# Competitive Pressure and Corporate Investment: Evidence from Trade Liberalization

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**ABSTRACT**

This paper examines how tougher competition from foreign rivals triggered by trade liberalization affects corporate investment. Using a difference-in-differences framework, we find that, on average, U.S. firms significantly reduce capital and R&D investment and accumulate cash reserves in response to large tariff reductions which induce an inflow of foreign rivals. Moreover, and consistent with theory, firms' reaction to increased competition is heterogeneous and depends on their competitive position as well as on the structure of product markets. Our results highlight that trade globalization and competition from foreign firms is an important factor that shapes the investment choices of U.S. firms.

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# I Introduction

Over the last decades, globalization has progressed on several grounds. Successive trade liberalizations, falling transportation costs, as well as improved technology have considerably boosted international trade and, in the process, triggered profound changes in firms' business environments. In particular, by facilitating the penetration of foreign rivals into local markets, the softening of trade barriers has contributed to increase the competitive pressure that many U.S. firms face from their foreign rivals (Bernard, Jensen, and Schott (2006), or Irvine and Pontiff (2009)). While the trade literature indicates that openness plays a prominent role in explaining economic growth, productivity changes, inequalities, innovation, or households' consumption (Melitz and Trefler (2012), or Krugman, Obstfeld, and Melitz (2012)), existing research remains surprisingly silent on the interplay between trade globalization and firms' financial decisions. In particular, little is known on whether and how firms react to changes in product market competition generated by trade liberalization. To shed new light on this question, this paper examines how falling trade barriers affect the investment choices of U.S. companies, and seeks to understand what kind of firms are particularly vulnerable to changes in trade globalization.

The facilitated entry of foreign rivals on U.S. product markets can have distinct effects on the investment policy of U.S. companies. On the one hand, the prospect of facing tougher competition on domestic markets can prompt U.S. firms to select a more aggressive investment behavior in an attempt to strategically deter or delay the entry of foreign rivals (Caves and Porter (1977)). On the other hand, the threat of increased competition can erode growth opportunities and increase the uncertainty of potential projects, inducing firms to select more conservative investment decisions (Fudenberg and Tirole (1984)). Overall, the response to lower trade barriers should depend on the relative costs of preventing entry as well as on firms' anticipation about how the future inflow of foreign rivals will modify the product market environment.[1]

We exploit changes of industry-level import tariffs to identify whether and how the investment decisions of U.S. firms respond to falling trade barriers. Specifically, using annual tariff data for the U.S. manufacturing sector, we focus on 91 significant reductions of import tariffs between 1974 and 2005, occurring in 74 unique industries and affecting 1,108 firms. During these trade liberalization episodes, the average import tariff drops by 50%. In parallel, because the costs for foreign rivals to compete on U.S. markets decrease, import penetration surges by 19%. While generating large

[1] Section II provides more detailed theoretical predictions on the effects that an increase in foreign competition could have on firms' investment decisions.

shifts in competitive pressure, tariff reductions are not perfectly random events. This renders the identification of the causal impact of increased competitive pressure non-trivial. To account for the fact that affected and unaffected industries might differ on various unobservable dimensions (e.g. diverging growth prospects or political protection) we adopt a matching difference-in-differences approach. To ensure comparability, we match firms that operate in industries affected by tariff reductions (treated firms) with similar firms in unaffected industries (matched firms). We match firms by size, growth opportunities, cash flow, cash holdings, and leverage during the year that precedes the event. Then, we compare the changes in investment between treated and matched firms over the years that surround tariff reductions.

Our main finding is that U.S. firms make on average more *conservative* investment decisions following tariff reductions. Firms that experience tariff cuts in their industry significantly reduce capital expenditures compared to similar unaffected firms. The effect is economically large. Relative to matched firms, the capital expenditures of treated firms decline by 1.20% of total assets, a 17% drop relative to the investment level prior tariff cuts. This reduction represents an average decline of $9.88 million per firm, or $11 billion across all sample firms. Firms also cut R&D expenses by 1.47% of assets, which corresponds to an aggregate reduction of $7.7 billion. In parallel to the contraction of investment activity, we observe an expansion of liquid assets. The ratio of cash to assets increases on average by 1.70% ($15 billion in aggregate) relative to the sample of matched firms. Despite a considerable reallocation of the composition of assets, we observe no significant change in the size of firms' balance sheet.

Consistent with the recent finding of Xu (2012), the competitive threats induced by tariff reductions also modify firms' financing activity. In our sample, firms adopt more conservative financing choices by issuing less debt and more equity in response to tariff cuts. Importantly, the observed changes in asset composition appear to be tied to the adjustments on the financing side. For instance, the decline in capital investment is the largest (-2.65% of total assets) when firms simultaneously reduce debt and equity issues. In contrast, we detect no variation in capital investment when financing sources remain constant. Moreover, we find that the build-up of cash reserves is largely linked to equity issuance activity. The increase in the cash-to-asset ratio is largest (4.35%) among firms which issue more equity but use less debt financing in response to tariff cuts. On average, we find no evidence that firms increase investment preemptively in response to increased competitive threats from foreign rivals.

Numerous tests support the validity of our causal interpretation. First, when we compare trends

across treated and matched firms over a three-year period preceding the reductions of import tariffs, we find no evidence that the investment choices of the two groups follow different paths. Rather, they only start diverging after the tariff reductions. Moreover, we find no significant difference in analysts' expectations, including long-term earnings growth rates, between treated and matched firms prior to tariff reductions. In addition, we execute placebo tests that replicate our experiment over the years that precede the tariff cuts and we find no significant difference between treated and matched firms during these placebo periods. We also show that the effect of tariff reductions on corporate choices strengthens monotonically with the magnitude of tariff reductions. We find stronger effects when the tariff reductions are larger. These tests mitigate the concern that our results capture unobserved industry trends (e.g. politicians reducing tariffs in declining industries) or perfectly anticipated tariff reductions. Finally, our results are robust to alternative estimation methodologies, such as different matching procedures and OLS specifications.

We further examine how firms' response to cuts in tariffs varies within and across product markets, and find that it is very heterogeneous. In particular, the competitive position of firms in domestic markets appears to be an important determinant of their response. Only firms with low market shares (e.g. industry followers) adjust their investment policy in response to tariff cuts. We observe no effect among industry leaders. Likewise, the decrease in corporate investment and increase in liquid assets is mostly concentrated among the less productive firms. In line with the recent evidence in the trade literature (see Melitz (2003)), productive firms show little response to trade liberalization. Our analysis also reveals that the investment of diversified firms is much less affected by tariff cuts than that of stand-alone companies. Similarly, firms which exclusively sell their products on U.S. markets (purely domestic firms) respond more severely to increased foreign competition than multi-national companies.

Moreover, the response of U.S. firms to tariff reductions largely depends on the (ex-ante) competitive structure of their product market. We find virtually no change in the investment practice of firms in concentrated markets and in markets populated by fewer firms. Firms operating in these markets appear to be somewhat shielded from globalization pressure. In sharp contrast, the reduction of investment is large and significant in competitive markets. In the same vein, tariff cuts impact firms significantly more when they spur more entry of foreign rivals. When tariff cuts are not followed by increases in import penetration, we see little adjustment of corporate investment. Finally, we also document that the consequences of tariff cuts are especially large in industries with high growth potential. Overall, these cross-sectional tests show that growing, non-diversified,

domestically oriented, and low productivity firms operating in ex-ante more competitive markets are most vulnerable to falling trade barriers.

Despite substantial adjustments in investment activity, we find that firms manage to keep similar levels of profitability shortly after tariff reductions. The profit margin, sales growth, and the return on equity do not significantly change during the year that follows tariff cuts. However, when we take a longer-term perspective and compare the average three-year performance before and after the liberalization event, we observe a significant decline in performance. The average profit margin and return on equity of firms in affected industries shrink by 12.65% and 5.78%, respectively. Similarly, sales growth declines by 3.52%. These results suggest that tougher foreign competition hurts corporate profits on average, but that the effect takes some time to materialize.

Our paper makes three contributions to the literature. First, we contribute to the underdeveloped but growing literature that attempts to understand the connections between international trade and corporate finance. Recent research indicates that access to finance is of paramount importance to explain international trade flows (Beck (2002)), foreign direct investment (Desai, Foley, and Hines (2006)), and firms' exporting activity (Manova (2010), or Paravisini, Rappoport, Schnabl, and Wolfenzon (2012)). Our results, from the opposite angle, highlight that global trade patterns, trade barriers, and exposure to foreign competition are important elements that shape the dynamics of firms' investment. To the best of our knowledge, we are the first to examine and quantify the impact of increased competition from foreign rivals on the investment decisions of U.S. companies. Grounded in theoretical work at the intersection between finance and industrial organization, we also uncover several characteristics such as firms' organizational structure, multi-national profile, or market concentration, which condition firms' response to trade liberalization.

Second, our paper adds to the literature that studies the interactions between product market competition and finance. Focusing on sudden shocks to one specific source of competition, we show that U.S. firms adjust on *several* margins simultaneously in response to intensified competition from foreign rivals. Thus, our findings underscore new facets of the subtle economic mechanisms that link product market competition to the allocation of resources within companies. From a different perspective, our investigation provides *direct* evidence on how changes in competition alter firms' investment choices. While several authors provide indirect evidence on this question by linking investment to product market characteristics through the effect of financial leverage (Chevalier (1995), Kovenock and Phillips (1997), or Zingales (1998)), direct empirical evidence remains relatively scarce. One notable exception is Khanna and Tice (2000) who concentrate on

one specific industry (the discount department store industry) and use the entry of a large player (Wal-Mart) as a competitive shock. In contrast, we rely on a large sample that includes firms from 74 different manufacturing industries and examine their reaction to 91 different competitive shocks. Overall, our findings do not support the idea that firms strategically increase investment to deter the entry or expansion of potential foreign rivals. Some firms might, but on average, we find no systematic evidence of such behavior in the data. Instead, firms reduce capital and R&D investment and increase savings when facing new competitive threats.

Finally, our study adds to a growing initiative that aims at better understanding and quantifying how firms' financial decisions depend on the interactions they entertain with their direct business environment. Recent studies emphasize that corporate behavior is influenced by the decisions of their peers (Leary and Roberts (2012)), the similarity of their competitors' products (Hoberg and Phillips (2011)), the nature of the relationship with the workforce (Matsa (2010)), or the relationship with suppliers and customers (Banarjee, Dasgupta, and Kim (2008)). Our analysis stresses that, in a globalized world, interactions with foreign rivals also play a key role in firms' financial decision making.

The rest of the paper proceeds as follows. Section II develops the theoretical setting. Section III describes the sample and empirical strategy. Section IV presents the main results. Section V analyzes how firms' response varies within and across product markets. Section VI investigates the effect on corporate performance. Section VII concludes.

# II Global Competition and Corporate Investment

Over the last three decades, the U.S. authorities have gradually removed obstacles to international trade and substantially reduced import tariffs on a large variety of goods and services (see Sachs and Warner (1995), or Andersen and Van Wincoop (2004)). Andersen and Van Wincoop (2004) emphasize that import tariffs amount to a significant fraction of overall trade costs, and as a result, represent an important barrier to trade.[2] In the U.S. manufacturing sector for instance, the average tariff rate dropped by about 75% in thirty years, from 8.23% in 1974 to 2.15% in 2005. According to the vast literature on international trade, the lessening of trade barriers generally intensifies foreign competition (see Tybout (2003) for a survey). Reductions of import tariffs lower the cost

[2]Other barriers to trade include non-tariff policy barriers (e.g., quotas, import bans, or import licenses), transportation costs (both freight costs and time costs), information costs, contract enforcement costs, costs associated with the use of different currencies, legal and regulatory costs (e.g., employment or intellectual property laws), or local distribution costs. See Anderson and Van Wincoop (2004) for a survey on trade barriers.

of entering U.S. product markets and, as a result, facilitate the penetration of foreign rivals on domestic markets. Because goods and services supplied by foreign rivals become relatively cheaper on domestic markets, reductions of import tariffs magnify the competitive pressure on domestic producers, especially on those that do not participate in international trade and directly compete with foreign rivals on local markets. Why and how exactly does the competitive threat induced by trade liberalization impact firms' investment activity?

Although the theoretical research in international economics offers no specific answer to this question, the literature linking industrial organization to corporate finance provides a variety of useful insights.[3] There are two opposing views on how lower barriers to entry could affect the investment of incumbent firms.[4] According to the first view, an increase in competitive threats prompts firms to engage in more aggressive corporate behavior to maintain some degree of (endogenous) entry barriers, and preserve or enhance their competitive position. As emphasized by Caves and Porter (1977) or Spence (1979), incumbent firms may decide to expand as a strategic attempt to distort rivals' actions. In this spirit, Fudenberg and Tirole (1983) or Dixit (1980) predict that incumbents could increase investment to deter the entry or expansion (or mobility) of potential rivals. By investing more today in production capacity, technology, distribution networks, product differentiation, or client fidelity, incumbent firms aim at lowering the expected payoffs of foreign rivals and thereby limiting their entry or expansion on U.S. markets.[5] Empirical evidence related to the preemptive investment view is scarce and mainly focuses on specific industries. Notably, Gilbert and Lieberman (1987) find that investment reduces the probability that rivals expand capacity in 24 (U.S.) chemical product industries (but the effect is temporary). Khanna and Tice (2000) document increases in investment among certain incumbent supermarket chains (e.g. large and profitable incumbents) when Walmart enters their local markets. More recently, Simintzi (2012) documents that U.K. manufacturing firms tend to increase capital investment preemptively when a local rival announces a restructuring that improves its competitive position.

The second view yields opposite predictions. Competitive threats lower incumbents' prospects

[3]The theoretical literature in international economics mainly focuses on the effects of trade liberalization on (labor) productivity, prices, wages, welfare, or growth (see Krugman, Obstfeld, and Melitz (2012) for an overview).

[4]Generally, the models linking competitive choices to investment and financing decisions feature an incumbent and a potential entrant (or a leader and a potential expanding follower). In our context, we consider U.S. firms as the incumbents (or leaders) and examine how they respond to the increased ability of foreign firms (entrants or followers) to enter or expand on U.S. product markets.

[5]A related literature argues that incumbents could increase debt strategically in response to intensified competitive pressure (e.g. Brander and Lewis (1986)). Lyandres (2006) and Campello (2006) provide evidence consistent with the idea that debt increases firms' aggressiveness in the product market. In contrast, empirical evidence on the negative effect of competition on debt includes Phillips (1995), MacKay and Phillips (2005), or Xu (2012).

and render their business environment more uncertain. As a result, firms adopt more conservative investment choices to better accommodate lower barriers to entry. For instance, and as outlined by Schmalensee (1981), or Fudenberg and Tirole (1984), incumbents could choose to restrict expansion (e.g., in capacity, R&D, or advertising) and maintain a 'lean and hungry look' to commit to tougher competitive responses if entry occurs (i.e. strategic under-investment). Also, incumbents could scale down investment because competitive threats erode the attractiveness of investment projects by reducing their profitability (Grenadier (2002)) or amplifying business uncertainty (Gaspar and Massa (2006), or Irvine and Pontiff (2009)). In a similar spirit, incumbent firms could improve their financial position and invest in liquid assets (e.g. grow deep pockets) to better sustain or to deter the increased presence of foreign competitors on domestic markets (Telser (1966), or Bolton and Scharfstein (1990)). Only a handful of empirical studies support the idea that competitive pressure relates to more conservative investment choices. Khanna and Tice (2000) show that financially weak incumbents respond to Wal-Mart's entry with a lower level of capital investment. Similarly, Haushalter, Klasa, and Maxwell (2007) and Hoberg, Phillips, and Prabhala (2012) document a positive association between investments in liquid assets and the degree of competition.

Overall, and as outlined in Tirole (1988), the impact of trade liberalization on firms' investment choices depends on their incentives to (i) either deter the potential entry and delay the expansion of foreign competitors, or (ii) allow entry and prepare for the tougher competition lying ahead if rivals massively penetrate into U.S. markets. The literature linking industrial organization to corporate finance suggests that, in equilibrium, this choice is determined by the costs of preventing entry as well as the anticipations of U.S. firms about the reaction of foreign rivals. While it is difficult to measure these incentives and costs empirically, we hypothesize in our analysis that they likely depend on (i) the competitive position of U.S. firms as well as that of their foreign rivals, (ii) their relative exposure to the markets affected by trade liberalization, and (iii) the structure of product markets, i.e. existing barriers to entry. These potentially heterogeneous responses are also in line with recent research in international economics emphasizing the importance of firms' heterogeneity in trade (see Meltiz and Trefler (2012), or Bernard, Jensen, Redding, and Schott (2007) for recent surveys).

Our empirical analysis proceeds in two steps. First, we examine how, on average, U.S. manufacturing firms modify their investment behavior in response to large reductions of import tariffs. Second, using the insights from the existing literature, we investigate how their responses vary both within and across product markets.

# III Data and Empirical Methods

In this section, we describe the sample construction and the empirical methods. In particular, we discuss the rationale for using tariff reductions to measure the intensification of competitive pressure, and we detail the identification strategy.

## A Sample Construction and Industry Definition

We use accounting and financial data from Compustat's North America Fundamentals Annual database over the period 1974-2005. Because we want to understand whether and how changes in competitive pressure affect the composition of assets within firms, we focus on investment and cash policy. Specifically, in the baseline analysis, we focus on the following variables (policies): capital expenditures, R&D expenditures, cash holdings, and total assets. In ancillary tests, we also consider the following financing variables: net debt issuance, net equity issuance, and long-term and short-term (book) leverage. We exclude firm-year observations for which information on these variables is not available and winsorize all ratios at the 1% level in each tail. Moreover, we exclude observations with negative assets, sales, capital expenditures, and cash holdings, observations with sales growth larger than 500%, as well as observations where cash holdings and capital expenditures are larger than total assets. The Appendix details the definition of all the variables used in the analysis. Because tariff data are only available for manufacturing industries (2000-3999 SIC codes), we restrict our focus on these industries and classify product markets (industries) at the four-digit SIC level. This selection procedure reduces the sample to 222 four-digit SIC industries.

## B Reductions of Import Tariffs

Our tests exploit the dynamics of import tariffs to measure variations in competitive pressure from foreign rivals. Specifically, we follow Frésard (2010) and identify 'significant' reductions of import tariffs as events that trigger a sudden increase in foreign competitive threats.[6] To measure reductions of import tariffs at the four-digit SIC industry level, we use product-level import data compiled by Feenstra (1996), Feenstra, Romalis, and Schott (2002), and Schott (2010). The data span the period 1974-2005 and include 508 manufacturing industries. Products imported to the U.S. are coded based on the Harmonized System (HS) established by the World Customs Organization (WCO). Each product is assigned a ten-digit HS code. Feenstra (1996) and Schott (2010) develop

[6] Several recent papers use the variation of tariffs to measure changes in competition, see, e.g., Valta (2012), Xu (2012), Guadalupe and Wulf (2010), Lileeva and Trefler (2010), or Trefler (2004).

concordance tables that map each HS product code into four-digit SIC codes.[7] Using this mapping we compute, for each industry-year, the ad valorem tariff rate as the duties collected by U.S. custom divided by the Free-on-Board value of imports. After merging the tariff data with the firm-level accounting data from Compustat we are left with 133 industries.

Next, we compare the tariff reduction in a given industry to the same industry's average change over the whole sample period. Specifically, in our baseline tests, we define that a significant tariff reduction (tariff cut) occurs in a specific industry-year when the negative change in the tariff is three times larger than the industry's average change. Because the coding of imports changed in 1989, we ignore the tariff changes that occurred between 1988 and 1989.

We use five different definitions of tariff cuts to assess the sensitivity of our results to this choice. Moreover, to make sure that tariff cuts truly reflect non-transitory and relevant changes in the competitive environment, we exclude tariff cuts that are followed by equivalently large increases in tariffs over the three subsequent years as well as instances where the tariff rate is smaller than 1%. With this definition, we identify 91 events between 1974 and 2005. These events occur in 74 unique industries.[8] The Internet Appendix presents all the industry-years in our sample that experience a tariff cut as well as the magnitude of the tariff drop. Figure 1 shows that the tariff reductions are not clustered in any specific period. This repartition helps to ensure that our tests do not mix confounding effects that are time-specific such as economic downturns or stock market booms and busts.

[Insert Figure 1 about here]

The frequency of tariff cuts displayed in Figure 1 reflects the recent U.S. trade history. In particular, we identify large tariff drops occurring in 14 industries in 1976. This wave corresponds to the implementation of preferential tariff arrangements under the so-called 'Generalized System of Preferences (GSP)' on various products from developing countries such as wood products, cigarettes, electrical items, or toys (Baldwin and Murray (1977)).[9] A second wave took place in the early eighties touching 24 industries between 1980 and 1982. These reductions follow the ratification of the General Agreement on Tariffs and Trade (GATT) Tokyo round and the enactment of the U.S.

[7] Because HS codes are solely based on product characteristics, and SIC codes also take into account the method of production, HS codes cannot be directly matched to SIC codes. As a result, it is possible that a given HS category matches to several four-digit SIC codes. Yet, we find no case in which a specific product (HS code) was assigned to multiples (four-digit) SIC codes in the industries that compose our sample.

[8] Over the sample period, there is a decreasing trend in import tariffs. As a result, there are only six events for which we can identify a significant increase in tariffs. This limitation prevents us from executing the reverse test of how firms react to tariff increases.

[9] Baldwin and Murray (1977) provide details on these preferential tariff arrangements which were implemented subsequently to the Trade Act of 1974.

Trade Agreement Act (TAA) in 1979. Starting in 1980, multilateral and bilateral tariff reductions entered into force on a large variety of products, decreasing average tariffs on industrial product imports from 6.1% ad valorem to 4.2%.[10] We also observe several tariff reductions in the early and mid nineties. This wave coincides with the adoption of the Free Trade Agreement (FTA) between the U.S. and Canada in 1989, followed by the North American Free Trade Agreement (NAFTA) in 1994 that created a trilateral trade block between the U.S., Canada, and Mexico. The implementation of the FTA mainly consisted of the elimination of existing tariffs between Canada and the U.S. (Trefler (2004)), while the NAFTA brought the immediate elimination of tariffs on more than half of U.S. imports from Mexico (Chambers and Smith (2002)).

## C Identification Strategy

In the spirit of the Structure-Conduct-Performance paradigm extensively used in industrial organization research, we compare the investment choices of firms in industries experiencing large tariff cuts to that of similar firms in industries that do not experience such cuts. Our goal is to examine how exogenous changes in product market structure, measured by lower barriers to entry, impact firms' financial conduct and performance.

To do so, we define firms that operate in industries that are affected by a reduction of tariffs in a given year as the 'treated' firms. From the set of non-treated firms, we construct a sample of 'matched' firms which are similar to the treated firms except for the change in competitive pressure they experience. Specifically, for each treated firm we choose, with replacement, its nearest neighbor from the group of all the firms that operate in a different four-digit SIC code industry during the same year. The goal is to ensure that treated and matched firms are similar in terms of the standard determinants of corporate investment, especially in terms of their growth prospects. Thus, we follow Almeida, Campello, Laranjeira, and Weisbenner (2012) and match firms on the basis of their size (the logarithm of total assets), growth opportunities (market-to-book ratio), cash flow, cash holdings, and long-term debt-to-asset ratio during the year that precedes the events. We use a matching algorithm that simultaneously minimizes the Mahalanobis distance across all these matching characteristics.[11]

[10] See the 1979 annual report of the Office of the United States Trade Representative (USTR).

[11] For each treated firm $i$, we find a matched firm $j$ such that the Mahalanobis distance between the $i$'s and $j$'s covariates (matching variables) is the smallest. The Mahalanobis distance is given by: $\|X_i - X_j\| = ((X_i - X_j)' W_X^{-1} (X_i - X_j))^{1/2}$, where $X$ is a k-dimensional vector of covariates and $W_X^{-1}$ is the inverse of the covariance matrix of the covariates. In a robustness test we also use a propensity score matching estimator and obtain very similar results.

To measure the effect of tariff reductions on firms' investment decisions, we use a difference-in-differences estimator. Specifically, for each treated firm $i$ and each corporate policy $Y$, we compare the difference in $Y$ ($\triangle Y_i(Treated)$) from one year before to one year after the tariff reduction to that of its matched firm ($\triangle Y_i(Matched)$). Next, we obtain the effect of tariff reductions on policy $Y$ by averaging the difference-in-differences across all firms. Formally, the average treatment effect ($ATE$) is defined as:

$$ATE(Y) = \frac{1}{N}\sum_{i=1}^{N} \triangle Y_i(Treated) - \frac{1}{N}\sum_{i=1}^{N} \triangle Y_i(Matched), \tag{1}$$

where $N$ represents the number of treated and matched firms, respectively. The matching procedure helps to ensure that, prior to the reduction of tariffs, treated and matched observations have identical distributions along each of the matching dimensions. This procedure minimizes the possibility that cross-sectional or time-series differences across firms and industries affect the results. Hence, we assume that in the absence of the treatment, the treated firms would behave similarly to the matched firms.[12] The null hypothesis is that the $ATE(Y)$ is equal to zero. To be considered in our final sample, treated and matched firms need to have no missing observations for the matching variables during a window of at least one year around the event. Our final sample comprises 1,108 treated observations and the same number of matched observations. The matched observations are from 120 different industries. On average, each treated industry is matched to firms operating in 9.04 distinct industries.[13]

[Insert Table I about here]

Table I presents the summary statistics for the treated and matched firms during the year that precedes the tariff reductions. Overall, the treated firms are very similar to the matched firms. The Kolmogorov-Smirnov tests reveal that there are no significant differences in the distributions of the matching variables across treated and matched firms. The $p$-values range between 0.23 for cash holdings to 0.95 for size. In sum, the matching process removes any meaningful differences along matching observables from the two groups.[14]

[12] Similar matching procedures have recently been used, among others, by Villalonga (2004), Lemmon and Roberts (2010), or Almeida, Campello, Laranjeira, and Weisbenner (2012).

[13] This heterogeneity further reduces the concern that our estimates are driven by specific links between treated and matched industries. To make sure that treated and matched firms truly are from unrelated industries, we have also used the 1992 input-output tables from the Bureau of Economic Analysis and computed inter-industry relatedness following Fan and Lang (2000). Our results do not change if we remove from the matching sample industries that are related to treated industries (relatedness coefficient larger than 5%). These results are available in the Internet Appendix.

[14] The reason for the smaller number of observations for the R&D variable is that this variable has many missing values in the Compustat database. For all reported results, we do not replace these missing values with zeros. However, in additional tests we get very similar results when we do replace the missing values with zeros.

## D Validity

To properly measure the effect of competitive pressure from foreign rivals on corporate decisions, our empirical design needs to meet two requirements. First, reductions of tariffs should generate *relevant* changes in the competitive structure of U.S. product markets. Second, the events should be *exogenous* to corporate conducts. We provide evidence which supports both requirements.

[Insert Figures 2 and 3 about here]

Regarding the first requirement, Figure 2 reveals that the average tariff plummets on average by 50% in treated industries (from 4.60% one year prior to the event to 2.36% one year after the event). In contrast, it declines by less than 20% in matched industries (from 3.33% to 2.73%). The fall in tariffs spurs a non-trivial relative increase in import penetration by 19.1% in treated industries from 15.17% to 18.01%, compared to only 6.1% in the matched industries from 18.51% to 19.65% (see Figure 3). As a comparison, Trefler (2004) reports that the passage of the FTA between the U.S. and Canada in 1989 lowered the average tariff for Canadian products from 4% in 1988 to about 2% in 1992, and 1% in 1996. In terms of magnitude, our average tariff shock is close to that generated by the FTA, which is considered by many as a sizable event affecting U.S. firms on various levels. Further emphasizing the economic importance of these shocks, we use aggregate industry data from the NBER-CES database and estimate that the average aggregate capital investment falls by 6.2% (from $870 million to $819 million) in industries experiencing a tariff reduction while it increases by 6.9% in unaffected industries (see Figure 4). Similarly, aggregate employment slightly decreases by 0.24% in affected industries, while it increases by 0.60% in unaffected industries (see Figure 5).

[Insert Figures 4 and 5 about here]

Regarding the second requirement, a potential threat for our identification strategy is that trade policy results from the interactions between politicians and the corporate sector. As a result, politicians could modify import tariffs based on certain industry characteristics that are related to firms' investment prospects. For instance, politicians could lower tariffs in declining industries which exhibit low expected investment rates. While our matching approach is designed to control for observable differences across treated and matched firms, the interpretation of our results could be invalid if the matching process neglects relevant unobservable differences, such as industry trends or the effect of active lobbying activity.

We provide several tests and economic arguments that minimize these concerns. First, we examine the possibility that treated and matched firms differ across characteristics that affect

future corporate decisions and that may not be completely captured by our matching process. Specifically, we follow Derrien and Kecskes (2012) and compare financial analysts' expectations across treated and matched firms. We use three measures of analysts' expectations: (1) earnings estimates for the next fiscal year as a percent of the stock price, (2) investment recommendations measured on a five-point scale, and (3) long-term earnings growth rate estimates for the next five years. These three variables are obtained from the I/B/E/S database and CRSP. The bottom part of Table I indicates that analysts' expectations measured one year prior to the tariff reductions are similar across treated and matched firms.[15] We find no statistical differences in the distributions of analysts' anticipations between these two groups of firms. This result suggests that analysts do *not* anticipate the effect of tariff reductions on corporate earnings.

Second, we check whether the outcome variables of treated and matched firms follow different parallel trends prior to the tariff reductions. In our setting, the parallel trend test is important because a key identification assumption behind the difference-in-differences strategy is that, in the absence of treatment, the observed difference-in-differences estimates should be systematically zero. Yet, because our events occur at industry-level, a potential identification concern is that we compare the behavior of firms from industries that follow different latent trends (due to, for instance, different technological advances or phases of the product cycle). These unobserved industry differences could affect corporate decisions and explain part of the differential behavior we observe in the post-event period. To verify whether the parallel trend assumption holds in our setting, we follow Roberts and Whited (2011) and compute the mean and median of the average growth rates of the investment variables over the three years that precede the tariff reductions for both treated and matched firms. Table II reports these estimates, together with the $p$-values associated with the test statistics for differences in means (standard t-test) and in medians (Wilcoxon signed-rank test) across groups. In support of our identification strategy, both $t$-tests and signed-rank tests suggest that the growth rates are indistinguishable across treated and matched firms in the pre-event period.[16]

[Insert Table II about here]

The Internet Appendix contains additional discussions supporting the exogeneity of tariff reductions. In particular, we argue that lobbying activity and political capture usually aim at protecting influential import-competing industries (Krugman, Obsfeld, and Melitz (2012)). There is no ob-

[15] Note that this test relies on a limited sample of treated and matched firms as I/B/E/S is incomplete for the first years of our sample.

[16] The only exception is R&D expenditures. To make sure that our results are not biased by this discrepancy in growth rates, we ran additional tests in which we excluded the extreme observations that make the growth rates of treated and matched firms diverge. The results of these tests are very similar to our main results.

vious reason why the corporate sector would lobby to reduce trade protection. Moreover, in the case in which some industries could benefit from lower tariffs because they import a high fraction of intermediate production inputs, we show that these industries adjust their corporate choices to tariff cuts in a similar way as industries with no imports of intermediate inputs. Finally, we show that firms' investment activity has no statistical power in predicting the dynamics of import tariffs.

# IV Main Results

We start by presenting the main difference-in-differences estimates of firms' investment response to reductions of import tariffs. Next, we investigate the links between adjustments on the investment and financing side. Finally, we provide robustness tests that confirm the validity of our inference and support the identification strategy.

## A Tariff Reductions and Corporate Investment

Table III presents the main results. Reductions of import tariffs have significant effects on the allocation of resources within firms. In the first row of Panel A, we observe that firms respond to tariff cuts by reducing investment spending. For firms in the treated group, capital expenditures decline by 1.10% of total assets (from 6.58% to 5.48% of assets). In contrast, for matched firms, the ratio of capital expenditures to assets slightly increases by 0.10%. The difference-in-differences estimate is -1.20% and statistically different from zero (with a $t$-statistic of 4.88). The effect is economically large. The investment drop represents a relative decline of 17% from the pre-event level of capital expenditures and corresponds to a decrease of $9.88 million. Aggregating this effect over firms and time in our sample, it amounts to an $11 billion decline in capital spending over thirty years (or $365 million decline per year). While Akdogu and MacKay (2008) document that firms speed up investment in more competitive industries, our estimates reveal that increased competitive pressure from foreign rivals significantly reduces the *level* of investment of U.S. firms. This result is consistent with the idea that competitive threats erode firms' future prospects and/or increase uncertainty about the payoffs of potential projects, inducing firms to invest more conservatively.

[Insert Table III about here]

We find a very similar pattern for R&D expenditures. Results in row 2 reveal that, on average, firms significantly reduce R&D expenses in response to tariff reductions. The difference-in-differences estimate indicates that the ratio of R&D to assets of treated firms decreases by 1.47% (with a $t$-statistic of 2.38) relative to that of matched firms. The overall effect of tariff reductions on

firms' investment policy is substantial. When we consider the sum of capital and R&D expenditures we observe a large and significant decrease. Specifically, treated firms reduce overall investment in capital and R&D to assets by 2.89% relative to matched firms. This reduction amounts to a drop of 11% compared to the average investment rate prior to the tariff reductions.

In parallel to the decline in corporate investment, our estimates reveal that tariff reductions are followed by massive investments in liquid assets. Treated firms appear to grow deep pockets. In row 4, the difference-in-differences estimate reveals an increase in the ratio of cash-to-assets by 1.70% relative to that of matched firms. Again, this response is economically important as the change of cash reserves represents a relative increase of about 10% (or $14 million) compared to the pre-event cash-to-asset ratio. Whether firms increase cash to better cope with a riskier business environment (Frésard (2010)) or to threaten potential rivals (Bolton and Scharfstein (1990)), the observed cash accumulation confirms that firms become more conservative following a drop in tariffs.[17]

Despite significant changes in liquid assets, we observe no significant variation in the size of firms' total assets. Although positive, the difference-in-differences estimate for the logarithm of total assets is not significantly different from zero. Taken together, these first estimates indicate that firms respond to increased competitive threats from foreign rivals by making more conservative choices on the asset side of their balance sheet. While keeping the size of their assets constant, treated firms markedly alter their composition. On average, U.S. firms react to trade liberalization by hoarding more liquid resources and cutting down capital and R&D investment.

Panel B of Table III reveals that falling trade barriers also affect the structure of firms' financing. The first row indicates that the ratio of net debt issuance to assets of treated firms decreases by 2.27% relative to that of matched firms ($t$-statistic of 3.75). This result is in line with existing evidence reporting a negative association between product market competition and the use of debt (MacKay and Phillips (2005), or Xu (2012)). Simultaneously, we observe that the ratio of equity issuance to assets of treated firms increases by 1.71% compared to that of matched firms. This shift in financing activity significantly reduces firms' ratio of long-term debt to assets (long-term leverage), which decreases by 2.29% for treated firms (with a $t$-statistic of 4.15 in the third row). This effect is economically large as it represents a relative decline of about 16% compared to the pre-event long-term leverage ratio. In contrast, we do not observe a significant change in the ratio of short-term debt to assets in row 4. Hence, similarly to what we observe on the investment side,

[17] This result is consistent with the findings of Haushalter, Klasa, and Maxwell (2007) who document a positive association between cash and product market competition, measured using an Herfindhal index, and Hoberg, Phillips, and Prabhala (2012) who proxy for competition using a new measure capturing the dynamics of industries' products.

the strengthening of foreign competition prompts firms to substitute sources of capital and adopt more conservative financing decisions.

## B The Links between Investment and Financing Responses

To further understand the real effects of trade liberalization, we examine whether the changes in investment around tariff reductions are tied to the adjustments on the financing side. To do so, we double-sort the difference-in-differences estimates of net debt and net equity issuance to form four partitions based on their respective medians and compute the mean difference-in-differences estimates for capital expenditures, R&D, and cash holdings for each partition.

[Insert Table IV about here]

Table IV presents the results. Across all panels, we see clear linkages between financing and investment responses to the tariff cuts. In particular, Panel A shows that the observed reductions of capital expenditures are largely tied to debt issuance patterns. Reductions of capital investment only occur simultaneously with a decrease in debt financing, i.e. when the difference-in-differences estimate of net debt issuance is below the median. Specifically, when firms simultaneously issue less debt and less equity their capital expenditures relative to matched firms declines by 2.65% of assets. If instead firms issue less debt but increase their equity issues after tariffs drop, the decline in investment is still 1.62%. Remarkably, firms that have above median debt issuances around tariff reductions seem to also keep their capital investment constant. Interestingly, even when we split the sample based on firms' financing responses to tariff cuts into four partitions, we detect no instance in which firms increase investment.

Panel B indicates that the reduction of R&D investment that follows tariff reductions is primarily related to adjustments of equity financing. Indeed, the declines of R&D investment coincide with increases in equity issuances. In particular, firms which reduce R&D investment appear to issue more equity (even though the results are not statistically significant). Given the intangible nature of R&D investment, our estimates suggest that firms affected by increased competitive pressure do not issue equity to preserve investment in R&D.

Panel D indicates that the variation in cash holdings is also linked to adjustments on the financing side. Across all partitions, the increase in cash reserves is the largest (4.35% of assets) for firms that simultaneously issue less debt but more equity in the aftermath of tariff reductions. These dynamics suggest that, on average, firms that issue new equity augment their cash balances at the same time (Kim and Weisbach (2006)). Furthermore, treated firms also increase their cash

to asset ratio by 2.41% when they intensify both their debt and equity issuance activity. The joint adjustment of financing and cash reserves is in line with Acharya, Almeida, and Campello (2007) who predict that cash holdings play an important hedging role when future prospects are uncertain.

## C Robustness Tests

We perform several robustness tests to strengthen the interpretation of the results. First, we replicate the same experiment but modify the 'dosage' of the competitive shock triggered by tariff reductions. To this end, we use five different definitions of tariff cuts. Specifically, we define that a tariff cut occurs in a specific industry-year when a negative change in tariffs is one (small change in competitive pressure), two, three (baseline case), four, or five (large change in competitive pressure) times larger than the average tariff change in that industry. Table V presents the results with columns labeled Cut#1 to Cut#5. Generally, the changes in corporate investment are monotonically increasing in the intensity of the shocks. For example, we find very small effects for capital expenditures (-0.35% of assets), R&D (+0.30% of assets), or cash holdings (-0.09% of assets) for Cut#1 where the average tariff decreases by 1.42 percentage points (from 4.85% to 3.43%). By contrast, the effects are large and significant for Cut#5 where the average tariff drops by 3.42 percentage points (from 5.49% to 2.07%). In this latter case, capital expenditures fall by 1.22% of assets, R&D by 1.83% of assets, and cash holdings increase by 2.86% of assets relative to matched firms.

[Insert Table V about here]

Second, we repeat the baseline experiment during placebo periods that precede the reduction of tariffs. We use years (-4) and (-3) relative to the actual event years to sort firms into treated and matched firms. We then examine the change in investment choices from year (-4) to year (-2) and from year (-3) to year (-1). We perform these falsification tests using the exact same sampling criteria and matching variables as we use in the baseline tests. Columns 1 and 2 of Table VI present the results. The estimated changes in corporate policies across treated and matched groups are negligible for placebo periods. These findings are internally consistent and support our interpretation that the changes in corporate behavior really stem from the tariff reductions.

[Insert Table VI about here]

While we show that our results are unlikely to be driven by specific industry effects, they might still be affected by the endogeneity of trade policy to lobbying activity. To help address this concern, we focus on tariff reductions that are part of multilateral agreements. As argued

by Krugman, Obsfeld, and Melitz (2012), lobbying groups are less likely to influence tariff changes resulting from multilateral trade agreements. Indeed, the multi-country-industry dimension of such agreements limits the ability of government officials to acquiesce to political pressures. Furthermore, the participation of international institutions imposes rules and formal obligations that restrict the influence of special interests. For that reason, these reductions can be viewed as relatively more exogenous than reductions resulting from bilateral agreements. Hence, we only consider years around the GSP, GATT, and NAFTA multilateral trade agreements and keep the following years in the analysis: 1976, 1980, 1981, 1982, 1994, and 1995. The focus on these trade events reduces our sample to 605 treated and matched firms, respectively. Column 3 of Table VI displays the results, which are very similar to our main results. This additional test lessens the concern that our results are driven by the endogeneity of trade policy to political pressure and lobbying activity.

Finally, we change the matching methodology in two ways. First, we use a propensity score matching approach. Using the sample of treated and matched firms we run probit regressions every year and estimate propensity scores. These scores represent the probability of being treated over the next year when the tariff reduction occurs. The set of covariates includes the same variables used in the non-parametric matching (market-to-book, size, cash flow, cash holdings, and long-term leverage). Next, we match each treated firm to a matched firm with the nearest predicted propensity score.[18] Second, we repeat our baseline non-parametric matching but this time match on relative-to-industry median covariates, as in Gormley and Matsa (2012). Columns 4 and 5 of Table VI indicate that our results are not affected by these changes in the matching procedure.[19]

# V Heterogeneity in Firms' Responses

The previous section established that, on average, firms become more conservative in their investment choices when affected by reduction of tariffs. However, this average response masks an important heterogeneity. To see that, Figure 6 reports the empirical distribution of the estimated responses of firms' investment and cash policy. One benefit of our matching difference-in-differences method is that we obtain individual estimates of the effect of tariff reduction for each treated firm. Practically, we compute the difference between the change in policy $Y$ for firm $i$ around the tariff cut($\triangle Y_i(Treated)$) and that of its sample match ($\triangle Y_i(Matched)$). While the majority of firms

[18]Note that there is almost no overlap between the matched samples obtained from the propensity score matching and non-parametric matching (Mahalanobis). Only 14 matched firms are present in both samples.

[19]In the Internet Appendix we also estimate OLS regressions for each of the eight variables using treated and matched firms before and after the decrease in tariff. The regression results closely mirror the results in Table III.

exhibit a decrease in capital and R&D spending after tariff reductions (i.e. a larger probability mass below zero), Panels A and B reveal that some firms increase investment instead. Similarly, Panel C highlights that some firms experience a decline in their holdings of liquid assets.

[Insert Figure 6 about here]

As discussed in Section II, there is theoretical reason to expect such heterogeneity. In particular, firms' responses to increased foreign competition likely depend on their relative position in the product market, existing market structures, and barriers to entry. Therefore, to further dissect the nature of our main results, we investigate how the impact of tariff reductions varies both within and across industries. By doing so, we aim at understanding which type of firms and market structures are the most affected by trade liberalization episodes, and identifying which characteristics shield firms from competitive threats.

## A Firms' Characteristics

We start by investigating whether characteristics related to firms' exposure to competitive threats (prior to the tariff cuts) influence their response to tariff reductions. We focus on three types of attributes: (1) the relative competitive position of firms in their product market, (2) their productivity profile, and (3) their relative exposure to the industries experiencing tariff cuts.[20] We first use firms' U.S. market shares to measure their competitive position.[21] We classify firms as 'leaders' if they are in the top tercile of the market share distribution of treated firms. Likewise, 'followers' are firms in the bottom tercile.

Second, we differentiate firms based on their productivity. Following Maksimovic and Phillips (2002) we compute firm-level total factor productivity (TFP) as the Solow residual from a Cobb-Douglas production function estimated with OLS.[22] We label firms as 'high-productivity' or 'low-productivity' if they belong to the top or bottom tercile of the TFP distribution, respectively.

Third, to measure firms' exposure to the affected product markets, we separate firms according to their degree of business diversification. Using Compustat's Business Segment files we define a firm as 'diversified' ('focused') if it reports operations in more than one (only one) four-digit SIC code industry in a given year. Similarly, we also separate firms based on their degree of

[20] In the Internet Appendix, we report the results where we differentiate firms based on proxies for financing constraints and the quality of governance.

[21] We compute firms' U.S. market shares as the sales of a company divided by total sales of its four-digit SIC industry, where total sales are obtained Compustat firms. We find very similar results if instead we divide a company's sales by the sum of total domestic production and foreign imports at the four-digit SIC level.

[22] We obtain similar results if we measure TFP using the semi-parametric procedure developed by Olley and Pakes (1996).

geographical diversification. We rely on Compustat's Geographic Segment files and define firms as 'multinational' if they realize positive sales abroad (Denis, Denis, and Yost (2002)).[23] By the same token, 'domestic' firms are those selling their products exclusively in the U.S. All the above classifications into subgroups are made during the year that precedes the tariff reductions.

[Insert Table VII about here]

The results reported in Table VII highlight the heterogeneous impact of tariff reductions across firms. We concentrate on the upper and lower tercile of each partitioning variable to limit the impact of measurement errors in the four proxies. The first column reveals that firms' response to tariff cuts is closely tied to their competitive position, as only followers alter their investment behavior. Notably, we see no significant reactions among market leaders. The magnitude of the differential responses between leaders and followers is large. For instance, the capital expenditures of followers decline by 2.24% of assets around tariff cuts, but remains constant (+0.03% of assets) for market leaders.

In column 2, we observe similar patterns when we compare the responses across productive and unproductive firms. While the most productive firms slightly reduce capital expenditures after tariff reductions, the adjustments of the less productive firms are much larger. Both of these findings are consistent with market leadership and high level of productivity providing firms with a competitive advantage to cope with increased foreign competition. This advantage could arise for a variety of reasons. For instance, as put forth by Caves and Porter (1977), large domestic market shares may provide a 'first-mover' edge against potential foreign rivals (e.g., larger distribution network, higher brand recognition, or better product differentiation). Also, the better cost structure or advanced production technology of the most productive firms could allow them to better handle the entry of foreign competitors (Melitz (2003)).

Columns 3 and 4 show that firms' exposure to the markets affected by trade liberalization also plays a substantial role in explaining the observed changes in investment choices. In particular, we observe large variations in the asset composition of focused firms, i.e. firms that exclusively operate in the product markets experiencing tariff reductions. Their capital expenditures decline by 1.47% of assets and their cash reserves rise by 2.54% of assets after the tariff cuts. In line with the idea that business diversification limits exposure to industry specific shocks (Dimitrov and Tice (2006)), the investment activity of diversified firms exhibit little response to tariff reductions. A similar

[23] With these classifications, 29% of the treated observations are classified as 'diversified' and 23% of treated observations are classified as 'multinational' firms. This low fraction of international firms is in line with the fact that very few U.S. firms participate in international trade (Bernard, Jensen, Redding, and Schott (2007)).

picture emerges when we look at geographical diversification (column 4). Firms that sell part of their production in foreign markets, i.e. geographically diversified firms, display almost no response to tariff reductions.[24] The changes in capital investment and cash holdings are indistinguishable from zero for these multinational firms. In sharp contrast, we observe large investment adjustments for purely domestic firms. Relative to matched firms, their capital expenditures drop by 1.53% of assets, while they increase cash balances by 2.08% of assets after tariff reductions. Because they arguably face stronger changes of competitive threats in response to tariff reductions, focused and purely domestic firms become markedly more conservative than otherwise diversified firms.

## B Market Structures

Next, we investigate whether firms' conservative responses to tariff reductions vary across market structures. We conjecture that the overall effect of lower trade barriers should depend on: (1) the competitive structure of product markets prior to the tariff cuts, (2) the intensity of foreign rivals' expansion around the liberalization episodes, and (3) the growth profile of the affected markets.

To test these conjectures we classify firms experiencing tariff reductions into subgroups based on four different industry characteristics. We use the fitted Herfindahl-Hirschman Index (HHI) provided by Hoberg and Phillips (2010) to measure industry concentration. Notably, this index of concentration accounts for the market shares of domestic privately- and publicly-held companies and varies over time. We define industries in the top tercile of the HHI distribution as 'concentrated', and industries in the bottom tercile as 'competitive'. Alternatively, we use the number of (publicly-held) firms in each industry to further characterize existing barriers to entry. According to Bain (1954), markets with few incumbents generally feature high fixed costs and hence high barriers to entry. Because the intensity of competition is probably not linear in the number of firms, we use the logarithm of the number of firms as a proxy for existing entry barriers. We again classify industries based on terciles, with industries populated by more firms labeled as more 'competitive'. Second, we exploit the actual changes in industry-level import penetration around the tariff reductions (from one year before to one year after) to capture the intensity with which foreign competitors penetrate into U.S. product markets. We associate larger increases in import penetration (top tercile) with more foreign competitors, and hence stronger declines in structural barriers to entry. Finally, we use the average market-to-book ratio in each industry prior to the tariff cuts to distinguish between growth industries (top tercile) and mature industries (bottom tercile).

[24] Because some of the tariff reductions are part of multilateral trade agreements, some international U.S. firms benefit from growth opportunities in the export markets.

[Insert Table VIII about here]

Table VIII indicates that the influence of tariff reductions on corporate investment is particularly large in markets with low barriers to entry. Consistent with the idea that market concentration shields firms from competitive pressure (Hou and Robinson (2006)), columns 1 and 2 illustrate that the adjustments of investment policy clusters primarily in the more competitive markets. The magnitude of the adjustments appears considerable in these markets with the ratio of capital expenditures to assets declining by 1.53% and 2.62% respectively, and cash reserves rising by 3.37% and 5.90% of assets in the aftermath of tariff cuts. We see virtually no change in corporate investment when tariff reductions occur in concentrated industries (high value for the HHI) or in industries populated by fewer incumbents. Likewise, the rise of investment conservatism is especially large in markets experiencing large expansions of foreign rivals (column 3). By contrast, we observe limited response when tariff reductions are not followed by an increase in import penetration.

Turning to the last classification, column 4 of Table VIII reveals that firms response to tariff cuts varies across the stage of their markets life cycle. In particular, firms in growth markets (high market-to-book industries) experience a larger decline in capital and R&D investment (-1.87% and -2.67% of assets respectively) relative to firms in more mature markets (-0.06% and +0.57% of assets respectively). These results underscore two things. First, they could indicate that lower tariffs do not generate sizeable competitive threats in mature markets. As a matter of fact, foreign rivals may find it too costly or not profitable enough to expand their presence on mature U.S. markets. Second, the results attenuate concerns that the observed adjustments of investment activity are simply capturing trends of declining industries. Rather, most of our results are driven by firms in growing industries.

In sum, these cross-sectional results illustrate that trade liberalization affects firms unevenly. The impact of tariff reductions on firms' investment decisions is closely tied to their competitive position and to market structures. In this sense our findings mirror the recent trend in international economics that emphasizes the importance of firms' heterogeneity to understand the real effects of trade globalization (see Melitz and Trefler (2012) for a recent survey).

Notably, Figure 6 indicates that a subset of firms react to tariff reduction by expanding (capital and R&D) investment and reducing cash reserves. Yet, none of the above sub-samples enable us to identify precise characteristics of firms or markets that are systematically related to the investment increase or cash decrease that we observe in the data. We restrict our attention to a set of characteristics that is guided by theory. Arguably, other specificities could be related to firms'

response. While interesting, a complete investigation is beyond the scope of this paper.[25]

# VI Implications for Performance

Our final analysis examines the impact of tariff reductions on measures of firms' performance. Specifically, we investigate the responses of profit margins (operating profit over sales), return on equity, and sales growth to changes of import tariffs using the matching framework discussed above. Table IX presents the results. In Panel A, we report the change in performance from one year prior to one year after the tariff cut. We observe no significant variation in margins, return on equity, or sales growth across treated and matched firms in the short run. Margins and sales growth of treated firms decrease (-4.02% and -1.66%, respectively), but the difference-in-differences estimates are not significantly different from zero. It seems that despite tougher foreign competition and the associated changes in investment choices, treated firms manage to keep profitability and sales at similar levels as matched firms.

[Insert Table IX about here]

To complement this analysis, we take a longer-term perspective and compare the average three-year performance before with the three-year performance after the tariff cut. Panel B of Table IX displays the results. Over this longer horizon, we observe significant declines in the profit margin, return on equity, and sales growth of treated firms. The magnitude of these effects appears economically large. Compared to matched firms, the average profit margin of treated firms decreases by 12.65%. Similarly, the return on equity and sales growth drop on average by 5.78% and 3.42%, respectively. Both differences are statistically significant. This evidence suggests that, on average, increased competitive pressure from foreign rivals hurts corporate performance, but that the effect takes some time to materialize.

This negative impact of tougher foreign competition on performance is consistent with existing studies (Katics and Petersen (1994), or Pugel (1980)). Yet, before concluding, we caution the reader with the interpretation of the performance results. While we see no deterioration of performance shortly after tariff reductions, our results do not imply that this finding is a by-product of more conservative investment choices. Indeed, we do not know what would have happened if firms did not shift towards conservative policies in reaction to lower tariffs. Unfortunately, we do not observe such a counterfactual. Likewise, the long-term negative effects reported in Table IX do not

[25] In the Internet Appendix, we show that governance characteristics are largely unrelated to firms' response to tariff cuts.

imply that the firms' conservatism is sub-optimal. Due to the nature of our identification strategy, our results only say something about the behavior and performance of firms shortly after tariff reductions. Arguably, moving further away from the event could allow other confounding factors to contaminate our results and threaten the validity of the identification strategy.

Admittedly, our analysis focuses on partial equilibrium effects, that is, the short-term consequences of tariff reductions for firms' investment choices. Future research could take a more general equilibrium approach to understand whether falling trade barriers are desirable or detrimental as a whole. This challenging question is beyond the scope of our paper.

# VII Conclusion

This paper shows that falling trade barriers have a significant impact on firms' investment choices. Using reductions of import tariffs to measure variation in competitive threats from foreign rivals, we document that firms adopt more conservative investment choices in response to tariff reduction. Firms affected by tariff cuts reduce capital and R&D expenditures and accumulate more cash reserves. These responses vary widely across firms and product market structures. Specifically, the reaction to tariff reductions are stronger for firms that are not diversified, concentrate on the U.S. domestic market, and have a relatively low market share and low productivity. Similarly, firms adjust their investment activity significantly more in competitive and growing markets, populated by many firms, and in product markets experiencing relatively large inflows of foreign rivals post tariff reductions.

Our paper sheds new light on the fairly unexplored interplay between corporate finance and international trade. While we show that the liberalization of trade activities affects the dynamics of corporate investment, our results leave several related questions unanswered, some of which we outline here. We solely focus on import tariffs to measure trade barriers. However, several other important determinants of trade activities are likely to be central in determining equilibrium competitive environments. For instance, variations in quotas, anti-dumping measures, import licenses, transportation costs, or exchange rates could also impinge on corporate decision making in interesting and relevant ways.

Also, our analysis underlines several salient new results that may be interesting to research more. For example, we find that firms that are active in several markets, i.e. diversified firms, show little response to tariff reductions. As we argue in the paper, one explanation could be that their bottom line of business is protected against industry-specific shocks. Yet, it would be interesting

to examine whether this obtains via an active internal capital market. Indeed, diversified firms could reallocate resources across divisions to mitigate the negative impact of increased competitive threats. In a related spirit, we document that the overall (consolidated) investment activity of multi-national companies is not modified when U.S. import tariffs drop. Future research could investigate whether these firms re-organize their activities internationally by shifting part of their production abroad.

# Appendix: Definition of variables

| Variable | Definition |
|---|---|
| Size | Logarithm of total assets (AT) (from Compustat). |
| Capital expenditures | Capital expenditures (CAPX) divided by total assets. |
| R&D | Research and Development expenses (XRD) divided by total assets. |
| Cash holdings | Cash and short term investments (CHE) divided by total assets. |
| Net debt issuance | Current debt changes (DLCCH) plus long-term debt issuance (DLTIS) minus long-term debt reductions (DLTR) divided by total assets. |
| Net equity issuance | Sale of common and preferred stock (SSTK) minus purchase of common and preferred stock (PRSTKC) divided by total assets. |
| Long-term leverage | Long-term debt (DLTT) divided by total assets. |
| Short-term leverage | Short-term debt (DLC) divided by total assets. |
| Market-to-book | Total assets minus common equity (CEQ) plus the market value of equity (CSHO×PRCC_F) divided by total assets. |
| Cash flow | Income before extraordinary items (IBC) divided by total assets. |
| Tariff | Duties collected at U.S. Custom divided by the Free-On-Board custom value of imports at the four-digit SIC industry. The data are available on Peter Schott's website. |
| Cut#x | Dummy variable equal to one if the reduction in the tariff rate is more than x times larger than the average tariff rate reduction in the industry, and zero otherwise. |
| Import penetration | Total imports divided by the sum of total imports and domestic production minus total exports at the four-digit SIC industry. |
| Aggr. investment | Aggregate industry capital investment in USD (NBER-CES database). |
| Aggr. employment | Aggregate industry number of employees (in thousands NBER-CES database). |
| Market share | Proportion of a firm's sales in the four-digit SIC industry. |
| Multinational | Dummy variable equal to one if a firm realizes positive sales abroad, and zero otherwise (from Compustats Geographic Segment files). |
| Focused | Dummy variable equal to one if a firm reports only one business segment, and zero otherwise (from Compustats Business Segment files). |
| Productivity (TFP) | OLS estimate of total factor productivity at the three-digit SIC industry. |
| HHI | The fitted Herfindahl-Hirschman Index from Hoberg and Phillips (2010). The data are available in the Hoberg-Phillips data library. |
| Profit margin | Income before extraordinary items (IB) + depreciation and amortization (DP) divided by sales (SALE). |
| ROE | Net income (NI) divided by shareholders equity (CEQ). |
| Sales growth | Growth in sales (SALE) from year $t-1$ to year $t$. |
| Earnings estimates | Average earnings per share (EPS) estimate for the next fiscal year (from I/B/E/S) as a percent of firm stock price (from CRSP). |
| Recommendations | Average investment recommendation (from I/B/E/S) measured on a five-point scale, where larger scores indicate more favorable recommendations. |
| LT earnings growth | Average long-term earnings growth rate estimates for the next five years (from I/B/E/S). |

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**Table I: Descriptive statistics**

This table presents descriptive statistics comparing treated and matched firms. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. The last column shows the $p$-value from a two-sample Kolmogorov-Smirnov test (K-S Test) for equality of distribution functions across treated and matched firms. The null hypothesis is that the distribution functions are equal. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| Matching variables | | Obs | Mean | 25% | Median | 75% | K-S Test |
|---|---|---|---|---|---|---|---|
| Market-to-Book | Treated | 1,108 | 2.06 | 1.04 | 1.5 | 2.37 | 0.44 |
| | Matched | 1,108 | 1.98 | 1.03 | 1.43 | 2.25 | |
| Log of total assets | Treated | 1,108 | 4.05 | 2.69 | 3.76 | 5.16 | 0.95 |
| | Matched | 1,108 | 4.07 | 2.68 | 3.74 | 5.18 | |
| Cash flow | Treated | 1,108 | -3.14% | -1.91% | 4.90% | 9.23% | 0.23 |
| | Matched | 1,108 | -2.16% | -0.20% | 5.30% | 8.91% | |
| Cash holdings | Treated | 1,108 | 17.60% | 3.02% | 8.89% | 24.55% | 0.23 |
| | Matched | 1,108 | 16.90% | 2.94% | 8.19% | 23.24% | |
| Long-term leverage | Treated | 1,108 | 13.97% | 1.37% | 9.73% | 21.84% | 0.86 |
| | Matched | 1,108 | 13.82% | 0.99% | 9.60% | 21.29% | |
| **Other variables** | | **Obs** | **Mean** | **25%** | **Median** | **75%** | **K-S Test** |
| Capital expenditures | Treated | 1,108 | 6.58% | 2.65% | 4.90% | 8.59% | $0.06^a$ |
| | Matched | 1,108 | 6.23% | 2.79% | 5.01% | 8.04% | |
| R&D | Treated | 637 | 9.77% | 2.56% | 5.80% | 11.28% | $0.01^c$ |
| | Matched | 637 | 8.26% | 1.70% | 4.52% | 10.22% | |
| Net debt issuance | Treated | 1,108 | 2.81% | -16.21% | 7.85% | 24.92% | $0.02^b$ |
| | Matched | 1,108 | 3.40% | -16.99% | 8.57% | 25.52% | |
| Net equity issuance | Treated | 1,108 | 7.83% | 0.00% | 0.15% | 1.85% | 0.99 |
| | Matched | 1,108 | 7.38% | 0.00% | 0.12% | 1.88% | |
| Short-term leverage | Treated | 1,108 | 6.35% | 0.49% | 2.72% | 7.90% | $0.03^b$ |
| | Matched | 1,108 | 6.39% | 0.41% | 2.09% | 8.36% | |
| **Analyst variables** | | **Obs** | **Mean** | **25%** | **Median** | **75%** | **K-S Test** |
| Earnings estimates | Treated | 450 | 2.63% | 0.76% | 2.61% | 5.49% | 0.11 |
| | Matched | 450 | 2.71% | 0.76% | 2.61% | 6.11% | |
| Recommendations | Treated | 325 | 3.93 | 3.5 | 4 | 4.33 | 0.65 |
| | Matched | 325 | 3.94 | 3.64 | 4 | 4.25 | |
| LT earnings growth | Treated | 318 | 21.97% | 14.00% | 20.00% | 29.27% | 0.16 |
| | Matched | 318 | 21.59% | 12.50% | 19.00% | 26.50% | |

**Table II: Trends in corporate policies for treated and matched firms**

This table reports the mean and median of the average growth rates for the main variables. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. We compute the growth rate of each variable one and two years prior to the tariff reduction. Next, we calculate the average growth rate for each variable during the two years preceding the tariff reduction. The table also reports $p$-values associated with test statistics for differences in means (standard $t$-test) and in medians (Wilcoxon signed-rank test) across subgroups. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| | | Avg. Growth | $t$-test ($p$-value) | Med. Growth | Signrank ($p$-value) |
|---|---|---|---|---|---|
| Capital expenditures | Treated | 1.71% | 0.15 | 0.70% | 0.52 |
| | Matched | 1.41% | | 0.74% | |
| R&D | Treated | 2.15% | $0.05^b$ | 0.61% | $0.01^b$ |
| | Matched | 1.67% | | 0.48% | |
| Cash holdings | Treated | 6.45% | 0.5 | 0.43% | 0.71 |
| | Matched | 7.14% | | 0.72% | |
| Net debt issuance | Treated | 1.85% | $0.06^a$ | 0.22% | $0.10^a$ |
| | Matched | 1.03% | | 0.08% | |
| Net equity issuance | Treated | 5.37% | 0.76 | 0.00% | 0.43 |
| | Matched | 5.70% | | 0.02% | |
| Long-term leverage | Treated | 2.73% | 0.18 | 0.00% | 0.12 |
| | Matched | 2.16% | | 0.00% | |
| Short-term leverage | Treated | 0.46% | 0.74 | 0.00% | 0.25 |
| | Matched | 0.38% | | 0.06% | |

**Table III: Main results**

This table presents the difference-in-differences estimates for the changes in corporate policies following reductions of import tariffs. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined the Appendix. For each variable, we compute the mean change from the year before the tariff reduction to the year after the tariff reduction for treated firms (average treated difference), the matched firms (average matched difference), and the difference between treated and matched firms (difference-in-differences). Panel A reports the variables related to investment, and Panel B reports the variables related to financing. We report absolute values of $t$-statistics in parentheses below the estimates. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| **Panel A: Investment** | Average treated difference | Average matched difference | Diff-in-diffs |
|---|---|---|---|
| Capital expenditures | -1.10% | 0.10% | -1.20% |
| | (6.26)$^c$ | (0.61) | (4.88)$^c$ |
| R&D | -0.75% | 0.72% | -1.47% |
| | (1.77)$^a$ | (1.42) | (2.38)$^b$ |
| Capex + R&D | -1.98% | 0.91% | -2.89% |
| | (4.04)$^c$ | (1.6) | (4.02)$^c$ |
| Cash holdings | -0.08% | -1.78% | 1.70% |
| | (0.2) | (4.09)$^c$ | (3.18)$^c$ |
| Total assets (log) | 0.24 | 0.23 | 0.01 |
| | (26.59)$^c$ | (16.35)$^c$ | (0.43) |
| **Panel B: Financing** | | | |
| Net debt issuance | -1.09% | 1.18% | -2.27% |
| | (2.52)$^b$ | (2.65)$^b$ | (3.75)$^c$ |
| Net equity issuance | -1.02% | -2.73% | 1.71% |
| | (1.43) | (4.17)$^c$ | (1.82)$^a$ |
| Long-term leverage | -0.02% | 2.27% | -2.29% |
| | (0.05) | (5.05)$^c$ | (4.15)$^c$ |
| Short-term leverage | 0.43% | 0.15% | 0.28% |
| | (1.28) | (0.42) | (0.6) |

**Table IV: The effect on investment and cash by financing activity**

This table presents the difference-in-differences estimates for the changes in corporate investment following reductions of import tariffs for sub-samples based on firms' financing activity. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined the Appendix. We rank the sample firms into four groups based on whether the diff-in-diffs of net debt issuance or net equity issuance are above or below the sample median. For the investment and cash variable, we compute the difference in the mean change from one year before the tariff reduction to the year after the tariff reduction between treated and matched firms (difference-in-differences). We report absolute values of $t$-statistics in parentheses below the difference-in-differences estimates. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| **Panel A: Capital expenditures** | | | |
|---|---|---|---|
| | | Diff-in-Diffs of Net debt issuance | |
| | | Below median | Above median |
| Diff-in-Diffs of Net equity issuance | Below median | -2.65% | 0.02% |
| | | (6.10)$^c$ | (0.05) |
| | Above median | -1.62% | 0.05% |
| | | (3.63)$^c$ | (0.08) |
| **Panel B: R&D expenditures** | | | |
| | | Below median | Above median |
| Diff-in-Diffs of Net equity issuance | Below median | -0.85% | -1.03% |
| | | (0.77) | (1.26) |
| | Above median | -2.42% | -1.65% |
| | | (1.71)$^a$ | (1.00) |
| **Panel C: Capital + R&D expenditures** | | | |
| | | Below median | Above median |
| Diff-in-Diffs of Net equity issuance | Below median | -3.38% | -2.12% |
| | | (2.69)$^c$ | (1.87)$^a$ |
| | Above median | -3.51% | -2.30% |
| | | (2.21)$^b$ | (1.23) |
| **Panel D: Cash holdings** | | | |
| | | Below median | Above median |
| Diff-in-Diffs of Net equity issuance | Below median | 1.46% | -1.29% |
| | | (1.42) | (1.45) |
| | Above median | 4.35% | 2.41% |
| | | (4.09)$^c$ | (1.82)$^a$ |

**Table V: Variation of the magnitude of the tariff reduction**

This table presents the difference-in-differences estimates for the changes in corporate investment following different magnitudes of import tariff reductions. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. For each variable, we compute the difference in the mean change from one year before the tariff reduction to the year after the tariff reduction between treated and matched firms (difference-in-differences). We compute these difference-in-differences for different magnitudes of tariff reductions. *Cut#1* is for tariff reductions that are larger than the average tariff reduction in an industry; *Cut#2* is for tariff reductions that are larger than two times the average tariff reduction in an industry, etc. (see Section 4.3 in the main text). We also report the mean change in tariffs and import penetration by tariff cut. We report absolute values of $t$-statistics in parentheses below the difference-in-differences estimates. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| | *Cut#1* | *Cut#2* | *Cut#3* | *Cut#4* | *Cut#5* |
|---|---|---|---|---|---|
| Mean Δ Tariff | -1.42% | -1.81% | -2.23% | -2.93% | -3.42% |
| Mean Δ Import Penetration | 1.23% | 2.22% | 2.83% | 3.30% | 3.27% |
| # of observations | 2,221 | 1,762 | 1,108 | 615 | 445 |
| Capital expenditures | -0.35% | -0.05% | -1.20% | -1.03% | -1.22% |
| | (2.31)$^b$ | (0.29) | (4.88)$^c$ | (2.88)$^c$ | (2.89)$^c$ |
| R&D | 0.30% | -1.57% | -1.47% | -2.07% | -1.83% |
| | (0.93) | (3.67)$^c$ | (2.38)$^b$ | (2.48)$^b$ | (1.81)$^a$ |
| Capex + R&D | 0.06% | -1.77% | -2.89% | -3.52% | -3.64% |
| | (0.16) | (3.56)$^c$ | (4.02)$^c$ | (3.59)$^c$ | (3.08)$^c$ |
| Cash holdings | -0.09% | 0.65% | 1.70% | 2.38% | 2.86% |
| | (0.3) | (1.78)$^a$ | (3.18)$^c$ | (3.55)$^c$ | (3.50)$^c$ |
| Total assets (log) | -0.01 | 0.03 | 0.01 | 0.04 | 0.01 |
| | (0.79) | (2.19)$^b$ | (0.43) | (1.49) | (0.27) |

**Table VI: Additional robustness tests**

This table presents the difference-in-differences estimates for changes in corporate investment following reductions of import tariffs. The sample comprises treated and matched firms that experience a significant import tariff reduction between 1974 and 2005. Columns 1 and 2 contain placebo tests. In particular, in these tests firms are matched in years *before* the actual tariff reduction. In column 1, firms are matched three years before the tariff reduction, and in column 2 they are matched four years before the tariff reduction. Column 3 restricts the sample on the following years surrounding multilateral trade agreements: 1976, 1980, 1981, 1982, 1994, or 1995. The sample size reduces to 605 matched and treated observations, respectively. Column 4 uses propensity score matching. Column 5 matches based on relative to industry median variables. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. For each variable, we compute the difference in the mean change from one year before the tariff reduction to the year after the tariff reduction between treated and matched firms (difference-in-differences). We report absolute values of $t$-statistics in parentheses below the estimates. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Matched on Year -3 | Matched on Year -4 | Multilateral agreements | Propensity score | Relative-to-ind. median |
| Capital expenditures | 0.05% | -0.01% | -1.08% | -0.55% | -0.72% |
| | (0.18) | (0.02) | $(3.29)^c$ | $(2.31)^b$ | $(2.88)^c$ |
| R&D | 1.32% | -1.12% | -2.00% | -1.56% | -1.62% |
| | $(2.09)^b$ | $(1.77)^a$ | $(2.26)^b$ | $(2.26)^b$ | $(2.58)^c$ |
| Capex + R&D | 1.35% | -0.93% | -3.09% | -2.40% | -2.23 |
| | $(1.81)^a$ | (1.27) | $(3.04)^c$ | $(2.99)^c$ | $(3.03)^c$ |
| Cash holdings | -0.44% | -0.10% | 1.95% | 1.21% | 1.04% |
| | (0.79) | (0.17) | $(2.84)^c$ | $(2.03)^b$ | $(2.13)^b$ |
| Total assets (log) | 0.02 | 0.03 | 0.02 | 0.06 | 0.06 |
| | (0.92) | (1.30) | (0.99) | $(2.72)^c$ | $(3.06)^c$ |

**Table VII: The effect of tariff reductions on investment: Within-industry variation**

This table presents the difference-in-differences estimates for sub-samples based on firm characteristics. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. We sort firms into terciles (groups) based on market share, productivity, business diversification (more than one business segment), and geographic diversification (positive or no exports) one year before the tariff reduction occurs. We report absolute values of $t$-statistics in parentheses below the difference-in-differences estimates. $t(\Delta)$ indicates whether the values from tercile 1 and tercile 3 are significantly different from each other. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| | **Market share** | | | **Productivity** | | | **Bus. diversification** | | | **Geogr. diversification** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | High | $t(\Delta)$ | Low | High | $t(\Delta)$ | Focused | Divers. | $t(\Delta)$ | Dom. | Multinat. | $t(\Delta)$ |
| Capital expenditures | -2.24% | 0.03% | $3.85^c$ | -1.84% | -1.17% | 1.1 | -1.47% | -0.81% | 1.16 | -1.53% | -0.50% | $1.74^a$ |
| | $(4.60)^c$ | (0.09) | | $(4.31)^c$ | $(2.74)^c$ | | $(4.87)^c$ | $(1.67)^a$ | | $(5.21)^c$ | (0.94) | |
| R&D | -3.37% | 0.07% | $1.99^b$ | -4.25% | 0.50% | $2.88^c$ | -1.79% | -0.85% | 0.63 | -1.67% | -1.12% | 0.34 |
| | $(2.33)^b$ | (0.29) | | $(2.78)^c$ | (0.6) | | $(2.08)^b$ | (1.34) | | $(2.03)^b$ | $(1.70)^a$ | |
| Capex + R&D | -5.75% | -0.07% | $2.95^c$ | -6.62% | -0.18% | $3.39^c$ | -3.47% | -1.37% | 1.2 | -3.24% | -1.82% | 0.76 |
| | $(3.64)^c$ | (0.13) | | $(3.78)^c$ | (0.19) | | $(3.57)^c$ | (1.46) | | $(3.47)^c$ | $(1.88)^a$ | |
| Cash holdings | 4.92% | -0.83% | $4.15^c$ | 3.38% | 0.24% | $2.26^b$ | 2.54% | 0.19% | $1.91^b$ | 2.08% | 0.98% | 0.84 |
| | $(3.84)^c$ | (1.58) | | $(3.59)^c$ | (0.24) | | $(3.34)^c$ | (0.24) | | $(2.92)^c$ | (1.12) | |
| Total assets (log) | 0.01 | -0.03 | 0.84 | 0.02 | -0.03 | 1.11 | 0.00 | 0.03 | 0.52 | 0.00 | 0.05 | 1.03 |
| | (0.32) | (1.42) | | (0.61) | (0.95) | | (0.17) | (1.06) | | (0.02) | (1.6) | |

**Table VIII: The effect of tariff reductions on investment: Between-industry variation**

This table presents the difference-in-differences estimates for sub-samples based on industry characteristics. The sample comprises 1,108 treated firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms. The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. All variables are defined in the Appendix. We sort firms into terciles (groups) based on industry concentration (Herfindahl Index), the number of firms in the industry one year before the tariff reduction, the change in (industry-) import penetration around tariff reductions (one year prior to one year after the event), and industry growth profile (average market-to-book ratio) one year before the tariff reduction. We report absolute values of $t$-statistics in parentheses below the difference-in-differences estimates. $t(\Delta)$ indicates whether the values from Tercile 1 and Tercile 3 are significantly different from each other. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

| | **Herfindahl Index** | | | **Number of Firms** | | | **ΔImport Penetration** | | | **Growth** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | High | $t(\Delta)$ | Low | High | $t(\Delta)$ | Low | High | $t(\Delta)$ | Low | High | $t(\Delta)$ |
| Capital expenditures | -1.53% | -0.59% | 1.61 | -0.30% | -2.62% | $3.68^c$ | -0.74% | -1.80% | 1.6 | -0.06% | -1.87% | $2.98^c$ |
| | $(3.81)^c$ | (1.43) | | (0.72) | $(5.60)^c$ | | $(1.72)^a$ | $(3.58)^c$ | | (0.14) | $(4.27)^c$ | |
| R&D | -2.77% | 0.44% | $1.77^a$ | -0.11% | -2.86% | 1.54 | -1.15% | -0.89% | 0.18 | 0.57% | -2.67% | $1.83^a$ |
| | $(2.11)^b$ | (1.3) | | (0.23) | $(2.09)^b$ | | (1.34) | (0.78) | | $(2.11)^b$ | $(2.03)^b$ | |
| Capex + R&D | -4.29% | -0.11% | $2.02^b$ | 0.48% | -5.37% | $2.37^b$ | -2.21% | -2.83% | 0.34 | 0.50% | -4.24% | $2.35^b$ |
| | $(2.95)^c$ | (0.15) | | (0.59) | $(3.49)^c$ | | $(2.12)^b$ | $(2.07)^b$ | | (0.76) | $(2.89)^c$ | |
| Cash holdings | 3.37% | 0.19% | $2.34^b$ | -0.52% | 5.90% | $4.53^c$ | 0.18% | 2.70% | $1.77^a$ | -0.64% | 3.64% | $3.18^c$ |
| | $(2.99)^c$ | (0.32) | | (0.79) | $(4.70)^c$ | | (0.26) | $(2.10)^b$ | | (1.11) | $(2.91)^c$ | |
| Total assets (log) | 0.04 | -0.05 | $2.10^b$ | -0.02 | 0.00 | 0.49 | -0.03 | 0.00 | 0.65 | -0.01 | -0.02 | 0.14 |
| | (1.21) | $(2.18)^b$ | | (0.98) | (0.02) | | (1.19) | (0.02) | | (0.49) | (0.44) | |

**Table IX: The effect of tariff reductions on corporate performance**

This table presents the difference-in-differences estimates for performance variables. The sample comprises 1,108 treatment firms that experience a significant import tariff reduction between 1974 and 2005, and the same number of matched firms The firms are matched in the year before the tariff reduction by market-to-book ratio, logarithm of total assets, cash flow to total assets, long-term debt to total assets, and cash to total assets. Both groups of firms are publicly traded U.S. manufacturing firms. Profit margin is operating income before depreciation divided by sales; ROE is net income divided by shareholders equity; sales growth is the change annual sales. All variables are defined in the Appendix. For each performance variable, we compute the mean change from the year (three-year average) before the tariff reduction to the year (three-year average) after the tariff reduction for treated firms (average treated difference), the matched firms (average matched difference), and the difference between treated and matched firms (difference-in-differences). We report absolute values of $t$-statistics in parentheses below the estimates. $a$, $b$, and $c$ indicate statistical significance at the 10%, 5%, and 1% level, respectively.

**Panel A: -1 to +1**

| | Average treated difference | Average matched difference | Diff-in-diffs |
|---|---|---|---|
| Profit margin | -0.01% | 3.88% | -4.02% |
| | (0.04) | (1.21) | (0.77) |
| ROE | -2.43% | -3.60% | 1.16% |
| | (0.8) | (1.16) | (0.29) |
| Sales growth | -7.35% | -5.74% | -1.66% |
| | $(4.22)^c$ | $(3.61)^c$ | (0.75) |

**Panel B: 3-year averages**

| | Average treated difference | Average matched difference | Diff-in-diffs |
|---|---|---|---|
| Profit margin | -4.32% | 8.34% | -12.65% |
| | (1.02) | $(1.86)^b$ | $(2.02)^b$ |
| ROE | -5.53% | 0.24% | -5.78% |
| | $(2.46)^b$ | (0.1) | $(1.81)^a$ |
| Sales growth | -6.88% | -3.46% | -3.42% |
| | $(6.33)^c$ | $(2.97)^c$ | $(2.21)^b$ |

**Figure 1: Tariff reductions through time**

This figure shows the number of tariff cuts by year for our sample firms. Tariffs are computed at the four-digit SIC industry level as duties collected at U.S. Custom divided by the Free-On-Board custom value of imports. An industry experiences a tariff cut if the tariff reduction is three times larger than the average tariff reduction in that industry.

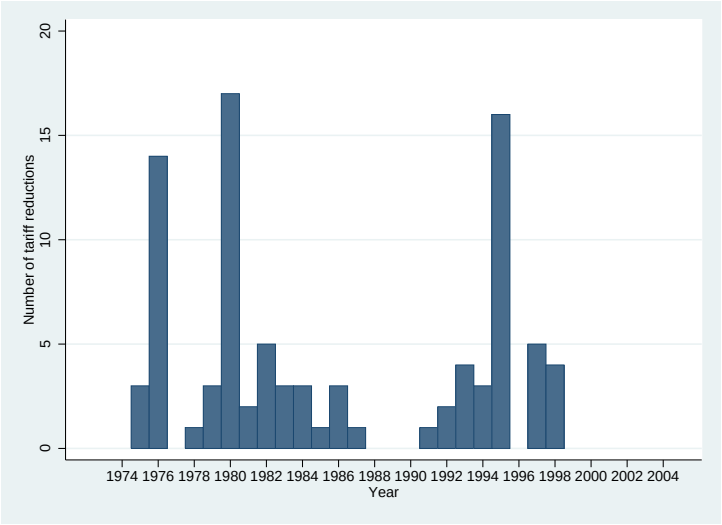



**Figure 2: Tariff rates around tariff reductions**

This figure shows the average tariff rate in event time for the sample of treated and matched industries. The sample comprises 91 treated industries that experience a tariff cut between 1974 and 2005. Tariff rates are computed at the four-digit SIC industry level as duties collected at U.S. Custom divided by the Free-On-Board customs value of imports.

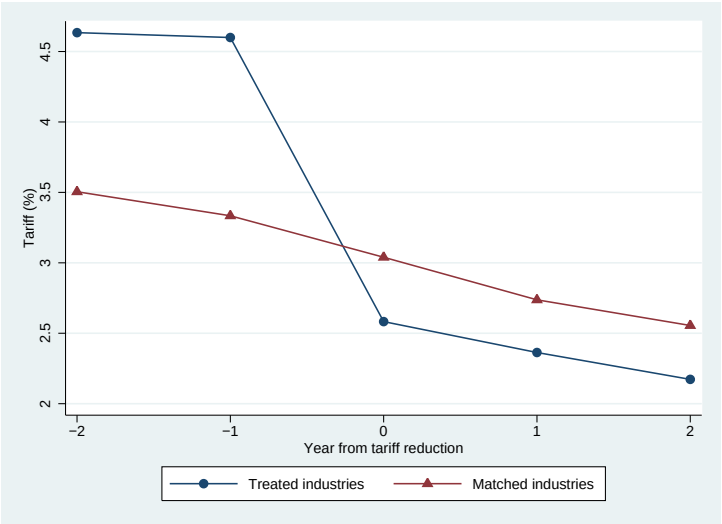


**Figure 3: Import penetration around tariff reductions**

This figure shows the import penetration in event time for the sample of treated and matched industries. The sample comprises 91 treated industries that experience a tariff cut between 1974 and 2005. Import penetration is computed at the four-digit SIC industry level as total imports divided by domestic production plus total imports minus total exports.

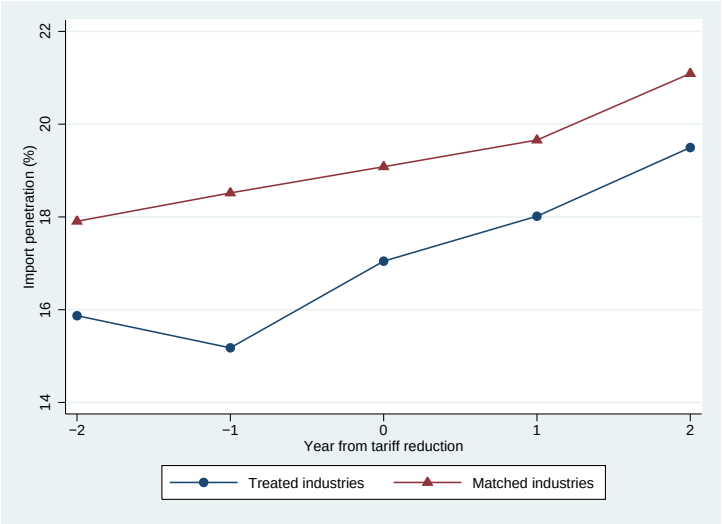



**Figure 4: Aggregate investment around tariff reductions**

This figure shows the aggregate investment in event time for the sample of treated and matched industries. The sample comprises 91 treated industries that experience a tariff cut between 1974 and 2005. Aggregate investment (in $ million) is obtained at the four-digit SIC industry level from the NBER-CES database.

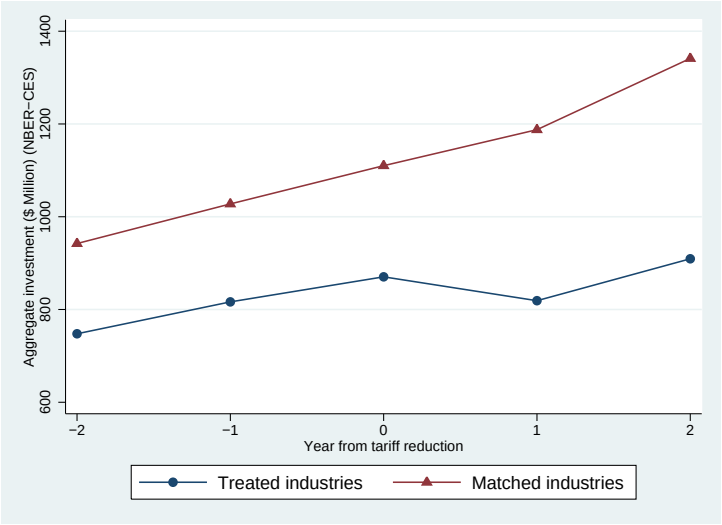


**Figure 5: Aggregate employment around tariff reductions**

This figure shows the the aggregate employment in event time for the sample of treated and matched firms. The sample comprises 91 treated industries that experience a tariff cut between 1974 and 2005. Aggregate employment (in thousand employees) is obtained at the four-digit SIC industry level from the NBER-CES database.

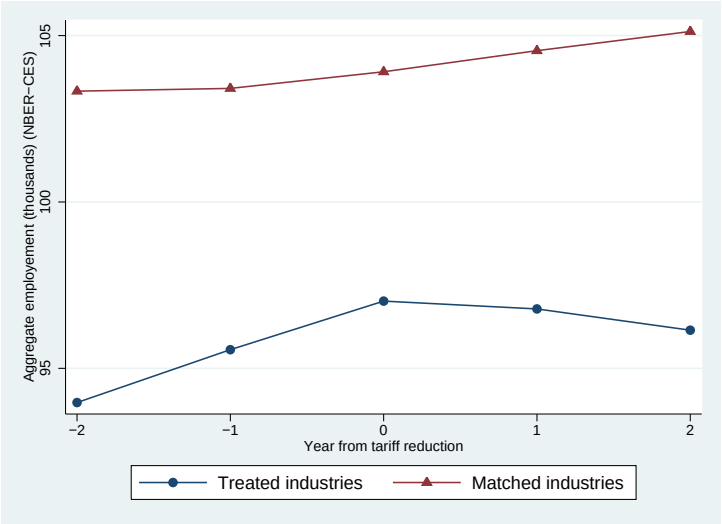
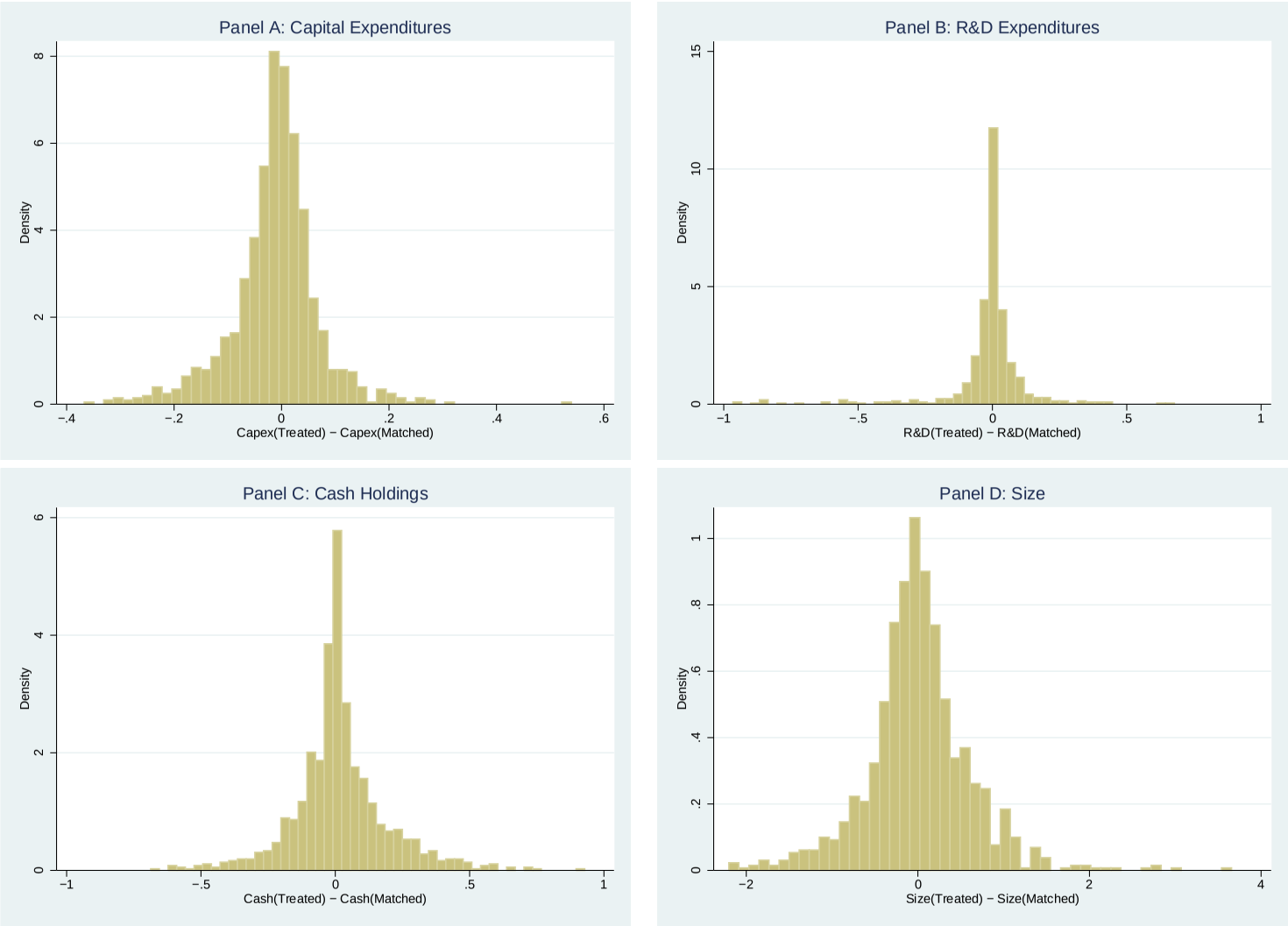


**Figure 6: Empirical distribution of firms' response to tariff reductions**

This figure shows the empirical distribution of the estimated response of firms' investment and cash policy. For each treated firm, we compute the difference between the change in a variable (e.g. capex) around the tariff reduction for this firm and that of its sample match. The sample comprises 1,108 treated firms that experience a tariff cut between 1974 and 2005.