HONG KONG MONETARY AUTHORITY

US-China Trade Tensions in a Supply-Chain Connected World: an Asia Perspective

Key points

- *Under the Trump administration, the US has taken an increasingly protectionist stance against foreign trade, inciting a full-scale tit-for-tat trade dispute in 2018 with the world's second largest economy that has wreaked havoc on global financial markets. Investor sentiment has been particularly dented in Asia, where China is at the centre of an intimately-connected regional supply chain network, exposing the region to negative spillovers from the escalating trade conflict.*

- *Using firm-level data on supply chain relationships, this study examines the impact of the US's mainly China-targeted protectionist trade measures on the equity returns and profits of Asian firms. We find strong evidence that investors differentiate Asian firms based on their different business linkages with Chinese companies, which we carefully sorted into mutually exclusive groups. In particular, the stock prices of firms that are suppliers to China were affected most by the negative trade-related headlines, with the more exposed suppliers yielding a 0.38 percentage point greater decline than firms with other types of business linkages.*

- *While the equity market impact was immediately apparent as investors are forward-looking, firm profitability showed no significant signs of deterioration in the last two quarters of 2018, as it takes time for firms to adjust their operations, and there may have been some offsetting effects from firm front-loading behaviour.*

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The views and analysis expressed in this paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.
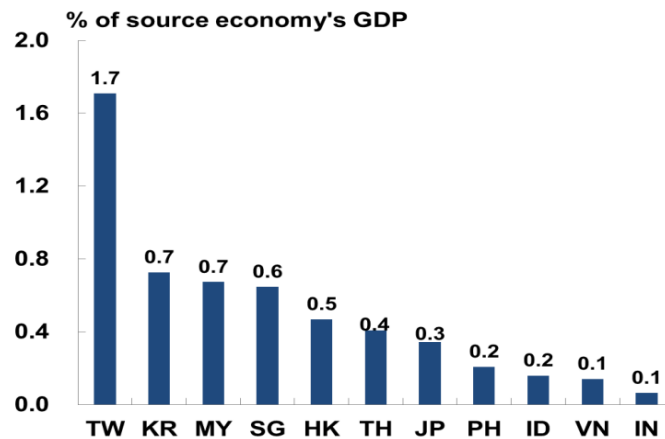
I.   INTRODUCTION

Since United States President Donald Trump was voted into office in late-2016, the US has pursued a string of changes to its trade policies. A full-blown trade war with China, an economy whose large trade deficit with the US was a focal point of Trump's election campaign, ensued in 2018 when the US started to charge tariffs on a large portion of Chinese imports, prompting retaliatory tariffs from China. While China and the US have been on the frontlines of this trade dispute, the proliferation of global value chains has placed many economies at their crossfire. As companies increasingly rely on internationally-segmented production stages, final product exports often include value-added from firms outside of the exporting economy. This phenomenon is most evident in Asia, where China is at the core of an elaborate and intimately-linked regional supply chain network. As such, impacts of the trade conflict, such as a slowdown in supply chain activity, have likely propagated to Asian players.

In view of the potential impacts, negative spillovers from the US-China trade conflict to regional economies have garnered much interest and discussion over the past couple of years. Nevertheless, multiple limitations, including data availability and supply chain complexity, have kept analyses at the aggregate national level. For instance, a widely referenced indicator is the origin of value added in China's exports to the US provided by the OECD-WTO Trade in Value Added (TiVA) database. TiVA data suggest that among economies in the region, Taiwan and South Korea are likely to be affected most by the trade war as they contribute relatively more to China's US exports in value added terms (see Chart 1).

Chart 1: Origin of value added in China's exports to the US

% of source economy's GDP

	TW	KR	MY	SG	HK	TH	JP	PH	ID	VN	IN
	1.7	0.7	0.7	0.6	0.5	0.4	0.3	0.2	0.2	0.1	0.1

Sources: OECD-WTO TiVA database, CEIC.

While such analyses are useful for deducing the aggregate impacts, they provide little insight into the distributional effects of the trade dispute among sectors and across firms. In fact, there could be significant differences at the firm level, as companies differ in their business linkages with China and thus their exposure to the trade tensions. In our study, we examine this heterogeneous impact in an attempt to shine light on the most susceptible firms. Our findings suggest that firms with real trade linkages with China, notably suppliers, suffered disproportionately in the financial markets and that these vulnerable firms are concentrated in the IT and Industrials sectors in Taiwan, Japan and South Korea. In particular, we employ the event study methodology to examine the trade conflict's impact on investor sentiment in the region, assessing whether investors have differentiated Asian firms that are more exposed to the potential spillovers in terms of their supply chain relationships with China. Furthermore, we explore whether the actual performance of these vulnerable firms has deteriorated as a result of the recently-imposed US tariffs. We find no significant signs of deteriorated profitability in 2018, likely because supply chain adjustment takes time, and firms may have offset some of the ensuing decline with front-loading prior to the tariffs taking effect.

The rest of this paper is organized as follows: Section II briefly reviews the event study literature and highlights our contribution, Section III

describes the data and empirical methodology, Section IV discusses the results, and Section V concludes with suggestions for further analysis.

II.   LITERATURE REVIEW AND CONTRIBUTIONS

Our work builds upon an extensive literature using event study analysis to explore the impact of unanticipated incidents on firms' forecasted future earnings captured in their equity price movements. Provided that markets are efficient, stock prices will reflect the fundamental value of the firm, and events that alter the expected profitability will immediately be reflected in stock price changes. MacKinlay (1997) provides a summary of methodologies and studies conducted prior to 1997, noting that this literature dates back as early as the 1930s, when Dolley (1933) analysed equity price responses to stock splits. More recent work in this area includes: Brooks, Patel, and Su (2003) who studied the intraday price reactions of US firms to a wide set of unanticipated events ranging from plane crashes to CEO deaths; Miyajima and Yafeh (2007) who looked at the abnormal stock returns of Japanese firms around major events associated with the Japanese banking crisis of 1995-2000; Arya and Zhang (2009) who examined the impact of announcements relating to Corporate Social Responsibility initiatives on the stock prices of South African firms; Liargovas and Repousis (2011) who analysed the abnormal equity returns of Greek banks following announcements of mergers and acquisitions; and Kutan, Muradoglu, and Sudjana (2012) who explored the impact of IMF program-related headlines on Indonesian asset values during the Asian financial crisis.

A large branch of this literature focuses on policy-related events. For example, Bernanke and Kuttner (2004) studied the impact of monetary policy changes on the US equity market, while Amromin, Harrison, and Sharpe (2006) analysed the market price movements of US firms in response to the 2003 dividend tax cut. In the area of trade policy more specifically, examples include: Moser and Rose (2011) who measured national stock market reactions to the ratification of regional trade agreements between 1988 and 2009; Breinlich (2014) who examined

the equity market responses of Canadian manufacturing firms to the 1989 Canada-US Free Trade Agreement; and Crowley and Song (2015) who studied the stock market performance of Chinese firms following announcements of 2013 EU import restrictions on Chinese solar panel exports. Touching on trade policy, Wagner, Zeckhauser, and Ziegler (2017) explored the equity price reactions of US firms to the Trump election result, finding that they reflected investor expectations on his trade policy intentions. In a recent study most similar to ours, Huang et al. (2018) assessed the impact of Trump's March 22, 2018 announcement[1] on the equity returns of US and Chinese firms based on their varying degrees of trade exposures to each other, finding that US firms more dependent on Chinese trade experienced larger declines.

Existing work in this area has focused on the frontline impact—that is, how economies directly targeted by the policy changes are affected. However, with the growing importance of international supply chains and the interconnectedness of the global trading system, changes in trade policy (especially if concerning the world's two largest economies) will not be felt in isolation, with implications for all participants along the value chain. Our study differs from those mentioned above by exploring the equity market reaction to changes in trade policy that are channelled through cross-border supply chain relationships, where the economies of interest are not directly targeted by the policy. To the best of our knowledge, it is the first study to examine the firm-level financial market impact of trade policy news that is propagated to other economies through supply-chain linkages.

III. DATA AND METHODOLOGY

3.1 Data

Data used in our analysis were mainly taken from Standard & Poor's Capital IQ platform which provides qualitative information on the business relationships among firms; Capital IQ constructs these relationships using information from regulatory agencies, company annual filings, press releases, and

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[1] To impose tariffs on $50 bn of Chinese imports.

stock exchanges. Using these classifications, we collect equity market and financial filings data for a sample of 1397 publicly-listed firms in 11 Asian economies that recently declared a business linkage with at least one Chinese firm.[2] As a company might have multiple types of relationships, we carefully sort firms into categories with mutually exclusive business linkages with China to isolate the unique effects of each group (see Chart 2). Each category name refers to the relationship of the Asian firm with respect to the Chinese firm; e.g. "Customer" consists of Asian firms that receive goods, services, or products from one or more Chinese companies, and those Asian firms share no other reported relationship type with a Chinese firm. For detailed relationship definitions, see Table A1 in the Appendix.

Chart 2: Relationship type with Chinese firms

Total firms: 1397
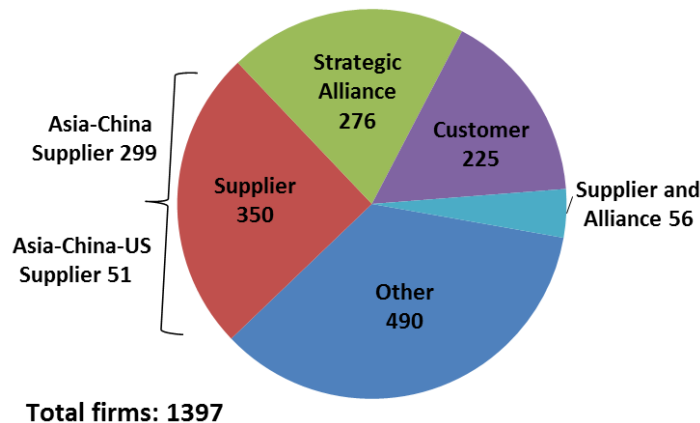
Notes: this breakdown of relationship types is for the equity returns model only.

Sources: Capital IQ and author's calculations.

We also construct an overlapping category ("Supplier and Alliance") including firms with both the "Supplier" and "Strategic Alliance" relationships with China. As supplier relationships involve the selling of products or services to Chinese buyers and strategic alliances imply a strong interdependence through the mutual pooling of resources, firms with these two types of linkages are expected to be significantly affected by the trade tensions; thus, firms with *both* relationship

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[2] Data on stock market indices were taken from Bloomberg, while data on firm equity prices and financial filings were taken from Capital IQ. The economies include: Hong Kong, Taiwan, Japan, South Korea, Singapore, Indonesia, Thailand, Malaysia, the Philippines, Vietnam, and India. The sample size of 1397 is a subsample of originally 2232 firms, of which 835 firms with missing data during the estimation period were removed. Note that the sample of 1397 is for the equity returns model only; for the profitability model, firms were not excluded based on missing data and explanatory variables differed, so the sample size will differ from the equity returns model.

types would likely also be negatively impacted.[3] Remaining firms are grouped into the "Other" category, consisting of companies with non-categorised relationship types (firms with Chinese tenants, landlords, licensors, licensees, franchisors, franchisees, borrowers, or creditors) and other overlapping linkages (e.g. firms with Chinese suppliers *and* customers).[4]

Of particular interest is the "Supplier" category, which represents Asian firms that supply goods and services to one or more Chinese companies, a relationship we conjecture to be the most vulnerable to the US-China trade tensions. We further decompose firms in this category into those who supply to Chinese firms which in turn supply to US firms, which we call "Asia-China-US Suppliers," and those who supply to Chinese firms without such a US link, which we call "Asia-China Suppliers." For example, a firm with an "Asia-China-US Supplier" relationship is defined as follows: Asian firm A supplies to Chinese firm B, and Chinese firm B supplies to US firm C. The "Asia-China-US Supplier" relationship acts as a proxy for intermediate goods suppliers in China's export value chain to the US, and helps identify the supply chain linkage most directly affected by the tariffs. This further breakdown of the "Supplier" category gives us a total of six mutually exclusive relationship types ("Asia-China-US Supplier", "Asia-China Supplier", "Customer", "Strategic Alliance", "Supplier and Alliance", "Other") which we use in our analysis.

3.2 Event Dates

To gauge the financial market impacts of the trade dispute in an event study framework, we identify several dates when significant trade policies or intentions to make policies were announced by the US administration, leading up to and including those directly targeted at China. As detailed in Table 1, events begin with the election of Trump in late-2016, as correcting America's large trade deficit

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[3] Note that the "Supplier and Alliance" category is mutually exclusive with the other categories; firms in the "Supplier" category will have a supplier relationship *only* with China, while firms in the "Supplier and Alliance" category will have "Supplier" *and* "Strategic Alliance" relationships.
[4] Relationship types included in the "Other" group, such as Borrowers and Creditors, were not explicitly modelled due to the small sample sizes of firms with those (mutually exclusive) linkages.

with China was one of the main talking points of his campaign. Following his election victory, the president withdrew the US from the Trans-Pacific Partnership (TPP), initiated renegotiations of the North America Free Trade Agreement (NAFTA) and the US-Korea Free Trade Agreement (KORUS), and issued numerous executive orders addressing trade agreement violations, anti-dumping laws, and trade deficits.

In mid-2017, Trump ordered an investigation into Chinese policies and practices that may be harming the US, kicking off the ensuing trade conflict with China. In 2018, a full-scale trade conflict materialized with the US announcing tariffs on up to $60 billion of Chinese imports, with subsequent threats of tariffs on $100 billion, $200 billion, and even all of imported Chinese goods.[5] While developments have been largely negative, there were days with positive trade headlines, such as when a temporary truce was agreed upon at the G20 meetings in late 2018. As such, we also consider several positive developments, allowing us to evaluate the symmetry of the announcement impact.

Table 1: Event Dates and Descriptions

Negative Events	
November 8, 2016	Donald Trump is elected president of the United States
January 23, 2017	Trump announces to withdraw the US from the TPP
March 31, 2017	Trump issues executive orders regarding trade deficits and anti-dumping
April 18, 2017	Trump issues executive orders on "Buy American and Hire American"
April 29, 2017	Trump issues orders addressing trade agreement violations and abuses
May 18, 2017	USTR notifies Congress that Trump intends to renegotiate the NAFTA
July 12, 2017	USTR calls for a session under KORUS to address serious concerns regarding the trade pact
August 14, 2017	Trump orders probe of China's intellectual property practices

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[5] Note that we do not include tariff implementation dates, as they should already be priced in to the market after the tariffs are announced.

September 2, 2017	Trump hints at withdrawal from the KORUS trade pact
January 22, 2018	Trump approves safeguard tariffs on solar panels and washing machines
March 1, 2018	US announces steel and aluminium tariffs
March 22, 2018	US indicates forthcoming tariffs on up to $60bn of Chinese products
April 3, 2018	US releases list of Chinese products under consideration of 25% tariffs
April 5, 2018	US considers additional tariffs on $100bn of Chinese goods
June 15 and 18, 2018[6]	US announces forthcoming 25% tariffs on Chinese products covering $34bn of US imports; US considers additional tariffs on $200bn of Chinese goods
July 10, 2018	US releases list of $200bn worth of Chinese goods to be subject to 10% tariffs
July 20, 2018	In an interview, Trump threatens tariffs on all imports from China
August 1, 2018	US may raise tariffs on $200bn of Chinese goods to 25%
August 13, 2018	US passes new law on trade and national security
September 7, 2018	Trump again threatens tariffs on all imports from China
May 5, 2019	After several rounds of negotiations, Trump threatens to raise tariffs on $200bn of Chinese imports to 25%
May 10, 2019	Trump instructs to begin the process of increasing tariffs on all remaining Chinese imports
Positive Events	
May 11, 2017	US announces initial actions of the "US-China Economic Cooperation 100-Day Plan"
May 20, 2018	Tariffs are put temporarily on hold following US-China trade talks
December 1, 2018	US and China agree to a temporary truce after the G20 meetings
February 24, 2019	Trump delays tariff hike on Chinese goods, citing substantial progress in trade talks with China

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[6] As the June 15th and June 18th announcements were on consecutive week days, we only include the June 18th announcement capturing the equity price change from June 15th through to June 19th, which we think is appropriate given that the June 15th announcement is reflected in June 16th prices due to the time difference.

April 4, 2019	Trump says US-China trade deal may be reached within four weeks

Sources: PIIE, USTR, CNBC, Reuters, The Economist, The Washington Post, The Guardian, The Financial Times, The New York Times, Bloomberg, NPR.

3.3 Empirical Methodology

3.3.1 Equity Returns Model

To assess the impact of the above trade headlines on Asian firms' stock prices, we perform an event study using a panel data framework with firm fixed effects[7]:

$$
\begin{aligned}
\Delta Equity\_Price_{i,t} &= \alpha_i + \beta_1 \Delta Benchmark\_Price_{i,t} + \beta_2 Log(Market\_Cap_{i,t}) \\
&+ \beta_3 PTB_{i,t} + \beta_4 ROA_{i,t} + \beta_5 Negative\_Events_t \\
&+ \beta_6 Positive\_Events_t \\
&+ \sum_{j=1}^{5} \beta_{j+6} Negative\_Events_t \times Business\_Relationship_i^j \\
&+ \sum_{j=1}^{5} \beta_{j+11} Positive\_Events_t \times Business\_Relationship_i^j + e_{i,t}
\end{aligned}
$$

(1)

Where $\Delta Equity\_Price_{i,t}$ represents the three-day cumulative daily change in firm i's last sale price in percentage terms; i.e. for any event date t, the equity price response takes into account the daily change in stock price from time (t-1) to (t+1); key regressors that capture trade announcement effects for firms with varying business linkages with China are the interaction terms between event dummies ($Negative\_Events_t$, $Positive\_Events_t$) and firms' Chinese relationship type ($Business\_Relationship_i^j$), where j is one of the previously-mentioned six mutually exclusive linkages. We exclude the "Other" category to avoid dummy variable multicollinearity. The coefficient on this interaction term represents the

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[7] Before running the regression, data were winsorised at the 1st and 99th percentiles.

average stock price decline (increase) of firms with relationship type j surrounding negative (positive) event dates, relative to firms with business linkages falling under the "Other" category. We expect this coefficient to be greater in magnitude for firms with more-exposed supply chain relationships with China, such as "Asia-China-US Suppliers."

We choose a three-day event window to take into account the time difference between Asian and US markets (around 12 hours) and allow for the possibility of early information transfer; meanwhile, the window is narrow enough to avoid any confounding effects from unrelated events. As is frequently done in the literature on modelling equity returns[8], several financial variables that could affect the fundamental value of the firm – the market capitalisation ($Market\_Cap_{i,t}$), price-to-book ratio ($PTB_{i,t}$), and return-on-assets ($ROA_{i,t}$) in percentage terms – are included to account for equity price fluctuations based on firm fundamentals that are unrelated to the trade announcement effect; these variables are averaged over a three-day period surrounding date t.[9] We also control for the three-day cumulative change in each firm's respective market benchmark index ($\Delta Benchmark\_Price_{i,t}$) in percentage terms to capture the excess return beyond broad market movements surrounding event dates. Our sample runs from January 1, 2016 to May 17, 2019.

3.3.2 Profitability Model

To complement our equity returns analysis, we further look at whether firms have actually underperformed as a result of the trade conflict by estimating a simple fixed-effects model of firm profitability and business relationship type with China for the period of 2009 to 2018, using quarterly data. Following Deloof (2003), we control for firm size, revenue growth, and the debt-to-asset ratio[10,11]:

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[8] E.g. Miyajima and Yafeh (2007), Wagner, Zeckhauser, and Ziegler (2017), Huang et al. (2018).

[9] As the book value and return-on-assets variables are of quarterly frequency, and 2019 Q1 and Q2 data are not yet fully updated, 2018:Q4 data is used where data is unavailable.

[10] Deloof (2003) modeled the profitability of Belgian firms in a fixed-effects panel framework to examine the impact of working capital management on corporate performance; in his study, he controls for firm size using sales (we use revenue), sales growth, the debt-to-asset ratio, and the ratio of fixed financial assets to total assets. As fixed financial assets data is not available for our sample of firms, we exclude this variable.

$$ROE_{i,t} = \alpha_i + \beta_1 Log\big(Revenue_{i,t}\big) + \beta_2 \Delta Revenue_{i,t} + \beta_3 Debt\_Assets_{i,t}$$

$$+ \sum_{k=1}^{9} \beta_{k+3} Year_t^{2009+k} + \sum_{k=1}^{3} \beta_{k+12} Quarter_t^{1+k}$$

$$+ \beta_{16} Year_t^{2018} \times Quarter_t^3 + \beta_{17} Year_t^{2018} \times Quarter_t^4$$

$$+ \sum_{j=1}^{5} \beta_{j+17} Year_t^{2018} \times Quarter_t^3 \times Business\_Relationship_i^j$$

$$+ \sum_{j=1}^{5} \beta_{j+22} Year_t^{2018} \times Quarter_t^4 \times Business\_Relationship_i^j$$

$$+ e_{i,t}$$

(2)

Where $ROE_{i,t}$ represents firm i's annualized return-on-equity for quarter t in percentage terms; to capture the heterogeneous impact of US tariffs on the profits of Asian firms with different Chinese business linkages, we include interaction terms between firm relationship type ($Business\_Relationship_i^j$), a year dummy for 2018 ($Year_t^{2018}$), and quarter dummies for Q3 and Q4 ($Quarter_t^3, Quarter_t^4$). While all tariffs on Chinese goods during the sample period were implemented in Q3 of 2018, we also include a Q4 interaction term as tariffs on the largest portion of goods ($200 billion) only took effect at the end of Q3 in late September. We also capture revenue as a proxy for size ($Revenue_{i,t}$), the percentage change in total revenue ($\Delta Revenue_{i,t}$), the debt-to-assets ratio in percentage terms ($Debt_Assets_{i,t}$), a yearly-dummy variable ($Year_t$), a quarterly-dummy variable ($Quarter_t$), and quarter-year interactions for Q3 and Q4 of 2018 ($Year_t^{2018} \times Quarter_t^3$, $Year_t^{2018} \times Quarter_t^4$).

IV. ESTIMATION RESULTS

4.1 Equity Returns Model

Since the end of 2016, equity markets in Asia have been roiled by news headlines of protectionism from the US and its escalating trade tensions with

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[11] Before running the regression, data were winsorised at the 1st and 99th percentiles.

China. If investors are forward-looking and able to differentiate the more exposed firms (e.g. firms integrated in China's supply chain), those companies should exhibit greater declines in equity prices surrounding announcements of trade-tension escalations. Indeed, our findings suggest that Asian firms with more vulnerable Chinese business linkages, notably suppliers, saw greater stock price declines surrounding negative announcement dates. Table 2 presents a simplified version of our results from the equity returns model, focusing on the interaction terms between event dummies and firm business relationship type (full results are given in Table A2 of the appendix).

Table 2: Simplified Estimates of the Equity Returns Model

Dependent variable:	Specification:		
$\Delta Equity\_Price_{i,t}$, %	(1)	(2)	(3)
Negative events dummy ($Negative\_Events_t$) interacted with below relationship types:			
Asia-China-US Supplier	-0.372***	-0.379***	-0.496**
	(0.124)	(0.126)	(0.205)
Asia-China Supplier	-0.239***	-0.241***	-0.384***
	(0.058)	(0.058)	(0.090)
Customer	-0.063	-0.058	-0.072
	(0.061)	(0.061)	(0.098)
Strategic Alliance	-0.189***	-0.188***	-0.176*
	(0.061)	(0.061)	(0.091)
Supplier and Alliance	-0.212	-0.216	-0.293
	(0.130)	(0.132)	(0.234)
Positive events dummy ($Positive\_Events_t$) interacted with below relationship types:			
Asia-China-US Supplier	0.564**	0.549**	0.552**
	(0.245)	(0.244)	(0.244)
Asia-China Supplier	0.118	0.123	0.124
	(0.130)	(0.130)	(0.130)
Customer	-0.108	-0.102	-0.102
	(0.127)	(0.127)	(0.127)
Strategic Alliance	-0.120	-0.118	-0.115

	(0.118)	(0.118)	(0.118)
Supplier and Alliance	0.447*	0.451*	0.453*
	(0.249)	(0.248)	(0.248)
Negative events dummy announcements	ALL	ALL	US-CN conflict only
Firm fundamentals?	NO	YES	YES
N	1397	1397	1397
Within R-squared	0.139	0.140	0.140

Notes: Robust standard errors are reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Estimation period: January 1, 2016 – May 17, 2019. The dependent variable is the three-day cumulative change in firm equity price; controls include: three-day cumulative change in market benchmark price, market capitalisation, price-to-book ratio, and return-on-assets. In specification (3), the negative events dummy consists only of announcements related directly to the US-China trade conflict; in specification (1), firm fundamentals (market capitalisation, PTB, and ROA) are excluded.

Not surprisingly, "Asia-China-US Suppliers" were the hardest hit, as firms with this business linkage are proxies for upstream suppliers in China's export value chain to the US; this result holds even after controlling for firm fundamentals (see column (2)) and using alternative specifications of the negative events dummy (see column (3)). Focusing on the results from specification (2) more specifically, "Asia-China-US Suppliers" experienced stock prices declines of an average 0.38 percentage points more than firms with the "Other" relationship type in a three-day window surrounding negative announcement dates. Suppliers without the US link ("Asia-China Suppliers") also suffered a significant loss, with an average 0.24 percentage point equity price decline, while firms with Chinese strategic alliances yielded a significant but less pronounced reaction. For firms with both the supplier and strategic alliance relationships ("Supplier and Alliance"), while the sign and magnitude of the equity price response were as expected, the result was slightly insignificant, with a p-value of 10.1%.

On the other hand, firms on the goods-purchasing side of the supply chain, "Customers", showed insignificant equity price responses, as they are not

directly affected by the US protectionist developments. We also find a more or less symmetric impact when considering positive announcements relating to the trade conflict. Firms with certain relationship types that saw significant and large declines in equity prices surrounding negative announcement dates also exhibited significantly larger increases surrounding positive announcement dates. For example, the stock prices of "Asia-China-US Suppliers" increased by an average 0.55 percentage points on days when favourable developments regarding the trade conflict were announced.

To test the robustness of our results to dates included in the negative events dummy, we estimate the equity returns model using a smaller subset of dates when only announcements relating directly to the US-China trade dispute are included.[12] As shown in specification (3) of Table 2, results produce no qualitative difference, with "Asia-China-US Suppliers" exhibiting the largest significant price declines, followed by "Asia-China Suppliers" and those with Chinese strategic alliances. The price response of supplier firms is larger in magnitude when only dates of US-China trade tension escalations are included, while that of strategic alliance firms is similar. This makes intuitive sense as announcements specific to the China-targeted trade tariffs are more relevant to suppliers than general US trade protectionist developments.

Our results provide insight into which economies and industries are most exposed to the trade conflict from the perspective of investors. As findings suggest that suppliers to China (including both "Asia-China-US Suppliers" and "Asia-China Suppliers") suffered relatively larger drops in equity prices surrounding the trade protectionist headlines, economies and industries which constitute large numbers of supplier firms are likely to be more exposed to the trade war's crossfire. In this view, the regional breakdown of supplier firms (Chart 3, left) suggests that Taiwan, Japan, and South Korea are the most vulnerable, as they hold the highest share of suppliers to China, together accounting for 72% of these types of firms in our sample. In terms of sectoral distribution (Chart 3, right), the
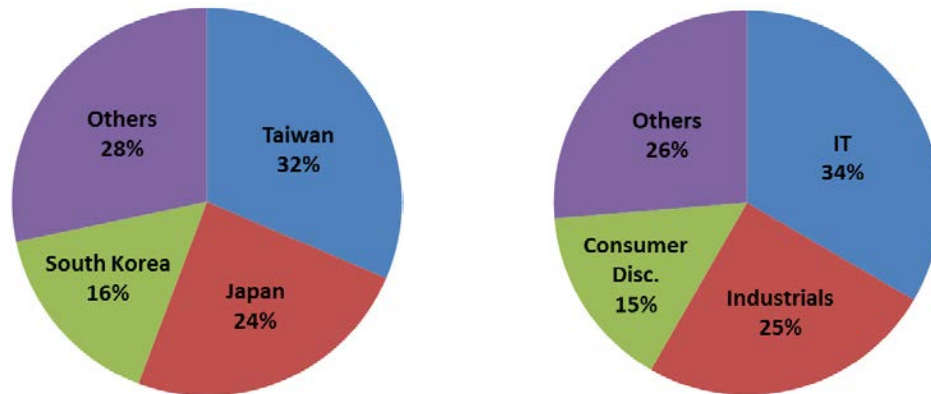
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[12] Aug 14 2017; Mar 22, Apr 3, Apr 5, June 18, Jul 10, Jul 20, Aug 1, Sep 7, 2018; May 6, May 10, 2019.

Information Technology, Industrials, and Consumer Discretionary sectors account for the majority, making up 74% of industries among regional suppliers to China.

Chart 3: "Suppliers to China" economy and industry distribution

Sources: Capital IQ and author's calculations.

4.2 Profitability Model

In contrast to the equity market impacts identified in the previous section, results from our profitability model suggest no significant negative shock to 2018 Q3 and Q4 profits for firms with the most exposed business linkages with China (see Table 3 below for the simplified results and Table A3 in the Appendix for the full results). While the effect of the trade tariff announcements is immediately reflected in the financial markets, the impact on firm profits will appear with some lag as it takes time for firms to adjust their operations. Our results could also reflect some front-loading, where companies bring forward their orders before the tariffs go into effect, offsetting some of the decline after implementation. Although insignificant, the ROE reaction of "Asia-China-US Suppliers" reversed from positive 3.4 percentage points in Q3 to negative 5.1 percentage points in Q4 relative to other firms, hinting that some profit deterioration has likely started to appear at the end of 2018.

Table 3: Simplified Estimates of the Profitability Model

Dependent variable: $ROE_{i,t}$, %

2018 year dummy ($Year_t^{2018}$) interacted with Q3 dummy ($Quarter_t^3$) interacted with below relationship types:

Asia-China-US Supplier	3.382
	(3.500)
Asia-China Supplier	1.749
	(1.178)
Customer	0.724
	(1.305)
Strategic Alliance	1.298
	(1.407)
Supplier and Alliance	1.077
	(3.318)

2018 year dummy ($Year_t^{2018}$) interacted with Q4 dummy ($Quarter_t^4$) interacted with below relationship types:

Asia-China-US Supplier	-5.120
	(6.994)
Asia-China Supplier	0.458
	(2.235)
Customer	4.375**
	(1.890)
Strategic Alliance	2.910
	(2.273)
Supplier and Alliance	1.871
	(4.346)
N	2089
Within R-squared	0.060

Notes: Robust standard errors are reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Estimation period: 2009:Q1 – 2018:Q4. The dependent variable is annualized return-on-equity; controls include: revenue, change in revenue, and debt-to-assets ratio. The sample size for the profitability model differs from the equity returns model, as the variables used in each model are not the same, and firms were *not* excluded based on missing data in the profitability model due to the fact that the sample period extends back to 2009 during which many firms had missing data.

Although 2019 data on firm profits are still mostly unavailable, data on the growth of Chinese exports to the US of tariff-targeted goods can provide some insight as signs of slowdown more recently will likely propagate to China's upstream suppliers in Asia. Indeed, Chart 4 shows that exports of all three tariff-targeted groups have slowed noticeably between late-2018 to early-2019. There is also evidence of a front-loading effect, as exports of tariffed goods showed increases in growth leading up to their respective tariff implementation dates (indicated by the circles).

Chart 4: Growth of Chinese exports to the US by tariff-targeted groups
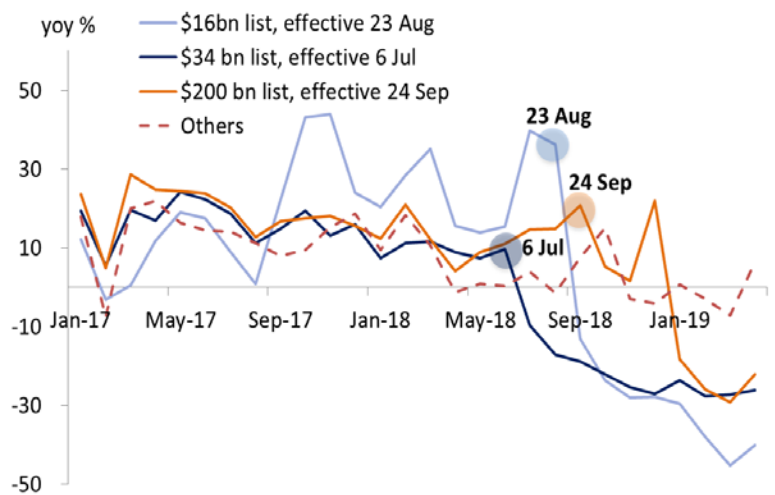
Notes: Circles indicate the respective tariff implementation dates.

Sources: USITC, USTR, and author's calculations.

V. CONCLUSIONS AND FUTURE WORK

In this study, we explored the heterogeneous financial market impact of the US administration's trade protectionist headlines on Asian firms based on their varying business relationships with Chinese companies. Our results show that spillovers from the trade conflict to regional equity markets are indisputably present with forward-looking investors discerning of the unique supply chain linkages between Asian and Chinese firms amid protectionist developments in the US and a Sino-US trade war. Upon receiving news of escalations in trade tensions, they sell firms with business linkages that are more vulnerable to the China-targeted tariffs, such as suppliers, which saw the largest relative declines in

equity returns. To complement our financial market analysis, we further investigated whether firms with more vulnerable Chinese business linkages showed signs of deteriorated profitability as a result of the newly-imposed tariffs. Our findings suggest no meaningful negative impact as of 2018, but it lays the groundwork for further analysis, as the trade conflict has likely begun to take its toll on firm performance more recently with the unwinding of the front-loading effect.

Our analysis paves the way for possible further research in this area using Capital IQ's global database on firm-level business relationships. For example, while our study emphasized the damaging impacts of the trade war, there is room for Asian firms to benefit as American customers shift away from China in search of alternative suppliers; information on supply chain relationships and industry breakdowns could facilitate the identification of trade war "winners" with the potential of substituting for Chinese goods. Furthermore, as economies in Asia were not the only victims of Trump's protectionist rhetoric (the US has also targeted its neighbouring countries, for example), supply chain linkages between American companies and those in other targeted economies could provide insight into the distributional impacts of the US's inward-looking trade policies on a more global scale.

REFERENCES

Amromin, G., Harrison, P., & Sharpe, S., 2006. "How Did the 2003 Dividend Tax Cut Affect Stock Prices?", *Federal Reserve Board FEDS Discussion Paper*, 2005-61.

Arya, B. & Zhang, G., 2009. "Institutional Reforms and Investor Reactions to CSR Announcements: Evidence from an Emerging Economy", *Journal of Management Studies, 46(7)*, 1089-1112.

Bernanke, B. S. & Kuttner, K. N., 2004. "What Explains the Stock Market's Reaction to Federal Reserve Policy?", *National Bureau of Economic Research Working Paper*, 10402.

Bohl, M. T., Siklos, P. L., & Sondermann, D., 2008. "European Stock Markets and the ECB's Monetary Policy Surprises", *International Finance, 11(2)*, 117-130.

Breinlich, H., 2014. "Heterogeneous Firm-Level Responses to Trade Liberalization: A Test Using Stock Price Reactions", *Journal of International Economics, 93(2)*, 270-285.

Brooks, R. M., Patel, A., & Su, T., 2003. "How the Equity Market Responds to Unanticipated Events", *The Journal of Business, 76(1)*, 109-133.

Crowley, M. A., Meng, N., & Song, H., 2015. "Policy Shocks and Stock Market Returns: Evidence from Chinese Solar Panels", *Cambridge Working Papers in Economics*, 1529.

Deloof, M., 2003. "Does Working Capital Management Affect Profitability of Belgian Firms?", *Journal of Business Finance & Accounting, 30(3, 4)*.

Dolley, J. C., 1933. "Characteristics and Procedure of Common Stock Split-Ups", *Harvard Business Review, 11,* 316-326.

Huang, Y., Lin, C., Liu, S., & Tang, H., 2018. "Trade Linkages and Firm Value: Evidence from the 2018 US- China "Trade War", *The Graduate Institute Geneva Centre for Trade and Economic Integration Working Paper*, CTEI-2018-04.

Kutan, A. M., Muradoglu, G., & Sudjana, B. G., (2012). "IMF programs, financial and real sector performance, and the Asian crisis", *Journal of Banking & Finance, 36*, 164-182.

Liargovas, P. & Repousis, S., (2011). "The Impact of Mergers and Acquisitions on the Performance of the Greek Banking Sector: An Event Study Approach", *International Journal of Economics and Finance, 3(2)*, 89-100.

MacKinlay, A. C., 1997. "Event Studies in Economics and Finance", *Journal of Economic Literature, XXXV,* 13-39.

Miyajima, H. & Yafeh, Y., 2007. "Japan's banking crisis: An event-study perspective", *Journal of Banking & Finance, 31(9)*, 2866-2885.

Moser, C. & Rose, A. K., 2011. "Who Benefits from Regional Trade Agreements? The View from the Stock Market", *National Bureau of Economic Research Working Paper*, 17415.

Wagner, A., Zeckhauser, R. J, & Ziegler, A., 2017. "Company Stock Reactions to the 2016 Election Shock: Trump, Taxes and Trade", *National Bureau of Economic Research Working Paper*, 23152.

Table A1: Mutually Exclusive Business Relationships with China, Definitions

Relationship	Description
Asia-China-US Supplier	An Asian firm that supplies a particular good, service, or product to one or more Chinese firms, and at least one of those Chinese firms supplies a particular good, service, or product to one or more US firms. This Asian firm shares no other relationship type with a Chinese firm.
Asia-China Supplier	An Asian firm that supplies a particular good, service, or product to one or more Chinese firms, and none of those Chinese firms supply to a US firm. This Asian firm shares no other relationship type with a Chinese firm.
Customer	An Asian firm that receives goods, services, or products from one or more Chinese firms. This Asian firm shares no other relationship type with a Chinese firm.
Strategic Alliance	An Asian firm that is pursuing a common objective through mutual cooperation, pooling of resources, etc. with one or more Chinese firms. This Asian firm shares no other relationship type with a Chinese firm.
Supplier and Alliance	An Asian firm that is a Supplier to one or more Chinese firms *and* has a Strategic Alliance with one or more Chinese firms. This Asian firm shares no other relationship type with a Chinese firm.
Other	An Asian firm that has one or more of the following relationship types with one or more Chinese firms: ● Borrower/Creditor ● Tenant/Landlord ● Licensor/Licensee ● Franchisor/Franchisee ● Supplier *and* Customer

	- Strategic Alliance *and* Customer - Supplier *and* {borrower, creditor, tenant, landlord, licensor, licensee, franchisor, or franchisee} - Strategic Alliance *and* {borrower, creditor, tenant, landlord, licensor, licensee, franchisor, or franchisee} - Customer *and* {borrower, creditor, tenant, landlord, licensor, licensee, franchisor, or franchisee}

Notes: Information on business relationships is based on what is reported by the firms, and no relationship could also mean an unreported relationship. "Asia-China-US Supplier", "Asia-China Supplier", "Supplier and Alliance," and "Other" are relationship categories that we created using relationship definitions given by Capital IQ. "Supplier" also includes Asian firms that supply to Chinese companies for the purpose of resale/distribution.

Sources: Capital IQ and author's calculations.

Table A2: Estimates of the Equity Returns Model

Dependent variable:	Specification:		
$\Delta Equity\_Price_{i,t}$, %	(1)	(2)	(3)
$\beta_1(\Delta Benchmark\_Price_{i,t})$	0.839***	0.838***	0.838***
	(0.010)	(0.010)	(0.010)
$\beta_2(Log(Market\_Cap_{i,t}))$		0.210***	0.210***
		(0.023)	(0.023)
$\beta_3(PTB_{i,t})$		0.000	0.000
		(0.000)	(0.000)
$\beta_4(ROA_{i,t})$		0.016***	0.016***
		(0.002)	(0.002)
$\beta_5(Negative\_Events_t)$	-0.086***	-0.099***	-0.262***
	(0.033)	(0.033)	(0.051)
$\beta_6(Positive\_Events_t)$	0.181***	0.180***	0.180***
	(0.067)	(0.067)	(0.067)
$\beta_7(Negative\_Events_t$ $\times Asia - China - US\ Supplier_i)$	-0.372***	-0.379***	-0.496**
	(0.003)	(0.126)	(0.205)
$\beta_8(Negative\_Events_t$ $\times Asia - China\ Supplier_i)$	-0.239***	-0.241***	-0.384***
	(0.058)	(0.058)	(0.090)
$\beta_9(Negative\_Events_t$ $\times Customer_i)$	-0.063	-0.058	-0.072
	(0.061)	(0.061)	(0.098)
$\beta_{10}(Negative\_Events_t$ $\times Strategic\ Alliance_i)$	-0.189***	-0.188***	-0.176*
	(0.061)	(0.061)	(0.091)
$\beta_{11}(Negative\_Events_t$ $\times Supplier\ and\ Alliance_i)$	-0.212	-0.216	-0.293
	(0.130)	(0.132)	(0.234)
$\beta_{12}(Positive\_Events_t$ $\times Asia - China - US\ Supplier_i)$	0.564**	0.549**	0.552**
	(0.245)	(0.244)	(0.244)
$\beta_{13}(Positive\_Events_t$ $\times Asia - China\ Supplier_i)$	0.118	0.123	0.124
	(0.130)	(0.130)	(0.130)
$\beta_{14}(Positive\_Events_t$ $\times Customer_i)$	-0.108	-0.102	-0.102
	(0.127)	(0.127)	(0.127)
$\beta_{15}(Positive\_Events_t$ $\times Strategic\ Alliance_i)$	-0.120	-0.118	-0.115
	(0.118)	(0.118)	(0.118)
$\beta_{16}(Positive\_Events_t$	0.447*	0.451*	0.453*

	(1)	(2)	(3)
× *Supplier and Alliance$_i$*)	(0.249)	(0.248)	(0.248)
Constant	-0.027***	-1.351***	-1.352***
	(0.001)	(0.141)	(0.141)
Negative events dummy announcements	ALL	ALL	US-CN conflict only
Firm fundamentals?	NO	YES	YES
N	1397	1397	1397
Within R-squared	0.139	0.140	0.140

Notes: Robust standard errors are reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Estimation period: January 1, 2016 – May 17, 2019. The dependent variable is the three-day cumulative change in firm equity price; controls include: three-day cumulative change in market benchmark price, market capitalisation, price-to-book ratio, and return-on-assets. Specifications (1) and (2) include 22 event dates in the "Negative_Events" dummy, consisting of US trade protectionist announcements leading up to and including those directly targeted at China (see Table 1 for details); specification (3) includes 11 event dates consisting only of announcements related directly to the US-China trade conflict (Aug 14 2017; Mar 22, Apr 3, Apr 5, June 18, Jul 10, Jul 20, Aug 1, Sep 7, 2018; May 6, May 10, 2019); specifications (2) and (3) include firm fundamentals (market capitalisation, price-to-book ratio, and return-on-assets), while specification (1) excludes them.

Table A3: Estimates of the Profitability Model

Dependent variable: $ROE_{i,t}$, %

$\beta_1(Log(Revenue_{i,t}))$	3.232***
	(0.566)
$\beta_2(\Delta Revenue_{i,t})$	0.047***
	(0.004)
$\beta_3(Debt\_Assets_{i,t})$	-0.382***
	(0.030)
$\beta_4(Year_t^{2010})$	5.269***
	(0.472)
$\beta_5(Year_t^{2011})$	1.217**
	(0.496)
$\beta_6(Year_t^{2012})$	0.868
	(0.535)
$\beta_7(Year_t^{2013})$	0.680
	(0.587)
$\beta_8(Year_t^{2014})$	0.214
	(0.623)
$\beta_9(Year_t^{2015})$	-0.658
	(0.613)
$\beta_{10}(Year_t^{2016})$	-0.751
	(0.606)
$\beta_{11}(Year_t^{2017})$	-1.135*
	(0.653)
$\beta_{12}(Year_t^{2018})$	-1.541**
	(0.693)
$\beta_{13}(Quarter_t^2)$	0.675***
	(0.205)
$\beta_{14}(Quarter_t^3)$	0.971***
	(0.233)
$\beta_{15}(Quarter_t^4)$	-0.629**
	(0.287)
$\beta_{16}(Year_t^{2018} \times Quarter_t^3)$	-2.204***

	(0.724)
$\beta_{17}(Year_t^{2018} \times Quarter_t^4)$	-5.866***
	(1.329)
$\beta_{18}(Year_t^{2018} \times Quarter_t^3 \\ \times Asia - China - US\ Supplier_i)$	3.382
	(3.500)
$\beta_{19}(Year_t^{2018} \times Quarter_t^3 \\ \times Asia - China\ Supplier_i)$	1.749
	(1.178)
$\beta_{20}(Year_t^{2018} \times Quarter_t^3 \\ \times Customer_i)$	0.724
	(1.305)
$\beta_{21}(Year_t^{2018} \times Quarter_t^3 \\ \times Strategic\ Alliance_i)$	1.298
	(1.407)
$\beta_{22}(Year_t^{2018} \times Quarter_t^3 \\ \times Supplier\ and\ Alliance_i)$	1.077
	(3.318)
$\beta_{23}(Year_t^{2018} \times Quarter_t^4 \\ \times Asia - China - US\ Supplier_i)$	-5.120
	(6.994)
$\beta_{24}(Year_t^{2018} \times Quarter_t^4 \\ \times Asia - China\ Supplier_i)$	0.458
	(2.235)
$\beta_{25}(Year_t^{2018} \times Quarter_t^4 \\ \times Customer_i)$	4.375**
	(1.890)
$\beta_{26}(Year_t^{2018} \times Quarter_t^4 \\ \times Strategic\ Alliance_i)$	2.910
	(2.273)
$\beta_{27}(Year_t^{2018} \times Quarter_t^4 \\ \times Supplier\ and\ Alliance_i)$	1.871
	(4.346)
$Constant$	-6.197**
	(3.091)
N	2089
Within R-squared	0.060

Notes: Robust standard errors are reported in the parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. Estimation period: 2009:Q1 – 2018:Q4. The dependent variable is annualized return-on-equity; controls include: revenue, change in revenue, and debt-to-assets ratio. The sample size for the profitability model differs from the equity returns model, as the variables used in each model are not the same, and firms were *not* excluded based on missing data in the profitability model due to the fact that the sample period extends back to 2009 during which many firms had missing data.