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Trade liberalization, profitability, and financial leverage

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Abstract
We investigate the effects of trade liberalization on profitability and financial leverage using Canadian data arising from implementation of the Canada–US Free Trade Agreement. We find that falling domestic tariffs are associated with declining profits, especially for import-competing firms, while falling foreign tariffs are associated with increasing profits, especially for export-oriented firms. Also, import tariff reductions tend to increase leverage while export tariff reductions tend to decrease leverage.
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Introduction

Understanding the major factors affecting a firm's profitability is among the most fundamental objectives of research in the business disciplines. The international trading environment, especially the structure of international trade policy, is an increasingly important factor that might affect profits. In Canada, for example, trade flows have increased to the extent that, as of the early years of the 21st century, well over two-thirds of private sector output is either sold in import-competing industries or exported.[1]

A major change in North American trade policy occurred in 1989, when the Canada–US Free Trade Agreement (FTA) went into effect. This was followed in 1994 by creation of the North American Free Trade Agreement (NAFTA) when Mexico joined the FTA. Even before the FTA, the US market was very important to Canada. As of 1988 about 73% of Canadian exports or about 27% of GDP was exported to the US. Following implementation of the FTA in 1989, the US share of Canadian trade grew markedly, and total Canadian trade also grew. By 2004, about 82% of Canadian exports or about 33% of Canadian GDP was exported to the US. Imports have shown a comparable pattern.[2] In view of the importance of US trade to Canada and the importance of the FTA, it seems possible that the profitability effects of the FTA-related trade liberalization might be large enough to be observable for Canadian firms. Accordingly, the primary objective of this paper is to empirically assess the effects on profitability of the trade liberalization arising from the Canada–US FTA.

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The primary effect of the FTA was to reduce tariffs. As tariffs act much like a tax or an extra cost for imports, we expect that a reduction in US tariffs is like a cost reduction for Canadian firms exporting to the United States and should therefore increase their profits. Conversely, we expect that a reduction in Canadian tariffs should encourage US firms to compete more aggressively in Canada and therefore reduce the profits of firms in Canada that compete with imports. Thus, we expect the tariff–profit relationship to vary across firms, reflecting the heterogeneity in firms' export opportunities and import exposure.

One important characteristic of our data is the ability they afford to distinguish between export-oriented firms and import-competing firms. We are also able to distinguish import tariff changes from export tariff changes. Accordingly we have what we believe is an unprecedented opportunity to distinguish the effect of increased import competition on profit from the effect of increased export market access on profit, and to estimate both effects. The effect of trade liberalization on profits might seem straightforward, but relatively little previous work has documented its existence. The relationship between trade liberalization and profits is so fundamental to the mechanisms underlying the theory of international trade and business that documentation and estimation of this effect is, in our view, an important research objective.

If trade liberalization affects profitability, it might also lead to adjustments in a firm's financial structure. For example, if a firm's profits increase, this might allow a firm to reduce its short-run debts. Furthermore, tariff changes affect the extent of competition in a market and therefore change the perceived risk and return associated with that market, possibly leading to long-run strategic adjustments in the relative amount of debt and equity. As the determinants of financial structure form a major area of study in both financial economics and business strategy, we take the opportunity provided by our data to assess the impact of the FTA trade liberalization on financial leverage – the relative importance of debt as opposed to equity in financing the firm. A second objective of the paper is therefore to estimate the effect of the FTA trade liberalization on leverage.

The motivation for looking at the effects of trade liberalization seems strong. From a managerial point of view it is clearly important to understand the implications of exposure to international trade policy changes for profitability. If, for example, it turns out that export-oriented firms are positively and significantly affected by reductions in foreign tariffs, this suggests that positioning the firm to take advantage of export markets as trade liberalization occurs is likely to be a high-value strategy. As far as leverage is concerned, we believe that the effects of trade liberalization on leverage have not been fully understood in the past, and that it is helpful for firms to anticipate the pressures on financial leverage arising from trade policy changes. For example, a firm that can anticipate increasing leverage could then prepare for the corresponding increase in its vulnerability to competitive pressures and to bankruptcy.

At the public policy level decision-makers are interested in whether trade liberalization provides net benefits to the overall economy. Understanding the effect on firm profitability is a major component in pursuing this interest. It is particularly helpful for policy authorities to understand the differential impact of trade liberalization on import-competing and export-oriented firms. This has important implications for regional growth patterns, for tax revenues, for the industrial composition of the economy, and for the distribution of income.

The reason for policy interest in financial leverage is perhaps less obvious, although some relevant issues do arise. For example, because changes in leverage affect the firm's likelihood of bankruptcy, we would argue that the pattern of leverage across firms, regions, and industries affects exposure to and propagation of business cycles. In addition, changes in leverage affect a firm's exposure to competition and therefore have implications from a competition policy point of view. From an academic perspective we believe that the motivation for examining the effect of trade liberalization on profits and leverage is compelling, as the determinants of profit and leverage are central questions in strategy and finance.

Our principal findings are that lower Canadian tariffs tend to reduce the profits of Canadian firms, especially for the firms most subject to competition from imports, whereas lower US tariffs tend to increase profits, especially for the most export-oriented Canadian firms. Thus, we find that the FTA (and NAFTA) had an important pro-competitive effect on the Canadian economy, creating pressures on import-competing firms and creating opportunities for firms well positioned to compete with American rivals.

We also find significant effects of trade liberalization on financial leverage as measured by the debt to asset ratio. Falling Canadian tariffs are associated with increasing leverage, especially for import-competing firms, whereas reduced US tariffs are associated with decreasing leverage, especially for export-oriented firms. Putting these results together with the profitability results, we find that import-competing firms tend to experience lower profits and higher leverage while export-oriented firms tend to experience higher profits and lower leverage. This is consistent with the idea that firms often take advantage of increased profit to reduce debt, and react to decreased profit by allowing debt to rise.

The next section provides a brief literature review followed by a formal statement of our major hypotheses. The subsequent section contains a description of the data set, and this is followed by a presentation of the empirical results. The final section provides concluding remarks, including a discussion of managerial and policy implications of our findings. An appendix contains further information about the data.

Literature review and hypothesis development

The idea that trade policy changes might have an effect on profits is well established in the academic literature on international trade and in the lobbying practices of firms, labor unions, and industry associations. Papers outlining the likely effects of tariff changes on profits under imperfect competition include Brander and Spencer (1984) and Buffie and Spiller (1986). The empirical literature studying the effect of trade liberalization on profit is surprisingly small. One recent paper is Hay (2001), which studies the effect of the post-1990 Brazilian trade liberalization on large manufacturing firms. A very interesting paper by Thompson (1993) links events leading up to final agreement on the FTA to stock market valuations of Canadian firms. She finds modest but positive evidence that investors reacted in the expected directions across sectors when agreement on the FTA was reached. In a related paper, Brander (1991) finds that stock market valuations of Canadian firms were sensitive to changes in election polls in the 1988 election (in which ratification of the FTA was the major election issue).

There is also a substantial literature on the effect of trade liberalization on firm-level outcomes other than profitability. In particular, papers by Pavcnik (2002), Gu *et al*. (2003), Lewis-Bynoe *et al*. (2002), and Baggs (2005) investigate the effect of trade liberalization on exit. There is also a set of papers dealing with the effects of the Canada–US FTA on employment and firm size, particularly Gaston and Trefler (1997), Head and Ries (1999), Beaulieu (2000), and Trefler (2004). In addition, Feinberg and Keane (2001) analyze the effect of Canadian and US tariff changes in the 1980s and 1990s on production location and intra-firm trade decisions by multinationals. Feinberg and Keane (2005) address the causes of increases in bilateral MNC-based Canada–US trade flows. Interestingly, they find that arm's length trade was increased by trade liberalization but intra-firm trade was not. We are not aware of any work focusing on the profit consequences of the Canada–US FTA or NAFTA.

There is a large modern literature on financial leverage, starting with the fundamental contribution of Modigliani and Miller (1958). The idea that leverage is responsive to profitability goes back at least as far as Donaldson (1961) and is implied by the modern 'pecking order' theory of financial structure as described by Myers (1984). It is also related to the 'market timing' or 'window of opportunity' theory of financial structure as presented by Baker and Wurgler (2002), among others. See Frank and Goyal (2005) for a valuable review of the empirical work on leverage.

Our paper builds on the idea that changes in the product market environment are likely to give rise to changes in financial leverage. Early papers making and analyzing this point include Titman (1984), Brander and Lewis (1986), Allen (2000), and Maksimovic and Zechner (1991). We are not aware of papers dealing explicitly with trade liberalization as the cause of changes in the product market environment. One tangentially related paper is Bris *et al*. (2003), which focuses on the effect of a change in the exchange rate regime (adoption of the euro) on firm valuation.

Our first hypothesis concerns the effect of trade liberalization on profits. As noted in the Introduction, import tariff reductions should put downward pressure on profits of import-competing firms, as such firms experience more vigorous competition from foreign rivals facing lower tariffs. Conversely, export-oriented firms should tend to benefit from trade liberalization, as they experience lower export tariffs and better access to foreign markets. Overall, we expect firm profits to be negatively affected by import tariff reductions and positively affected by export tariff reductions. The extent of these effects

should depend on the firm's exposure to import competition and on its export orientation, as expressed in Hypothesis 1.

Hypothesis 1: The profit hypothesis

H1a: Reductions in import tariffs tend to reduce profits, especially for firms most subject to import competition.

H1b: Reductions in export tariffs tend to increase profits, especially for firms most strongly oriented toward exports.

In predicting the effect of trade liberalization on leverage there are several possible effects to consider. One important possibility is that, as tariff changes affect profitability, firms will absorb those effects by allowing debt and hence leverage to vary. Taking Hypothesis 1 as a maintained hypothesis, it follows that declines in domestic tariffs would put downward pressure on profits and would therefore induce firms to allow debt and leverage to rise. Conversely, falling foreign tariffs should raise profits and allow the firm to reduce debt and leverage.

Hypothesis 2: the leverage hypothesis

H2a: Reductions in domestic tariffs tend to increase the firm's leverage, especially for firms most subject to competition from imports.

H2b: Reductions in foreign tariffs tend to decrease the firm's leverage, especially for the most export-oriented firms.

The debt to asset ratio is our measure of leverage, where debt includes both short- and long-term debt. Changes in short-run debt (or 'current liabilities') reflect what is often referred to as working capital management. It is sometimes useful to distinguish between working capital management and long-run capital structure management. However, our analysis of leverage reflects both short- and long-run financial management. We view this as desirable, although it is also a choice forced upon us by the fact that our data do not distinguish between current liabilities and long-term debt.

Data description

We use a data set created by Statistics Canada and referred to as the T2-LEAP data set or simply 'T2-LEAP'. It was created by linking two underlying sources of data: corporate tax information from T2 tax forms, and the Longitudinal Employment Analysis Project (LEAP), which obtains its data from firm-specific payroll information filed with the Canada Revenue Agency (CRA). Firm names are removed and replaced with numerical identifiers so as to make the data set anonymous.

T2-LEAP is a longitudinal data set that provides information on every incorporated Canadian establishment[3] that legally hires employees (and hence files payroll information with the CRA) and, in the same year, files a T2 corporate income tax return. T2-LEAP covers the period 1984 through 1997. It provides annual firm-level data documenting the firm's employment level, profit, revenues, debt, equity, assets, location, and industry affiliation at the three-digit Standard Industrial Classification-Establishment (SIC-E) level. The data set contains almost the entire Canadian private sector as measured by either output or employment. Components of the economy that are omitted include non-incorporated enterprises and corporations that hired no employees. Several filters are applied in order to 'clean' the data, as described in the Appendix.

One advantage of the data is that they include both publicly traded firms and (the more numerous) privately held firms. The results obtainable from this data set are an important complement to empirical analysis based just on publicly traded corporations. However, we are restricted to book values of debt, equity, and assets. As noted above, data are annual. All financial data are converted to real (1986) Canadian dollars using the Consumer Price Index (CPI).

In order to estimate the effect of tariff changes on profits and leverage we must link T2-LEAP to tariff data. Canadian and US tariffs can be translated, following Lester and Morehen (1987) and Head and Ries (1999), to three-digit SIC codes for manufacturing firms. As described in our data appendix, individual commodity-level tariffs are aggregated to the three-digit level using combined production and import weights. This is possible only for manufacturing firms, so we are forced to restrict attention to the manufacturing sector. Each firm is, for each year, associated with the import and export tariff for its three-digit SIC code. Most firms are confined to a single three-digit industry. Those that span more than one three-digit industry are assigned by Statistics Canada to the most important three-digit code for that firm. Our data set has over 284,000 observations and 53,000 firms.

Profits are taken from corporate tax returns. Thus the measure of profit we have is taxable corporate income after allowable adjustments are made for depreciation and extraordinary items, and after interest is paid, but before corporate income tax is paid. Many firms do not report profits (taxable income) because firms that do not earn positive accounting profits are not required to report profits. Their profits are coded as zero, although most such firms in fact have negative accounting profits.

New equity offerings and new bond issues are relatively infrequent occurrences, but changes in bank debt and other liabilities are frequent. Leverage changes virtually every year for virtually every firm. Thus, most of the variation in leverage arises from short-run working capital management issues rather than long-term capital structure decisions. Table 1 reports descriptive statistics regarding profit and leverage.

Average leverage in our data is about 0.66, implying that the average firm has about 66% of its assets represented by debt and about 34% represented by equity. Median leverage is 0.65, just slightly less than the average. Median leverage rose from 0.63–0.68 over the 1989–1993 period, then fell to 0.65 as of 1997. Leverage is not highly skewed. Some firms (about 3% in our data) report debts that exceed assets, implying that equity is negative for these firms. This normally arises because the book value of assets does not capture their full economic value. However, firms might sometimes have genuine negative equity, implying that creditors are unlikely to be paid off in full. This would, for example, often be true of firms operating under bankruptcy protection.

The explanatory variables of central interest are tariffs (or changes in tariffs). For Canada, the largest tariff in 1989 was 18.3% and the median was 5.4%. For the US the largest 1989 tariff was 18.6% and the median was 2.3%. The smallest tariff for both countries was of course zero as, under the FTA, some tariffs fell to zero as of 1989. Some tariffs fell to zero over 5 years, and some fell to zero over 10 years. Thus, by 1997 tariffs were all but eliminated, with 1 year of tariff reduction remaining for those industries in the 10-year group, and all other industries at zero already. The largest manufacturing sector tariff in both countries in 1997 was approximately 2%.

One important issue concerns the collinearity between US and Canadian tariff changes. Our analysis requires that we distinguish between decreases in Canadian and US tariffs. If every Canadian tariff reduction on a good were matched by an equal US tariff reduction on that good, the correlation would be 1.0 and it would be difficult to separately identify the effect of US and Canadian tariff changes. However, the initial tariff structures had significant differences, implying that tariff reductions were not collinear. The correlation between export and import tariff reductions in our data is 0.82. Although this correlation is large, it allows enough independent variation to estimate distinct effects of US and Canadian tariffs. Table 2 reports descriptive statistics on firm- and industry-specific variables used as control variables.

Import intensity shows the share of US imports in total sales for a given three-digit industry for a given province. The export intensity variable shows the share of the output in a given three-digit industry and province that was exported to the US. These trade intensity variables should be good measures of exposure to import competition and of export orientation respectively.

As expected, variables related to firm size are highly skewed. The median firm has assets of only about C$378,000, whereas the mean level of assets is an order of magnitude larger at over C$9 million.

Table 1 Descriptive statistics regarding profit and leverage

	All firms		*Profitable firms*	
Number of firms	53,389	53,389	45,607	45,607
Number of observations	284,517	284,517	186,183	186,183
	Profits (000s)	*Leverage (debt/assets)*	*Profits (000s)*	*Leverage (debt/assets)*
25th percentile	30.9	0.41	63.4	0.42
Median	124.3	0.65	168.6	0.65
Mean	990.0	0.66	1155.4	0.66
75th percentile	388.3	0.88	473.5	0.86
99th percentile	12,227	1.71	14,304	1.70

Table 2 Descriptive statistics regarding control variables (all observations)

	Assets ($000s)	*Employees*	*Age*	*Import intensity*	*Export intensity*
25th percentile	129	4.0	6	0.08	0.07
Median	378	9.9	8	0.20	0.17
Mean	9512	54.1		0.24	0.25
75th percentile	1187	25.7	11	0.38	0.40
99th percentile	85,183	671.1		0.71	0.92

Employment levels are in standardized units that are adjusted to appropriately reflect the mix of full-time and part-time employment in each firm. Employment is strongly skewed, with the average of 54 employees exceeding the median of about 10 employees by a factor of 5. The age variable shows the number of full calendar years a firm is in the data up to and including the current observation. As LEAP data started in 1984, firms that existed prior to 1984 have their age 'top-coded' as if they started in 1984. Accordingly we do not report the mean or 99th percentile for age, and we use age only to identify new and young firms.

Some variables that might be used as explanatory variables for leverage, such as R&D expenditure, Tobin's Q, and dividends, are not available to us. The same is true of some potential explanatory variables for profit. These omitted variables must be viewed as entering the error terms in our regressions. If these omitted variables were correlated with tariffs, then our estimates would be susceptible to omitted variable bias. Although the possibility of such bias can never be completely ruled out, we have no reason to expect bias to be important in this case. In addition to firm-specific variables, there might also be macroeconomic variables that affect profits or leverage. We have reported results including two such variables: the exchange rate and interest rates (represented by the Canadian prime rate). For each of these variables, we have one economy-wide observation for each year, as described in the data appendix.

Empirical analysis and results

The effect of tariff changes on profits

Hypothesis 1 concerns the effect of tariff changes on profits. We test this hypothesis using a regression methodology. In view of the skewness of profits, it is appropriate to use the (natural) logarithm of profits as the dependent variable.[4] Changes in export tariffs and import tariffs are the primary explanatory variables. The regression equation has the following form:

$$\ln(\pi_{it}) = \alpha_0 + \alpha_1 \Delta\tau^m_{it} + \alpha_2 \Delta\tau^x_{it} + \alpha_c C_{it} + \varepsilon_{it} \quad (1)$$

where π represents profit, τ^m represents the import tariff, τ^x represents the tariff on exports, C represents a vector of control variables, and ε is a random error. The subscripts i and t refer to the ith firm at time t. The change in tariffs is the change between the last period and the current period. Thus, a tariff reduction appears as a positive $\Delta\tau$. As for control variables, we can control for firm size by using the log of assets (a rough measure of capital) and the log of employment (a good measure of labor) as explanatory variables. We include industry fixed effects at the two-digit SIC level. (As tariffs vary by industry only at the three-digit SIC level we believe it would be impractical to include three-digit industry fixed effects.[5]) We also use a time trend, and we capture the effect of firm age by including fixed effects for 'new' firms (those firms in their first eligible year) and 'young' firms (those in their second or third eligible years). We also control for the exchange rate.

The data form an unbalanced panel covering the period 1989 through 1997. Firms might be in the panel for any length of time from one year to the full nine years. There are several ways of taking account of the panel structure of the data. The three most standard possibilities are to use first differences, to introduce firm-specific fixed effects (which would supersede industry fixed effects), or to use firm-specific random effects. Each of these methods corrects for profit differences that arise from firm-specific effects. Given that we have a large N (many firms) and a small T (a comparatively short time series), we might prefer the first difference approach, but all approaches provide the same qualitative picture.

In considering Hypothesis 1, it is important to identify which firms are most likely to be affected by import tariffs changes and by export tariff changes. This is achieved by using the trade intensity variables and related interaction effects. Specifically, we allow for an interaction term between import tariff changes and import intensity, and we allow for a second interaction term involving export tariff changes and export intensity. The coefficients on these interaction terms then reflect whether tariff effects increase (as

predicted) as the extent of import competition and/or export orientation rises.

The error term incorporates unobserved influences on profit. Unobserved idiosyncratic influences will certainly be more important than changes in tariffs in determining the profit of any one firm. However, these effects should in general be uncorrelated with tariff changes. We therefore have a good chance to detect and isolate the effects of tariff changes on profit and leverage.

One very important aspect of the data is truncation of the profit variable. As can be inferred from Table 1, almost 100,000 of the approximately 285,000 observations have non-positive profits. These non-positive profits are all coded as 0. Apart from issues related to data accuracy, this would be a textbook example of a limited dependent variable that can be handled using a Tobit estimation procedure, as described, for example, in Wooldridge (2002). However, if we are concerned about data reliability among the firms that report non-positive profits we can simply drop the observations with non-positive profits and use ordinary least squares. In Table 3 we report three Tobit regressions using all observations. We also report three regressions using just the observations with positive profits.

The results shown in Table 3 are consistent with Hypothesis 1. Specification 1 provides results incorporating the tariff changes and a vector of relevant control variables as explanatory variables, but not including import and export intensity effects. The tariff change variables and the control variables come through strongly, with expected signs and reasonable magnitudes. Regressions without control variables (not reported) also show strong effects of tariff changes.

The variables that correct for size – employment and assets – can be viewed as measures of the labor and capital inputs respectively. If the dependent variable were viewed as a rough proxy for output, we would be estimating a production function, and the sum of the coefficients on labor and capital would be the estimate of local returns to scale. It is therefore reassuring that this sum is not far from 1. The fact that both assets and labor are highly and independently significant suggests that this is the best way to control for size – better than simply dividing profits by either assets or employment.

The exchange rate coefficient has a negative sign and is highly significant, indicating, as expected, that a depreciation of the Canadian dollar is good for the profits of Canadian firms (measured in Canadian dollars) and an appreciation is bad for Canadian profits. The 'new firm' effect indicates that, other things being equal, new enterprises (i.e., enterprises in their first full year as corporations) have lower profits than more experienced firms. Young firms (those in their second and third years) also suffer a profit discount, but that discount is of considerably smaller magnitude than for new firms.

The specification of greatest interest is Specification 2, which introduces import and export intensity variables and related interaction variables. The import intensity variable is negative and highly significant, indicating that, other things being equal, firms in industries and regions subject to more vigorous competition with imports from the United States had lower profits than other firms. Conversely, the export intensity variable is positive and significant, indicating that firms that were in export-oriented industries and regions did better than other firms, other things being equal.

The import interaction is the product of the import tariff change and the level of import intensity. The export interaction is the product of the export tariff change and the export intensity. If Hypothesis 1 is correct, then the negative effect of import tariff reductions on profit should be strongest for firms with high import intensity, leading to a negative coefficient on the import interaction. Similarly, the export interaction term should have a positive coefficient. If the effects of tariff changes are strongly concentrated at the most extreme levels of import competition and export orientation, it is even possible that the basic tariff change variable might lose its significance. The coefficients on the interaction terms are consistent with Hypothesis 1, and the effects are statistically significant.

The regression results obtained with Specifications 3–6 illustrate the primary methods of handling panel data. Specification 3 allows for random effects in a Tobit regression with all observations. Specifications 4 and 5 allow for fixed effects and random effects respectively using just the observations with positive profits, and Specification 6 uses first differences. As we have a large number of cross-sectional units (firms) and a relatively modest number of time series observation for each firm, we might expect the use of random or fixed effects to 'absorb' some of the effect due to tariffs. In fact, however, the results in Specifications 3–6 are similar to Specification 2, albeit with a weakening of trade intensity or interaction effects in some cases. However, the overall qualitative pattern of the results is clear, and is consistent with Hypo-

Table 3 Effect of tariff changes on profits

Specification regressors	*1 Tobit*	*2 Tobit*	*3 Tobit with random effects*	*4 OLS with fixed effects*	*5 OLS with random effects*	*6 OLS with 1st diff*	*Exp. sign*
No. of observations	284,517	284,517	284,517	186,183	186,183	186,183	
Intercept	9.32*** (0.16)	9.37*** (0.16)	8.65*** (0.115)	4.39*** (0.08)	4.60*** (0.09)	−0.014 (0.015)	
Δimport tariff	−28.6*** (1.8)	−35.8*** (2.2)	−28.2*** (2.1)	−12.7*** (2.4)	−4.83*** (1.74)	−4.95** (2.0)	−
Δexport tariff	6.76* (3.6)	6.99 (4.46)	6.33* (3.54)	24.7*** (4.5)	16.5*** (3.3)	24.2*** (3.8)	+
ln(employment)	0.417*** (0.005)	0.415*** (0.005)	0.319*** (0.006)	0.215*** (0.005)	0.302*** (0.003)		+
Δln(employment)						0.121*** (0.008)	+
ln(assets)	0.418*** (0.005)	0.421*** (0.005)	0.548*** (0.006)	0.610*** (0.005)	0.523*** (0.003)		+
Δln(assets)						0.743*** (0.008)	+
Exchange rate	−10.3*** (0.18)	−10.4*** (0.18)	−10.2*** (0.13)	−4.13*** (0.095)	−4.05*** (0.09)		−
Δexchange rate						−3.50*** (0.18)	−
Time trend	−0.053*** (0.004)	−0.046*** (0.004)	−0.075*** (0.003)	−0.018*** (0.002)	−0.009*** (0.002)		
New firm	−0.174*** (0.018)	−0.173*** (0.018)	−0.133*** (0.016)	0.00 (0.013)	0.066*** (0.009)	0.121*** (0.014)	
Young firm	−0.099*** (0.014)	−0.099*** (0.014)	−0.071*** (0.012)	−0.005 (0.009)	0.043*** (0.007)	0.012 (0.014)	
Import intensity		−0.731*** (0.059)	−0.104** (0.049)	−0.134*** (0.043)	−0.14*** (0.03)	−0.124*** (0.042)	−
Export intensity		0.732*** (0.051)	0.148*** (0.042)	0.232*** (0.041)	0.150*** (0.026)	0.144*** (0.034)	+
Import interaction		−42.8*** (4.4)	−36.1*** (4.2)	−13.3*** (4.3)	−20.5*** (3.05)	−6.50** (3.5)	−
Export interaction		16.3* (9.2)	8.54 (7.3)	34.3*** (7.7)	18.6*** (6.0)	34.1*** (8.3)	+
Two-digit industry fixed effects	Yes	Yes	Yes	No	Yes	Yes	
Log likelihood	−587766	−587600	−521002	R^2=0.23	R^2=0.78	R^2=0.09	

Dependent variable = ln(profits+1) for specifications 1–5; =Δln(profits+1) for specification 6.
Standard errors are in parentheses. ***, **, *=significance at 0.01, 0.05 and 0.10 levels, respectively.

thesis 1. Declining import tariffs tend to reduce profits, particularly for firms facing substantial import competition, whereas declining export tariffs tend to raise profits, especially for firms with high export intensity.

We do recognize, however, the important finding of Feinberg and Keane (2001, 2005) that there is considerable heterogeneity across firms within three-digit industries in their response to changes in the trade environment. What we can say is that a representative firm from an industry and region with high export orientation tended to earn higher profits than a representative firm in an industry and region with high levels of competition from imports. We believe this finding is novel, important, and robust.

The effect of tariff changes on leverage

Hypothesis 2 requires the use of leverage as the dependent variable. The basic regression links leverage, as measured by the debt to asset ratio, to changes in tariffs. The direct method of doing this is to regress leverage on tariff changes and appropriate control variables as expressed by the following regression specification:

$$\text{Lev}_{it} = \beta_0 + \beta_1 \Delta\tau_{it}^{m} + \beta_2 \Delta\tau_{it}^{x} + \beta_c C_{it} + u_{it} \qquad (2)$$

C is a vector of control variables, including industry fixed effects, a possible time trend, whether the firm is new, young or experienced, and the exchange rate, as with the profit regression. We can use import and export intensities and interactions with tariffs to address Hypothesis 2. In addition, we introduce interest rates, as represented by the Canadian prime rate, as a firm's willingness to choose debt as a method of finance might well reflect the cost of debt as specified in the 'market timing' approach to financial structure. It is likely that using tariff changes lagged by 1 year is preferable to using current tariff changes. Therefore, we report results using lagged tariff changes as regressors. This makes very little difference, as tariff changes from 1 year to the next for a given firm are closely correlated. Table 4 provides a set of regression results showing the relationship between leverage and tariffs.

In addition to the direct regression specified in Eq. (2), it is also possible to use a two-stage approach in which the first stage consists of regressing profit on tariffs and other variables and the second stage consists of regressing leverage on fitted or predicted values of profits. Thus, fitted profits would replace the tariff change variables in the regression. The indirect method would be appropriate if tariffs affect leverage largely through profits. We report results using this method in Specification 3 of Table 4 with lagged fitted profits as the profit variable.

As we use profits as a regressor in Table 4, we use only those observations for which profits are positive. We have also run but not reported the regressions using all data, setting profits to zero for the cases where profits are non-positive, and including a fixed effect for those observations. This produces very similar results to Table 4.

The primary fact arising from Table 4 is clear. Leverage appears to be related to changes in tariffs. Specifically, reductions in import tariffs tend to increase leverage, and reductions in export tariffs tend to reduce leverage. New firms tend to have higher leverage than other firms, and young firms also tend to have higher leverage, but not as high as that of new firms.

The trade intensity variables and the associated interaction terms are of central interest. These results are reported in Specification 2, which shows that firms in industries with high levels of import competition tend to have higher leverage than other firms. Correspondingly, firms in industries with high export orientation tend to have lower leverage than other firms. Furthermore, the interaction between import tariffs and import competition shows that firms in import-competing industries tend to have a larger response of leverage to import tariff changes. The export tariff – export intensity interaction is not statistically significant at the 0.1 level, but it is negative, indicating that firms with high export orientation tended to reduce leverage more in response to export tariff reductions than other firms.

The role of profits warrants some attention. When we include actual profits as a regressor (as in Specification 2), the size and significance of the export tariff effect do fall, and the profit effect is negative and highly significant: higher profit tends to reduce leverage. However, tariff changes remain significant. Similarly, when we use fitted profit instead of actual profit, as in Specification 3, it is also highly significant. The trade intensity variables lose much of their economic significance, but remain statistically significant with the expected signs. This pattern of results is consistent with the possibility that trade liberalization effects on leverage operate largely but not entirely through profits.

Specifications 4 and 5 report fixed effect and random effect panel data regressions, and exhibit

Table 4 Effect of tariff changes on leverage

Specification regressors	*1*	*2*	*3*	*4 Fixed effects*	*5 Random effects*	*6 1st diff.*	*Exp. sign*
No. of observations	186,183	186,183	186,183	186,183	186,183	186,183	
Intercept	1.08*** (0.05)	1.00*** (0.051)	0.946 (0.031)	0.92*** (0.03)	1.01*** (0.028)	0.003 (0.003)	
Fitted ln(profit)			−0.038*** (0.001)				−
Δimport tariff	3.80*** (0.48)	5.04*** (0.60)		1.99** (0.84)	3.13*** (0.690)	1.29*** (0.40)	+
Δexport tariff	−2.70*** (0.92)	−2.49** (1.2)		−3.48** (1.58)	−4.17*** (1.30)	−1.29* (0.78)	−
Exchange rate	−0.597*** (0.057)	−0.281*** (0.058)	−0.092** (0.046)	−0.245*** (0.033)	−0.250*** (0.032)		−
Δexchange rate						0.592*** (0.04)	
Interest rate	−0.180* (0.096)	−0.032 (0.096)	0.056 (0.071)	0.119*** (0.04)	−0.085* (0.044)		−
Δinterest rate						0.005 (0.04)	
Time trend	−0.001 (−0.001)	−0.002 (0.001)		−0.003*** (0.001)	−0.001 (0.001)		
New firm	0.227*** (0.005)	0.208*** (0.005)	0.190*** (0.005)	0.060*** (0.004)	0.123*** (0.004)	−0.031*** (0.003)	
Young firm	0.175*** (0.003)	0.161*** (0.003)	0.150*** (0.003)	0.031*** (0.003)	0.073*** (0.003)	−0.033*** (0.002)	
ln(profit)		−0.024*** (0.001)		−0.015*** (0.001)	−0.024*** (0.001)	−0.009*** (0.001)	
Import intensity		0.081*** (0.014)	0.018* (0.010)	0.020*** (0.005)	0.031** (0.013)	0.011 (0.010)	+
Export intensity		−0.028** (0.011)	−0.015** (0.007)	−0.036** (0.014)	−0.029** (0.010)	−0.008 (0.008)	−
Import interaction		6.90*** (1.2)		1.72** (0.783)	3.056** (1.22)	0.712 (0.80)	+
Export interaction		−0.427 (2.5)		−3.55 (2.68)	−3.35** (2.31)	−2.87* (1.69)	−
Two-digit industry fixed effects	Yes	Yes	Yes	No	Yes	Yes	
Adjusted R^2	0.05	0.06	0.07	0.01	0.05	0.01	

Dependent variable=leverage (debt/assets) for specifications 1–5; =Δleverage for specification 6. Standard errors are in parentheses. ***,** and *=significance at 0.01, 0.05 and 0.10 levels, respectively. Tariff changes, fitted profits and trade intensities are lagged one period.

similar qualitative properties to Specifications 1–3. Similarly, Specification 6 reports a regression explaining first differences in leverage. The trade interaction effects are not as strong as in the level regressions, but the overall pattern is clear. Falling import tariffs tend to increase leverage, and falling export tariffs tend to reduce leverage. As with Specification 2, profits have a very significant negative effect on leverage. These results are consistent with our theoretical expectations. Part of the interpretation is that, if profits decline, the firm is forced to stretch its accounts payable and/or borrow more, increasing leverage. If profits rise, the firm can cut back on short-term borrowing. Therefore, the effects on leverage that we observe incorporate and might be dominated by working capital management issues rather than by long-run strategic financial structure decisions.

Robustness

Expectations might be important. As of late 1988, when the final tariff reduction schedules were determined and it became clear that the FTA was going forward, it was possible to calculate the implied tariff changes for the next 10 years. We expect that the market value of each firm's equity would respond quickly to these expected tariff changes.[6] However, we are using book values of debt, equity, and assets, which should evolve primarily according to day-to-day changes in the firm's debt position. Anticipation of tariff reduction schedules should, therefore, not introduce estimation problems or interpretation problems in our analysis. We ran regressions with current tariff changes, tariff changes lagged by 1 year, and tariff changes lagged by 2 years, and obtained very similar results in each case.

There might also be some question as to whether each year for a given firm should be treated as a separate observation. Some firms had the same tariff reduction each year for 5 years (after which the tariff was eliminated), and some had the same reduction each year for 10 years. However, the other variables of interest were changing from year to year, as were tariffs themselves, so we would argue that year-to-year changes are legitimately distinct observations that should be included in any estimation. We tried adding categorical variables indicating where the firm was in its tariff reduction schedule. Incorporating these categorical effects has little effect on the coefficients of interest.

It is possible that tariffs (and hence tariff changes) might be endogenous, as political considerations in the pre-FTA period might have led to more protection (i.e., higher tariffs) for declining industries. If so, this would induce a possible correlation between the error term and the tariff change variable in our leverage regressions. Following Gaston and Trefler (1997), Beaulieu (2000) and Trefler (2004), we checked for this effect by using the instrumental variables (IV) estimation method outlined in Gaston and Trefler (1997). Specifically, we regress 1988 tariff levels on 1984–1987 import growth, employment growth, and sales growth. We apply a common phase-out rule for all industries starting from the fitted values of tariffs. This produces predicted values for tariffs over the 1989–1997 period. These predicted values are used as instruments (i.e., explanatory variables) in place of the actual tariffs. Using these instruments we get similar results to those already reported. If anything, the results offer slightly stronger support for Hypothesis 1. However, statistical tests indicate that, although the instruments are valid, firm-level endogeneity of tariff changes can be rejected at the 0.01 level. Accordingly we do not report the IV results.[7]

Economic significance

So far we have focused on the statistical significance of the results, reflecting our primary interest in the qualitative pattern of the results and the implications for our central hypotheses. Standard errors of estimates and variations across specifications are large enough that we would not attach great weight to specific point estimates of coefficients. Nevertheless, it is worth considering the economic significance (as implied by the magnitude of the coefficients) of our estimates. These magnitudes are of interest in themselves, and the extent to which they are plausible provides an additional check on the overall analysis.

In Table 5, we report implied effects of tariff changes on profits and leverage using Specification 6 from Table 3 and Specification 6 from Table 4. These specifications are chosen because they deal directly with differences in profits and leverage, respectively. The table shows the effect of 'large' and 'average' changes in export and import tariffs. 'Large' refers to the annual change for the set of tariffs at the maximum level in the data as of 1989 (i.e., about 2% per year). Average tariff changes are obtained by taking the equally weighted average tariffs across SIC three-digit manufacturing indus-

Table 5 Economic significance

	Average firm				
	Large import Δtariff	*Large export Δtariff*	*Ave. import Δtariff*	*Ave. export Δtariff*	*Combined effect (ave.)*
Δimp. tariff	0.02[a]		0.009		
Δexp. tariff		0.02		0.004	
empl	54	54	54	54	
Initial profit	990	990	990	990	
Δprofit	−146	985	−84	180	96
Initial leverage	0.66	0.66	0.66	0.66	
Δleverage	0.032	−0.074	0.016	−0.026	−0.01
	Median firm				
	Large import ΔTariff	*Large export ΔTariff*	*Med. import ΔTariff*	*Med. export ΔTariff*	*Combined effect (med)*
Δimp. tariff	0.02		0.006		
Δexp. tariff		0.02		0.003	
empl	10	10	10	10	
Initial profit	124	124	124	124	
Δprofit	−17	108	−8	15	7
Initial leverage	0.65	0.65	0.65	0.65	
Δleverage	0.032	−0.074	0.015	−0.024	−0.01

[a]We note that a value of 0.02 is an annual change of 2 percentage points per year.

tries as of 1988, and dividing by 10. The first panel of Table 5 shows the effects on an 'average' firm (i.e., a firm with average profit, leverage, and import intensity). Averages for firm-specific variables are taken over all firms in the data as of 1989. Profits are measured in thousands of dollars. The final column shows the effect on an average firm affected by both average import and export tariff changes. The second panel provides the same calculations for a median firm. Skewness in firm size implies that the median firm is much smaller than the average firm. Accordingly, the effects on the median firm are smaller than for the average firm.

The magnitudes indicated in Table 5 appear plausible. The implied profit effects of export changes are rather high, but a 95% confidence interval includes reasonable values. The effect of a large import tariff reduction reduces profit by $146,000 for an average firm. At this rate, many firms protected by initially large tariffs would have had profits reduced to zero over the phase-in period. Many firms did in fact go out of business. The implied effects on leverage are plausibly modest but large enough to be of interest. Looking at just tariff-related effects, an average firm in our data set would have experienced a reduction in leverage on the order of 0.01 per year, going from, for example, 0.66–0.65 over a 1-year period and going from about 0.7 to about 0.6 over the implementation period. This holds other factors constant. Not surprisingly, other factors did change over time, with the result that average leverage rose slightly over the period.

Concluding remarks

This paper underscores the idea that profits, financial structure, and product market competition are closely interrelated. It is clear that changing the competitive structure of the output market might change the profitability of firms. In addition, such changes might also affect the level of financial leverage chosen by the firm. We focus in particular on the change in product market conditions arising from trade liberalization. We ask whether trade liberalization has a significant impact on profits and on financial leverage.

We have the good fortune to have a compelling policy event at our disposal. This policy event[8] was the Canada–US FTA of 1989, which ushered in a 10-year period of successive tariff reductions culminating in the elimination of tariffs in the

manufacturing sector for trade between these two countries. The trade liberalization was large, well publicized, and not subsumed in a larger package of macroeconomic reforms. In addition, by focusing on Canadian manufacturing firms we exploit the fact that the Canadian manufacturing sector is closely integrated into the US economy.

During our sample period, the manufacturing sector exported about 40% of its total production to the US (rising, over the period, from about 30% to about 50%). In addition, about 35% of manufacturing output consumed in Canada was imported from the United States and also rose sharply over the period. In Canada, virtually every manufacturing firm is either export-oriented or import-competing, and many fall into both categories. Conveniently, however, there is substantial heterogeneity across firms in the relative importance of Canadian and US tariff changes. Putting these facts together implies that the Canada–US FTA offers an excellent opportunity to test the idea that trade liberalization might affect profits and leverage, and to estimate the nature of these effects. These data also allow us a rare opportunity to separately identify the impact of import and export tariff changes.

We find that trade liberalization appears to have a significant effect on profitability. Declining import tariffs are associated with falling profits as firms are subject to increasing import competition. This effect is strongest for the firms in (three-digit SIC) industries and regions with the highest levels of import competition. Declining export tariffs tend to increase profits, and this effect is strongest for firms in the most export-oriented industries and regions. Trade liberalization also affects leverage. Falling Canadian tariffs are associated with increasing leverage, whereas reduced US tariffs are associated with decreasing leverage.

This paper focuses on drawing inferences about decisions made by financial managers rather than on providing a normative prescription for managers. Nevertheless, there are lessons of managerial interest. Our findings are consistent with the general perception that exporting firms benefit from falling export tariffs and import-competing firms are harmed by falling import tariffs. Perhaps, the most noteworthy aspect of these findings is the striking responsiveness of profits to changes in tariffs, particularly export tariffs. Thus, our results emphasize the importance of export markets and the importance of taking advantage of trade policy changes. We also find the less obvious result that trade liberalization is, on balance, good for profits.

It follows that our results are consistent with the general support of the business community for trade liberalization. However, it is perhaps surprising that support for trade liberalization among exporting firms is not stronger than it is. There is some associated lobbying activity, but coverage in the media and the associated political pressure seem modest compared with coverage of alleged employment losses and 'outsourcing' arising from trade liberalization. This asymmetry in political pressure is less marked in Canada than in the United States, perhaps because of the greater relative importance of trade to Canada.

We draw attention to the idea that changes in trade policy might induce a change in the appropriate financial structure in the firm. However, it is likely that many managers do not react effectively to such changes. Even among those who do react, many managers are 'forced into' changing leverage by default as profits fall or rise rather than by anticipating the effects and acting accordingly. It is quite possible that firms would do better by intentionally changing leverage at an early stage.

At the public policy level the FTA (and NAFTA) experience has been extensively studied. Nevertheless, we do have some points to add. As indicated by Table 5, the net effect of the FTA in Canada was to increase profits and reduce leverage. Increased profits suggest that gains from trade in the form of enhanced export opportunities more than offset losses from increasing export competition. This of course looks only at the effect on firms and does not include the unambiguous benefits to consumers from trade liberalization. In addition, the reduced net leverage would have made the economy less susceptible to the propagation of business contractions through bankruptcy. We believe that these results should be of considerable interest, both for professional managers in the private sector and for policymakers.

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Notes

[1]Statistics Canada information on national income accounts, available at the Statistics Canada website at www.statcan.ca, indicates that between 2000 and 2004 exports averaged more than 40% of GDP and imports were close to 40% of GDP. See CANSIM Table 228–0003. Putting these numbers together and adjusting for government output (most of which is not traded) implies that well over two thirds of the private sector economy is either export-oriented or import-competing.

[2]The share of exports and imports going to and coming from the United States is readily available from the Statistics Canada website at www.statcan.ca. See CANSIM Table 379–0017.

[3]An 'establishment' is not necessarily equivalent to a 'firm', as some large firms have more than one establishment, but the overwhelming majority of firms are single establishments and, correspondingly, the vast majority of establishments correspond to independent firms. We shall use the term 'firm' to represent the units in the data set from now on.

[4]We use the log of (profits + 1) so as to bound the argument of the log function strictly away from 0. This is desirable given that the log of 0 is not defined. Using the log of profits (i.e., without adding 1) has no significant effect on the results but, in our view, is conceptually flawed.

[5]In view of the time-series variation in the data it is possible in principle to include three-digit fixed effects. However, the only source of variation in tariff changes for a given firm is that some tariffs went to zero over 5 years and thereafter remained unchanged. Computationally, three-digit fixed effects absorb the variation due to cross-sectional variation in tariff changes. Also, we expect industry effects to operate at a higher level of aggregation than the three-digit level in any case. We therefore report results based on two-digit SIC fixed effects. There are 22 two-digit industries in the data and 121 three-digit industries. For example, the two-digit industry 'Transportation Equipment' is subdivided into eight three-digit industries, including aircraft, motor vehicles, motor vehicle parts, truck and bus body parts, and railroad rolling stock. We have run regressions using three-digit industry fixed effects and find that the effects of tariffs on profit remain significant and qualitatively similar to the results in the paper. However, the significance of the effect on leverage is largely eliminated.

[6]This is consistent with the empirical work of Brander (1991) and Thompson (1993) showing that expected and actual ratification of the FTA had a significant effect on stock market valuations of Canadian firms.

[7]These results and all other regression results referred to in the text but not reported in tables are available from the authors on request.

[8]Strictly speaking, this event cannot be called a true 'experiment' as the tariffs and subsequent tariff reductions arose from an endogenous process, not from the exogenous determinations of an experimenter. However, we might describe it as a 'quasi-experiment' in which the 'treatment group' consists of firms subject to large tariff changes. At the very least, we would follow Trefler (2004) in saying that the Canada-US FTA was a relatively clean policy exercise in that the changes in trade policy consisted almost entirely of tariff changes.

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Data appendix

The T2-LEAP data set is created by linking the Longitudinal Employment Analysis Project (LEAP) with the Corporate Tax Statistical Universe File (T2SUF). Firms enter the LEAP database when they first hire employees, and exit the database when they cease to have employees. Annual employment for each firm is measured in average labor units (ALU). The reported ALU is interpreted as the number of 'standardized employees' working for a firm during a year. A standardized employee corresponds to the industry-specific average (based on payroll data) across full-time and part-time workers.

The T2SUF tracks every incorporated firm in Canada filing a T2 form with the Canada Revenue Agency (CRA). Thus, the T2-LEAP data set contains every firm in Canada that is both incorporated and legally hires employees. We limit our data to firms with more than one employee. This removes the very smallest firms and a lot of 'noise' from the data. The eliminated firms are significant in number but negligible in economic importance.

A second filter relates to leverage as measured by debt to asset ratio. Firms report assets, debt, and equity. CRA reporting imposes the constraint that the sum of debt plus equity equals assets. Firms normally determine a book value of assets and a book value of debt according to tax law and generally accepted accounting principles (GAAP). Equity is then determined as the difference between assets and debt. Assets almost always (i.e., in about 97% of cases) exceed debt, leading to a leverage ratio between 0 and 1. However, firms can have debts exceeding the book value of assets, implying a leverage ratio exceeding 1. Most such cases reflect a measurement problem. A firm might borrow money on the basis of a business idea that is, conceptually, an economic asset, but that is not reported as an asset. Debt could then exceed reported assets, and the leverage ratio could exceed 1, even though the 'true' debt to asset ratio would be less than 1. In fact, a few firms report positive debt and no assets, leading to infinite leverage ratios. There are also some finite but absurdly large ratios that would be misleading outliers in any regressions. We eliminate all observations for which the debt to asset ratio exceeds 2. This filter eliminates observations whose values consist primarily of measurement error.

T2-LEAP contains firm information for 15 years, from 1984 to 1998. However, the first and last years are subject to partial reporting, leaving the usable portion as 1985 to 1997. We use observations from 1989 forward, and use earlier data when necessary in constructing lags. For each firm, we discard the first and last year of its life in T2-LEAP, as the first and last years will typically be partial years. As we use first differences for some variables, we need two full calendar years of data for a given observation. For example, the firms appearing in our sample for 1989 are those that became incorporated and hired one or more employees on or before 31 December 1987, and did not exit the market before 1990.

The data set includes Canadian subsidiaries of foreign corporations. A large majority of firms either have purely Canadian or widely dispersed

ownership. The share of Canadian manufacturing assets controlled by wholly owned or partially owned subsidiaries of American firms is fairly large (approximately 26%), but this ownership is concentrated in large firms (GM Canada, Ford Canada, etc.). We believe that subsidiaries will, in any case, normally be subject to the same incentives as other firms in making capital structure decisions, and that any deviations would have no systematic effect that would bias our analysis.

For firms involved in mergers, acquisitions or spinoffs during the sample period, the T2LEAP record is defined by retrospective reconstruction. If, for example, firm A merged with firm B in year *t*, then a new firm, C, is created and given a synthetic history aggregated from the histories of firms A and B. The individual histories of A and B disappear from the database, and firm C represents their joint operations.

Using three-digit SIC codes, we are able to match both Canadian and US tariff rates to each firm by year and industry as in Head and Ries (1999). The matching of tariffs to three-digit SIC codes is from Lester and Morehen (1987). The starting point is statutory commodity-level tariffs. These tariffs are aggregated to the three-digit level by taking a weighted average of the underlying commodities in each three-digit category. The weights are production weights where possible, augmented by trade weights. US tariffs are compiled using the 93 industry classification provided in Table A2.1 of the Canada–US Free Trade Agreement: An Economic Assessment (Government of Canada, Department of Finance, 1988).

The annual prime rate and exchange rate are used as control variables. The prime rate was 13.3% in 1989, peaked at 14.1% in 1990, and reached its lowest point in 1997 at 5.0%. The exchange rate was 0.845 US dollars per $C in 1989, rose as high as 0.873 (in 1991), and fell to 0.722 as of 1997.

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