Trade policy uncertainty and stock market performance

Marcelo Bianconi — Tufts
Federico Esposito — Tufts
Marco Sammon — Kellogg

July 2018

Abstract

We study the impact of trade policy uncertainty on stock market performance. The policy shock we use to identify the causal effect is the U.S. government granting China Permanent Normal Trade Relations (PNTR) in 2000, that eliminated potential tariff spikes on Chinese imports. Our empirical results show that US industries more exposed to the policy change experience significantly lower stock returns. Results are robust to other potential explanations for the decline in realized returns, including industry-time varying financial valuation ratios, as well as other US-China policy changes, such as the expiration of the Multi-Fiber Arrangement and the reduction in Chinese import tariffs associated with the China accession to WTO. We develop a simple asset pricing model that features input-output linkages on the production side to explain the empirical results. Preliminary results suggest that the intensity of intermediate input linkages between US and Chinese industries matters for the response of stock returns to the policy shock.

1 Introduction

Following the Trump administration's decision to give the EU another 30 days to negotiate for permanent exemptions over steel and aluminum tariffs, the European Commission claimed, *"The U.S. decision prolongs market uncertainty, which is already affecting business decisions"* (May 1st 2018).[1] The European Commission statement reflects a widespread view that economic and policy uncertainty hinder the economic performance of firms. The role of uncertainty is particularly important when firms undertake costly irreversible investments (see Handley and Limao (2015), Esposito (2017)), and has considerably increased in the last decades due to the increased global integration of supply chains, which exposes companies also to foreign policy uncertainty.

A recent empirical literature analyzes the effect of trade policy uncertainty on labor market outcomes and firms' economic outcomes - see Handley and Limao (2015), Handley and Limão (2017) and Pierce and Schott (2016). However, the threat of a tariff change in a certain product category or industry can affect not only the *current* economic outcomes, as highlighted by the literature, but also investors' expectations on *future* cash flows and discount rates, which in turn affect firms' stock market performance.

In this paper, we examine the impact of trade policy uncertainty on US firms' stock market performance. This is important since the level of stock prices has crucial implications for firm value, investment decisions as well as hiring decisions, as shown by Black (1976), Christie (1982), Davis et al. (2006) and Bloom (2009), among others. In particular, we investigate the response of US stock returns to the U.S. government granting China Permanent Normal Trade Relations (PNTR) in October, 2000. US imports from China had been subject to the relatively low NTR, or equivalently ''Most Favored Nation'' tariff rates reserved for WTO members since 1980. However, for China these low rates required annual renewals by the US Congress. Had NTR status been revoked, the United States would have reverted tariffs to the higher non-NTR rates, established under the Smoot-Hawley Tariff Act of 1930. For example, in 2000, the average US MFN tariff was 4 percent, but if China had lost its MFN status, it would have faced an average tariff of 31 percent - see Handley and Limão (2017). Therefore, PNTR removed the threat of substantial U.S. import tariff increases on Chinese goods.

We follow Pierce and Schott (2016) and quantify the transition from annual to permanent normal trade relations via the "NTR gap," defined as the difference between the non-NTR rates, to which tariffs would have risen if annual renewal had failed, and the NTR tariff rates.

[1] Source: https://www.bloomberg.com/news/articles/2018-05-01/european-union-warns-of-more-u-s-uncertainty-after-tariff-delay.

Our difference-in-differences identification strategy exploits the large cross-sectional variation in the NTR gap before China was granted PNTR. We test whether US manufacturing firms in high NTR gap industries had lower average returns, relative to low NTR gap industries, after the policy change was implemented. This approach is able to isolate the role of the change in policy from other confounding factors.

Our empirical results show that US industries more exposed to the policy change, i.e. industries that before the PNTR had a high gap between non-NTR and NTR rates, experienced significantly lower stock returns. The relationship between PNTR and US firms' stock returns remains statistically and economically significant after controlling for industry-time varying financial valuation ratios, typically used in the empirical finance literature, as well as for lagged industry volatility.[2] Furthermore, results are robust to controlling for other US-China policy changes, such as the expiration of the global Multi- Fiber Arrangement (MFA), governing Chinese textile and clothing export quotas, and the reduction in Chinese import tariffs associated with the China accession to WTO. The baseline specification implies that high NTR gap industries had lower average annual returns of 0.15 log points than low NTR gap industries.

To explore the potential mechanisms behind our results, we develop a simple asset pricing model, where stock returns are directly linked to the firms' expected profits, as in Gordon (1962) and Campbell and Shiller (1988b). We assume that US firms compete under monopolistic competition a la Melitz (2003) and Chaney (2008) with Chinese firms. In addition, the firms produce their differentiated variety by using labor and inputs from other sectors. These inputs can be sourced either domestically or can be imported from abroad, as in Blaum et al. (2015).

We show that, in our framework with input-output linkages, a change in the expected tariff applied on Chinese products imported to the US impacts the expected profits, and thus stock returns, through three different channels. The first is a competition effect: higher tariffs for Chinese goods imply higher prices, which makes US goods relatively cheaper for US consumers, increasing profits for US firms. The second is the direct input effect: higher tariffs on Chinese goods imply a higher cost of intermediate inputs for US firms, and thus lower profits. The third is an indirect input effect: since US goods are more expensive because Chinese inputs are more expensive due to the tariffs, US goods sold in China will be more expensive relative to Chinese goods, and thus US firms will lose market shares and have lower profits.

Eliminating the possibility of sudden tariff spikes on Chinese imports may have affected

[2]Specifically, we control for the price/earnings ratio, the price/book ratio, the return on investment, the return on equity, the EBITDA, the debt/equity ratio and the current ratio.

US stock prices through any of these channels. Thus, we go back to the data and empirically quantify the contribution of each of these channels on the negative effects of the PNTR on stock returns that we have estimated. This part of the project is still a work in progress, but preliminary results suggest that the intensity of intermediate input linkages between US and Chinese industries matters for the response of stock returns to the policy shock.

This paper is complementary to the empirical literature that investigates the effect of trade policy uncertainty on *current* economic outcomes, such as Carballo et al. (2014), Handley and Limao (2015), Handley and Limão (2017), Pierce and Schott (2016) and Crowley et al. (2018). Our focus, instead, is on how tariff uncertainty interacts with investors' expectations on *future* cash flows and discount rates, which in turn affect firms' stock market performance.

Our paper also contributes to the recent literature about the effect of the PNTR on the US economy. Pierce and Schott (2016) find that industries more exposed to PNTR experience a relative decline in employment, while Pierce and Schott (2017) find that greater exposure to PNTR is associated with a relative decline in investment by US firms. A priori, it is not obvious to predict, from this empirical evidence, what would have been the effect of the PNTR on stock returns. In fact, one one hand, lower employment and investment would suggest that US firms were suffering competition from Chinese firms, which would imply lower confidence of investors in the future prospects of US firms, and thus lower realized returns. On the other hand, the reduction in the workforce in the industries highly exposed to tariff uncertainty also translated into a reduction of the firms' production costs, which is typically welcomed by financial investors - see Boyd et al. (2005) and Hou et al. (2015). Our empirical results suggest that the competition effect dominates the cheaper inputs effect.

Our work also contributes to the trade literature that studies the impact of input-output linkages on economic outcomes, such as Caliendo and Parro (2014), Blaum et al. (2015) and Boehm et al. (2015). The novelty of this paper is to investigate the impact of these international production linkages on the stock returns in presence of trade policy uncertainty.

Finally, we also contribute to the strand of literature that studies the impact of economic uncertainty on financial markets. Boguth and Kuehn (2013) find that sensitivity of firms' cash flow to economic uncertainty explains cross sectional variation in firms' expected returns. Bansal et al. (2014) show that time varying economic uncertainty explains the joint dynamics of returns on equity and human capital. Bali and Zhou (2016) provide strong evidence for a positive relationship between price uncertainty and expected stock returns. We are the first, to the best of our knowledge, to link trade policy uncertainty to firms' stock returns.

2 Empirical analysis

US imports from China were subject to the relatively low NTR tariff rates reserved for WTO members since 1980. For China, however, these low rates required annual renewals that were uncertain and politically contentious - see Pierce and Schott (2016). Without renewal, US import tariffs on Chinese goods would have jumped to the higher non-NTR tariff rates assigned to non-market economies. The United States granted the Permanent Normal Trade Relations (PNTR) status to China in October 2000, and it became effective upon China's accession to the World Trade Organization (WTO) at the end of 2001. PNTR permanently removed the uncertainty associated with annual renewals by setting US duties on Chinese imports to NTR levels.

We take the stance that the NTR-gap measure is exogenous to stock-market performance after 2000. As shown in Pierce and Schott (2016), 79% of the variation in the NTR gap across industries arises from variation in non-NTR rates, set 70 years prior to passage of PNTR. This feature of non-NTR rates effectively rules out reverse causality that would arise if non-NTR rates could be set to protect struggling industries.

2.1 Main specification

Following Pierce and Schott (2016), we quantify the transition from annual to permanent normal trade relations via the "NTR gap," defined as the difference between the non- NTR rates to which tariffs would have risen if annual renewal had failed,

$$NTRGap_i = NonNTR_i - NTR_i \tag{1}$$

Our difference-in-differences identification strategy exploits the large cross-sectional variation in the NTR gap before China was granted PNTR. We compare the relative performance of US manufacturing firms in high NTR gap industries to low NTR gap industries (first difference), before and after the policy change was implemented (second difference). We use the NTR gap for each industry computed by Pierce and Schott (2016).[3] We use the NTR gaps for 1999—the year before passage of PNTR in the United States—in our regression analysis, but note that the baseline results are robust to using the NTR gaps from any available year (see Section 2.2). In 1999, the average NTR gap across industries is 0.29 with a standard deviation of 0.156, and its distribution is displayed in Figure 1.

[3] Pierce and Schott (2016) compute NTR gaps using ad-valorem equivalent NTR and non-NTR tariff rates from 1989 to 2001 provided by Feenstra, Romalis, and Schott (2002). Both types of tariffs are set at the eight-digit Harmonized System (HS) level. The gap for industry i is the average NTR gap across the eight-digit HS tariff lines belonging to that industry.

To compute stock returns, we start with the universe of US firms publicly listed from 1990 to 2007. We start with the entire universe of ordinary common shares (share-codes 10 and 11) traded on major exchanges (NYSE, AMEX and NASDAQ), downloaded from CRSP. We construct value-weighted portfolios each month at the industry level, where the weights are proportional to each firm's lagged market capitalization.[4] We then compound up these monthly returns to compute the total annual returns. To take out systematic effects, we compute market adjusted returns as in Campbell et al. (2001) by subtracting the annual market return from each annual industry returns.[5] We use value-weighted industry portfolios to reduce the influence of small firms on our results.[6] Table 1 reports some summary statistics about the sample used.[7]

We estimate the following equation:

$$R_{it} = \theta PostPNTR_t \times NTRGap_i + PostPTNR_t \times \boldsymbol{X}_i'\gamma + \boldsymbol{X}_{it}'\lambda + \delta_i + \delta_t + \alpha + \epsilon_{it} \quad (2)$$

where the dependent variable is the total return of each industry in year t. The first term on the right-hand side is the DID term of interest, an interaction of the NTR gap and an indicator for the post- PNTR period, i.e., years from 2001 forward. The second term on the right-hand side is an interaction of the post- PNTR dummy variable and time- invariant industry characteristics. This term allows for the possibility that the relationship between stock returns and these characteristics changes in the post- PNTR period. The third term on the right-hand side captures the impact of time-varying industry characteristics. We include several financial valuation and health metrics, such as the price/earnings ratio, the price/book ratio, the return on investment, the return on equity, the EV/EBITDA ratio, the debt/equity ratio and the current ratio.[8] We also follow Pierce and Schott (2016) and control for the industry exposure to MFA quota reductions, changes in Chinese import tariffs, as well as NTR tariff rates. Finally, we include time and industry fixed effects. Industry-year observations are weighted by industry stock market capitalization at the beginning of the sample period.[9] The final sample consists of 324 different industries, 18 years for a total of

[4]Our definition of industry is the same used in Pierce and Schott (2016), and it is similar to a 4-digit SIC classification.

[5]We use the market returns computed by Ken French. See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[6]Note however that our results are robust to using firm-level returns.

[7]Note that the initial sample of industry returns and valuation ratios includes about 650 different industries, but when we merge it with the NTR gap, the number of industries drops. In addition, we follow Pierce and Schott (2016) and consider only industries that have been always classified as "manufacturing" throughout the whole sample period.

[8]In the Appendix we describe the methodology used to compute the variables and their data sources.

[9]This avoids introducing a "look ahead" bias, and biasing results toward firms that eventually became

4,272 observations.

2.2 Results

The baseline results are shown in Table 2, with robust standard errors clustered by industry. Column 1 shows the result of the regression with only the DID term and the fixed effects, while the second column adds important controls, such as the NTR rates and changes in Chinese import tariffs, associated with the China accession to WTO. Further, Column 3 includes several financial valuation and health metrics, and represents the "baseline" specification to which we refer throughout the remainder of the paper.

We can see that the coefficient of the DID term of interest is negative and statistically significant throughout all the specifications. The removal of uncertainty had a negative and significant impact on US firms' stock returns. In particular, industries that had higher uncertainty on the level of tariffs imposed on Chinese products experienced worse relative stock performance when this uncertainty was removed. This effect is significant at 1% level, and is robust across different specifications. The estimated effects are also economically significant. The difference-in-differences coefficient in the baseline specification in column 3 indicates that moving an industry from an NTR gap at the twenty-fifth (low uncertainty, 0.17) to the seventy-fifth percentile (high uncertainty, 0.38) of the observed distribution decreases the relative average stock return by 0.09 log points.

We also perform a two-step calculation of the implied impact of PNTR. First, for each industry i, we multiply the coefficient θ by the industry's NTR gap. This yields an implied effect of PNTR (versus the pre-period) on stock returns for each industry relative to a hypothetical industry with a zero NTR gap. Second, we average the implied relative effects for all manufacturing industries, using initial industry stock market capitalization as weights. The baseline specification implies a relative decline in the total return of -0.15, or, up to a first order approximation, a decline of 0.15 log points.

In our empirical results, we obtain a negative DID coefficient, $\theta < 0$. Potentially, this could have happened because either i) returns went down in all industries, but they went down more in high-gap industries; or ii) returns went up in all industries, but they increased less in high-gap industries; or iii) returns went down in high uncertainty industries, but went up in low-gap sectors. Figure 3 shows that the latter was the case: average (market adjusted) returns in high uncertainty industries went down after the policy, while returns in low gap sectors went up, although not substantially.

large, i.e. firms that benefited from the PNTR with China.

2.3 Robustness and extensions

We perform a number of robustness exercises, documented in Table 3. Column 1 adds more controls from Pierce and Schott (2016), such as the log of skill intensity and log of capital intensity of an industry interacted with the Post dummy, and MFA Quota exposure. Column 2 uses an Arellano-Bond GMM estimator to control for the auto-correlation of the stock market returns. We can see that in both specifications the magnitude and sign of the coefficient are very close to the baseline estimates in Column 3 of Table 2.

Furthermore, we follow Pierce and Schott (2016) and examine two alternate specifications designed to evaluate the exogeneity of the NTR gaps. First, we estimate a two-stage least squares specification in which we instrument the baseline DID term, $PostPNTR_t \times NTRGap_i$, with an interaction of the post-PNTR indicator and the Smoot-Hawley non-NTR tariff rates, $PostPNTR_t \times NNTR_i$. As indicated in the Column 3 of Table 3, the DID term remains negative and statistically significant, with a magnitude in line with our baseline result. Second, we re-estimate our baseline specification using, rather than NTR gap observed in 1999, the one instead observed in 1990, ten years prior to PNTR. As shown in column 4 of Table 3, the DID coefficient estimate remains negative and statistically significant. In addition, Column 5 uses revealed tariffs, as computed by Pierce and Schott (2016), in place of NTR tariff rates, with very similar results.[10] Lastly, we also performed a "placebo" test, in which we draw from the NTR gap distribution each year and randomly assign each gap to an industry. If the gap was really what drove differences in returns, we would expect the coefficient on the placebo gap to be insignificant. Reassuringly, this is indeed what Column 6 in Table 3 shows.[11]

We also examine the dynamics of the response of US stock returns to the PNTR. For the decline in stock market returns to be attributable to PNTR, our policy measure, the NTR gap, should be correlated with stock returns after PNTR, but not before. To determine whether there is a relationship between the NTR gap and stock returns in the years before 2001, we replace the PostPNTR indicator used in equation (2) with interactions of the NTR Gap and the full set of year dummies,

$$R_{it} = \sum_{y=1990}^{2007} (\theta_y 1\{y = t\} \times NTRGap_i) + \boldsymbol{X}'_{it}\lambda + \delta_i + \delta_t + \alpha + \epsilon_{it} \tag{3}$$

[10] Pierce and Schott (2016) calculate ad-valorem equivalent revealed NTR tariff rates by summing the duties collected for each eight-digit HS product by year and dividing this sum by the corresponding dutiable value. These revealed tariff measures capture changes in tariff rates due to NAFTA and other preferential trade agreements.

[11] In another specification, not reported here, we control for lagged industry volatility, and results are similar to the baseline.

Results for the DID coefficients, θ_y, are displayed visually along with their 90 percent confidence intervals in Figure 2. As indicated in the figure, point estimates are statistically insignificant at conventional levels until after 2001, at which time they become statistically significant and increasingly negative. This pattern is consistent with the parallel trends assumption implicit in our difference- in-differences analysis, and also suggests that the policy had a medium-run impact on stock returns. Moreover, the fact that before the shock there is not a significant effect of the DID term on the stock returns also suggests that the policy was not expected by the markets, which did not react to the shock before it happened.

3 Exploring the mechanism

In this section, we develop a simple asset pricing model that features input-output linkages across sectors and countries in production. Then we use the results suggested by the model to further investigate in the data the determinants of the negative effect of PNTR on stock returns.

3.1 Theoretical Framework

We propose a simple model for explaining the results obtained in the empirical analysis. Assume there are two countries, US and China. In each country, there are multiple industries indexed with k, and in each industry there is one representative firm that produces a differentiated good under monopolistic competition.

3.1.1 Consumers

The representative consumer maximizes a Cobb-Douglas utility function across goods from different sectors

$$\max U_j = \prod_{k=1}^{K} Q_{jk}^{\mu_k} \tag{4}$$

where $\sum_k \mu_k = 1$ and Q_{jk} is a CES aggregator of goods in sector k produced in US and China:

$$Q_{jk} = \left(\sum_{k=1}^{K} \left((q_{Uj,k})^{\frac{\sigma-1}{\sigma}} + (q_{Cj,k})^{\frac{\sigma-1}{\sigma}} \right) \right)^{\frac{\sigma}{\sigma-1}} \tag{5}$$

where q_{ij} is the good produced in i and sold in j, σ is the elasticity of substitution between US and Chinese goods. The maximization problem implies that the demand for the industry

k;s good is:

$$q_{ij,k} = \frac{p_{ij,k}^{-\sigma}}{P_{jk}^{1-\sigma}} \mu_k Y_j, \tag{6}$$

where Y_j is the total income in country j, and

$$P_{jk}^{1-\sigma} \equiv \sum_i (p_{ij,k})^{1-\sigma} \tag{7}$$

is a sectoral price index.

3.1.2 Producers

In each country and sector production occurs under monopolistic competition, using a combination of domestic labor and intermediate inputs. Specifically, we assume a Cobb-Douglas production function across inputs:

$$q_{i,k} = z_k L_{i,k}^{\gamma_k} \Pi_{s=1}^{K} (x_{U,s})^{\alpha_{U,s}^k} \Pi_{g=1}^{K} (x_{C,g})^{\alpha_{C,g}^k} \tag{8}$$

where $\sum_{s=1}^{K} \alpha_{U,s}^k + \sum_{g=1}^{K} \alpha_{C,g}^k = 1 - \gamma_k$, K is the total number of sectors, and z_k is the industry k total factor productivity. The assumption of monopolistic competition implies that the optimal price in industry k equals

$$p_{ij,k} = \frac{\tau_{ij,k} c_{i,k}}{z_k} \frac{\sigma}{(\sigma - 1)} \tag{9}$$

where the marginal cost is:

$$c_{i,k} = \chi_k w_i^{\gamma_k} \Pi_{s=1}^{K} (\tau_{Ui,s} \tilde{p}_{Ui,s})^{\alpha_{U,s}^k} \Pi_{g=1}^{K} (\tau_{Ci,g} \tilde{p}_{Ci,g})^{\alpha_{C,g}^k}$$

where $\chi_k = (\gamma_k)^{-\gamma_k} \Pi_{s=1}^{K} \left(\alpha_{U,s}^k\right)^{-\alpha_{U,s}^k} \Pi_{g=1}^{K} \left(\alpha_{C,g}^k\right)^{-\alpha_{C,g}^k}$ is a constant, and $\tau_{ij,k}$ is an ad-valorem tariff applied by country j on goods in sector k from country i, $\tilde{p}_{ji,s}$ is the net-of-tariff price of the intermediate inputs. We assume that the intermediate inputs are produced under perfect competition using only domestic labor, with unitary productivity. Under the additional assumption, as in Chaney (2008), of an outside good produced with labor and freely traded, wages are 1 in both countries, and thus $\tilde{p}_{ji,s} = 1$ for all i j and s.

The optimal profits of industry k in country j are:

$$\pi_{j,k} = \pi_{Uj,k} + \pi_{Cj,k} = P_U^{\sigma-1} \mu_k Y_U \left(\frac{\tau_{iU,k} c_{i,k}}{z_k} \frac{\sigma}{(\sigma - 1)} \right)^{1-\sigma} \frac{1}{\sigma} + P_C^{\sigma-1} \mu_k Y_C \left(\frac{\tau_{iC,k} c_{i,k}}{z_k} \frac{\sigma}{(\sigma - 1)} \right)^{1-\sigma} \frac{1}{\sigma}$$

or more compactly:

$$\pi_{i,k} = \sum_j X_{ij,k}\frac{1}{\sigma} = \sum_j x_{ij,k}Y_{j,k}\frac{1}{\sigma} = \frac{1}{\sigma}\sum_j x_{ij,k}\mu_k w_j L_j \tag{10}$$

where $X_{ji,k}$ are trade flows (revenues) from j to i in industry k, $x_{ij,k}$ are the sectoral trade shares and $Y_{j,k}$ is the income spent by country j on sector k. We can log-linearize the profits to get:

$$\Delta\text{log}\pi_{i,k} = \sum_j y_{ij,k}\Delta\text{log}x_{ij,k} + \sum_j y_{ij,k}\Delta\text{log}w_j \tag{11}$$

where

$$y_{ji,k} = \frac{X_{ji,k}}{\sum_d X_{jd,k}} \tag{12}$$

are revenues shares. Note that sectoral trade shares equal

$$x_{ij,k} = \frac{(p_{ij,k})^{1-\sigma}}{\sum_o (p_{oj,k})^{1-\sigma}} \tag{13}$$

and thus the log change in trade shares equals:

$$\Delta\text{log}x_{ij,k} = (1-\sigma)\Delta\text{log}p_{ij,k} + (\sigma-1)\sum_o x_{oj,k}\Delta\text{log}p_{oj,k} \tag{14}$$

Finally, note that the log change in the price equals

$$\Delta\text{log}p_{ij,k} = \Delta\text{log}\tau_{ij,k} + \Delta\text{log}w_i + \sum_{s=1}^{K}\alpha^k_{U,s}\Delta\text{log}\tau_{Ui,s} + \sum_{g=1}^{K}\alpha^k_{C,g}\Delta\text{log}\tau_{Ci,g} \tag{15}$$

Using the fact that the wage is the numeraire, we plug equations (14), (15) into equation (11) to obtain

$$\Delta\text{log}\pi_{i,k} = \sum_j y_{ij,k}(1-\sigma)\left[\Delta\text{log}\tau_{ij,k} + \sum_{s=1}^{K}\alpha^k_{U,s}\Delta\text{log}\tau_{Ui,s} + \sum_{g=1}^{K}\alpha^k_{C,g}\Delta\text{log}\tau_{Ci,g}\right]$$

$$-\sum_j y_{ij,k}(1-\sigma)\sum_o x_{oj,k}\left[\Delta\text{log}\tau_{oj,k} + \sum_{s=1}^{K}\alpha^k_{U,s}\Delta\text{log}\tau_{Uo,s} + \sum_{g=1}^{K}\alpha^k_{C,g}\Delta\text{log}\tau_{Co,g}\right]$$

Expanding this expression for US, noting that there are no domestic tariffs and assuming no change in tariffs on US goods to China:

$$\Delta\log\pi_{U,k} = y_{UU,k}(1-\sigma)\left[(1-x_{UU,k})\sum_{g=1}^{K}\alpha_{C,g}^{k}\Delta\log\tau_{CU,g} - x_{CU,k}\Delta\log\tau_{CU,k}\right] + y_{UC,k}(1-\sigma)\,(1-x_{UC,k})\sum_{g=1}^{K}\alpha_{C,g}^{k}\Delta\log\tau_{CU,g} \tag{16}$$

This leads to the following proposition.

Proposition 1. *Up to a first-order approximation, the effect of a change in the tariff on Chinese goods in industry k is:*

$$\frac{\Delta log\pi_{U,k}}{\Delta log\tau_{CU,k}} = \underbrace{y_{UU,k}(\sigma-1)x_{CU,k}}_{competition\ effect} > 0$$

while the effect of a change in the tariffs on Chinese goods used as intermediate inputs by industry k is:

$$\frac{\Delta log\pi_{U,k}}{\Delta log\tau_{CU,g}} = \underbrace{y_{UU,k}(1-\sigma)\,(1-x_{UU,k})\,\alpha_{C,g}^{k}}_{direct\ input\ effect} + \underbrace{y_{UC,k}(1-\sigma)\,(1-x_{UC,k})\,\alpha_{C,g}^{k}}_{indirect\ input\ effect} < 0$$

We can decompose the effect of tariff change on profits into three components. The first is a competition effect: higher tariffs for Chinese goods imply higher prices, which makes US goods relatively cheaper for US consumers, increasing profits for US firms. This effect is increasing in the share of US expenditures in sector k on Chinese goods, $x_{CU,k}$. The second is the direct input effect: higher tariffs on Chinese goods in industry g imply a higher cost of intermediate inputs for US firms, and thus lower profits. This effect is stronger the higher is the relative usage of the Chinese input g for the production of k, i.e. $\alpha_{C,g}^{k}$. The third effect is an indirect input effect: since US goods are more expensive because Chinese inputs are more expensive due to the tariffs, US goods sold in China will be more expensive relative to Chinese goods, and thus US firms will lose market shares and will have lower profits.

Assume that there is uncertainty on the level of US tariffs on Chinese goods. In particular, assume there are two states of the world. In the first, the tariffs are set at the (lower) NTR level, while in the second they are set at the (higher) Smoot-Hawley level. Thus the expected tariff equals:

$$E\left[\tau_{CU,k}\right] = \tau_k^1\lambda_k + (1-\lambda_k)\tau_k^0 \tag{17}$$

where $\tau_k^1 > \tau_k^0$. We assume for simplicity that $\lambda_k = \lambda$.

3.1.3 Asset Pricing

On the asset side of the economy, we assume a stationary dividend-discount model, featuring rational expectations and constant dividend growth.[12] We express the expected real rate of return on industry equity, R_{kt} as the dividend yield, D_t/P_t, plus the expected real growth rate of dividends, g. Note that, if we allow for multinational activity, the real growth rate of dividends refers to capital owned by U.S. companies worldwide in the industry. The appropriate measure of expected real growth rate of dividends includes dividends worldwide, denoted g_{wt} and may differ from domestic companies. The formula is then

$$R_k = \frac{E[D_k]}{Q_k} + g_w \tag{18}$$

Given the dividend yield, if U.S. companies in an industry dis-invest (invest) in the U.S. and invest (dis invest) abroad in net terms, the expected real growth of dividends of domestic companies will be below (above) the overall growth of dividends and the domestic stock market will have relatively lower (higher) rates of return. Given expected dividend growth, equity returns are directly related to expected dividend yield.

Assuming that households own firms, they are the claimants of profits which will determine the dividend yield and ultimately the rate of consumption growth of households.[13] We assume that all profits are rebated to shareholders, i.e. the household, as dividends per share price, so we can write the return as

$$R_k = E\left[\pi_k\left(\boldsymbol{\tau}\right)\right] + g_w \tag{19}$$

3.1.4 Interpretation of empirical results

The DID regression compares industries with higher gaps vs industries with lower gaps, before vs after the policy. Thus we can write the DID coefficient as a double-difference in the mean:

$$\theta = \frac{1}{K}\sum_{k\in H}\left[(R_k^{after}) - (R_k^{before})\right] - \frac{1}{K}\sum_{s\in L}\left[(R_s^{after}) - (R_s^{before})\right] \tag{20}$$

where H is the set of industries that have a high gap (above the median of the distribution), and L is the set of industries with a low gap (below the median of the distribution). Using

[12]The constant dividend-discount model, originally due to Gordon (1962), is widely used in the literature, e.g. Campbell and Shiller (1988b,a). An open economy extension is discussed in Baker et al. (2005). The implicit key assumption is that the expected returns exceeds the dividend growth.

[13]See e.g. Lucas Jr (1978).

the equations above, we have:

$$\theta=\frac{1}{K}\sum_{k\in H}\left[E\left[\pi_k^{after}\left(\boldsymbol{\tau}\right)\right]-E\left[\pi_k^{before}\left(\boldsymbol{\tau}\right)\right]+\left(g_w^{after}-g_w^{before}\right)\right]$$

$$-\frac{1}{K}\sum_{s\in L}\left[E\left[\pi_s^{after}\left(\boldsymbol{\tau}\right)\right]-E\left[\pi_s^{before}\left(\boldsymbol{\tau}\right)\right]+\left(g_w^{after}-g_w^{before}\right)\right]=$$

$$=\frac{1}{K}\sum_{k\in H}\Delta E\left[\pi_k\left(\boldsymbol{\tau}\right)\right]-\frac{1}{K}\sum_{s\in L}\Delta E\left[\pi_s\left(\boldsymbol{\tau}\right)\right]$$

Our empirical analysis suggests that i) the DID term θ is negative; ii) high gap industries on average experience a decrease in their return, relative to the market, after the PNTR; and iii) low gap industries on average experience a mild increase in their return, relative to the market, after the PNTR. This means that

$$\frac{1}{K}\sum_{s\in L}\Delta E\left[\pi_s\left(\boldsymbol{\tau}\right)\right]>0>\frac{1}{K}\sum_{k\in H}\Delta E\left[\pi_k\left(\boldsymbol{\tau}\right)\right]$$

Since the expected profits after the policy simply equal $\pi_k^{after}\left(\boldsymbol{\tau^0}\right)$, we have:

$$\sum_{s\in L}\left[\pi_s^{after}\left(\boldsymbol{\tau^0}\right)-\lambda\pi_s^{before}\left(\boldsymbol{\tau^1}\right)-(1-\lambda)\pi_s^{before}\left(\boldsymbol{\tau^0}\right)\right]>0>\sum_{k\in H}\left[\pi_k^{after}\left(\boldsymbol{\tau^0}\right)-\lambda\pi_k^{before}\left(\boldsymbol{\tau^1}\right)-(1-\lambda)\pi_k^{before}\left(\boldsymbol{\tau^0}\right)\right]$$

Assume that tariffs are the only time-varying shocks (this can be relaxed later). Assume that the NTR rates did not change after the policy (we can relax this assumption later), i.e. the vector $\boldsymbol{\tau^0}$ is the same before and after the policy. Then we have that

$$\sum_{s\in L}\left[-\lambda\pi_s^{before}\left(\boldsymbol{\tau^1}\right)+\lambda\pi_s^{before}\left(\boldsymbol{\tau^0}\right)\right]>0>\sum_{k\in H}\left[-\lambda\pi_k^{before}\left(\boldsymbol{\tau^1}\right)+\lambda\pi_k^{before}\left(\boldsymbol{\tau^0}\right)\right]$$

$$\sum_{s\in L}\left[\pi_s^{before}\left(\boldsymbol{\tau^0}\right)-\pi_s^{before}\left(\boldsymbol{\tau^1}\right)\right]>0>\sum_{k\in H}\left[\pi_k^{before}\left(\boldsymbol{\tau^0}\right)-\pi_k^{before}\left(\boldsymbol{\tau^1}\right)\right]$$

$$\sum_{s\in L}\pi_s^{before}\left(\boldsymbol{\tau^1}\right)\Delta\log\pi_s\left(\Delta\log\boldsymbol{\tau}\right)>0>\sum_{k\in H}\pi_k^{before}\left(\boldsymbol{\tau^1}\right)\Delta\log\pi_k\left(\Delta\log\boldsymbol{\tau}\right)$$

where $\Delta\log\pi_s\left(\Delta\log\boldsymbol{\tau}\right)$ is the log change in profits after tariffs go up from $\boldsymbol{\tau^0}$ to $\boldsymbol{\tau^1}$. Then, using Proposition 1 we can write:

$$-\eta_L^{direct}-\eta_L^{indirect}+\eta_L^{compe}>0>-\eta_H^{direct}-\eta_H^{indirect}+\eta_H^{compe} \tag{21}$$

where $\eta_H^{direct}\equiv\sum_{k\in H}\pi_k^{before}\left(\boldsymbol{\tau^1}\right)y_{UU,k}(\sigma-1)\left[\left(1-x_{UU,k}\right)\sum_{g=1}^{K}\alpha_{C,g}^{k}\Delta\log\tau_{CU,g}\right]>0$, $\eta_H^{indirect}\equiv$

$\sum_{k\in H}\pi_k^{before}\left(\boldsymbol{\tau^1}\right)(\sigma-1)\left(1-x_{UC,k}\right)\sum_{g=1}^{K}\alpha_{C,g}^{k}\Delta\log\tau_{CU,g}>0$, $\eta_H^{compe}\equiv\sum_{k\in H}\pi_k^{before}\left(\boldsymbol{\tau^1}\right)y_{UU,k}(\sigma-1)\left[x_{CU,k}\Delta\log\tau_{CU,k}\right]>0$, and similarly for $\eta_L^{direct},\eta_L^{indirect},\eta_L^{compe}$.

These terms are all averages across high and low gap industries, respectively, each weighted by their (positive) profits. Equation (21) shows that, in order to have the DID coefficient negative, it has to be that either i) the average (negative) input effects in low gap industries are higher than in high gap industries, or ii) the average positive competition effect in low gap industries are higher than in high-gap industries; or iii) both. The following section empirically investigates which effect is predominant in determining the results of Section 2.

3.2 Empirical evidence

In this section we use the insights developed in the theoretical framework to uncover the mechanisms behind the empirical results of section 2.

TBA

4 Conclusions

TBA

References

Baker, D., DeLong, J. B., Krugman, P. R., 2005. Asset returns and economic growth. Brookings Papers on Economic Activity 2005 (1), 289--315.

Bali, T. G., Zhou, H., 2016. Risk, uncertainty, and expected returns. Journal of Financial and Quantitative Analysis 51 (3), 707--735.

Bansal, R., Kiku, D., Shaliastovich, I., Yaron, A., 2014. Volatility, the macroeconomy, and asset prices. The Journal of Finance 69 (6), 2471--2511.

Black, F., 1976. The pricing of commodity contracts. Journal of financial economics 3 (1-2), 167--179.

Blaum, J., Lelarge, C., Peters, M., 2015. The gains from input trade in firm-based models of importing.

Bloom, N., 2009. The impact of uncertainty shocks. econometrica 77 (3), 623--685.

Boehm, C., Flaaen, A., Pandalai-Nayar, N., 2015. Input linkages and the transmission of shocks: Firm-level evidence from the 2011 tōhoku earthquake.

Boguth, O., Kuehn, L.-A., 2013. Consumption volatility risk. The Journal of Finance 68 (6), 2589--2615.

Boyd, J. H., Hu, J., Jagannathan, R., 2005. The stock market's reaction to unemployment news: Why bad news is usually good for stocks. The Journal of Finance 60 (2), 649--672.

Caliendo, L., Parro, F., 2014. Estimates of the trade and welfare effects of nafta. The Review of Economic Studies, rdu035.

Campbell, J. Y., Lettau, M., Malkiel, B. G., Xu, Y., 2001. Have individual stocks become more volatile? an empirical exploration of idiosyncratic risk. The Journal of Finance 56 (1), 1--43.

Campbell, J. Y., Shiller, R. J., 1988a. The dividend-price ratio and expectations of future dividends and discount factors. The Review of Financial Studies 1 (3), 195--228.

Campbell, J. Y., Shiller, R. J., 1988b. Stock prices, earnings, and expected dividends. The Journal of Finance 43 (3), 661--676.

Carballo, J., Handley, K., Limão, N., 2014. Trade collapses: The role of economic and policy uncertainty in the great recession.

Chaney, T., 2008. Distorted gravity: The intensive and extensive margins of international trade. American Economic Review 98 (4), 1707--1721.

Christie, A. A., 1982. The stochastic behavior of common stock variances: Value, leverage and interest rate effects. Journal of financial Economics 10 (4), 407--432.

Crowley, M., Song, H., Meng, N., 2018. Tariff scares: Trade policy uncertainty and foreign market entry by chinese firms. Journal of International Economics.

Davis, S. J., Haltiwanger, J., Jarmin, R., Miranda, J., Foote, C., Nagypal, E., 2006. Volatility and dispersion in business growth rates: Publicly traded versus privately held firms [with comments and discussion]. NBER macroeconomics annual 21, 107--179.

Esposito, F., 2017. Entrepreneurial risk and diversification through trade. Tech. rep.

Gordon, M. J., 1962. The investment, financing, and valuation of the corporation. RD Irwin.

Handley, K., Limao, N., 2015. Trade and investment under policy uncertainty: theory and firm evidence. American Economic Journal: Economic Policy 7 (4), 189--222.

Handley, K., Limão, N., 2017. Policy uncertainty, trade, and welfare: Theory and evidence for china and the united states. American Economic Review 107 (9), 2731--83.

Hou, K., Xue, C., Zhang, L., 2015. Digesting anomalies: An investment approach. The Review of Financial Studies 28 (3), 650--705.

Lucas Jr, R. E., 1978. Asset prices in an exchange economy. Econometrica: Journal of the Econometric Society, 1429--1445.

Melitz, M. J., 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica 71 (6), 1695--1725.

Pierce, J. R., Schott, P. K., 2016. The surprisingly swift decline of us manufacturing employment. The American Economic Review 106 (7), 1632--1662.

Pierce, J. R., Schott, P. K., 2017. Investment responses to trade liberalization: Evidence from us industries and plants. Tech. rep., National Bureau of Economic Research.

5 Appendix

5.1 Construction of valuation variables

The price-to-earnings ratio (P/E ratio) is a valuation measure of its current share price relative to its per-share earnings. We construct this using annual Compustat data. It is the ratio of the total market capitalization [PRCC_F * CSHO] of all firms in the industry, divided by the total earnings [EPSFX] of all firms in the industry.

The Price-to-book ratio is also a valuation multiple that compares market value to book value. This is also constructed using annual Compustat data, as the ratio of the total market capitalization, divided by total book value of equity [CEQ].

The EV/EBITDA is a valuation tool, allowing investors to compare the value of a company, debt included, to the company's cash earnings less non-cash expenses. We compute this with annual Compustat data as the total enterprise value of the industry [PRCC_F*CSHO + PSTK + DLTT - CHE] divided by the total EBITDA of the industry.

The Return on invested capital (ROI), is a measure of the profitability, or the return earned on capital invested in operating assets. We compute this with annual Compustat data as the ratio of net income - dividends [NI-DVC] of the industry, divided by the industry's total capital [CEQ + DLTT - CHE].

The Return on equity (ROE) measures profitability. We compute this with annual Compustat data as the total net income [NI] of the industry, divided by the industry's total market capitalization.

The debt-to-equity ratio compares the company's debt to its stockholder equity. It is calculated as total liabilities over stockholders' equity and indicates what proportion of shareholders' equity and debt a company is using to finance its assets. We compute this with annual Compustat data as the ratio of total long-term debt [DLTT] to total market capitalization.

The Current ratio is a liquidity ratio that measures a company's ability to pay short-term and long-term obligations. We compute this with annual Compustat data as the the total current assets [ACT] divided by total current liabilities [LCT].

6 Tables and Figures

Table 1: Summary statistics

Statistics	Value
Number of Industries	324
Avg. Industry Market Cap, in Billion $	17.50
Median Annual Industry Return	8.96%
Standard-Deviation of Annual Returns	19.78%
Years	1990-2007
Number of observations	4,272

Figure 1: Distribution of NTR gaps

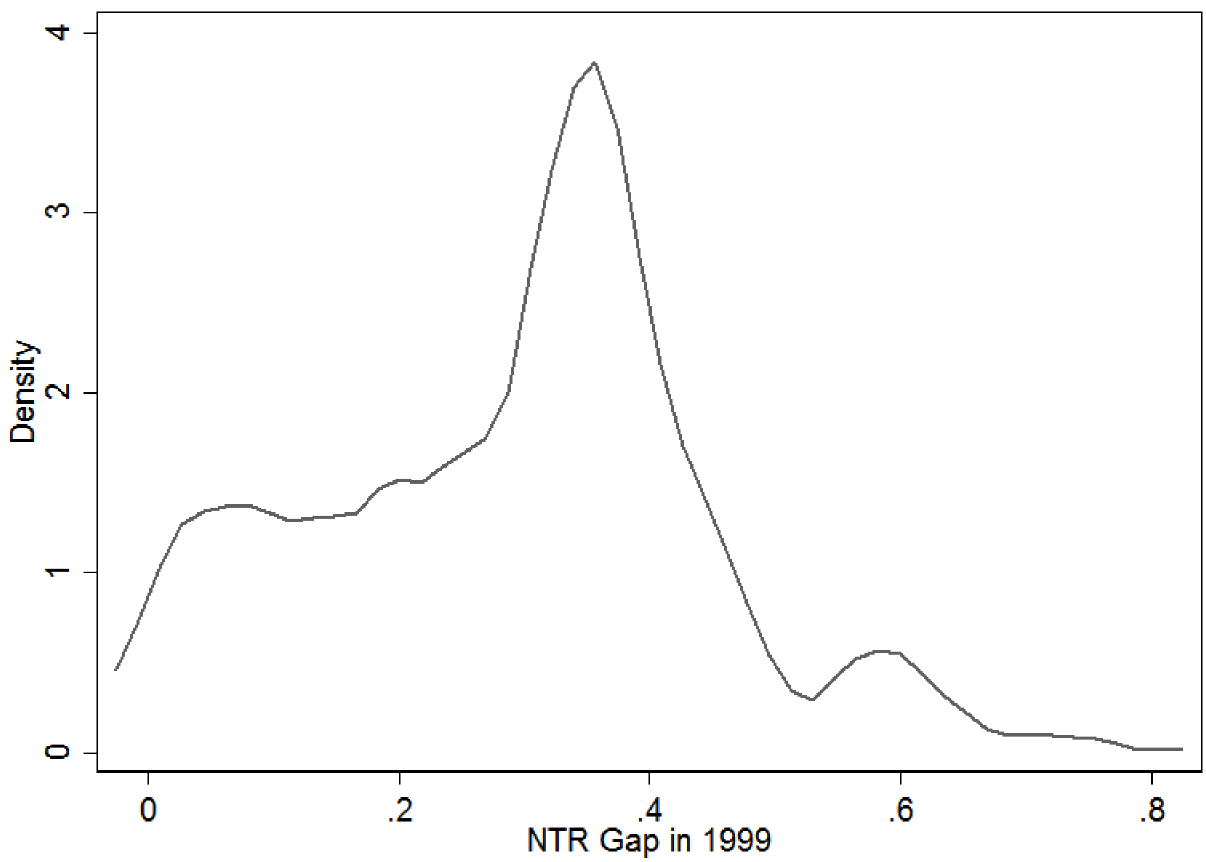

Table 2: Baseline results

Dep. var.: Excess Stock Return	(1)	(2)	(3)
NTR Gap ×Post	-0.429**	-0.480**	-0.563***
	(0.20)	(0.20)	(0.13)
NTR Rate		-0.574	-1.120
		(0.41)	(2.09)
Chinese tariff ×Post		-0.185	-0.242*
		(0.19)	(0.13)
Price/earnings ratio			0
			(0)
Price/book ratio			0.042***
			(0.01)
ROI			0.008
			(0.01)
ROE			-0.156
			(0.18)
EBITDA			0
			(0)
Debt/Equity ratio			-0.181***
			(0.05)
Current ratio			0.072*
			(0.04)
Year Fixed Effect	Y	Y	Y
Industry Fixed Effect	Y	Y	Y
Number of Observations	4,272	3,986	1,712
R^2	0.179	0.180	0.236

Note. Standard errors, robust and clustered at the industry level, are in parentheses. *** p-value<0.01, ** p-value<0.05, * p-value<0.1

Table 3: Robustness

Dep. var.: Excess Stock Return	(1)	(2)	(3)	(4)	(5)	(6)
NTR Gap ×Post	-0.432**	-0.701***	-0.232**	-0.389*	-0.576***	0.165
	(0.18)	(0.15)	(0.11)	(0.21)	(0.13)	(0.13)
NTR Rate	-1.489	0.812	0.086	0.203		1.369
	(2.11)	(3.40)	(1.68)	(1.81)		(1.85)
Chinese tariff ×Post	-0.247	-0.254	-0.382***	-0.261*	-0.242*	-0.265
	(0.17)	(0.20)	(0.09)	(0.15)	(0.13)	(0.21)
Price/book ratio	0.040***	0.069***	0.035***	0.046***	0.044***	0.045***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Debt/Equity ratio	-0.203***	-0.199**	-0.141***	-0.163***	-0.185***	-0.137**
	(0.06)	(0.09)	(0.05)	(0.05)	(0.05)	(0.06)
Current ratio	0.076*	0.010	0.092**	0.067	0.079*	0.077*
	(0.04)	(0.06)	(0.04)	(0.04)	(0.04)	(0.04)
Log of skill intensity ×Post	-0.085					
	(0.06)					
Log of capital intensity ×Post	0.032					
	(0.03)					
MFA Quota exposure	0.032					
	(0.68)					
Lagged Excess Return		-0.284***				
		(0.07)				
Twice-Lagged Excess Return		-0.312***				
		(0.09)				
Revealed Tariffs					-0.749	
					(0.92)	
Year Fixed Effect	Y	Y	Y	Y	Y	Y
Industry Fixed Effect	Y	N	Y	Y	Y	Y
Number of Observations	1,698	1,250	1,652	1,712	1,670	1730
R^2	0.240		0.109	0.221	0.238	0.218

Notes. Column 1 adds more controls from Pierce and Schott (2016), such as the log of skill intensity and log of capital intensity of an industry interacted with the Post dummy, and MFA Quota exposure. Column 2 controls for autocorrelation of the dependent variable by means of the Arellano-Bond estimator. Column 3 instruments the variable NTR Gap ×Post with non-NTR rates. Column 4 uses the 1990 NTR-gap in place of the 1999 NTR-gap. Column 5 uses revealed tariffs, as computed by Pierce and Schott (2016), in place of NTR tariff rates. Column 6 reports the results of a placebo test. In all specifications, the variables EBITDA, ROE, ROI and Price/Earnings ratio are not shown for brevity, since they are never significant. Standard errors, robust and clustered at the industry level, are in parentheses. *** p-value<0.01, ** p-value<0.05, * p-value<0.1

Figure 2: Timing

Figure 3: Average Trends