

The Flattening Firm and Product Market Competition: The Effect of Trade Liberalization on Corporate Hierarchies

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Abstract

This paper establishes a causal effect of product market competition on various characteristics of organizational design. Using a unique panel-dataset on firm hierarchies of large U.S. firms (1986-1999) and a quasi-natural experiment (trade liberalization), we find that competition leads firms to flatten their hierarchies: (i) firms reduce the number of positions between the CEO and division managers and (ii) increase the number of positions reporting directly to the CEO. The results illustrate how firms redesign their organizational structure through a set of complementary choices in response to changes in their environment. We discuss several possible interpretations of these changes. (JEL J33, L22, M21, M52)

Firms are flattening their corporate hierarchies. Spans of control have broadened and the number of levels within firms has declined. These trends are suggested and documented in a number of academic papers (e.g., Paul Osterman, 1996; Richard Whittington, et al., 1999; and Raghuram Rajan and Julie Wulf, 2006) and are often discussed in the business press. However, much less is known about what causes flattening and organizational change more broadly. This is surprising given the role found, not only for hierarchies (Jose Maria Liberti, 2005; Luis Garicano and Thomas Hubbard, 2007), but also for organizational (Timothy Bresnahan, Erik Brynjolfsson and Loren Hitt, 2002) and human resource practices in explaining firm productivity (Casey Ichniowski, Kathryn Shaw, and Giovanna Prennushi, 1997; Sandra Black and Lisa

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Lynch, 2001; Nicholas Bloom, Raffaella Sadun and John Van Reenen, 2009). At the same time, a number of economic forces have strengthened competition in product markets. International competition has intensified from falling tariffs and transport costs, and several waves of trade liberalization; domestic competition has increased from deregulations as well as reductions in information and transport costs. A number of authors have suggested that the trends in organizational change and competition are related (R. Preston McAfee and John McMillan, 1995; Dalia Marin and Thierry Verdier, 2003 and 2008; John Roberts, 2004; Ricardo Alonso, Wouter Dessein and Niko Matouschek, 2009; Paola Conconi, Patrick Legros and Andrew Newman, 2009), but there is little convincing empirical evidence to support this claim.

In this paper, we investigate whether and how changes in product markets lead firms to restructure their organizations. In particular, we focus on how hierarchical structures - measured by the number of management levels (depth) and CEO span of control - respond to competition. One important contribution of the paper is to go beyond correlations between measures of product market competition and organizational change to establish causal identification. Our main finding is that *greater competition causes firms to flatten their hierarchies*: they reduce the number of management levels and broaden the span of control for the CEO. We also discuss several possible interpretations of these changes. To the best of our knowledge, this is the first paper to use a credible identification strategy to show that exposure to trade leads to changes in organizational form.

Hierarchies and the implied reporting relationships between supervisors and subordinates are central to numerous organizational processes including, but not limited to, information-sharing, decision-making, and performance evaluation. In the organizational economics literature, there are two strands of research that analyze hierarchies as characterized by their depth and span of

control. The first strand considers hierarchies as a form of governance in which managers supervise subordinates and align incentives with firm objectives. Managerial span of control is limited by the time required to supervise employees, while the number of levels in the organization is limited by the loss of control across levels (e.g., Oliver Williamson, 1967; Guillermo Calvo and Stanislaw Wellisz, 1978, 1979; Sherwin Rosen, 1982; and Yingyi Qian, 1994). While more recent papers about incentive problems focus on the allocation of authority inside the firm (e.g., Philippe Aghion and Jean Tirole, 1997; Oliver Hart and John Moore, 2005; and Alonso, et al., 2008a), they do not make explicit predictions on hierarchical levels or spans of control.² The second strand of the literature focuses on the role of hierarchies in processing and communicating information. Levels in a hierarchy potentially lead to distortions in the transmission of information and implementation delays, while spans of control are limited by how much information a manager can process (e.g., Michael Keren and David Levhari, 1979; Roy Radner, 1993; Patrick Bolton and Mathias Dewatripont, 1994; Luis Garicano, 2000).³

In contrast with the number of theoretical papers, there has been limited empirical work analyzing depth and span because of the difficulty in obtaining data. The richness of our data allows us to address this gap and leads to a significant advantage over most of the existing empirical research on organizations that is traditionally based on cross-sectional analysis or a study restricted to a specific industry. We use a unique panel dataset of the internal organization of large U.S. firms in a broad set of manufacturing industries over 14 years (1986-1999). The data include detailed information on characteristics of firm hierarchies -CEO span of control and hierarchical depth (or number of management levels) - as well as rich information on

² One exception is Raghuram Rajan and Luigi Zingales (2001) who predict that flat hierarchies with fewer levels are optimal in human capital-intensive industries.

³ For a discussion of the measures of corporate hierarchy and a survey of related research, see Massimo Colombo and Marco Delmastro, (2008).

compensation for various senior manager positions. To ensure that our results are not driven by unobserved attributes of firms or divisions that may be correlated with organizational decisions, we fully exploit the panel dimension of the data (i.e. variation both within firms and within division manager positions).

Using this panel dataset we show that flattening is indeed associated with a variety of proxies for product market competition, such as import penetration, industry price-cost margins, and trade costs (sum of transport costs and tariffs). But, while this evidence is suggestive of a link between competition and hierarchical structure, it is not conclusive evidence.⁴ We go beyond existing research and exploit exogenous changes to entry barriers into an industry in order to identify a causal effect of foreign competition on organizational change. Our identification strategy exploits a quasi-natural experiment based on a trade shock. Our experiment is the Canada-United States Free Trade Agreement of 1989 (FTA) that eliminated tariffs and other trade barriers between the two countries (Daniel Trefler, 2004). The U.S. firms most affected by the liberalization were those with the largest tariff reductions –i.e., firms in industries with high U.S. tariffs on Canadian imports prior to 1989. These firms experienced a larger decline in entry barriers and thus were arguably exposed to a greater increase in competition.

We use this quasi-natural experiment and the differential increase in competitive pressure across industries in order to implement a difference-in-differences strategy. We find that for a firm with average tariffs before the liberalization, span of control increased by 6 percent and depth decreased by 11 percent after 1989. Overall, our results show a number of precisely estimated effects of competition on hierarchies and account for a moderate, but arguably causal share of the secular change in firm hierarchies

⁴ The standard measures, as is well known, are subject to numerous concerns: they do not measure the underlying competition parameter (the entry barrier), they are endogenous to changes in the competitiveness of markets, and they are non-monotonic in competition (Richard Schmalensee, 1989).

Since the trade liberalization was bilateral, it also implied a reduction in Canadian tariffs on U.S. exports potentially leading to market expansion opportunities for our U.S. firms. However, while we find effects of these market expansion opportunities on other outcomes (such as firm size and market value), if anything they had a dampening effect on firm flattening (although not statistically significant). So, all the ‘flattening’ is driven by intensifying competition from the fall in import tariffs (and not by market expansion from the fall in export tariffs).

We also evaluate a number of alternative explanations for the observed flattening and assess the robustness of the main results to additional specifications. In particular we evaluate the role of the rise of information technology,⁵ CEO turnover, and a host of other potential factors. Overall, we find that the results are robust to alternative specifications and that increasing competition leads firms to adopt flatter structures, reducing depth and increasing span.

While the main result in this paper is to establish a robust causal relationship between the trade liberalization and the flattening of firms, we also discuss possible interpretations of these changes. Management scholars have long argued that increased competition leads firms to search for new organizational practices in an attempt to replace traditional hierarchical structures.⁶ To our knowledge, in economics, there are very few theoretical papers that directly link competition and the main measures of hierarchical structure -depth and span.⁷ The purpose in this paper is not so much to discriminate between theories, but rather to exploit the unique richness of the data to document causal changes in several organizational variables in response to an exogenous shock.

⁵A number of papers have explored the relationship between IT and organizational characteristics (eg., Bresnahan, Brynjolfsson and Hitt, 2002; George P. Baker and Thomas Hubbard, 2004; Ann Bartel, Casey Ichniowski, and Kathryn Shaw, 2007).

⁶Refer to Richard Whittington, Andrew Pettigrew, Simon Peck, Evelyn Fenton and Martin Conyon (1999) for a review of the relevant literature in management. For early works that discuss the link between organizational change and the environment, refer to Paul Lawrence and Jay Lorsch (1967).

⁷ One exception is McAfee and McMillan (1995) who develop a model of the costs of private information arising from an agent’s ability to exploit an informational advantage in a hierarchical organization. Since hierarchies with more levels have greater informational inefficiencies, firms might flatten in response to an increase in competition to offset these inefficiencies.

Firms could flatten in the face of competition to improve their speed in responding to market changes (David Thesmar and Mathias Thoenig, 2000) or to minimize the distortion of information across levels within the hierarchy (McAfee and McMillan, 1995). Relatedly, they could also flatten to exploit increased returns to decentralized decision-making in more competitive environments (Marin and Verdier, 2003 and 2008; Alonso, et al., 2008b, 2009; Conconi et al., 2009). Other reasons for flattening might be to eliminate slack and cut costs (Harvey Leibenstein, 1966); or to alter the structure in response to a change in scope (i.e., the number of products or businesses as in Andrew Bernard, Stephen Redding and Peter Schott, 2006), the location of production, or their outsourcing decisions. We explore these different mechanisms in the data and, overall, our findings show little support for flattening as a way to simply cut costs. However, we do find some evidence that the liberalization led firms to become less diversified. We also find that the trade liberalization, in addition to causing firms to flatten, led to an increase in division manager compensation which we argue is more consistent with greater authority being allocated to division managers rather than less (Bengt Holmstrom and Paul Milgrom, 1994; Canice Prendergast, 2002).

Given the simultaneity of the organizational changes in response to an exogenous shock, our results are a good illustration of the theory of complementarities among a firm's organizational design elements (e.g. Paul Milgrom and John Roberts, 1995). We show that following an *exogenous* shock to their competitive environment, firms redesign their organizations to "fit" the environment in which they operate, and simultaneously reorganize along several dimensions: flattening the hierarchy by increasing span and reducing depth, changing their scope, and changing the structure of compensation.

The remainder of the paper is organized as follows. Section I describes the data and our empirical strategy. Section II outlines and discusses our results of changes in the hierarchy and other firm outcomes. Section III concludes.

I. Data and Empirical Strategy

A. Organizational Data

The primary dataset from which we draw our sample is an unbalanced cross-industry panel of more than 300 publicly traded U.S. firms over the years 1986-1999. This dataset includes detailed information on job descriptions, titles, reporting relationships, and reporting levels of senior and middle management positions. The dataset is rather unique because it allows us to identify changes in hierarchies within firms over a 14-year period that is characterized by significant organizational change.

The data are collected from a confidential compensation survey conducted by Hewitt Associates, a leading human resources consulting firm specializing in executive compensation and benefits. The survey is the largest private compensation survey (as measured by the number of participating firms).

Clearly, an important issue in datasets such as this one is the question of sample selection and whether the firms in the dataset are distinct from, or representative of, employers of similar size in their industry. The survey participants are typically the leaders in their sectors and, in fact, more than 75 percent of the firms in the dataset are listed as Fortune 500 firms in at least one year. We evaluate the representativeness of the broader sample by comparing key financial measures of our survey participants to a matched sample from Compustat. We begin by matching each firm in the Hewitt dataset to the Compustat firm that is closest in sales within its two-digit SIC industry in the year the firm joins the sample. We then perform Wilcoxon signed

rank tests to compare the Hewitt firms with the matched firms. While the firms in the Hewitt dataset are, on average, slightly larger in sales than the matched sample, we found no statistically significant difference in employment and profitability (return on sales). We also found no statistically significant difference in sales growth, employment growth, or annual changes in profitability for all sample years.⁸ In sum, the survey sample is most representative of Fortune 500 firms (for more details, see Rajan and Wulf, 2006).

An observation in the dataset is a managerial position within a firm in a year. This includes both operational positions (e.g., Chief Operations Officer and Division Managers) and senior staff positions (e.g., Chief Financial Officer and General or Legal Counsel). The data for each position include all components of compensation; as well as position-specific characteristics such as job title, the title of the position that the job reports to (i.e., the position's boss), number of positions between the position and the CEO in the organizational hierarchy, and both the incumbent's status as a corporate officer and tenure in position.

We analyze changes in organizational structure by focusing on two characteristics that are discussed in the theoretical literature on hierarchies: span of control and depth of the hierarchy (Colombo and Delmastro, 2008). These can be defined consistently across firms and over time and reflect important information about two important positions in the hierarchy, namely the division manager and the Chief Executive Officer (CEO).

Our first measure, span, is a firm-level measure that captures a horizontal dimension or breadth of the hierarchy (e.g., Keren and Levhari, 1979; Qian, 1994, Garicano, 2000). It measures CEO span of control and is defined as the number of positions reporting directly to the

⁸We also calculate financial measures for the sample of Compustat firms with 10,000 employees or greater over the period from 1986 to 1999 (excluding firms operating in financial services). On average, survey participants are more profitable, but growing at a slower rate relative to the sample of large Compustat firms. This is consistent with our observation that the firms in our sample are likely to be industry leaders (hence slightly more profitable) and also large (hence the slightly slower growth).

CEO. One obvious question when using this variable is: what information is reflected in a direct reporting relationship to the CEO? First, the CEO should have direct authority over the manager in the position (i.e., his subordinate) (e.g., Hart and Moore, 2005). Second, presumably the exchange of information between the CEO and the manager is more direct than it would be if the “chain of command” included other intermediary positions. Since the CEO is at the top of the lines of authority and communication, his job involves decision-making at the highest level, but also includes a role as coordinator of information and decisions that are associated with a complex, multidivisional firm (e.g., Alonso, et al., 2008a; Heikki Rantakari, 2008).

Our other measure, depth, is defined at the division level and represents the vertical dimension, or steepness, of the hierarchy (Williamson, 1967; Radner, 1993; Qian, 1994; Garciano, 2000). It is defined as the number of positions between the CEO and the division manager. Division managers (DM) are the highest authority in the division, where a division is defined as “the lowest level of profit center responsibility for a business unit that engineers, manufactures and sells its own products.” We focus on the division manager position for two reasons: (i) it is the position furthest down the hierarchy that is most consistently defined across firms; and (ii) it is informative about the extent to which responsibility is delegated in the firm.

Figure 1 displays an example of a hierarchy for a textile manufacturer that demonstrates both measures of span and depth in two time periods (pre- and post-FTA). In the pre-FTA chart, the measure of span equals 5 - there are five positions reporting directly to the CEO - and the measure of depth equals 2 — there are two positions between the CEO and each division manager. In the post-FTA chart, the span has increased to 7 and the depth has decreased to 1 as the division managers move closer to the CEO. In our sample, average span increased from 4.5 positions in 1986 to 7 positions in 1999 and average depth fell from around 1.5 to 1.

In this paper, we focus on the subset of firms that operate in the manufacturing sector for which we have data on tariffs. This leads to a sample of approximately 1962 firm-years and 5702 division-years that includes 230 firms and 1524 divisions. We will report both firm-level regressions (span of control is a firm level variable) and division-level regressions (division depth varies by division within the firm).

We also have information on division-level sales and employment and the above data are supplemented with financial information from Compustat. Finally, we construct a number of variables that are used as controls and that we will describe in the results section.

B. A Quasi-Natural Experiment for Product Market Changes: The 1989 Canada U.S. Free Trade Agreement

In January 1989, U.S. President Reagan and Canadian Prime Minister Mulroney signed the Canada U.S. Free Trade Agreement (FTA) to eliminate trade barriers, and in particular, all tariffs between Canada and the United States. The agreement encountered substantial opposition in Canada, and the Liberal Party announced that it would use its majority in the Senate to block passage of the free trade agreement until Canadian voters decided the agreement's fate in a general election. The highly contested election took place in October 1988 with a narrow Conservative victory. Three months later the agreement came into effect and the first round of tariff reductions took place.

This turn of events has important advantages for our empirical strategy (see also discussion in Trefler, 2004). Since the passage of the agreement was highly improbable and unexpected, it can be interpreted as an exogenous shock. Furthermore, there were no other important trade

agreements during that period so that the shock to trade with Canada is unlikely to be confounded with other factors.

This reduction of U.S. tariffs on imports from Canadian firms increased imports from Canada substantially (Kimberly Clausing, 2001). The FTA actually affected a significant fraction of U.S. trade since the U.S.-Canada trade relationship is the world's largest (Canadian imports represented an average of 20 percent of total U.S. imports at the time). Tariff reductions for industries defined at 4 digit SIC ranged from 0 percent to as high as 36 percent (with more variation at higher levels of aggregation). In addition, Canada is similar to the U.S. in terms of product specialization, so that Canadian products are likely to compete directly with U.S. products.⁹ Below we discuss more extensively the effect that the liberalization had on U.S. firms.

In order to evaluate the effect on organizational change of the trade agreement as a quasi-natural experiment, we exploit the fact that U.S. firms in industries with high tariffs on Canadian imports prior to 1989 suffered a bigger 'competitive shock' following the liberalization than firms facing low tariffs. The reductions in U.S. tariffs on imports from Canada after 1989 were dramatic.

All tariffs were scheduled to go to zero after 1989, but while some tariff reductions took effect immediately, others were scheduled to be phased out over a period of five or ten years. This phase-out schedule is a potential source of endogeneity: the phase-out times are endogenous choices, given they are potentially influenced by firms that seek protection from the government through lobbying. To avoid the endogeneity of the schedule, we treat all industries equally regardless of their phase-out schedule, and only exploit the level of tariffs before the

⁹ Keith Head and John Ries (2001) estimate the elasticity of substitution between U.S. and Canadian goods to be very high, at approximately 8.

agreement.¹⁰ Therefore, we define $AvT89_s$ to measure the level of exposure of the firm to the liberalization. This is the 3-year average tariff on Canadian imports by industry s for the period between 1986 and 1988 (Robert Feenstra, 1996),¹¹ where tariffs are defined as duty divided by customs value by 4 digit SIC (or 3 digit SIC) by year. Our dependent variables are a set of organizational variables ORG_{dst} (e.g. division-level depth and firm-level CEO span of control) by division d (or firm), industry s and year t , such that our basic empirical specification is the following reduced form:

$$(1) \quad ORG_{dst} = \theta AvT89_s * Post89_t + X_{dst}' \beta + d_t + \eta_d + \eta_d * t + \varepsilon_{dst}$$

Where $AvT89_s$ is the average level of tariffs on Canadian imports in the industry pre-89, $Post89_t$ is a dummy that equals one from 1989 onwards, X_{dst} are division (or firm) characteristics such as size, d_t are year dummies, η_d are division fixed effects that absorb any permanent cross-sectional division/firm/industry differences and ε_{dst} is an error term. This is a standard difference-in-differences specification that exploits the trade liberalization, where $AvT89_s$ (the “treatment”) is continuous. The coefficient of interest, θ , captures the differential effect of the liberalization on firms according to their trade exposure prior to 1989. Or, in other words, since all tariffs were scheduled to go to zero, it is the effect of the change in tariffs due to the FTA, net of the general change post 1989 and net of possible permanent differences across industries.¹²

¹⁰ This is the correct specification if one is concerned about endogeneity, and also given that all information on future tariff reductions was known in 1989. We also find that our main result holds if we use the actual Canadian tariff changes year by year –instead of the tariff reduction based on $AvT89_s$ - as a regressor (Table A2). But since this is endogenous for the reasons discussed earlier, we focus on the specification of equation (2) in the paper.

¹¹ The data are available from <http://www.internationaldata.org/> in the “1972-2001 U.S. import data”.

¹² Firms and divisions are assigned the industry reported as the firm’s primary four digit SIC in the first year they appear in the sample using historic SICs. This industry classification is not allowed to vary over time since these changes are endogenous.

We argued earlier that the agreement itself was largely unexpected and therefore one can consider it as an exogenous shock to the different industries. However, in order to make sure that there are no differential pre-existing trends in organizational variables that may be correlated with the initial tariff level, we saturate the model even further and include division (firm)-specific linear trends, $\eta_d * t$.

But even if the implementation of the agreement was unexpected, and if we do not allow for endogenous phase-out of tariffs to identify our results, we still need to address the fact that the pre-89 level of tariffs is not necessarily random. We do this in two different ways. Trefler (2004) argues that one source of tariff endogeneity is that declining industries may have high tariff levels. He addresses this concern by controlling for industry-specific trends. As mentioned, we address this concern by controlling for division-specific time trends ($\eta_d * t$) that absorb the industry secular trends. We further control for other pre-existing industry characteristics that are typically related to tariff protection: skill intensity, capital intensity and TFP growth of U.S. industries. The vector Z_s includes the averages of each of these measures by industry before the FTA (between 1986 and 1988). Analogous to our tariff measure, we also allow organizational change to vary along these dimensions after 1989 through the interaction term ($Z_s * Post89_t$).

Finally, one concern in estimating equation (1) is that our organizational variables—both span and depth—exhibit a strong trend over time (as suggested in Figures 2 & 3) leading to autocorrelated errors.¹³ We estimate equation (1) in first-differences, since this removes the autocorrelation (F statistic of 2.6), and thus is the efficient estimator in this case. Furthermore,

¹³ A test of autocorrelation strongly rejects the null of no autocorrelation, even when allowing for division-specific time trends (F statistic of 431.2). This implies that the fixed effects (within) estimation is inefficient.

since $AvT89_s$ is defined at the industry level, we cluster standard errors by four digit SIC in all specifications to allow for correlation across observations within an industry.

Once we include all the relevant variables and take first-differences, the regression we estimate is:

$$(2) \Delta ORG_{dst} = \theta \Delta AvT89_s * Post89_t + \Delta X_{dst}' \beta + \Delta d_t + \eta_d + \Delta(Z_s * Post89_t)' \varphi + \Delta \varepsilon_{dst}$$

Economic Impact of the FTA on U.S. Firms

An important final question before we proceed to the results is what evidence do we have on the impact of the FTA on U.S. firms? Clausing (2001) studies the FTA using disaggregated data at the commodity level (10 digit product categories) and finds that the increase in U.S. imports from Canada was larger the larger the tariff reduction (the higher the pre-1989 tariff). For imports that saw a tariff reduction in excess of 5 percent, trade doubled in size between 1989 and 1994. Head and Ries (2001) and John Romalis (2007) also find a sizable effect of the tariff reductions on trade volumes.

So, overall, the trade liberalization increased bilateral trade flows and import penetration, which is consistent with an increase in competitive pressure for firms on both sides of the border. Using our data, we also found a significant effect of the FTA on firms in our sample (Table A1), and evidence that the FTA led to greater competitive pressure for our firms from the reduction in U.S. tariffs, but also increased opportunities for market expansion from Canadian tariff reduction.¹⁴ Next, we assess the organizational response to this quasi-natural experiment.

¹⁴ We found (Table A1) that reductions in U.S. tariffs on Canadian imports led to reductions in average price-cost margin for our firms suggesting a significant negative effect of competition on accounting measures, and no significant changes on market returns or employment. Canadian tariff reductions –computed in an analogous way to $AvT89$ and using data from Trefler (2004)) did raise firm employment and excess market returns (and had no effect on price-cost margins), which is consistent with the market expansion interpretation. Trefler (2004) shows that the

II. Results

A. Trade Liberalization and Flattening: Changes in Division Depth and CEO Span of Control

In this section, we focus on the effect of the trade liberalization on changes in division depth and CEO span of control as the main organizational variables.¹⁵ In Section III.B., we will explore how other aspects of organizations are also changing over time in order to provide a fuller picture of organizational change and to explore the possible explanations for these changes.

Figures 2 and 3 show the main variation that we exploit in our empirical analysis. We divide firms and divisions according to whether the firm is in an industry with an above or below the median tariff reduction following the FTA (i.e., with a tariff above or below the median tariff pre-1989). We plot the average span (Figure 2) and depth (Figure 3) by year for the two subgroups. While we observe trending in organizational variables in both groups, there is a distinct difference in the change in trend after 1989 between the groups. Firms in industries with large tariff changes increase their span by more and decrease depth by more after the trade liberalization in comparison to firms in low-tariff reduction industries.¹⁶ While the figures depict raw differences in organizational change of firms in industries facing different competitive

FTA increased productivity of Canadian firms and their exports to the U.S. which is consistent with increased competitive pressure for U.S. firms.

¹⁵Before turning to the main specification of the paper that exploits a quasi-natural experiment, we studied the correlation between some standard measures of product market competition, depth and span. We found that division depth and CEO span significantly respond to other standard measures of competitive pressure (Table A2). Higher competition as reflected in lower trade costs (defined as tariffs plus transport costs, columns 1 and 4), a lower industry Lerner Index (columns 2 and 5) or higher import penetration (columns 3 and 6) significantly reduces depth and increases CEO span of control. While these measures can be subject to many criticisms and are by no means exogenous –that is why we use the FTA as our core specification- they provide evidence consistent with the main result in this paper: flattening is a response to increased competitive pressure.

¹⁶ These graphs restrict the sample to firms that are present in the data before 1989 to avoid compositional changes driving these patterns (we observe even starker patterns in the whole sample).

shocks, they do not take into account firm or division characteristics, unobserved heterogeneity, or the overall time trend. For this, we turn to our regression analysis.

Estimates of the Effect of the FTA on Division Depth and CEO Span

In Tables 2 and 3, we report the results of the effect of the FTA on division depth and CEO span of control, respectively. The tables have a similar structure with specifications reported in roughly the same order. In the depth regressions (Table 2), the unit of observation is the division-year (there are 1524 divisions in the data); while in the span regressions (Table 3), it is the firm-year (230 firms).¹⁷

All regressions follow the structure of equation (2) and include year dummies and controls for firm size (as the natural logarithm of sales) and the endogeneity of tariffs through interactions of industry characteristics (skill intensity, capital intensity and TFP growth) with a post 89 dummy. Standard errors are clustered at the industry level. The regressions also account for permanent unobserved heterogeneity (firm or division) that might bias our estimates. This is a big advantage of this dataset, in that the estimates are exclusively identified from within firm variation in their exposure to the FTA (and not from differences across firms).

The coefficient of interest is the interaction of the average tariff in the industry before the 1989 FTA with a post 89 dummy (variable $AvT89*Post89$). We expect the 1989 FTA to lead to a greater increase in competitive pressure (i.e., a larger fall in entry barriers) in industries with high tariffs relative to low-tariff industries.

¹⁷ It is important to run the depth regressions at the division level –instead of averaging by firm- in order to look at changes of the same division over time, and to be able to control for division size. Given that the coverage of divisions within a firm can fluctuate (firms do not report all divisions in the data), changes in average depth within firms may be capturing compositional changes.

The main results are shown in column 1 of Tables 2 and 3. In column 1 of Table 2 (depth) the coefficient on the interaction term is negative and statistically significant. This suggests that firms in industries with higher tariffs prior to the trade liberalization decreased division depth more over the period as their product markets faced greater competition due to a decline in tariffs. A firm in an industry with average U.S. tariffs on Canadian imports (4 percent) decreased division depth by 0.146 positions following the trade liberalization ($3.661 * 0.04$). This represents 11.2 percent of average depth in the sample. But, how can we interpret the magnitude of the effect? One way to interpret it is to imagine a firm with six division managers each with one position between them and the CEO (i.e., depth of 1). Following the trade liberalization, a firm with average tariffs would move one of the six division managers to report directly to the CEO. This requires a change in the level of reporting for one of the divisions in this example, so it is relatively easy to implement and does not involve significant reorganization costs (it simply requires that the CEO decides that one of the six division managers now reports directly to him).

Turning to span of control, in Table 3 column 2, we find a positive and statistically significant coefficient suggesting that firms increase span of control more in response to a greater fall in tariffs in their industries. A firm with average tariffs before 1989 increased span by 0.324 positions following the trade liberalization ($8.106 * 0.04$), or 6 percent of average span in the sample. This implies that one of every three firms in our sample increased the CEO's span of control by one position (i.e., that either one more division manager or functional staff reports directly to the CEO). Again, this could simply require the CEO to change the reporting structure of one position.

In Table 2 (depth) columns 2 through 7, we also control for division-specific time trends and for division size (the log of division employment) and still find that firms more affected by the

FTA repositioned their division managers closer to the top of the hierarchy.¹⁸ We lose around 700 observations where division employment is missing, but this does not substantially alter the results. Perhaps not surprisingly, larger firms have greater depth and larger divisions within firms are closer to the top. Column 2 of Table 3 (span) controls for firm-specific time trends, and we obtain a similar though slightly larger effect than in column 1 (coefficient of 9.9 instead of 8.1). This indicates that the result is not driven by pre-existing trends in span that may have pre-dated the liberalization agreement.

Next, since the trade liberalization implied not only a fall in U.S. tariffs on Canadian imports, but also a reduction of Canadian tariffs on U.S. exports, we allow for an effect of this second aspect of the liberalization, that we know affected employment and market value significantly for these firms (Table A1). Column 3 includes an interaction of the average Canadian tariff on U.S. exports with a post 1989 dummy (labeled as Export AvT89 and defined in an analogous way to U.S. AvT89). The effect is positive for depth and negative for span, suggesting that on average the market expansion possibilities led U.S. firms to steepen their hierarchies relative to the trend. However, since this is the opposite effect of that for import tariffs (although it is not statistically significant), we conclude that firms flatten in response to increasing competition from imports and not from greater export opportunities.

Column 4 in both Tables 2 and 3 provides a test of the assumption that the shock was unanticipated. We replace the Post 89 dummy in AvT*Post89 with a Post88 dummy variable (equals one from 1988 onwards) and keep the same set of controls (this is a standard placebo test for differences-in-differences). If the liberalization was anticipated, or if there was a pre-existing trend, then this new variable would pick up what we argue is a discrete “shock” before it

¹⁸ This suggests that our main result is unlikely to be driven by downsizing of divisions due to outsourcing, or offshoring of certain activities, since this would possibly lead to a reduction in employment. (We found no relationship between log division employment and the experiment and hence we can include it as a control.)

occurred. If it is zero, it provides support to the maintained hypothesis that the shock was unanticipated (recall our estimates are in first-differences). The coefficient is statistically insignificant in both tables, lending credibility to the fact that the liberalization was truly unanticipated and that firms only started to respond after 1989.

Overall, we find convincing evidence that the effect of the trade liberalization on the flattening of firms took place around the 1989 period.¹⁹ Next, we consider two important alternative explanations that could affect our main results.

One frequent reason for why firms change their organizations is because there is a change in firm leadership. We found no significant effect of the trade liberalization on CEO turnover (unreported), so that we can include a dummy that indicates a change in CEO as a regressor in column 5. We find that depth decreases by 0.182 positions (division managers move closer to the top) in the event of a change in the CEO, and that span increases by 0.446 positions. However, as expected, the effect of the trade liberalization is unchanged, confirming that it has an independent effect on organizational change that is distinct from CEO turnover.

Finally, we try to consider the relevance of IT as a driver of organizational change. The mere availability of IT and falling IT prices should not be a problem for our identification since the availability of IT was similar across industries and our experiment exploits the differential effect across industries after 1989. However, if the FTA causes firms to adopt IT, the effect we are estimating would not be the direct effect of competition on hierarchies, but the indirect effect of competition through higher IT adoption. Since both effects are interesting in themselves, we would like to assess their relative importance to the extent that the data allow, and given we only

¹⁹ We also found larger effects in firms that did not change industry over the sample period, in firms that reported a 4-digit SIC industry, and when using a weighted average of tariffs taking into account the different segments the firm operated in a base year. We also found that flattening was more pronounced in industries that had an average tariff on Canadian imports in 1989 larger than the average tariff on imports from the rest of the world (unreported).

have one source of exogenous variation. First, we tested whether IT adoption is related to our quasi-natural experiment with insignificant results (unreported). Therefore, we introduce IT investment as a control in our main specification. We control for two types of IT investment at the industry level: total IT in column 6 (includes hardware, software and communications) and communication technology (CT) in column 7 of Table 2.²⁰

First, we confirm that our coefficient of interest is unaffected. But, more importantly for the interpretation of our results, the coefficient on overall IT (column 6 in both tables) is positive for both depth and span suggesting that increases in IT are associated with *steeper* organizations (more levels) and wider spans of control. However, both coefficients are statistically insignificant. Interestingly though, when we focus on the communications component of IT (Table 2 column 6), we find a positive and statistically significant coefficient in the depth regression (but, insignificant for span -unreported). This is consistent with theories of IT and hierarchies that say that improvements in communication technologies (costs of acquiring/communicating information) can increase depth and span (Garicano, 2000). Therefore, if anything, the effect on delayering of more IT (CT) goes in the *opposite* direction to the competition effect that we have shown in this study.

Finally, we assess how much of the increase in span is directly related to the reduction in depth, and whether the change in span and depth are capturing different phenomena inside the firm. Span can increase because division managers start reporting directly to the CEO, but also because other senior staff positions report directly to the CEO. Column 7 of Table 3 regresses the number of non-operational positions that report directly to the CEO (i.e. positions independent of

²⁰ These are defined as the investment in IT (CT) capital stock at the 2-digit SIC industry level based on data from the Bureau of Economic Analysis (BEA)). The data are very aggregated relative to what one would require for a conclusive analysis, however, they allow us to shed light on the importance of investments in information technology in explaining our results.

division managers) and shows that this increases as a result of the reduction in import tariffs, and decreases from the reduction in export tariffs. Since the measure of span that excludes division managers (and the effect from changes in depth) increases with tariff reductions, we conclude that the two dimensions of hierarchies, depth and span, are capturing related but distinct responses to the FTA.

Overall, we find systematic evidence that firms experiencing a larger shock following the trade liberalization (those in more protected industries prior to 1989) reduced division depth and increased CEO span of control *more* relative to firms less affected by the liberalization.

B. Why Are Firms Flattening?

The previous results show that the quasi-natural experiment based on the FTA explains flattening —both the increased span of control of the CEO and the decreased depth of division managers. However, even though we document a significant effect, we have not discussed the reasons why firms may decide to alter their organizational structure. While it is beyond the scope of the paper to try to identify the precise channels for these facts, in this section we discuss to what extent the evidence is consistent with a number of possible mechanisms.

Changes in Decision-Making

Mirroring the two strands in the theoretical literature, flattening hierarchies could reflect two distinct, but related changes in the way that firms make decisions. Firms may flatten to improve the processing and communication of information (e.g., Keren and Levhari, 1979; Radner, 1993; Bolton and Dewatripont, 1994; Garicano, 2000). Or, firms may flatten to align incentives and improve governance by delegating authority to better-informed managers (e.g.,

Williamson, 1967; Calvo and Wellisz, 1978, 1979; Rosen, 1982; Qian, 1994). However, what causes these changes? Organizational change may be a direct response to increased competition in product markets (Thesmar and Thoenig, 2000). For example, when firms face greater competition and lower profit margins, they may eliminate levels to reduce inefficiencies arising from informational advantages of lower level managers with greater market knowledge (McAfee and McMillan, 1995). Furthermore, competition can cause firms to change the allocation of decision-making authority (Marin and Verdier, 2003 and 2008; Alonso et al. 2008b and 2009; Rantakari, 2008b; Conconi et al., 2009).

Our variables, depth (number of reporting levels) and span (number of direct reports) cannot capture the flow of information, the speed of decisions, or where decisions are made. So we cannot test directly for changes in decision-making. However, as division managers move closer to the CEO, they are subject to less supervision by intermediaries (although possibly to more supervision by the CEO). Since there are clear theoretical predictions (e.g., Susan Athey and John Roberts, 2001; Prendergast, 2002) and supporting empirical evidence on the complementarities between decision-making authority and incentive provision, we can analyze how division manager compensation changes as competition increases and assess whether the decrease in depth is consistent with more or less authority for division managers.²¹

Column 3 of Table 4 shows that division manager pay increases more for firms with higher tariff reductions after 1989. This is controlling for individual times division specific fixed effects, such that it is the same individual with the same job title that sees his pay increase. Column 4, in turn, shows that the fraction of long-term incentives (defined as above) out of total pay that division managers receive also increases. The results show that the trade liberalization

²¹There is empirical evidence that delegation and incentives move together (Margaret Abernethy et al. 2004; Julie Wulf, 2007, Jan Bouwens et al., 2007).

led to a 3.5 percentage point higher fraction of total pay in the form of long-term incentives for division managers in a firm with average tariffs. We also found (unreported) that the sensitivity of division manager pay to division-level performance (as measured by the natural log of division sales) increased with competition from the trade liberalization (consistent with Vicente Cuñat and Maria Guadalupe, 2009). While not conclusive proof of changes in decision-making, to the extent that greater authority generally goes hand-in-hand with increased incentive provision, this set of facts is consistent with flattening reflecting greater decision-making authority to division managers as a result of intensified competition.

Cost-Cutting

Perhaps the simplest reason why firms reorganize is to downsize or cut costs. A common argument is that firms in a non-competitive setting do not fully minimize costs (managers live “the quiet life” of a monopoly) and that an increase in competition forces them to eliminate organizational slack or X-inefficiency (Leibenstein, 1966). To evaluate whether reducing slack and increasing efficiency is the first order reason for flattening, we focus on the intermediary position between the CEO and the division manager for which we have some information: the group manager. These managers have multiple profit center responsibility and are typically positioned between the CEO and the division manager (see Figure 1).

In column 1 of Table 4, we regress the number of group positions in the firm on our competition measure and include firm fixed effects, firm-specific linear trends and a control for firm size. We find that the trade liberalization (weakly) reduces the number of group managers. However, we also find that total pay of the remaining group managers increases (column 6). This increase in the total pay (labor costs) is at odds with the simplest version of the cost-cutting

explanation.²² Next, we evaluate how the level of pay of division managers themselves changes with the trade liberalization. The dependent variable in Column 3 of Table 4 is the logarithm of division manager total compensation defined as the sum of salary, bonus, and long-term compensation (including the Black-Scholes value of stock options grants, restricted stock and other long-term incentives). We control for manager times division-specific fixed effects and trends, such that it reflects the change in pay for the same individual in the same position. We find that higher competitive pressure leads to higher total pay. Division managers in industries with average tariff changes (average pre-1989 tariffs) received a 7.3 percent increase (1.817×0.04) in total compensation after the trade liberalization relative to managers in industries with no tariffs throughout.

Overall, we observe that total pay going to division managers and other senior managers increases in response to the trade liberalization. This is inconsistent with the simple explanation of cost-cutting, if the elimination of positions aims to reduce compensation costs.²³

Changes in Firm Scope

Another equally plausible explanation for some of the changes that we observe is that firms change the scope of their operations. First, firms may diversify into more businesses as the result of the liberalization, or reduce the number of products (Bernard, Redding and Schott, 2006) and as a result change their organizational structure. To test for this explanation, we use the Herfindahl index of sales across different 2 digit segments, as an inverse measure of firm

²² We also found that total pay for a group of senior executive positions increased including CEO, group managers, division managers, CFO, General Counsel, Head of Human Resources, and Head of Strategic Planning (unreported).

²³ We also looked at the effect of the trade liberalization on Selling, General and Administrative expenses (SG&A), as a measure of overhead costs. We found the effect to be, if anything, positive (although not significant) indicating higher overhead costs in response to greater competition which is also at odds with the simple cost-cutting explanation.

diversification. We find that firms decrease scope and focus their business operations (become less diversified), the larger the tariff reduction from Canada (column 5, Table 4). This suggests that a possible additional mechanism for increased flattening may be through reductions in firm scope. Relatedly, firms may respond to increased competition by restructuring, merging with other firms, or by outsourcing or off-shoring activities. However, as mentioned earlier, we find no effect of changes in employment as a result of the reduction in import tariffs due to the FTA, suggesting this is not a primary driver.

Finally, since many of these firms have multinational operations, and some are likely to have Canadian subsidiaries before 1989, we tested whether their choice of being located in Canada changed with the liberalization. If U.S. firms created Canadian subsidiaries because of trade barriers, we might expect the benefits of local presence in Canada to disappear with freer trade. Column 6 shows a negative but insignificant effect of the trade liberalization on the number of Canadian subsidiaries of the firm. We only have information on subsidiaries for 1988 and 1993, and therefore rely on the change between the two years, but overall one cannot ascribe the main effect we find on depth and span solely to this explanation.

III. Conclusion

Empirical evidence suggests that firm hierarchies have been flattening—they have fewer levels and broader spans of control. However there is little systematic evidence explaining these changes. The main contribution of this paper is to establish a causal effect between increased foreign competition from a quasi-natural experiment (the trade liberalization between Canada and the U.S.) and the flattening of firms. We use a unique panel-dataset of organizational practices that allows us to identify our results from variation within divisions and firms over

time, moving beyond cross-sectional analysis of earlier research. Since the trade liberalization was bilateral, it also implied a reduction in Canadian tariffs on U.S. exports potentially leading to market expansion opportunities for our U.S. firms. However, our findings suggest that it is increased competition that causes firms to flatten rather than greater market expansion opportunities. We find that U.S. firms in manufacturing industries more exposed to the trade liberalization reduce the number of hierarchical levels and broaden the span of control for the CEO.

We found no evidence that these changes resulted from pure cost-cutting efforts by firms. In fact, we find that pay of division managers (and other senior management positions) increases in more competitive environments which seems at odds with the simple cost-cutting or X-inefficiency explanation. We also find that the effect of competition on flattening is not driven by changes in outsourcing, changes in IT, or CEO turnover. We do, however, find some evidence that firms decreased their business scope as a result of the trade liberalization and became less diversified. This may be contributing to their flattening. We also find evidence on pay that indicates possible changes in the way decisions are made inside the firm, in particular, greater decision-making authority to division managers.

This paper is an important step in the understanding of the role of product markets in explaining organizational change. While we establish a causal effect, our results account for a moderate fraction of the flattening phenomenon. We would expect that other sources of increasing domestic and foreign competition (besides the FTA) are important contributors to the secular flattening of firms. Analyzing other drivers of competition, the interaction between organizational structure and other corporate responses, and the overall impact of these changes on firm performance is left for future research.

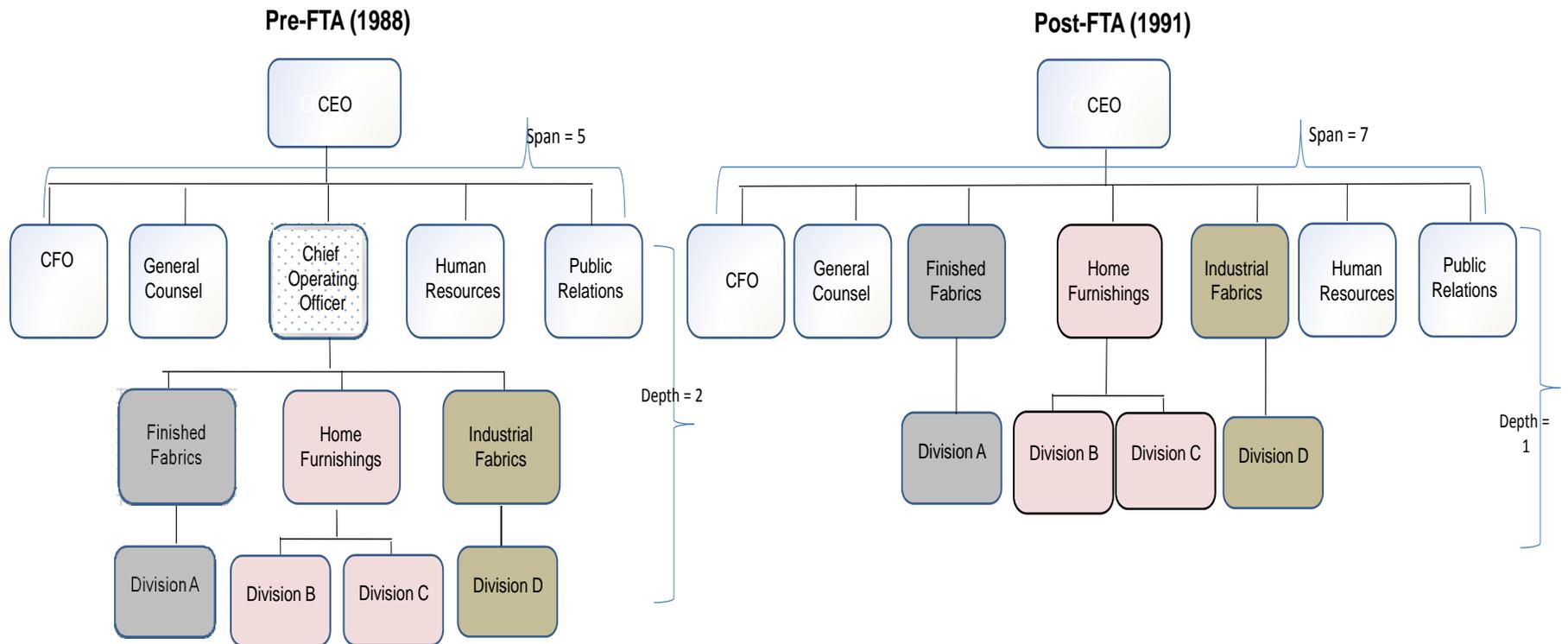
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Figure 1: Textile Manufacturer: Changes in Hierarchy pre-FTA versus post-FTA
 (Industry SIC 221: Broadwoven Fabric Mills, Cotton--U.S. Tariffs on Canadian Imports: 8.8 percent)



Span = number of positions reporting to CEO; Depth = number of positions between the CEO and Division Manager

Figure 2 The Differential Effect of the FTA on Span -High vs. Low Tariff Industries

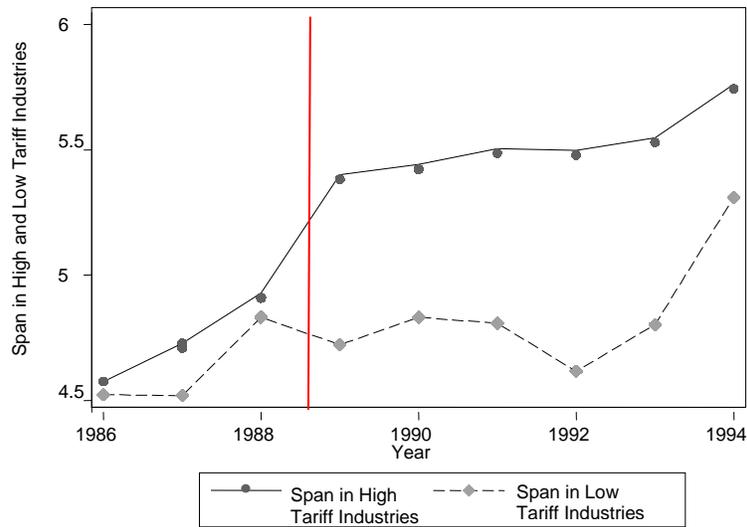


Figure 3 The Differential Effect of the FTA on Depth -High vs. Low Tariff Industries

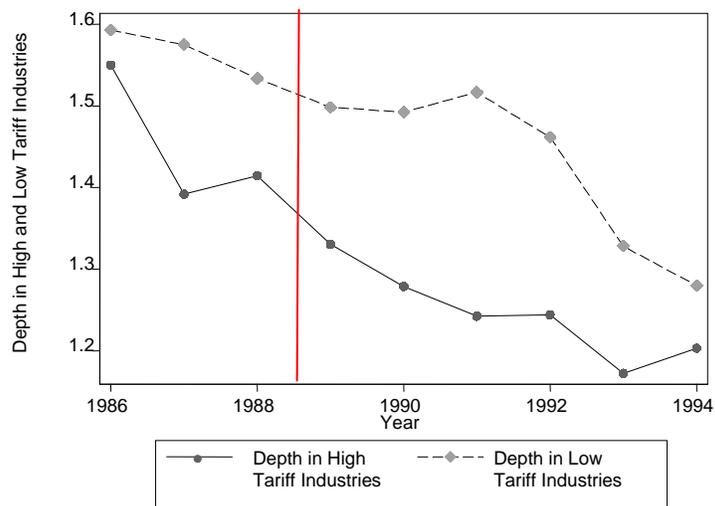


Table 1: Descriptive Statistics

	Mean	S.D.	# Observations
<i>Division level variables:</i>			
Division Depth	1.432	0.791	6396
ln DM Total Compensation	12.729	0.66	6396
Share Long Term Incentives	0.29	0.157	6396
ln Division Employment	-0.033	1.42	5857
ln Division Sales	12.454	1.404	5869
Information Tech. (IT) Investment	0.054	0.041	6396
Communication Tech. (CT) Investment	0.021	0.016	6396
<i>Firm level variables:</i>			
CEO span of control	5.473	2.82	1962
ln Firm Sales	8.296	1.228	1962
ln Firm Performance	8.095	1.596	1902
# Group Managers	2.7	1.596	1450
ln Pay Group Managers	14.91	0.846	1445
Segment HHI	0.761	0.243	1941
#Canadian Subsidiaries	2.413	3.046	1459
<i>Trade variables:</i>			
AvT89 (Average US Tariff on Canadian Imports pre-1989)	0.039	0.041	1962
Export: AvT89 (Average Canadian Tariff on US Exports pre-1989)	0.053	0.065	1962

Notes: Div. Depth is the number of managers between the DM and the CEO; ln DM Tot Comp. is the log of Div. Manager total pay; Share Long Term Incentives (Share LT Incent.) is the fraction of long term incentives over Div. Manager total pay; IT invest (CT invest) is the annual change in IT (Communication Technologies) capital stock at 2 digit SIC from BEA data; CEO Span is the number of managers that report directly to the CEO; ln Firm Performance is log total market value for the year including stock returns and dividends; # Group Mgrs is the number of group managers between the DM and the CEO; ln Pay Group Managers is # Group managers multiplied by group manager's average pay (in logs); Segment HHI is the Herfindahl index of 2 digit segment sales (sum of squared shares of each reported segment sales over total sales, an inverse measure of diversification) computed from Compustat Business Segment data; IT (CT) investment is the Change in the log of average real stock of the components of Information Technology (Communication Technology) capital, per year and industry (at 2 digit SIC) from the Bureau of Economic Analysis. Data are estimates of real non-residential fixed assets (all corporations and proprietorships) from Detailed Fixed Assets Tables available on the BEA website. Series are adjusted using the quality-adjusted PPI deflator; AvT89 is the average US tariff rate on Canadian imports in 86-88, by industry. Export: AvT89 is the Canadian Tariff on US exports. Firm variables obtained from Compustat unless otherwise indicated.

Table 2: Division Depth and Trade Liberalization

	Div.Depth 1	Div.Depth 2	Div.Depth 3	Div.Depth Placebo 4	Div.Depth Change CEO 5	Div.Depth IT 6	Div.Depth CT 7
AvT89*Post89	-3.661 [1.191]***	-3.501 [1.190]***	-3.73 [1.147]***		-3.279 [1.177]***	-3.539 [1.177]***	-3.739 [1.118]***
Export: AvT89*Post89			0.655 [0.894]				
AvT89*Post88(placebo)				1.5 [1.443]			
Change of CEO					-0.182 [0.025]***		
IT invest (2digit)						4.981 [3.693]	
CT Invest.							56.901 [17.044]***
In Firm Sales	0.238 [0.145]	0.216 [0.120]*	0.216 [0.121]*	0.217 [0.123]*	0.231 [0.122]*	0.2 [0.113]*	0.185 [0.109]*
In Div.Empl.		-0.07 [0.019]***	-0.07 [0.019]***	-0.071 [0.019]***	-0.068 [0.019]***	-0.07 [0.019]***	-0.07 [0.019]***
Division FE	yes	yes	yes	yes	yes	yes	yes
Division trends		yes	yes	yes	yes	yes	yes
Observations	6396	5702	5702	5702	5661	5702	5702
R-squared	0.016	0.031	0.03	0.026	0.062	0.033	0.043
Number of Divisions		1524	1524	1524	1517	1524	1524

Notes: Std. Errors in brackets, clustered by industry (SIC4). All regressions are estimated in first differences and include year dummies and the interaction of Post89 with US industry skill intensity, capital intensity and TFP growth pre-89 to account for tariff endogeneity in a base year (for all 3 measures, we take the average for 1986-1988), from Eric Bartelsman, et al (1996). Div Depth is the number of managers between the DM and the CEO. AvT89 is the average US tariff rate on Canadian imports in 86-88, by industry. Column 3 also includes the Canadian tariff on US exports. Change CEO is a dummy variable indicating a CEO change; see notes to Table 1 for definition of other variables.

Table 3: CEO Span of Control and Trade Liberalization

	CEO Span 1	CEO Span 2	CEO Span 3	CEO Span Placebo 4	CEO Span Change CEO 5	CEO Span IT 6	CEO Span Functional Pos. 7
AvT89*Post89	8.106 [3.613]**	9.908 [3.839]**	11.386 [3.590]***		9.89 [3.739]***	9.777 [3.883]**	7.746 [3.312]**
Export: AvT89*Post89			-3.544 [3.529]				-7.740 [3.032]**
AvT89*Post88 (placebo)				-5.61 [4.601]			
Change of CEO					0.446 [0.133]***		
IT invest (2 digit)						16.904 [20.164]	
In Firm Sales	0.461 [0.262]*	0.947 [0.294]***	0.961 [0.294]***	0.959 [0.290]***	0.918 [0.280]***	0.951 [0.292]***	0.410 [0.228]*
Firm FE	yes	yes	yes	yes	yes	yes	yes
Firm trends		yes	yes	yes	yes	yes	yes
Observations	1962	1962	1962	1962	1957	1962	1962
R-squared	0.015	0.021	0.021	0.02	0.031	0.021	0.018
Number of firms	230	230	230	230	229	230	230

Notes: Std. Errors in brackets, clustered by industry (SIC4). All regressions are estimated in first differences and include year dummies and the interaction of Post89 with US industry skill intensity, capital intensity and TFP growth pre-89 to account for tariff endogeneity. Span is the number of managers that report directly to the CEO. AvT89, is the average US tariff rate on Canadian imports in 86-88., by industry. Column 3 also includes the Canadian tariff on US exports. Change CEO is a dummy variable indicating a CEO change; see notes to Table 1 for definition of other variables.

Table 4: Possible Explanations for Flattening

	# Group Mgrs. 1	ln Pay Gr. Mgrs. 2	ln DM Tot. Comp. 3	ShareDM LT Incent. 4	Segment HHI 5	#Can. Subsid 6
AvT89*Post89	-1.07 [2.28]	2.35 [0.79]***	1.817 [0.564]***	1.066 [0.286]***	0.57 [0.22]***	-10.34 [7.05]
Firm FE	yes	yes			yes	yes
Firm trends	yes	yes			yes	
Division*Indiv FE			yes	yes		
Division*Indiv Trends			yes	yes		
Observations	1349	1341	4737	4737	1941	1459
R-squared	0.02	0.03	0.148	0.064	0.04	0.01
Number of Firms	191	191			230	158
Number of Divisions			1460	1461		

Notes: Std. Errors in brackets, clustered by industry (SIC4). All regressions include year dummies, ln firm sales and the interaction of Post89 with US industry skill intensity, capital intensity and TFP growth pre-89 to account for tariff endogeneity. AvT89 is the average US tariff rate on Canadian imports in 86-88, by industry. ln DM Tot Comp. is the log of Div. Manager total pay. Share LT Incent. is the fraction of long term incentives over Div. Manager total pay. Columns 3 and 4 control for ln division employment. We obtain the Number of Canadian Subsidiaries for 1988 and 1993 from the Directory of Corporate Affiliations. See notes to table 1 for definition of other variables.

Table A1: Effect of the Trade Liberalization on Stock Returns, Employment and Average Price Cost Margins

	Excess Returns 1	Excess Returns 2	In Firm Employ 3	In Firm Employ 4	Avg. PCM 5	Average PCM 6
AvT89*Post89	0.441 [1.015]	1.244 [1.310]	0.175 [0.279]	0.056 [0.384]	-0.103 [0.103]	-0.193 [0.094]**
Export: AvT89*Post89	1.612 [0.611]***	1.451 [0.656]**	0.483 [0.154]***	0.559 [0.178]***	0.038 [0.042]	0.051 [0.044]
Firm FE	yes	Yes	yes	yes	yes	Yes
Firm trends	yes	Yes	yes	yes	yes	Yes
Sample	all	main>50 percent	all	main>50 percent	all	main>50 percent
Observations	1838	1411	1954	1499	1960	1506
R-squared	0	0	0.02	0.02	0.054	0.065
Number of firms	217	173	230	184	230	184

Notes: Std. Errors in brackets, clustered by industry (SIC4). All regressions include year dummies. The dependent variables are the excess stock market returns (col. 1 and 2) computed from CRSP data as the difference between calendar year company and market returns. Company returns are compounded daily and include all dividends. Total market returns are CRSP's NYSE/AMEX/NASDAQ market weighted returns. The log of total firm employment (col. 3 and 4), and average price cost margin computed from Compustat data as (firm sales-cost of sales)/firm sales (col. 5 and 6); AvT89 is the average tariff rate on Canadian imports in 86-88 by industry (Export: AvT89 for U.S. exports respectively). Columns 2, 4 and 6 restrict the sample to firms whose largest segment represented at least 50 percent of sales before the liberalization (in 1988).

Table A2: Correlation between Organizational and Competition Variables

	Division Depth				CEO Span			
	Total Trade Costs 1	Canadian Tariff 2	Lerner Index 3	Import Penetration 4	Total Trade Costs 5	Canadian Tariff 6	Lerner Index 7	Import Penetration 8
Competition Variable	2.822** [1.304]	7.681 [2.478]***	0.004 [0.005]	-0.781** [0.362]	-21.927 [9.384]**	-16.396 [5.036]***	0.021 [0.009]**	-0.01 [1.448]
Division FE& trends	yes	yes	yes	yes	yes	yes	yes	Yes
Firm FE& trends								
Observations	4503	4462	5603	4018	1378	1365	2050	1196
Number of Div.	1161	1146	0.012	1100				
R-squared	0.021	0.02	1501	0.020	0.025	0.01	0.011	0.011
Number of Firms					157	157	259	156

Notes: Std. Errors in brackets, clustered by industry (SIC4). All regressions include year dummies. Trade costs are the sum of tariff and transport costs by industry, and import penetration is the percentage of imports out of total domestic consumption by 4 digit industry (Source: Bernard et al., 2006). Lerner index is the industry average price cost margin computed using Compustat (4 digit SIC), Columns 3 and 7 include firms in services and manufacturing, while the others are restricted to manufacturing industries.