for Canada) that make them more attractive to firms is that profits are higher than in smaller (domestic) markets. This is because the positive quantity effect offsets the negative one of the lower prices and markups due to tougher competition. This represents another good reason to direct changes in competition policy toward increases of domestic firms' opportunities to participate in foreign markets.

Procompetitive changes in competition policy make domestic firms more competitive, and often result in a higher number of home firms. In addition to this, only the more productive firms and those that find some niche market share by competing in quality will be able to export. Because of a stricter competition policy, less concentrated domestic market will lead to more entry. In line with the prediction of the monopolistic competition trade model, as the number of the home firm increases the likelihood that more firms will engage in export rises, and, therefore, contributing positively to country's exports.

## **Chapter 5. Empirical Model, Data Analysis, Findings and Result Interpretation.**

In this section, we specify an empirical model of export to test the hypothesis that procompetitive changes in competition policy have a positive effect on the country's exports. This export model reflects the demand and as well the supply side of the export. The model includes elements of competition policy, trade determinants, and the global demand for home exports. In addition, we construct this model using predictions of the monopolistic competition model of trade regarding the effects of competition policy on exports.

We perform the export model analysis separately on data for each of the fourteen (14) Canadian industries from 1970-1997. We considered the accomplishment of the goal of this study when choosing the country case and study period. There are two main reasons why we chose Canada's manufacturing sector to examine this hypothesis. First, it is because of the substantial changes that occurred in Canada's competition policy around 1986. These changes consisted of the adoption of a stricter competition law, 'Rule-of-Reason', and deregulation in several key service sectors. Second, presumably the best way to capture the impact on exports of marginal competition policy changes is to analyze it in countries that have a liberalized or free-trade policy.

### *5.1. Empirical Model of Export*

To estimate the relationship between competition policy and exports we focus on two main variables that represent them. They are the industry's export, as the dependent variable, and the industry's concentration level measured by the CR4 or HHI index. These market concentration measures represent and quantify changes in competition policy. The model's main independent variable is the industry's CR4 and HHI indices, which are proxies for competition policy into our export equation.



Competition law is a subset of competition policy, which involves a broader set of instruments that determine the overall condition of market competition. The CR4 and HHI indices are indicators of market structure and competitiveness. We use the structure-based measures of industry concentration CR4 and HHI indices to represent competition policy.

The industry's CR4 and HHI indices in this study are those calculated based on shipment of each firm. Generally, they are indicative of the level of competition and market structure over time. Nevertheless, we are aware of their shortcomings as not perfect measures to represent the overall condition of competition level in all industries. This is because the CR4 and HHI indices reflect only the structural approach and not the behavioral or dynamic aspects of market competitiveness.

The data for the CR4 and HHI indices were tabulated and obtained from Statistics Canada. They span from 1965-1997 as annual time-series data covering about 242 four digits Standard Industrial Classification (SIC) manufacturing, logging and mining industries. In line with the purpose of this study, we chose fourteen (14) Canadian manufacturing sectors that have had their CR4/HHI values drop substantially. In sample industries used to test the study's hypothesis, the CR4 index drop ranged from 13.7% up to 36.5% during the study period.

Furthermore, for nine (9) sectors we have the CR4 and HHI data from 1970-1997 while data for five (5) sectors run only from 1983-1997. We would expect that changes in national competition policy do not affect the competition level across industries or economic sectors uniformly. It depends on the industry-specific factors like the relevance of fixed entry costs and others related to them. The trend of the competition levels for the study sample shows a reduction of market concentration as indicated by the falling values of the CR4 and HHI indexes.

Empirical approach to estimate competition policy effects on export is based on the monopolistic competition model of trade results. Literature suggests that competition policy and international trade are linked through the impact of former on market competition and performance. Since competition policy through lowering fixed entry costs and a 'positive firm selection' process affects trade and its determinants, we included the CR4 and HHI indices as an independent variable in the model.

Besides the CR4 and HHI indices as a competition policy variable, we included other variables to control for factors that have substantial effects on both market sides of export. These variables represent the effects of Canadian manufacturing sector wages and productivity, nominal exchange rate, domestic sector's market share at home, and GDP of host countries. GDP of host countries in this study consists of GDP of the six largest trading partners to Canada. Theoretical reasoning behind the export model and the hypothesized relationships between changes in industry's export, and independent variables are as follows:

**CR4** and **HHI** indices as competition policy variable -To measure the direct effects of competition policy on exports, we include the market concentration ratio measured by the CR4 and HHI (the four largest firms' market share and Herfindahl-Hirschman) indices as a proxy for domestic competition policy. The inclusion of the CR4 and HHI indicators is based partially on the relationship of the CR4 and HHI to market power, behavior, and performance of firms otherwise known as Structure-Conduct-Performance model.

Furthermore, it is because changes in competition policy affect the number of domestic firm variable of the monopolistic competition model of trade, through lowering fixed entry costs. The number of the home firm is an important determinant of trade, and it is directly and highly correlated with the industry's CR4 and HHI indices.

The SCP model is a structural approach of competition and considers the degree of concentration as a measure of market power. The SCP model generally states that market performance within the industry, measured in terms of profitability, varies according to different degrees of market structure and conduct. However, the Chicago School of antitrust considering the competition as a process, has criticized the SCP model for the notion that market performance is not just strictly related to the market power.

On the other side, World Bank views on the SCP model uphold that the economic performance results from both market structure and conduct. Moreover, competition policy could influence such economic performance either by direct intervention on performance (regulation/deregulation) or indirectly through market structure and conduct. Based on this analysis and in accordance to World Bank views, we include the industry-specific CR4 and HHI indicators in the model to capture the effects of competition policy on industry's export.

In the case of implementation of a stricter competition policy, these effects are transmitted through lowering entry costs leading to market structure changes. A decrease of the market CR4 and HHI values, positively affects the number of domestic firms, their economic performance, and international competitiveness. This increased performance results in the relative price competitiveness reduced profit margins, growth in total factor productivity of industry, thus, having a positive effect on exports. As such, the competition policy variable measured by the CR4 and HHI indices is expected to have a negative sign with respect to changes in export.

We are aware that no market concentration statistical measures are perfect in representing the level of market competition due to their limitations. Furthermore, Kwoka (1985) shows that, despite the high correlation between the CR4 and HHI measures, when used separately in

regressions, they can have different explanatory power. This, since market shares of the industry's largest firms, representing the bulk of the exporters, are highly correlated with CR4 index. The CR4 changes will likely affect industry performance by more than the HHI changes, because of the entry-induced rivalry of relatively large firms. This entry significantly lowers the price-cost margins of dominant firms.

In contrast, changes in the HHI will likely represent a smaller impact on market competition and performance. This is because the non-leading firms which are included in HHI index do not greatly influence the industry leader's price-cost margins, especially in large-scale industries. Due to these differences between the CR4 and HHI, we use both indices when running export regressions. For this study's sample industries, the average correlation coefficient between the CR4 and HHI indices is 0.75.

**GDPHC**, Gross Domestic Product of Host Countries; this control variable is not sector-specific and represents Canada's trading partners global demand for its exports. We expect it to have a positive effect on home exports. We include this variable based upon the expectations that, all else equal, the larger the economies of Canada's trading partners, the more they will trade in general. Therefore, we would expect higher Canadian exports.

Furthermore, using this variable we control over the effects on Canadian trade, including export, of macroeconomic conditions, business cycles and demand fluctuations of Canada's trading partners. It is calculated as an export-share weighted average of the Canada's six largest trading partners GDP measured in U.S.\$\$. In this study, we use these weights; U.S. =76%, Japan =11%, E.U. =13%. In the European Union, we have included only the biggest four economies of Germany, France, Italy, and U.K.

**REER-ULC**, Wages, productivity at home and the exchange rate; The Real Effective Exchange rate based on the unit labor-cost of the manufacturing sector is a synthetic indicator of the relative price competitiveness of a country's manufacturing sector. Competition policy partially impacts REER-ULC through price-cost markup, which is a trade determinant also.

There are several real exchange rate indices based on which price deflator is used to calculate them like the CPI, PPI, WPI, GDP deflator, and the unit-labor cost deflator. Based on the question this study examines we use the real exchange rate based on unit-labor cost in the manufacturing industry. We think it is a better measure to capture the exports' effects of relative prices of the manufacturing sector than other price deflators.

Export performance of a country is related to the Real Effective Exchange Rate changes. Nominal exchange rate depreciation, costs of production reduction and productivity increases relative to those of trading partners, cause the REER-ULC depreciation and improve the country's export. To calculate the REER\_ULC variable, we correct the country's nominal effective exchange rate for the unit-labor cost differentials between that country and its trading partners.

The term "effective" means that exchange rate changes are measured against an average index of a whole basket of currencies weighted according to the importance of each respective trading partner. Based on how REER-ULC is computed it comprises two factors that drive the international competitiveness of a country. First, there is the trend in the unit-labor cost or the rate of change in wages relative to that of productivity (the unit labor cost is given as the ratio of hourly wage/hourly productivity according to the IMF methodology). Second, there is the change in the nominal effective exchange rate.

This variable reflects the export's effect of the nominal exchange rate movements. Furthermore, it reflects the effects of country's manufacturing competitiveness on exports. Changes in domestic competition policy reduce barriers to entry resulting in lower fixed cost of production and of the service sectors, relative to foreign competitors. If the cost of production as measured by unit-labor cost = (wages/productivity) increases, resulting in higher REER\_ULC index, ceteris paribus, it reduces the industry competitiveness and, therefore, ability to export. For this reason, we would expect the REER-ULC variable, which represents the relative price effect, to be negatively related with exports.

The Real Effective Exchange Rate based on unit-labor cost in manufacturing (REER-ULC) for Canada is calculated as an index, with 2005=100 as the base year. We obtain it from the OECD Fact Book of 2010, Economic, Environment and Social Statistics database. This variable is not industry-specific, but it is sector-specific. It represents unit labor-cost changes of the domestic manufacturing sector, part of which is the industry sample in our analysis, and excludes the unit-labor cost changes in other sectors such as services, transport, agriculture, etc.

The reading of REER\_ULC index changes and its interpretation is that when the REER\_ULC index falls below 100, it represents a competitive price advantage of home relative to foreign exports. In this case, it would result in higher demand for home exports, so the expected variable sign is negative. Fall of REER-ULC index could result due to either a relative decrease in wages or greater productivity at home versus foreign country, therefore, the overall relative lower cost of production. It also could be caused due to a more favorable nominal effective exchange rate, like the depreciation of CAD versus Canada's trading partners' currencies.

**MKTSHOME**, industry's market share at home: This is another industry-specific variable that indicates, among others, how competitive is the home sector relative to foreign competitors and the degree of market access. We calculate it as a share of domestic industry's production to the sector's domestic consumption, in percentage, in the exporting country.

$$MKTSH_{i,t} = \frac{Domestic\ production_{i,t}}{Domestic\ production_{i,t} - Export_{i,t} + Import_{i,t}} * 100$$

This variable coefficient is expected to be positive. It means that a more competitive home sector, represented by an increase in market share at home, will result in higher exports. Furthermore, it reflects other export's factors like the limitations of domestic supply, the positive effects of technological advances, the sector's trade effects due to a reduction of tariffs and lower transportation costs.

We run regressions of changes of the logarithm of export for each industry against these four above-mentioned variables. There are two explanations why we do not include tariffs as a direct independent variable in the export model. First, during 1970-1997, tariffs between Canada and its' largest trading partners on manufacture goods (especially U.S.) were brought down to below 5% level following the Tokyo and Uruguay Rounds of GATT.

In addition, the bilateral trade agreements based on the most-favored- nation clause reduced further or eliminated tariffs. U.S. tariff levels for Canadian exports became even lower after 1989 due to Canada-U.S. FTA implementation, moving towards their elimination within a 10-year period. In fact, average (trade-weighted) U.S. tariff on exports from Canada for all manufacturing sectors was at a rate about 4% before 1986 and fell to 1.1% in 1996 (Trefler, 2004). Most of Canada's manufacturing exports to U.S. were duty-free before the FTA implementation and these sample industries are no significant exception.

Second, since trade liberalization between Canada and its largest trading partners was reciprocal, at least with regards to Canada-U.S. FTA and NAFTA, it affected both sides of the trade, exporters and importers, therefore, country's total production. Since MKTSH variable includes the sector's domestic production and the sector's export and import, it indirectly captures the trade effects that relate to tariff reduction during the study period.

In most countries, including Canada, for all three macroeconomic variables in the export model, GDPHC, the real exchange rate (REER), and exports- X, the unit root hypothesis cannot be rejected at 5% significance levels, so they are integrated of order one processes I(1). We run regressions, using the OLS method which relies on stochastic processes to be stationary. When model's variables are I (1) the OLS regression results are biased, and referred to as 'spurious regression' results.

To correct for the unit root of these variables, we use the first differences of them so that they become stationary, and then apply the OLS method in estimating the export model. Variables in the export model are entered as first differences where the symbol ( $\Delta$ ) represents the change in variables between periods ( $t$ ) and ( $t - 1$ ).

The export regression model for analyzing each sector is:

$$\Delta \ln X_{it} = C + \beta_1 \Delta CR4_{i,t-k2} + \beta_2 \Delta \ln GDPHC_t + \beta_3 \Delta REER\_ULC_{t-k1} + \beta_4 \Delta MKTSHOME_{it} + \epsilon_{it}$$

Data sets are the annual time-series on fourteen (14) four-digit SIC codes manufacturing industries. Nine (9) industries span from 1970-1997 while five of them from 1983-1997. The availability of the industry's CR4 and HHI indices conditioned the study period. We use the Ordinary Least Square (OLS) method for regression analysis.

Dependent variable,  $\Delta \ln X_{it}$  - represents changes (first differences) in the natural logarithm of the  $i_{th}$  sector's export at time  $t$ . Independent variables are:



$\Delta CR4_{it}$  – Change in the four-firm market concentration ratio of  $i_{th}$  industry at time  $t$ .

$\Delta HHI_{it}$  – Change in the HHI index of the  $i_{th}$  industry at time  $t$ .

$\Delta \ln GDPHC_t$  – Change (first difference) in the natural logarithm of the GDP of the host countries at time  $t$ .

$\Delta REER\_ULC_t$  – Change in unit-labor cost based real effective exchange rate at time  $t$ .

$\Delta MKTSHOME_{it}$  – Change in the market share of the  $i_{th}$  industry at home market at time  $t$ . In Table 1 below there is a summary of export regression results for each of the fourteen (14) sectors.

Table 1. Export Equations Regression Results, dependent variable is the industry's Log of Export  
OLS estimates

Industries	MKTSH	REER-ULC	k1 lag	GDPHC	CR4	k2 lag	HHI	k3 lag	ser	R <sup>2</sup>	nobs.
1. Petroleum & refining SIC 2919/2999	0.044 0.011	-1.729 * 1.334	0	1.818 ** 1.437	-0.032 ** 0.042	1	-0.851 ** 4.642	1	0.30	0.63	22
2. Wood manufacturing SIC 2445+2591	0.007 ** 0.006	-0.945 0.511	0	1.448 0.539	-0.001 ** 0.010	0	-2.498 * 2.253	0	0.12	0.53	23
3. Leather manufacturing SIC 3121/3111	0.043 0.016	-0.561 ** 0.452	1	1.639 0.507	-0.021 0.010	1	-2.631 * 1.683	1	0.12	0.60	22
4. Cement and Lime SIC 3242	0.001 * 0.001	-1.494 0.583	0	1.231 0.684	-0.006 ** 0.006	2	-2.393 * 1.468	2	0.14	0.52	21
5. ceramic tiles & refractories SIC 3254/3257	-0.066 0.028	-1.397 0.771	3	2.998 1.099	-0.026 0.015	2	-2.541 ** 2.006	0	0.18	0.51	20
6. Misch. Indust. & Commun. equi. SIC 3591	0.040 0.019	-5.192 2.663	0	0.152 ** 2.778	-0.038 * 0.039	0	— —	—	0.68	0.35	23
7. Electrical mach. & Equipments SIC 3699	0.024 0.010	-2.233 0.863	0	0.388 ** 0.809	-0.019 0.009	0	— —	—	0.20	0.37	23
8. Aircraft engine parts SIC 3722	0.004 ** 0.004	-0.813 0.331	1	0.724 * 0.505	-0.005 * 0.004	3	-2.021 * 1.254	3	0.09	0.38	20
9. Rubber/plastic products SIC 3021	0.006 ** 0.007	-0.595 0.355	0	1.525 * 1.054	-0.016 0.009	0	-2.710 1.113	2	0.04	0.68	14
10. Gen. indust. Mach. Equip. bearing SIC 3562	0.021 0.009	-0.777 0.361	1	0.213 ** 1.599	-0.009 0.004	2	-3.083 1.370	2	0.05	0.63	12
11. Industrial mach. & equipments metal containers, wire, SIC 3594/99	0.007 ** 0.008	-1.887 0.641	0	-4.240 2.390	-0.020 0.007	1	-3.224 * 1.780	1	0.08	0.76	13
12. Transportation equipment motor veh., pass. Cars, SIC 3711	0.029 ** 0.040	-1.856 1.053	3	0.848 ** 5.103	-0.020 ** 0.024	0	— —	—	0.15	0.50	11
13. Ind. Machineries & equipment SIC 3542/3549	0.013 * 0.009	-1.452 0.651	0	0.953 * 0.609	0.035 0.012	0	-2.478 ** 3.838	0	0.15	0.51	23
14. Drugs and Pharmaceutical prod. SIC 2831(a) The regression not sign.	0.023 0.018	-2.064 1.188	0	-4.244 5.501	-0.015 0.022	3	— —	—	0.16	0.50	11
For all 13 industries											
Sample Mean	0.013	-1.608	0.70	0.691	-0.018	0.92	-2.523	1.2	0.18	0.54	
Median	0.013	-1.452		0.953	-0.019		-2.519				
St. deviation	0.027	1.157	1.07	1.647	0.011	1.00	0.738	0.98		0.12	
Minimum	-0.066	-5.192		-4.240	-0.038		-3.880				
Maximum	0.044	-0.561		2.998	-0.001		-0.851				

Notes on table 1: The dependent variable is the logarithm of export of each 14 manufacturing sector. The export equation is estimated using the OLS method. For every industry, the estimated coefficients and their standard errors (below the coefficient estimates) are provided. The lag periods with which the independent variables are entered into the export regression model (*k lag*), are provided for *Reer-ULC*, *CR4* and *HHI* respectively  $k_1$ ,  $k_2$ , and  $k_3$ . Furthermore, we provide the following statistics:  $R^2$ , standard error of the regression (*ser*), and the number of observation for each industry (*nobs*). The \*, \*\*, represent respectively the significance level 10% and insignificance of the coefficients. All other coefficient's estimates without an asterisk are significant at 5% level. The descriptive statistics of the coefficient estimates from the regressions include only 13 sectors, because the 14th sector's regression is not significant.

## 5.2. Result Interpretations

Based on results of the linear regressions' estimates for fourteen (14) industries, 13 out of 14 regressions are overall significant based on F-statistic critical values, except for SIC 2831, Drugs and Pharmaceutical Products industry. Our further analysis focuses on results for thirteen (13) industries. The F-statistic values of export regressions are above their respective critical values for the corresponding degrees of freedom for each of these industries.

Differences in the degrees of freedom for each sector are due to data set spanning in two various time periods and different lag periods of independent variables. The multiple coefficient of determination  $R^2$ - values range from 0.35-0.76 with a sample mean of 0.54 and a standard deviation of 0.12. In addition, quite all the sectors have the correct sign of coefficients for the independent variables CR4/HHI indices (negative), MKTSH (positive) and GDPHC (positive) as predicted by the export model. Moreover, 85% of all coefficient estimates are significant at 5%.

All sectors have the sign for the REER-ULC variable negative as expected by the model. Regarding the main variable of our hypothesis, the CR4 and HHI, all the sectors, but one, return the correct negative sign. One exception is the Industrial Machineries and Equipment (SIC 3542/3549) industry. This industry returns opposite signs, a correct expected negative sign for the HHI index, but a positive sign for the CR4 index.

Individual coefficients resulting from the export regression model, Table 1, are interpreted as estimates of changes in the dependent variable of export corresponding to a one-unit change in independent variables. With regard to changes in export due to changes in CR4, HHI, MKTSHOME and REER\_ULC variables, we can get a better understanding by calculating the estimated variables' elasticity of export using regression results of coefficient estimates. We report these elasticities in Table 2.

**Table 2. Estimated Independent Variables (CR4, HHI, GDPHC, Reer\_ulc, and MKTSH) Elasticities of Export for 13 Canadian Industries**

Industry Export, dependent variable Industries	$\widehat{\epsilon}_{X CR4}$	$\widehat{\epsilon}_{X HHI}$	$\widehat{\epsilon}_{X GDPHC}$	$\widehat{\epsilon}_{X Reerulc}$	$\widehat{\epsilon}_{X MKTSH}$	$\widehat{\epsilon}_{x CR4}$ truncated
1. Petroleum & refining SIC 2919/2999	-0.149	-0.012	2.835	-0.084	0.239	-0.829
2. Wood manufacturing SIC 2445+2591	-0.002	-0.021	2.140	-0.044	0.028	-0.021
3. Leather manufacturing SIC 3121/3111	-0.083	-0.023	2.723	-0.029	0.239	-0.107
4. Cement and Lime SIC 3242	-0.025	-0.024	1.970	-0.075	0.014	-0.058
5. ceramic tiles & refractories SIC 3254/3257	-0.132	-0.035	5.133	-0.075	-0.372	-0.065
6. Misch. Indust.& Commun.equi. SIC 3591	-0.207	–	0.292	-0.311	0.130	-0.302
7. Electrical mach. & Equipments SIC 3699	-0.056	–	0.646	-0.116	0.042	-0.068
8. Aircraft engine parts SIC 3722	-0.023	-0.018	1.141	-0.040	0.013	-0.032
9. Rubber/plastic products SIC 3021	-0.034	-0.010	2.191	-0.026	0.029	–
10.Gen. indust. Mach.Equip.bearing SIC 3562	-0.029	-0.020	0.315	-0.035	0.088	–
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	-0.051	-0.026	-6.457	-0.086	0.017	–
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	-0.044	–	1.161	-0.076	0.073	–
13. Ind. Machineries & equipment SIC 3542/3549	0.065	-0.006	1.413	-0.067	0.030	-0.007
<b>Average for 13 industries</b>	<b>-0.07</b>	<b>-0.02</b>	<b>1.193</b>	<b>-0.08</b>	<b>0.044</b>	

Based on average estimated elasticity of four independent variables for all 13 industries shown in Table 2, the cointegrating relationship between the log of export and independent variables is given by;

$$\ln Export_t = -0.07 CR4_{t-k_2} + 1.19 \ln GDPHC_t - 0.08 REER_{ULC_{t-k_1}} + 0.044 MKTSHOME_t \quad (22)$$

Since this study focuses on competition policy effects on exports as measured by the CR4 index, we first analyze the results for that variable. For all sectors, the average concentration ratio elasticity of export is -0.07. The negative sign, as expected by the model, means that, for a

one-percent decline in the market concentration ratio, exports will improve by 0.07%, or 7% as fast as the decrease in the industry's CR4.

So exports respond significantly to movements in the concentration ratio variable which represents changes in competition policy. We would expect a lag period between changes in market structure, measured by the CR4 index, and its effects on exports. From Table 1, we have that the average lag period for the CR4 variable for all sectors is  $k_2 = 0.92$  year (a little less than a year).

Furthermore, results in Table 2 show that the concentration ratio (CR4) elasticity of export is about 3.5 times higher than that of HHI. Also, the lag period of the HHI variable effect on exports is  $k_3 = 1.2$  year, which is longer than that for the CR4 variable, equal to 0.92. This shows that the HHI index influences exports at a later time than the CR4 index. Based on the above, it seems that exports are more sensitive to the CR4 than HHI index.

One possible explanation might be the different techniques used to calculate the CR4 and HHI indices. The CR4 index includes only the market share of the four largest firms while the HHI includes all firms. Furthermore, a higher and quicker impact of CR4 variable than that of the HHI index on exports might be interpreted as an argument in favor of the large-scale of firm's production. Such scale of production may be a relevant factor associated with firm's export capabilities.

In addition, in a 'small open economy', it is very likely that domestic companies may face output limitations related to the internal market size. Thus, in a correspondingly small economy, the possibility that the biggest firms, included in CR4 index, are going to reach efficient scales of output due to changes in competition policy is more likely. As such, they will seek to expand

their markets and profits beyond their home territory, by competing and entering into export markets.

This observation may also explain why the sector of Industrial Machineries (SIC 3542/3549) did not turn expected negative sign of estimated CR4 coefficient. Looking at this industry's CR4 value at the beginning and the end of study period, it changed from 34.44% to 26.26%. So this industry was already effectively competitive (Scherer (1980), the market structures with  $CR4 < 40\%$  are classified as effective competition) and that further reduction in the CR4 levels did not benefit to industry's exports.

High levels of intra-industry trade of differentiated products involving relevant firm's fixed costs characterize the manufacturing industry. As such, the efficient scale of production is an important factor in achieving international competitiveness and determining exports. However, for the same industry SIC 3542/3549, the sign of the coefficient estimate for the HHI index was negative. This means that the increase in market competition will generally result in higher level of the sector's exports.

Furthermore, results in Table 3 indicate that the effects of CR4 variable on exports get smaller as more competitive the industry is or becomes. When analyzing this relationship, the industry specifics should be taken into consideration, especially those related with the presence of relevant fixed entry costs. Sizeable fixed costs require the production efficiency to have a scale dimension resulting in relatively large firms.

It is realistic to expect that changes in competition policy, through lowering fixed entry cost, generate different effects across manufacturing industries. The concentrated industries tend to have higher fixed costs and barriers to entry than the competitive ones. Therefore, the expected impact of changes in competition policy, in these industries, is going to be the biggest.

In order to check this expectation, we look at the export's response due to a given change in CR4 value across thirteen (13) industries in the study sample.

For this purpose, we classify the industries into two groups based on CR4 values at beginning and the end of period 1970/83- 1997. Group One consists of industries that initially were highly or moderately concentrated and became somewhat concentrated or competitive; Group Two includes the industries that were slightly concentrated and became more competitive. Following guidelines from the Industrial Organization literature regarding classification of market structure and corresponding concentration ratios we have the following:

If the value of HHI index is:	HHI < 1000	1000 < HHI < 1800	HHI > 1800
Or if the value of the CR4 is:	CR4 < 50%	CR4 > 50%	CR4 > 50%
Markets are considered:	competitive	moderately concentrated	highly concentrated

Market with the CR4 > 75% are considered problematic in regard to the competition level.

**Table 3. The impact of the CR4 Movements to Export across Different Industries**

	estimated	CR4 in years		Change in CR4
	$\epsilon_{x CR4}$	1970/83	1997	
<b>Group 1 Industries</b>				
1. Petroleum & refining SIC 2919/2999	-0.149	81.35	70.06	-11.29
3. Leather manufacturing SIC 3121/3111	-0.083	66.66	52.34	-14.33
4. Cement and Lime SIC 3242	-0.025	69.90	41.90	-28.00
5. ceramic tiles & refractories SIC 3254/3257	-0.132	82.41	55.98	-26.43
6. Misch. Indust.& Commun.equi. SIC 3591	-0.207	77.40	54.60	-22.80
8. Aircraft engine parts SIC 3722	-0.023	72.20	47.70	-24.50
10.Gen. indust. Mach.Equip.bearing SIC 3562	-0.029	63.60	50.40	-13.20
Average of Group 1 industries	-0.092			-20.08
<b>Group 2 Industries</b>				
7. Electrical mach. & Equipments SIC 3699	-0.056	48.60	36.90	-11.70
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	-0.051	49.47	35.92	-13.55
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	-0.044	46.10	27.40	-18.70
2. Wood manufacturing SIC 2445+2591	-0.002	50.91	30.52	-20.39
9. Rubber/plastic products SIC 3021	-0.034	41.80	27.79	-14.01
13. Ind. Machineries & equipment SIC 3542/3549	0.065	34.44	26.27	-8.17
Average of Group 2 industries	-0.038 *			-14.42

(\*)The average elasticity ( -0.038) does not include the Industrial Machineries Industry (SIC 3542/49).

By comparing the average values of export elasticity for the CR4 variable between two groups in Table 3, we find that the elasticity of Group One is about 2.42 times higher than that of the second group. These results support the conclusion that export's response to competition policy changes is bigger in the more concentrated than in competitive industries.



GDPHC elasticity of export has the correct positive sign, as expected from the model, and overall average estimate is 1.19. Positive sign means that, on average, for a 1% increase in the gross domestic product of host countries; the home country (Canada in our case) exports increases by 1.19%. Export demand for the study's sample industries is income elastic, and the mean estimate is comparable with previous empirical findings. Authors Senhadji and Montenegro (1998) find an average income elasticity of export equal to 1.32 over a sample of 37 developing countries.

From the cointegrating relationship in equation (22), we see that the REER-ULC elasticity of export has the expected sign, and the average value for all sectors is -0.08. It represents the relative price elasticity of export, and the negative sign means that exports increase 8% as fast as the decrease in the relative prices. However, there is an expected lag time for the export's response to movements in the relative prices. The export's demand tends to be more price elastic than the domestic demand, and it becomes even more price elastic in the long-run. From Table 1, we see that the REER-ULC variable for all sectors has an average lag period equal to  $k_1 = 0.77$  year.

Industry's market share at home - MKTSH variable elasticity of export for all sectors has the correct positive sign. Its average estimate was 0.044, meaning that for a 1% increase in industry's market share at home exports increase by 0.04%. It mainly represents the relative competitiveness of the domestic sector to foreign competition. As well, it may include other important factors that influence directly or indirectly the domestic sector competitiveness and export volumes. However, the factors such as, tariff changes, technological advances, and lower cost of transportation are not analyzed in this study.

To have a better idea of the overall impact of competition policy on exports, it is of interest to quantify the share of the actual export growth that is explained by the competition policy variable (CR4). We use the long-term relationship in equation (22) and estimated elasticity to quantify the relative contribution of CR4 variable to the observed export's total growth. The actual total export growth on average for all 13 sectors during this period was 13.26%.

The CR4, competition policy variable, has a considerable effect on exports and is responsible for an estimated 1.86% increase of total export growth. This is equivalent to 14 percent share of the entire export growth. In addition, the worldwide demand for Canadian exports, GDPHC variable, has been the dominant factor explaining the largest part of export growth. It accounts for 9.92% or 74% of the total export growth. The remaining of export growth is explained by REER\_ULC, MKTSH and other variables not subject to this study.

Furthermore, to account for 'industry rationalization effect' of the 1988 U.S.-Canada free-trade agreement, which probably impacted positively the concentration ratio CR4 values, we truncate the sample and estimate the base model on data running from 1970-1988. By isolating the influence of the 1988 U.S.-Canada free-trade agreement on CR4 index, we believe that industry's CR4 coefficient estimates and their respective elasticities from this truncated series may be interpreted as a more accurate effect of competition policy on exports.

Thus, by comparing competition policy (CR4) elasticity of export between these two different periods, from Table 2, we find that competition policy effects on exports prior to U.S.-Canada free -trade agreement implementation is on average 1.5 times higher than that for the entire period. This finding is in line with 'rationalization industry effect' predicted by the monopolistic competition model of trade.

One possible explanation is, after the U.S.-Canada free-trade of 1988, changes in CR4 variable, a proxy for competition policy, represent the net effect containing both impacts from competition and trade liberalization policy. So this study's estimated results regarding competition policy effects on exports, captured by CR4 variations, could be understated on average by up to 50% for the entire period of study.

## **Chapter 6. Conclusions**

This study examines the role of competition policy, especially antitrust law and deregulation, on a country's exports. In particular, what is the impact on the country's exports due to the adoption of a stricter competition policy? We hypothesize that movement toward a stricter competition policy, positively affects a country's level of exports. This occurs mainly through lowering fixed entry costs. Bain (1956) identifies these fixed entry costs as the primary reason for existence of market barriers to entry.

The goal of competition policy is to promote the process of market competition primarily by reducing artificial entry barriers and facilitating entry and exit. Both competition law and deregulation are used to achieve this goal. Competition law promotes competition by targeting anticompetitive business practices that serve as entry barriers and result in highly concentrated markets. Deregulation of key economic and service sectors promote competition by removing entry and price control and provide all firms with equitable access to these services. The theory that led to the formulation of study's hypothesis is derived from the current literature that considers competition policy as a trade promoting policy.

The monopolistic competition models of trade (Krugman (1979), Kikuchi et al. (2008)), predict that the reduced fixed costs enhance market competition and facilitate entry, leading to a higher number of home firms, due to a pro-competitive competition policy. The increased number of home firms leads to 'positive firm selection' process within each industry, which improves market performance indicators. So competition policy affects market performance indicators such as the number of domestic varieties, price markups, productivity, R&D, and innovation intensity. Because most of these indicators are also considered trade determinants, we predict that changes in competition policy will impact trade and export volumes.

In addition, the presence of a 'positive self-selection' process in the domestic markets will allocate resources more efficiently. Because of lower fixed costs of entry and exit, the reallocation of resources will occur through the extra industry output from more efficient new entrants and existing firms. These efficient incumbents, by expanding their output will move down along their average cost curve exploiting the economies of scale and replacing the least productive firms.

Following the above reasoning, this study assesses the direct impact of competition policy on the country's trade, including exports, by testing the hypothesis that a country's export increases due to a stricter competition policy. This study's hypothesis is based on the monopolistic competition model of trade prediction, which asserts that the number of the domestic firm increases due to reduced fixed costs of the firm's entry.

Specifically, we estimate the competition policy effects as measured by changes in the CR4 and HHI index levels, on exports for fourteen (14) Canadian manufacturing industries from 1970-1997. We test this hypothesis on manufacturing industries because, generally they operate in a monopolistic competition market structure with relatively large fixed entry and exit cost. As such, in the manufacturing sector, the effects of competition policy on trade determinants are expected to be more significant than in another sector of the economy.

We have selected Canada for the case study, because of the substantial changes that occurred in its competition policy around 1986. Another reason was because presumably the best way to capture export effects due to the competition policy changes is to investigate their interactions in a relatively liberalized trade policy. This enables us to separate better the competition policy effects on exports from that of trade policy.

We have checked the possibility that the impact of competition policy on export would be more effective in highly concentrated industries than in competitive ones. This possibility is based on predictions of the monopolistic competition model of trade that the number of domestic firms, and, therefore, exports, are inversely related to the industry's fixed costs. In addition, this possibility is based on the relationship that exists between competition policy and the industry entry costs.

Generally, industries that are characterized by high fixed entry costs tend to be more concentrated and exhibit higher economies of scale than those with low entry costs. Because of this relationship between fixed costs and market structure, and since competition policy mostly affects the entry barriers, one would expect a bigger export response to changes in competition policy in highly concentrated industries than in competitive ones. To capture these industry-specific variations, we tested the above hypothesis for each of fourteen (14) four-digit SIC industries separately.

To test the study's hypothesis, we constructed an empirical export model, which is based on predictions of the monopolistic competition model of trade regarding relationships between the competition policy, the number of domestic firms and the export volume. In this study, the effects of competition policy on export are analyzed through the direct link between these two variables. Furthermore, we use the variations in the industry concentration ratio of the four largest firms -CR4 and the HHI index to measure changes in competition policy.

Control variables in the empirical model represent key factors for export; GDPHC reflects the activity of global demand for Canadian exports; REER-ULC represents the relative price of domestic export, and MKTSH reflects the comparative competitiveness of home industry to foreign competition. We computed industry's MKTSH variable as the ratio between

domestic production to domestic consumption, which includes volumes of industry's export and import. As such, this variable may partially capture trade liberalization effects on exports.

We use the Ordinary Least Square (OLS) method to analyze the data and interactions between the export regression variables. The model's variables are entered as first differences since Export, GDPHC, and REER-ULC are all integrated of order one processes,  $I(1)$ . The variables' first differences represent changes in levels between periods ( $t$ ) and ( $t-1$ ) and make these series stationary avoiding 'spurious regression' OLS results. In addition, we used the natural logarithm for the export and GDPHC series.

We check for multicollinearity and find that values of the Pearson's correlation coefficients for the data set show either no or a negligible relationship between variables. To account for a possible 'endogeneity' between competition policy and export variables, we use lagged values for the CR4 variable and control for most of the export's determinants. By using lagged values for the concentration ratio CR4 variable in 65, percent of the export regressions, further reduced a potential 'endogeneity' bias resulting from a two-way causality between export and competition policy.

We ran two different export regressions for each industry, based on whether industry's CR4 or HHI index was used as a measure for competition policy variable. Results are reported in Tables 1 and 2. We expected there would be a lag period for competition policy (represented by CR4 and HHI index) and relative price (REER-ULC) effects on export, and, therefore, used different lagged values for these variables. Since the CR4 values change slowly and in the long-run, the concentration ratios are unlikely to respond quickly to export changes.

We analyzed data for export equation variables, covering the period 1970/83\* until 1997, for each of the fourteen (14) four-digit SIC classification industries. For five of the sectors, we

have the CR4 and HHI values from year 1983. These time-series data represent; the volume of industry's export and import, the industry concentration ratios of the four-largest firms CR4 and the HHI index, GDP of the six largest trading partners of Canada, and Real Effective Exchange Rate based on unit-labor cost.

Data were obtained for industry, sector, and national levels and were collected from various sources. We obtain the annual volume of the industry's export, which is the dependent variable of the study's empirical model, from the OECD database, the International Trade by Commodity Statistics, SITC Revision 2. The industry's yearly concentration ratios, CR4, and the HHI index, based on the firm's shipments, represent competition policy, which is the main independent variable of the model.

We obtained manufacturing sector concentration data from Statistics Canada, as Industrial Organization and Concentration in the Manufacturing, Mining and Logging Industries, Unconsolidated Enterprise Concentration Data of four-digit SIC codes industries, ranging from SIC 1000-3999. From the same database, we used the number of industry's establishments and its total shipment to calculate the correlation between the CR4 ratios and the number of firms, as well as the domestic industry's market share variable, MKTSH.

Using the same manufacturing sector, we paired trade data, classified by Harmonized System of SITC Revision 3, with industry concentration data CR4 and HHI index, classified into four-digit SIC codes. Results are reported in Table 6, in Appendix. We obtained data on variables REER based on unit-labor cost and GDP of host countries from the OECD Fact Book 2010 and the OECD database, respectively.

### **Findings of the study**



The key finding from this study is that empirical results support the assertion that the adoption of a stricter competition law and market deregulation as measured by decreases in the CR4 and HHI indices, has a positive and significant impact on the country's export growth. Furthermore, this causal interpretation is established from the fact that we used lagged values for the competition policy variable (CR4) and that we controlled for most of the export's determinants in the model to account for a possible 'endogeneity' of the competition policy.

For all industries, the average concentration ratio elasticity of export is -0.07, meaning that exports will increase 7% as fast as the decrease in the industry's CR4 ratio. Exports react significantly to movements in the concentration ratio variable, and as expected, the response occurs with an average lag period of 0.92 year. We find that for almost each of the fourteen (14) industries; the CR4 elasticity of export is greater than that of the HHI index, and on average, about 3.5 times higher. Furthermore, the changes in CR4 index influence the export more quickly than those in HHI index, as shown by the average lag difference of 0.92 and 1.2 year respectively (Table 1).

Study's results show that competition policy effectively influences exports. Furthermore, with respect to control variables, they all have the expected signs and 85 percent of the estimated coefficients are statistically significant in impacting industry's export. In addition, our results indicate that export benefits of competition policy changes are sensitive to the degree of industry concentration. We divided the sample industries into two groups based on CR4 ratio values at the beginning period.

In Group One, we included industries that went from being highly to become moderately concentrated. We included industries that were somewhat concentrated and became competitive in Group Two. By comparing the average values of export elasticity for the CR4 variable

between two groups, we find that the elasticity of Group One is about 2.42 times higher than that of the second group. These results support the conclusion that export response to competition policy changes is bigger in more concentrated than in competitive industries.

Export elasticity for gross domestic product of the host countries' variable (GDPHC) has a sample mean estimate of 1.19. This result is comparable with previous empirical estimates that find its value to be greater than one. It means that export demand for the study's sample industries is income elastic. We find that variables REER-ULC and MKTSH have the expected signs, and their export elasticities were -0.08 and 0.04, respectively. Based on this study's results, the average contribution of competition policy changes on total export growth is about 14 percent, while changes in GDPHC variable account for 74 percent of it.

We estimate the CR4 elasticity of export, during the period 1970-1988 and compare it with our previous results, to account for the 'industry rationalization effect' on domestic industries. Free-trade causes the industry's CR4 and HHI index values to increase. For this reason, we expected that our model's estimated effects of a stricter competition policy (represented by a decline in CR4) on export would be smaller than their actual magnitudes, for the entire period 1970-1997.

We analyzed truncated series from 1970-1988, (because of U.S. - Canada free-trade agreement of 1988) for each of nine industries to determine the effect of competition policy on export before this agreement. Based upon the study's model regression analysis prior to free-trade, we conclude that these effects, as measured by the CR4 elasticity of export, are on average 1.5 times higher than those for the entire period of study. One possible explanation is that, after the U.S.-Canada -FTA in 1988, the variation of CR4 values contains the impacts of both competition and free-trade policy. Thus, for the entire study period, our model's estimated results

of competition policy effects on exports may be understated, by up to 50%, due to free-trade 'industry rationalization' effect.

This study's contribution consists in providing empirical estimates for competition policy's impact on the country's export, which is useful to the decision and policy makers dealing with these topics. These estimates serve to a better understanding of the very important linkages between competition policy and international trade, including export. In addition, they further improve the insight about the economic implications arising from the implementation of a stricter competition policy. Furthermore, the study's results contribute to the limited empirical evidence that exists on the effectiveness of competition policy on the country's export.

### **Limitations of the study**

The study limitations are mainly related to three key areas; the imperfect proxy used for competition policy that of the market's concentration ratio, CR4 and HHI indices; the relatively small sample size used in the empirical analysis of the study's hypothesis; the lack of measurement for the institutional aspect of competition policy and its enforcement. The CR4 and HHI indices are usually useful and readily available indicators to capture the effects of competition policy. However, they are not the perfect measures for the overall industry's competition level.

The limitations of CR4 and HHI indices are that they reflect only the structural approach to the degree of the market competitiveness and not the behavioral or dynamic aspects of it. Some of these restrictions include the pricing behavior, industry's innovations and profitability, degree of market contestability and 'positive firm selection'. Nevertheless, throughout this study, we followed the reasoning that a lower market ratio of CR4, represents a higher degree of industry's competition and efficiency, and as a result, better overall market performance.

The sample size in our analysis is fourteen (14) four-digit SIC code industries of the Canadian manufacturing sector. It includes yearly data set that covers the period from 1970/83-1997, with an average number of 22 observations for most of these sectors. Even though study's results provide interesting empirical estimates of the interactions between the competition policy and export, they are based on a relatively small data sample. In order to generalize the above results, we may need some further analysis over an expanded sample study, including either more industries and/or countries. Although the study's empirical estimates have good statistical properties, increasing the sample size would only improve the accuracy of the magnitude of these estimates to their true values.

Furthermore, the results of competition policy change on market competition and performance, and, therefore, its effectiveness on exports, would depend on levels of competition policy enforcement and the type of the legal system in different countries. Countries with efficient and consolidated legal institutions (like the antitrust authority, the judicial system, etc.) enforce the competition law effectively and with a low cost. In these countries, we would expect the competition policy to be more effective and have a greater impact on exports than in countries with an inferior rule of law or inefficient legal system. Thereby, the CR4 and HHI indices used in the study do not directly reflect the institutional features of competition policy, even though they capture the market structure and partially the behavioral aspect of it.

In this study, we did not perform an empirical analysis of the model's prediction regarding the decrease in the domestic country's imports for industries where market's concentration levels fell due to a stricter competition policy. We suggest that such analysis could be undertaken as a future research, in conjunction with a longer time-series data availability of CR4 and HHI indices. As mentioned previously, our current availability of the CR4 and HHI

indices was limited during the period from 1970 until 1997. This conditioned the number of observations in the study's export regressions.

Lastly, it would be of interest to test this study's main hypothesis over an expanded database, by using a larger sample size of industries and/or countries. If the sample size were to include a panel of countries, it would be interesting to estimate the effects of such policy change on trade volumes, especially in countries that are either about to adopt or have had their competition policy recently introduced.

## APPENDIX

Table 1. Export Equations Regression Results, dependent variable is the industry's Log of Export  
OLS estimates

Industries	MKTSH	REER-ULC	k1 lag	GDPHC	CR4	k2 lag	HHI	k3 lag	ser	R <sup>2</sup>	nobs.
1. Petroleum & refining	0.044	-1.729 *	0	1.818 **	-0.032 **	1	-0.851 **	1	0.30	0.63	22
SIC 2919/2999	0.011	1.334		1.437	0.042		4.642				
2. Wood manufacturing	0.007 **	-0.945	0	1.448	-0.001 **	0	-2.498 *	0	0.12	0.53	23
SIC 2445+2591	0.006	0.511		0.539	0.010		2.253				
3. Leather manufacturing	0.043	-0.561 **	1	1.639	-0.021	1	-2.631 *	1	0.12	0.60	22
SIC 3121/3111	0.016	0.452		0.507	0.010		1.683				
4. Cement and Lime	0.001 *	-1.494	0	1.231	-0.006 **	2	-2.393 *	2	0.14	0.52	21
SIC 3242	0.001	0.583		0.684	0.006		1.468				
5. ceramic tiles & refractories	-0.066	-1.397	3	2.998	-0.026	2	-2.541 **	0	0.18	0.51	20
SIC 3254/3257	0.028	0.771		1.099	0.015		2.006				
6. Misch. Indust. & Commun. equi.	0.040	-5.192	0	0.152 **	-0.038 *	0	—	—	0.68	0.35	23
SIC 3591	0.019	2.663		2.778	0.039						
7. Electrical mach. & Equipments	0.024	-2.233	0	0.388 **	-0.019	0	—	—	0.20	0.37	23
SIC 3699	0.010	0.863		0.809	0.009						
8. Aircraft engine parts	0.004 **	-0.813	1	0.724 *	-0.005 *	3	-2.021 *	3	0.09	0.38	20
SIC 3722	0.004	0.331		0.505	0.004		1.254				
9. Rubber/plastic products	0.006 **	-0.595	0	1.525 *	-0.016	0	-2.710	2	0.04	0.68	14
SIC 3021	0.007	0.355		1.054	0.009		1.113				
10. Gen. indust. Mach. Equip. bearing	0.021	-0.777	1	0.213 **	-0.009	2	-3.083	2	0.05	0.63	12
SIC 3562	0.009	0.361		1.599	0.004		1.370				
11. Industrial mach. & equipments	0.007 **	-1.887	0	-4.240	-0.020	1	-3.224 *	1	0.08	0.76	13
metal containers, wire, SIC 3594/99	0.008	0.641		2.390	0.007		1.780				
12. Transportation equipment	0.029 **	-1.856	3	0.848 **	-0.020 **	0	—	—	0.15	0.50	11
motor veh., pass. Cars, SIC 3711	0.040	1.053		5.103	0.024						
13. Ind. Machineries & equipment	0.013 *	-1.452	0	0.953 *	0.035	0	-2.478 **	0	0.15	0.51	23
SIC 3542/3549	0.009	0.651		0.609	0.012		3.838				
14. Drugs and Pharmaceutical prod.	0.023	-2.064	0	-4.244	-0.015	3	—	—	0.16	0.50	11
SIC 2831(a) The regression not sign.	0.018	1.188		5.501	0.022						
For all 13 industries											
Sample Mean	0.013	-1.608	0.70	0.691	-0.018	0.92	-2.523	1.2	0.18	0.54	
Median	0.013	-1.452		0.953	-0.019		-2.519				
St. deviation	0.027	1.157	1.07	1.647	0.011	1.00	0.738	0.98		0.12	
Minimum	-0.066	-5.192		-4.240	-0.038		-3.880				
Maximum	0.044	-0.561		2.998	-0.001		-0.851				

Notes on table 1: The dependent variable is the logarithm of export of each 14 industries. The export equation is estimated using the OLS method. For every industry, the estimated coefficients and their standard errors (below the coefficient estimates) are provided. The lag periods with which the independent variables are entered into the export regression model ( $k$  lag) are provided for *REER-ULC*, *CR4* and *HHI*, respectively  $k_1$ ,  $k_2$ , and  $k_3$ . Furthermore, in the table are provided the following statistics:  $R^2$ , standard error of the regression (ser), and the number of observation for each industry (*nobs*). The \*, \*\*, represent the significance level 10% and insignificance of the coefficients, respectively. All other coefficient's estimates without an asterisk are significant at 5% level. The descriptive statistics of the coefficient estimates from the regressions include only 13 sectors, because the 14 sector regression is not significant.

**Table 2. Estimated Independent Variables (CR4, HHI, GDPHC, Reer\_ulc, and MKTSH) Elasticities of Export for 13 Canadian Industries**

Industry Export, dependent variable Industries	$\widehat{\epsilon}_{X CR4}$	$\widehat{\epsilon}_{X HHI}$	$\widehat{\epsilon}_{X GDPHC}$	$\widehat{\epsilon}_{X Reerulc}$	$\widehat{\epsilon}_{X MKTSH}$	$\widehat{\epsilon}_{X CR4}$ truncated
1. Petroleum & refining SIC 2919/2999	-0.149	-0.012	2.835	-0.084	0.239	-0.829
2. Wood manufacturing SIC 2445+2591	-0.002	-0.021	2.140	-0.044	0.028	-0.021
3. Leather manufacturing SIC 3121/3111	-0.083	-0.023	2.723	-0.029	0.239	-0.107
4. Cement and Lime SIC 3242	-0.025	-0.024	1.970	-0.075	0.014	-0.058
5. ceramic tiles & refractories SIC 3254/3257	-0.132	-0.035	5.133	-0.075	-0.372	-0.065
6. Misch. Indust. & Commun.equi. SIC 3591	-0.207	_	0.292	-0.311	0.130	-0.302
7. Electrical mach. & Equipments SIC 3699	-0.056	_	0.646	-0.116	0.042	-0.068
8. Aircraft engine parts SIC 3722	-0.023	-0.018	1.141	-0.040	0.013	-0.032
9. Rubber/plastic products SIC 3021	-0.034	-0.010	2.191	-0.026	0.029	_
10. Gen. indust. Mach.Equip.bearing SIC 3562	-0.029	-0.020	0.315	-0.035	0.088	_
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	-0.051	-0.026	-6.457	-0.086	0.017	_
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	-0.044	_	1.161	-0.076	0.073	_
13. Ind. Machineries & equipment SIC 3542/3549	0.065	-0.006	1.413	-0.067	0.030	-0.007
Average for 13 industries	<b>-0.07</b>	<b>-0.02</b>	<b>1.193</b>	<b>-0.08</b>	<b>0.044</b>	

**Table 3. The impact of the CR4 Movements to Export across Different Industries**

	estimated	CR4 in years		Change in CR4
	$\varepsilon_{x CR4}$	1970/83	1997	
<b>Group 1 Industries</b>				
1. Petroleum & refining SIC 2919/2999	-0.149	81.35	70.06	-11.29
3. Leather manufacturing SIC 3121/3111	-0.083	66.66	52.34	-14.33
4. Cement and Lime SIC 3242	-0.025	69.90	41.90	-28.00
5. ceramic tiles & refractories SIC 3254/3257	-0.132	82.41	55.98	-26.43
6. Misch. Indust.& Commun.equi. SIC 3591	-0.207	77.40	54.60	-22.80
8. Aircraft engine parts SIC 3722	-0.023	72.20	47.70	-24.50
10.Gen. indust. Mach.Equip.bearing SIC 3562	-0.029	63.60	50.40	-13.20
Average of Group 1 industries	-0.092			-20.08
<b>Group 2 Industries</b>				
7. Electrical mach. & Equipments SIC 3699	-0.056	48.60	36.90	-11.70
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	-0.051	49.47	35.92	-13.55
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	-0.044	46.10	27.40	-18.70
2. Wood manufacturing SIC 2445+2591	-0.002	50.91	30.52	-20.39
9. Rubber/plastic products SIC 3021	-0.034	41.80	27.79	-14.01
13. Ind. Machineries & equipment SIC 3542/3549	0.065	34.44	26.27	-8.17
Average of Group 2 industries	-0.038	*		-14.42

(\*)The average elasticity ( -0.038) does not include the Industrial Machineries Industry (SIC 3542/49).



**Table 4. Correlation Coefficients between the CR4 Index and the Number of Establishments for 14 Canadian Industries during 1970/83- 1997 Period.**

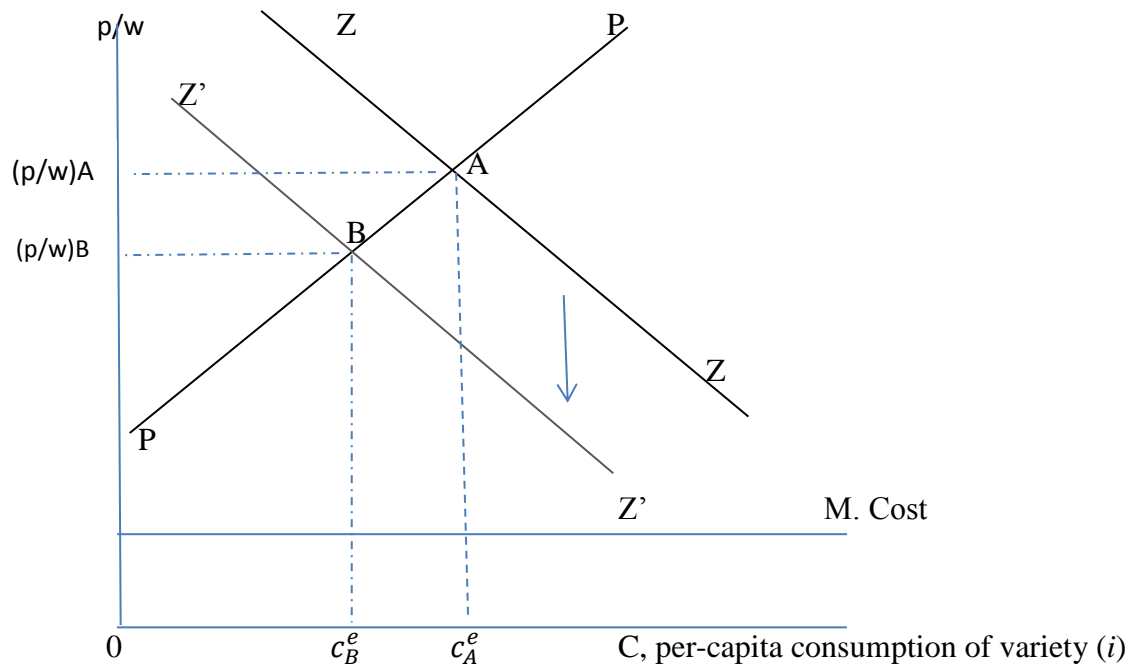
Industries	Correlation Coeff.
1. Petroleum & refining SIC 2919/2999	-0.62
2. Wood manufacturing SIC 2445+2591	-0.91
3. Leather manufacturing SIC 3121/3111	-0.88
4. Cement and Lime SIC 3242	-0.85
5. ceramic tiles & refractories SIC 3254/3257	-0.91
6. Misch. Indust.& Commun.equi. SIC 3591	-0.82
7. Electrical mach. & Equipments SIC 3699	-0.57
8. Aircraft engine parts SIC 3722	-0.93
9. Rubber/plastic products SIC 3021	-0.57
10.Gen. indust. Mach.Equip.bearing SIC 3562	-0.43
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	-0.18
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	-0.92
13. Ind. Machineries & equipment SIC 3542/3549	-0.38
14.Drugs and Pharmaceutical prod. SIC 2831	-0.012
Average for all 14 industries	<b>-0.64</b>

**Table 5. Correlation Coefficients between the CR4 Index and other Independent Variables**

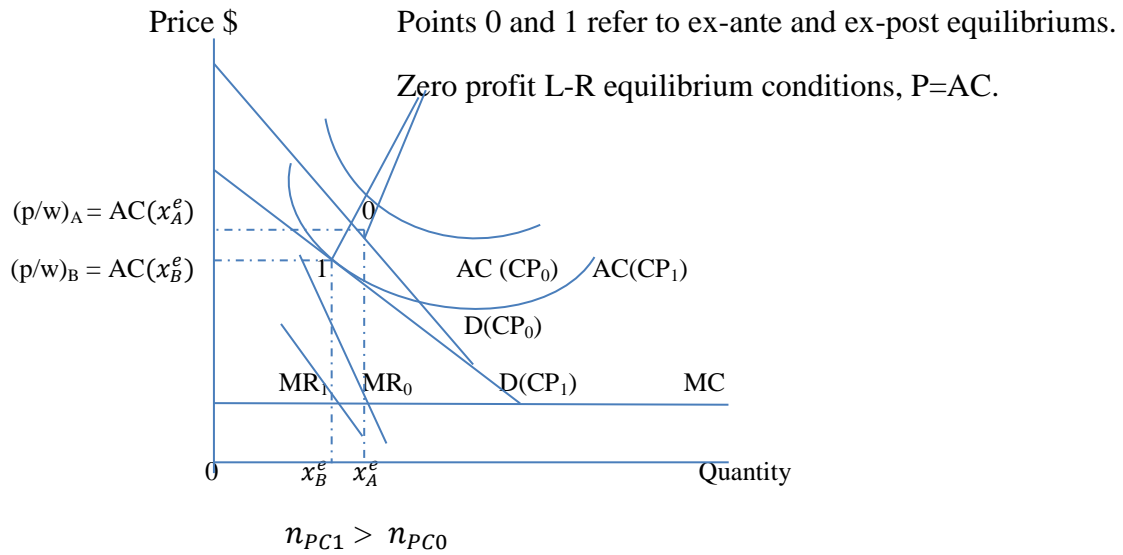
Industries	CR4/Reer-ulc	CR4/lnGDPHC	CR4/MKTSHOME	CR4/HHI
	in absolute value			
1. Petroleum & refining SIC 2919/2999	0.3604	0.1740	0.0747	0.8998
2. Wood manufacturing SIC 2445+2591	0.1330	0.3686	0.2223	0.6511
3. Leather manufacturing SIC 3121/3111	0.0204	0.0693	0.4519	0.7459
4. Cement and Lime SIC 3242	0.2054	0.1509	0.2481	0.7789
5. ceramic tiles & refractories SIC 3254/3257	0.0728	0.0559	0.3077	0.6445
6. Misch. Indust.& Commun.equi. SIC 3591	0.2549	0.2940	0.4988	0.8338
7. Electrical mach. & Equipments SIC 3699	0.4269	0.0309	0.4769	0.9060
8. Aircraft engine parts SIC 3722	0.1882	0.0139	0.0843	0.8871
9. Rubber/plastic products SIC 3021	0.1552	0.1241	0.5199	0.6356
10.Gen. indust. Mach.Equip.bearing SIC 3562	0.1959	0.0058	0.1302	0.9526
11. Industrial mach. & equipments metal containers,wire, SIC 3594/99	0.1533	0.0224	0.3756	0.9257
12. Transportation equipment motor veh.,pass. Cars, SIC 3711	0.1397	0.3569	0.1850	0.8809
13. Ind. Machineries & equipment SIC 3542/3549	0.1929	0.2757	0.2446	0.5616
14.Drugs and Pharmaceutical prod. SIC 2831	0.2625	0.1025	0.2496	0.2731
sample average (14 sectors)	0.1973	0.1461	0.2907	0.7555

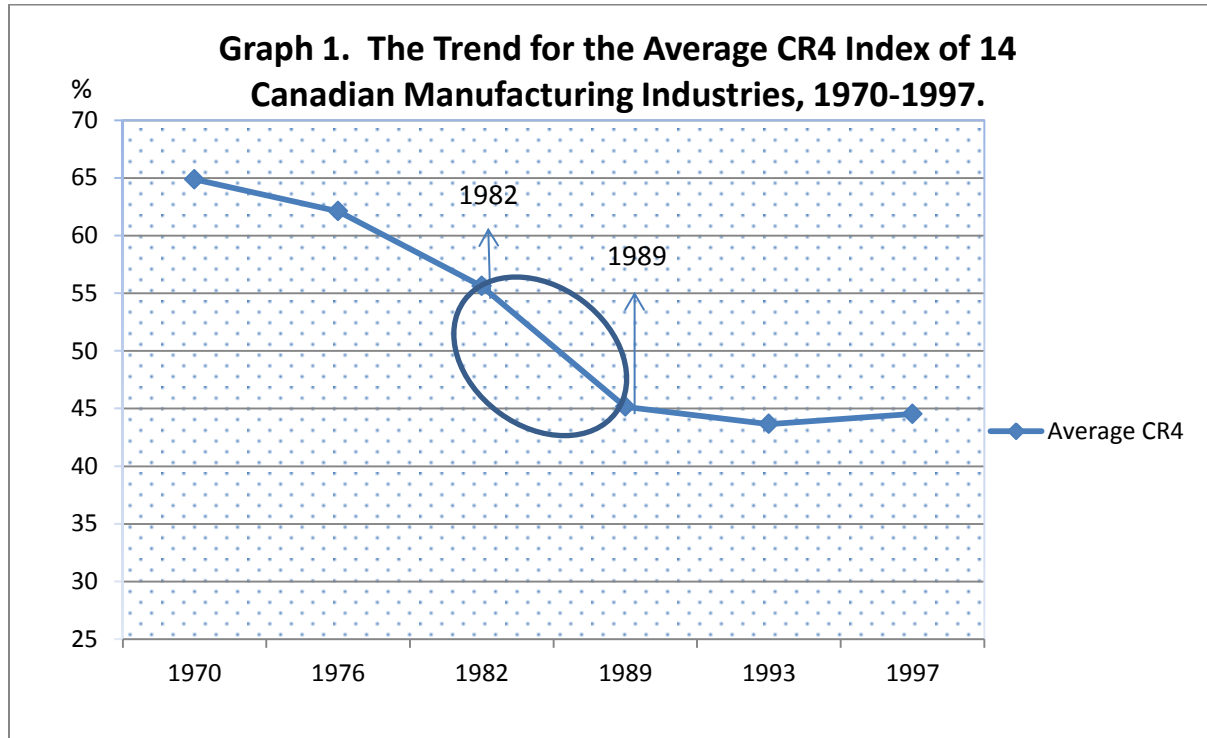
Table 6. Conversion between SITC (Trade Data) and SIC Codes (Industry Concentration Ratio Data) for 14 Canadian Industries.			
SIC codes		SITC Revision3 code	
Industrial concentration data	Group industry description	OECD data on trade	Group Industry Description
	<b>Group 24, Lumbar and Wood Products</b>		
2445	Wood containers	635	Wood Manufacture
	<b>Group 25, Furniture and Fixtures</b>		
2511,2522,2541 and 2542	Wood Household,office furniture	821	Furniture and parts, bedding etc
2591	Drapery hardware& windows	633 and 635	Cork and wood manufacture
	<b>Group 28, Chemicals and related products</b>		
2833	Drugs, medicinal& pharmaceutical products	541	Medicinal & pharmaceutical products
	<b>Group 29, petroleum and related products</b>		
2919	Petroleum refining	33 or (334 and 335)	Petroleum products & related materials
2921	same	same	
2961	same	same	
2999	Petroleum products	same	
	<b>Group 30, Rubber and Plastic products</b>		
3021	Rubber and Palstic products	62 or 621/625/629	Rubbber manufactures
3022	same	62	
3023	same	62	
3029	same	62	
3049	same	62	
	Manufacturing Goods SITC3, group 6		
	<b>Group 31, leather Manufacturing, tanning &amp; finishing</b>		
3111	Leather tanning and finishing	61/611	Leather and leather manufactures
3121	same	61/611	
	<b>Group 32 stone,clay and glass products</b>		
3242	Cement , hydraulic	661	Lime, cement, fabricated materials
3254	Ceramic floor and wall tiles	662	Clay construction, refractories cons. materials
3257	Clay refractories, structural clay	662	same
	<b>Group 35, industrial machinery and equipment</b>		
3542	Metalworking machinery & equipments	695/696/728/731/737	Tools, cutlery, machine tools, metalworking m.
3914	Metal flatware, steel mainly	695.6 /696/	Tools for hand use , cutlery
3562	General industrial machinery equipment	746 and 748	Ball & roller bearing, transmission shafts,
3591	Mischellaneous industrial & commercial	718/742/743/747	Pumps for liquid, compressors, appliances
3599	Industrial machinery and equipment	692/693/694/697/699/741/744/745/749	Metal containers,screws,wire products etc.
	<b>Group Machinery and transport equipments</b>		
	<b>Group 36, electronic &amp; other electronic equipments</b>		
3699	Electrical machinery,equipments & supplies	697/775/716/771/772/773/778/714/792	Electrical machineries, apparatus,appliances
	<b>Group 37, transportation equipments</b>		
3711	Motor vehicles and passeng. car bodies	713/781/782/784/786	Road vehicles, transportation of person & goods
3722	Aircraft engines and parts	792	Aircraft and associated equipments

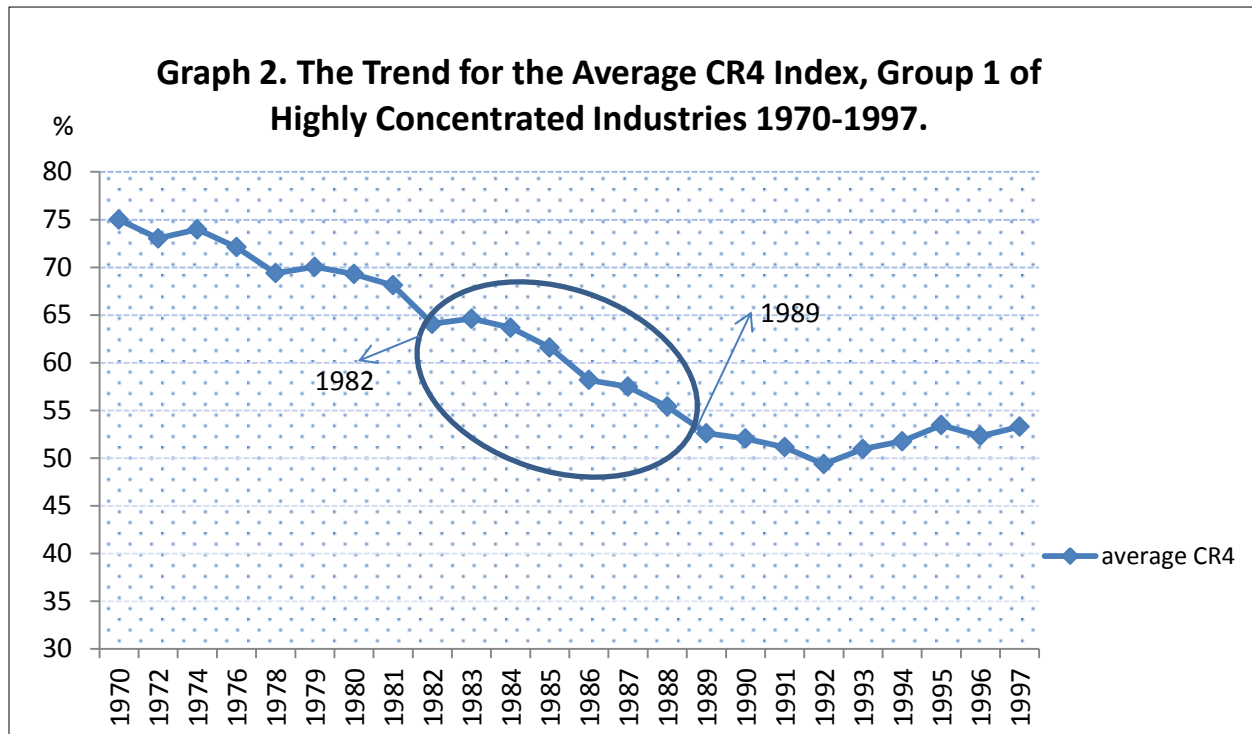
**Figure 1. Home country ZZ- PP schedules, Krugman P. (1979) Monopolistic Competition Model of Trade.**

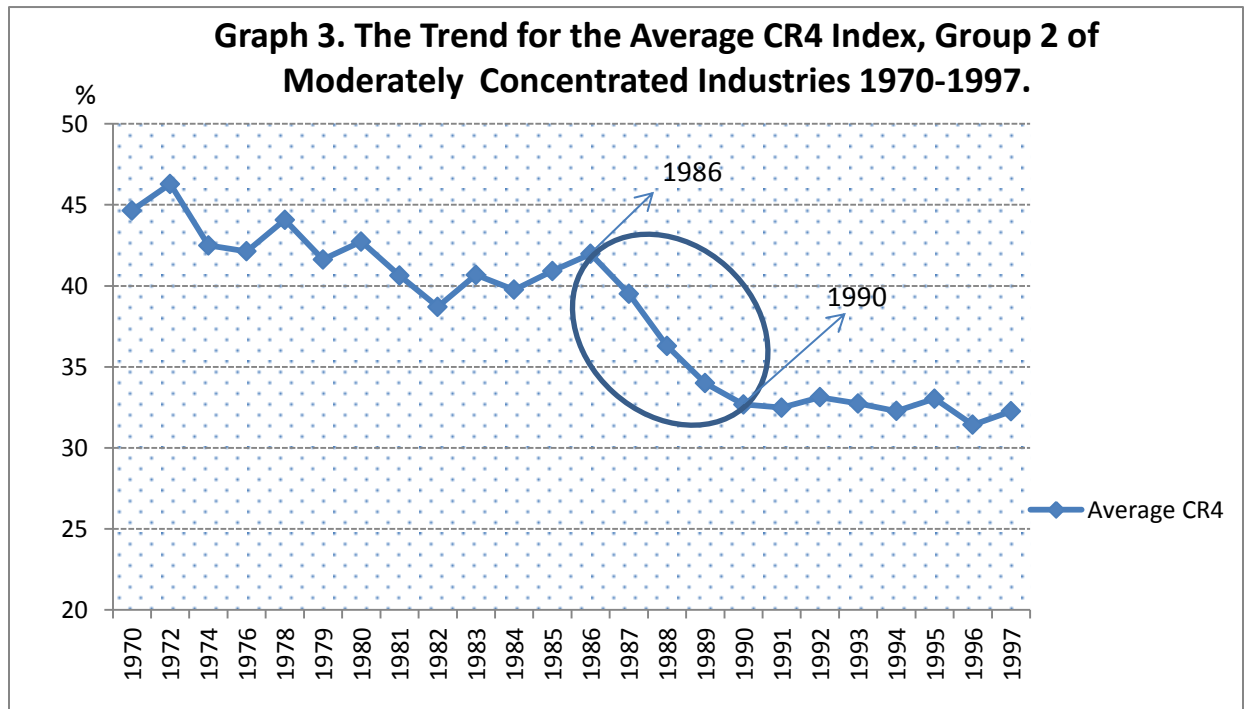


**Figure 2. The Short- and the Long-Run Equilibrium in a Monopolistic Competition Structure.**











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**ABSTRACT****THE EFFECTS OF COMPETITION POLICY CHANGES ON INTERNATIONAL  
TRADE AND EXPORT FLOWS: CANADA CASE ESTIMATES**

by

**RUBIN LUNIKU****May 2014****Advisor:** Professor Kevin Cotter**Major:** Economics**Degree:** Doctor of Philosophy

This dissertation investigates whether changes in the country's competition policy affect the flow and direction of its international trade, particularly its exports. We use a monopolistic competition model of trade, which predicts that an increase in domestic firms, resulting from the adoption of a stricter competition policy, has a positive impact on trade volume, including an increase in exports. We empirically test this hypothesis for 14 Canadian manufacturing sectors for the period 1970-1997. We show that the Canadian competition policy, as measured by the concentration ratio of the four largest firms' market share, is inversely and significantly related to the industry's exports, while controlling for other important export determinants. Furthermore, we find that the effect of competition policy changes is bigger in highly concentrated industries than in moderately concentrated ones. This result is in line with the predictions of the monopolistic competition model adopted in the study.

## AUTOBIOGRAPHICAL STATEMENT

Rubin Luniku is a part-time faculty at the Wayne State University, Department of Economics. He started teaching Principles and Intermediate Microeconomics and Macroeconomics subjects at Wayne State University in 2001, as a Graduate Teaching Assistant and continues today as part-time faculty. He worked as Economist/Cost Analyst at Form G. Tech Co. Troy, Michigan during 2008-2009. Before coming to U.S. in 1999, he has worked for various companies and Government Agencies in Albania, like the Ministry of Foreign Trade and the Central Bank of Albania. Currently, his research interest is in the International Trade and Industrial Organization fields.

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