SUPPLY CHAIN DISRUPTION: U.S. AND CHINA TRADE

David D. Hammonds, Missouri State University
Jenifer Skiba, Missouri State University
Carly Pierson, Missouri State University

ABSTRACT

At the outset of the 2018 Trade War between the U.S. and China, it was expected that an increase in tariffs would stimulate modifications to a significant number of supply chains. The tariffs, a form of supply chain disruption, represent an increase in costs without a corresponding increase in quality and encourage a shift in supply chains toward countries that do not have such a cost. The authors conducted an exploratory survey with U.S. manufacturers to identify whether or not these changes were actually occurring. The research showed that by and large changes were not being made. Most U.S. manufacturers made few modifications to their supply chains once the tariffs were announced and imposed. This led to the conclusion that the perceived risks of supply chain disruptions created an inelastic response to price increases. The costs of doing nothing, and accepting the tariff cost increase, therefore, were seen as less risky than modifying supply chains. To further investigate the lack of changes, the authors conducted a second exploratory study. Through in-depth interviews, the authors identified three primary reasons that supply chain shifts had not been made, and three categories of reactions that manufacturers had to the increased tariffs.

INTRODUCTION

We live in an uncertain world that is open to unpredictability due to natural and man-made disasters, terrorist attacks, economic crises, and the list goes on (Tang, 2006). Many successful firms have attempted to mitigate the risks of this unpredictability and vulnerability by implementing various supply chain strategies, such as not making rapid changes to their supply chains, establishing mutually beneficial, long-term relationships with suppliers, or focusing on increased revenue or cost reductions, etc. (e.g., Tang, 2006). However, some of these strategies may hinder firms from making needed changes when disruptions occur.

Supply Chain disruptions, or unplanned events that interrupt the flow of goods in a supply chain (Craighead, Blackhurst, Rungtusanatham, & Handfield, 2007) are a major source of risk and can be very costly (Blackhurst, Craighead, Elkins, & Handfield, 2005; Riddalls & Bennett, 2002). Disruptions, which can take many forms, are also becoming more expensive and more likely given the increased globalization of supply chains (Blackhurst et al., 2005). Previous literature has discussed natural and man-made disasters, along with fires and other accidents, as a source of risk that can be mitigated (e.g., Stecke & Kumar, 2009). Other research has examined supplier insolvency (Grötsch, Blome, & Schleper, 2013), supply uncertainty (Tomlin, 2006),

strikes and fraud (Grötsch et al., 2013), and terrorism (Sheffi, Rice, Fleck, & Caniato, 2003), but little research has been done to examine the impact of cost pressures, such as tariffs.

Cost pressures are a source of disruption risk. Chopra and Sodhi (2004) categorize various supply chain disruptions into nine primary buckets, one of which is procurement risks. The authors describe procurement risks as "unanticipated increases in acquisition costs" resulting from changes such as exchange rate fluctuations or price hikes that suppliers put into place.

One example of cost pressure comes in the form of the recent increase in tariffs between the United States and China, and reveals a unique supply chain disruption risk. Input cost changes and opportunities originally drove the shifting of manufacturing from the United States to China. So long as quality and consistency could be maintained, U.S. manufacturers that took advantage of lower labor costs in China and other low-cost labor nations gained a significant cost advantage over their domestic competitors. Whether they were first movers seeking this advantage, manufacturers trying to defend their profit margins, or driven to these offshoring practices by competitors, a significant amount of U.S. products are now made in these lower input cost countries. While changes in overseas lifestyles and development have gradually diminished these gains and labor rates in China have risen significantly, there is still a market-driven motivation to keep manufacturing in these nations (Chu, Zheng, & Wong, 2016). Thus far, these market forces and the weakening of trade barriers have driven manufacturers' decisions and alone would not indicate any need for change.

However, in early 2018, the United States attempted to shrink its current trade gap between imports and exports (see Figure 1 for a timeline of events in current the U.S. – China Trade war). The political administration blamed this gap on market forces driving manufacturing overseas as well as supposedly unfair trade policies in China (Selmi, Errami, & Wohar, 2020). Their solution to this problem was to impose significant tariffs on imports to the United States. Regardless of the motivations of the United States government, these tariffs represented a real input cost increase to U.S. manufacturers. It was, however, an artificial cost that was imposed on the market, rather than a market forces-driven cost increase. Thus, the U.S. administration could change this policy and erase or increase the cost at any time. While long-term trends and economic development create largely predictable changes in costs over a long period of time, the artificial nature of U.S. trade policy cost increases in 2018 means traditional economic theories may not adequately predict how supply chains will react. The question is, when market force pressures from cost increases dictate a change in a supply chain, will a firm take action and why? Our initial hypothesis was that, yes, cost pressures would dictate a change.

We took a two-step approach to begin to test this hypothesis. First, we conducted an exploratory survey of U.S. manufacturers. The primary purpose of this exploratory research was to gauge initial responses to the events that had transpired in the current China – U.S. trade war. We conducted this survey from the period between August and October of 2018, as noted on the timeline of events. In this survey, respondents answered questions about their reactions to these changes in U.S. trade policy. These questions were aimed at revealing the actual changes to supply chains made in the time period when the increase in U.S. tariffs was proposed and then implemented.

Second, we conducted interviews with thirteen manufacturers in person and over the phone to acquire more details about how manufacturers perceive these increased costs and their long-term plans for their supply chains. The interviews, primarily conducted between December 2018 and February 2019, were conducted to help us better understand some of the results we saw in the survey and to dig deeper into U.S. manufacturer responses to the tariffs and cost pressures. The overall impression we saw in the respondents of both surveys and interviews was that risk mitigation was more important than input cost reduction. We highlight these results in the remainder of this paper.

Figure 1
U.S. – China Trade War Timeline with Exploratory Research Dates
Adapted from: Timmons (2020)

April, 2017:	U.S. and China agree to 100-day plan for trade talks
January 22, 2018:	U.S. Tariffs imposed on imported washing machines and solar panels
March 8, 2018:	U.S. orders 25% tariffs on steel and 10% on aluminum
April 2, 2018:	China imposes tariffs of up to 20% on 128 U.S. products
April 3, 2018:	U.S. unveils plans for 25% tariffs on $50 billion Chinese imports
April 4, 2018:	China responds with plans of tariffs on approx. $50 billion of U.S. imports
June 15, 2018:	U.S. levies 25% tariffs on $34 billion of Chinese imports to go into effect July 6
	U.S. announces 25% tariffs on additional $16 billion of goods
	China responds with tariffs on $34 billion of U.S. goods
July 10, 2018:	U.S. unveils plans for 10% tariffs on $200 billion of Chinese imports
August, 2018:	First exploratory data collection begins
August 1, 2018:	U.S. orders July 10 tariffs to increase to 25%
August 7, 2018:	U.S. releases list of $16 billion of Chinese goods to be taxed by 25%
	China retaliates with 25% duties on $16 billion of U.S. goods
September 24, 2018:	U.S. 10% tariffs on Chinese products kick in
	Rate to increase to 25% on January 1, 2019
	China taxes $60 billion of U.S. goods
October, 2018:	First exploratory data collection ends
December 1, 2018:	U.S. and China agree to 90-day halt on new tariffs
	U.S. postpones January 1, 2019 increase to tariffs
December 2018:	Second exploratory data collection begins
February 2019:	Second exploratory data collection ends

THEORETICAL BACKGROUND

The existence of disruptions in supply chains has been examined in a number of ways, though most take a "high-level" view and help provide a bigger picture (Tang, 2006). Previous research has primarily been focused on what can be described as non-price disruptions, such as acts of terrorism or natural disasters (e.g., Sheffi et al., 2003; Stecke & Kumar, 2009). These events force a firm to shift their supply chain, rather than act as a motivator to shift from one viable supply chain configuration to another (i.e., Bode, Wagner, Petersen, & Ellram, 2011; Craighead et al., 2007)

Since all supply chains are considered inherently risky and disruptions are considered unavoidable, most recommendations are focused on the mitigation (i.e., reducing the impact) rather than the elimination of disruptions (Tang, 2006; Tomlin, 2006). Research has identified three strategies that firms can use in the face of supply chain disruptions.

- *Mitigation tactics* happen when firms have a plan in place and take action, in advance of a disruption, to reduce the impact of the potential disruption (Tomlin, 2006). These proactive tactics focus on avoiding risk and reducing the probability the event will occur (Grötsch et al., 2013). In this circumstance, manufacturers are called upon to perform a supply chain rationalization that would mitigate both internal and external causes of disruption. However, risk mitigating rationalizations are rarely used/implemented, regardless of their benefits. Since "no one gets credit for fixing problems that never happened," (Tang, 2006 p 36) this is understandable.
- Firms can also utilize *contingency*, or reactive, *tactics*. With contingency tactics, although the firm may put plans in place in advance of a disruption, the firm only takes action if and when a disruption actually occurs (Grötsch et al., 2013; Tomlin, 2006).
- Finally, firms can take a more *passive approach*. In this case, firms aren't planning ahead and only take action when a disruption occurs, though that action is often chaotic and aimless (Grötsch et al., 2013). This third strategy is more of a passive acceptance strategy, and despite being the "default strategy even when it is not appropriate, the strategy of doing nothing in the face of a disruption has had little attention" (Tomlin, 2006 p 640).

From a cost pressure perspective, basic economic theory indicates that when costs and complexities increase, producers will seek out lower-cost alternatives where they are available. We have seen this general trend play out among manufacturers given a long enough timespan (Johnson, 2006). Once producers become aware of lower-cost suppliers or more profitable customers, market forces pull them toward decisions that shift their supply chains. The alternative is to risk loss of market share to competitors or even the deletion of members of the supply chain. But what exactly is the timeframe for such shifts? To delay altering the supply chain would risk absorbing unnecessary costs and delays, but too rapid a change could cause unnecessary disruptions and complexities.

This dilemma has come to the forefront in the most recent changes to United States Trade Policy. Tariffs on imports to the United States, especially from China, have risen or been imposed on products that previously lacked tariffs. The same is true of U.S. goods bound for China. Given these conditions, market forces would urge supply chains to shift production to lower tariff-inducing or lower total cost locations if possible. The speed of this shift, however, might defy market forces depending on the risks and rewards manufacturers perceive.

The same is true with customers when the price of the products they purchase changes. Basic economic theory dictates that when price goes up, demand goes down, and vice versa. However, depending on customers' attitudes towards the product, a change in price can have a varying effect on their demand. This concept, derived from price elasticity, complicates the changes in purchasing behavior following a change in costs.

We can apply this concept of elasticity to the reactions made by manufacturers in the wake of changing U.S. trade policy. While the general trend of market forces will gradually shift supply chains, the speed at which manufacturers react to those changes can be complicated by their supply chains' perceived risk of disruption. This supply chain elasticity may allow for some acceptance of risk or it may reveal a low tolerance for disruption.

EXPLORATORY STUDY 1

In our initial study, we hoped to see evidence of firms utilizing a more proactive or reactive approach to the supply chain disruption caused by the change in U.S. trade policy; this could mean taking actions that would be indicative of the impact of supply chain elasticity. If the evidence showed many manufacturers were currently in the process of shifting their supply chains away from China, it would indicate their supply chains were elastic and responsive to cost pressures of a margin present in the increases in the tariffs. However, if there was evidence of few manufacturers making efforts to decouple their supply chains from China (a more passive approach), it would indicate their supply chains were inelastic and less responsive to cost changes of at least this level. To better understand the elasticity of these supply chains, and examine the 'tipping point' of cost increases (which is related to the risk aversion of the managers of a particular firm), we conducted an exploratory survey of U.S. manufacturers.

Methodology

Contemporary supply chain management thinking places more power in the hands of consumers to shift supply chains (Doorey, 2011). Power has also been shifting toward retailers rather than manufacturers. However, that power has focused on cost and quality issues rather than disruption or risk issues. The ability to satisfy an order from a retailer is the responsibility of the manufacturer, not the retailer. The retailer simply demands that it be done, and if it is not done, they will choose an alternative manufacturer. Therefore, while the motivation to shift supply chains originates from retailer and consumer power, the actual decision-makers for these actions are the manufacturer. There are exceptions of course, as retailers and other members of the supply chain exert pressures to rationalize their supply base. However, with all other factors being neutral, it is still the manufacturer who chooses what supplies to buy, where to buy, and who to buy from. Knowing this, and in order to minimize double-counting, U.S.-based manufacturers were sought out as respondents for this study. We also wanted to focus on smaller manufacturers, given they would likely be more impacted by cost pressures than larger, potentially multi-national corporations.

Given the rapidly changing nature of the ongoing trade war between the U.S. and China and contemporary political events, the simplest and quickest method was to use an internet search for manufacturers. We started by searching Google for "manufacturers in _" and then typed in the name of a city. This generated a list of websites for manufacturers in that city. We then visited those websites to search for publicly available email addresses. Once one was found, we utilized a cold-emailing strategy and sent a standardized email containing a link to a survey to each manufacturer on our list.

The primary goal of the survey was to get the quickest response possible, due to the nature of the trade war. Survey questions were written in order to capture both attitudinal views and behavioral changes that took place during the initial stages of the U.S. and China trade war. The aim was to get an initial, general understanding of what changes the trade war was creating in U.S. manufacturing firms and to gauge whether these firms planned on making changes to their supply chains in the future. We also wanted to get a better understanding of how U.S. manufacturers felt about the U.S. trade policies, and whether they were deemed to be helpful or hurtful.

The initial survey email was emailed to over 1,000 email addresses and we received a total of 100 respondents. Of these 100 respondents, 89% worked for manufacturers of 500 or less employees, tying into our desire to connect with smaller U.S. manufacturers. The respondents were also spread fairly evenly throughout the U.S.: Northeast (16%), Northwest (26%), Midwest (27%), South (14%), Southwest (14%), and manufacturers with locations in multiple U.S. regions (13%).

The survey covered two specific time points in order to gauge the changes that were taking place. The first time frame was 2017, prior to President Trump's initial tweets and announcements of additional tariffs to China which took place in early 2018. The second time frame was as of July 2018. The trade policy changes began in the early part of 2018, but threats of imposing tariffs did not begin until March, were not ordered until May, and were not put into effect until July (see Figure 1 for a more complete timeline of events). We collected data between August and October 2018, giving manufacturers some time throughout the beginning of 2018, to formulate a plan and begin to react to this artificial cost increase. Finally, we also asked questions regarding the firm's plans for the future regarding overseas markets / supply chains in order to gauge if the firms were planning ahead and just hadn't made changes yet, or whether they would take a more passive approach to these cost pressures.

Results

The results of our survey indicate that only small changes occurred in the supply chains of U.S. manufacturers in the period between calendar year 2017 and July 2018. Manufacturers taking our survey were asked whether they had made any changes to their volumes of international sales and/or imports and the markets or origins of these products; only a small percentage acknowledged any changes to their volume had occurred. When looking at imports, 82% of our respondents indicated that they currently imported goods from oversees. Of those, only eight manufacturers (9.8%) said they had decreased their imports. None indicated an increase. Of those eight manufacturers, only two made a significant decrease (i.e., 25% or more). Although few had made actual decreases in their imports, ten manufacturers (12.2%) did indicate they had shifted to more domestic suppliers, three (3.4%) shifted to non-China overseas suppliers, and three (3.4%) had moved to suppliers closer to home (such as Mexico and South America). When asked what has driven the current changes to import policy, 33 manufacturers (40%) indicated the changes made to their imports were due to tariff changes and 9 manufacturers (11%) specifically indicated they were pursuing lower input costs.

When looking at exports, 96% of our respondents indicated that they currently exported goods to overseas customers. Of those, three manufacturers (3.1%) indicated they had actually increased their exports by a small percentage, while only one manufacturer indicated a small decrease in exports. Although only a small number of manufacturers made actual changes to the volume of exports, there were some shifts happening. When asked about changes to their overseas markets, seven manufacturers (7.3%) indicating that they were pursuing customers in Europe, three manufacturers (3.1%) indicated they were moving toward more non-China Asian countries, and 2 manufacturers (2.1%) indicated they were pursuing more sales in South America. When asked what has driven these changes, only 12 manufacturers (12.5%) indicated it was due to tariff changes and 6 (6.3%) specifically noted it was to lower their landed costs.

What may be more striking is the number of manufacturers that indicated they would not be making any changes in the future. From an import perspective, 44 manufacturers (54%) indicated they saw no changes coming to their manufacturer's imports in the future, while only 31 manufacturers (37.8%) indicated they would seek to move to other suppliers such as domestic suppliers (18 or 22.0%); non-China Asian suppliers (11 or 13.4%); and near-source supplies such as in Mexico and South America (2 or 2.4%). From an export perspective, the results are even more significant. We found that 67 manufacturers (69.8%) had no plans to change anything regarding their overseas markets, while only 23 indicated they would seek to shift suppliers to other geographical regions such as non-China Asian markets (5 or 5.2%), European markets (12 or 12.5%), and South American markets (4 or 4.2%).

In addition to looking at the changes that were being made, we also wanted to identify how respondents felt about the overall U.S. trade policy and the impact it was having on their firms both in the short and long term. When asked about how U.S. trade policy was impacting their business in the short-term, manufacturers initially appeared to be ambivalent (3.57 mean on a 7-point Likert scale). However, when we dug a little further into the data, we found that manufacturers were actually fairly polarized in their opinion. Some indicated that they felt the trade policy was helping (25% responded agree or strongly agree) and others indicated that the trade policy was not helping (37% responded disagree or strongly disagree). When asked about the long-term, we initially see what appears to be that same ambivalence (4.25 mean on a 7-point Likert scale). Upon further analysis, we again see that polarization between those who felt the trade policy was helping (42% responding agree or strongly agree) and those who felt it was not helping (29% responding strongly disagree or disagree). Although there are similar results in the short- and long-term in general, it does appear that there is a bit of a shift toward optimism with more respondents feeling that long-term policy will be beneficial.

This attitudinal scale is the closest data point to capturing the tipping point of price elasticity discussed earlier. The subjective predictions by decision makers regarding future events would modify the perceived risks of taking a more passive approach to these changes. Such levels of optimism that trade policy would change, either by reverting to pre-trade war tariff levels or by creating other favorable conditions, would create a greater level of inelastic reactivity to these artificial cost pressures. In such an attitudinal level of optimism, the complexity of making any supply chain changes would be perceived as riskier than accepting the (perhaps temporary) cost increase.

STUDY 1 DISCUSSION

When reviewing the results of exploratory study 1, we found that although many supply chain alternatives exist, relatively few manufacturers stated that they had actually made use of any of these options. It appears they were taking a more *passive approach* to the U.S. trade policy. As such, we sought to further understand why these options were not being taken advantage of; why weren't manufacturers shifting their supply chains in response to the cost pressure of the increased tariffs? One reason could be that a much higher percentage of respondents stated that current U.S. trading policy would improve their position in the long-term, a complete reversal of the tariffs' short-term impact. Another was an as-yet-unconfirmed response from several manufacturers that indicated the Chinese government was actually "paying for the tariffs."

During informal discussions we had with a few manufacturers after study 1, some informed us that their suppliers had not increased costs despite the tariff increases. They explained that the Chinese government was paying the difference between normal costs before the tariff increase and what the cost would be for purchased and manufactured items after the tariff increase. We discovered no evidence for such payments, though repeatedly heard this rumor. One respondent suggested that the rumor came from the increase in the export VAT in China and the devaluing of the RMB, along with access to cheap loans, all done shortly after the implementation of U.S. tariffs. In addition, many Chinese manufacturers accepted lower margins. The result was an either modestly increased or largely unchanged price. This would eliminate any cost-based motivation to shift a supply chain and severely impact the conclusions of both this paper and other research. The conclusion of most firms we talked to was that this was a temporary measure meant to keep U.S. customers buying from Chinese firms until the U.S. government eliminated the tariffs. However, from a theoretical standpoint, it can be considered an external factor that cannot be reliably counted upon in the case of future cost-based disruptions and was not present in a significant amount of respondents' answers. Its impact may have been less literal than perceptive. Even if no subsidies from the Chinese government were actually paid to Chinese firms, U.S.-based firms believed it to be happening. This perception modified attitudes about tariff increases and may have affected decisions. Its literal cost impact is not fully known, and it might be quite pervasive, but it was either not done to enough of a scale or delayed in implementation long enough that many U.S. manufacturers still saw tariff-based cost increases.

The attitudes respondents had toward trade policy itself might have impacted the decisions made by those manufacturers who had been affected by these changes. The first attitude would be that the policies themselves, while potentially increasing costs, would be beneficial if they caused an improvement in Chinese trade policies. The hostile nature of U.S. manufacturers trading with Chinese manufacturers has been well-documented (e.g., Holmes, McGrattan, & Prescott, 2015; Lu & Koehn, 2015; Selmi et al., 2020). Whether the attitude that current U.S. trade policies will improve conditions for U.S. manufacturers in China is perceived from an internal strength or the actual effectiveness of U.S. tariffs in changing trade relations to

improve U.S. manufacturers' positions is unknown. However, in an informal interview, one manufacturer stated they were confident in their own ability to improve their status, but that they were pleased the U.S. government was standing up to a perceived hostile government in China. The manufacturer interviewed also stated that they believed the changes in U.S. trade policy were temporary. This attitude could affect how U.S. manufacturers reacted to changes, and may have led to decisions that would not align with traditional market force predictions. A personal or pervasive sense of nationalism could also lead to theoretically irrational behavior where self-sacrifice is considered a matter of national pride or necessity. Many of these discussions indicated what could be considered a form of nationalism and a desire to see "victory" in this "trade war."

One manufacturer stated they were willing to absorb higher costs in the short-term if it meant greater market access or a fairer playing field in the long-term. This fits with the attitudes discussed earlier, that the negative effects and perhaps the tariff increases themselves were temporary. The perception, then, of whether or not these changes would benefit or harm, be permanent or temporary, could be responsible for the lack of changes we found to be present in supply chains despite such a significant cost disruption. The tipping point for managers deciding to make a change could then shift toward a more inelastic position in relation to a decision maker's subjective optimism and even nationalism, which are subjective points that often go against what traditional studies have analyzed as rational and quantifiable decision making.

The cause for this lack of change might be more complex than simple reactions to tariffs, however. Roughly one-third of all respondents stated that tariff changes drove their changes in suppliers, if they made any changes at all. The desire to pursue lower input costs and a catch-all 'other' category took up the remainder. This reveals the robustness of existing supply chains. Economic factors such as rising wages among the Chinese workforce or increasing transportation costs might be more significant drivers toward changing supply chains than U.S. trade policy. Volatility in these markets has proven to be significant, so perhaps changing tariffs are seen as just another form of volatility?

The actual shift away from Chinese-based suppliers that market forces would predict might not have occurred yet, as our survey revealed that only 12.2% of manufacturers shifted to using more U.S.-based suppliers in 2018 and less than 4% have shifted to non-China Asian suppliers. However, their interest in moving suppliers in the future is significant. The numbers move up to 22% of manufacturers desiring to shift to using more U.S-based suppliers in the future, and 13.4% desiring to shift to non-China Asian suppliers. The increase to non-China suppliers is more than triple actual changes, showing a strong potential for investment in other Asian nations. Near-source suppliers such as Mexico and South America fared far worse, with only 3.4% shifting to near-source suppliers in 2018 and even less interest in doing so in the future, with only 2.4% claiming they plan to do so. The key driver seems to be tariff changes, with almost half claiming this as the reason for these changes or planned changes. However, plans for changes do not equate to actually making changes. The significant gap between actually shifting suppliers and planning to do so reveals either the difficulty in doing so or the reluctance to consider the tariffs to be permanent. So, while the increase in interest in shifting suppliers away from China is large, the total numbers are not. Many manufacturers are continuing to utilize their existing supply chains, and while their plans might change, the actual execution of those plans has yet to occur. If these manufacturers continue to display inelasticity in responding to tariffs, it might be unlikely that they will shift their supply chains any time soon.

The same seems to be true regarding exports, but with larger numbers. Only 1% of the respondents to our survey claimed they planned to increase sales in China, while 0% claimed they already have. Europe seems to be the market of interest, as 7.3% claimed they have pursued more European export markets in 2018 and 12.5% claim they intend to do so in the future. The increase was 3% to 5% for non-China markets, with similar increases in Africa and South America. The respondents overwhelmingly claimed, however, that they would not change their export policies, with 83.3% claiming to have made no changes and 69.8% claiming they will make no changes in the future. Tariffs do not seem to be a significant driver of these changes, with only 16% claiming tariffs as drivers of these changes, a much smaller number than the drivers for shifting suppliers. This could be because American manufacturers have more options for suppliers than for export markets when it comes to shifting their supply chains away from China, or it could mean that manufacturers do not see danger in the long-term impact of Chinese tariffs on U.S. goods, since so many manufacturers expressed optimism for their future trading positions.

Given the subjective nature of managers' reactions to the tariff increases, we decided that an online survey was insufficient to understand their impact. Therefore, it was determined that in-depth interviews would be necessary to provide further details and nuance, and to shine a light on our survey data.

EXPLORATORY STUDY 2

For exploratory study 2, we had two primary research questions: 1) Why weren't manufacturers shifting their supply chains in response to the cost pressure of the increased tariffs? 2) If manufacturers weren't shifting supply chains, were there other decisions or actions being taken to offset the cost pressure disruption?

During the process of emailing the survey to respondents, many firms replied to share personal opinions regarding the trade war. These responses came unprompted, and so their willingness to discuss the circumstances made them preferred candidates for further interviews. As such, we utilized a convenience sample of local manufacturers and those who had replied to the initial survey email with added comments for study 2. We interviewed 13 respondents, twelve via phone and one in person (Table 1). All respondents were manufacturers with operations or offices within the continental United States. All respondents had taken the online survey before the interviews were conducted. While a list of questions was used to probe respondents, respondents often volunteered additional information that was not initially sought after, but that offered insights into their firms' reactions and plans regarding the tariff increases.

Table 1
QUALITATIVE INTERVIEWS

Pseudonym	Industry
Taylor	Food Ingredients
Ben	Door and Truck Parts
David	Plastics
John	Packaging and Shipping
Betty	Safety Apparel and Workwear
Bob	Tree Nut Food
Deb	Contract Leather Bag / Garments
Jacob	Simulator Machines
Justin	Chocolates
Jason	Aluminum Materials
Kelly	Steel Tank Fabricator
Bill	Engine Remanufacturer
Michael	Apparel

The interviews reinforced some discoveries made in the initial survey, namely that U.S. manufacturers are not fully decoupling their supply chains from China. This seems to indicate a more passive response to the U.S. tariffs and the China trade war (i.e., "doing nothing" (Tomlin, 2006)), as noted above. During our interviews, we identified three principal reasons for this seemingly passive response that were not revealed in our initial survey, to help us answer our first research question:

1. A general 'cost inflation' has become accepted by most manufacturers
2. Shifting to the United States is not feasible
3. Non-Chinese manufacturing cannot match China's current quality levels

Inflation alone can be blamed for a general increase in the costs of goods, and this certainly includes the costs of purchased materials. Gas prices and general logistics costs, including costs of regulatory compliance, were all the examples of environmental cost pressures respondents discussed. Tariff costs were apparently less of a concern than these other inflationary pressures. One manufacturer quoted: "I think there's a minor, hard to determine impact [of tariffs], but I don't think it's a real significant impact for us at this time" (Michael). This is especially true for manufacturers with diverse supply chains, where Chinese-originating goods represent only a portion of total costs of goods sold. Since customers in these supply chains are apparently used to annual price increases of a marginal amount, few firms expressed concern that these tariffs would cause major customer pushback.

Some manufacturers shared that they understood the reasoning behind the tariffs, and were beginning to utilize more U.S.-based manufacturing. One manufacturer quoted: "I would say since the trade wars began there's probably at least $500,000 worth of tooling that we otherwise would have sourced in China that we have instead sourced domestically in the United States" (Dave). But these were the exception, not the rule. Instead, manufacturers who chose to

decouple their supply chains from China and use U.S.-based suppliers did so according to their own unique situations. A general frustration was shown, however, that most manufacturers understood it to be infeasible to do so. One told us: "The problem is there's not a lot of domestic manufacturing options that are viable in place currently. In the long term we'll probably see more of that manufacturing take place in areas that are not impacted by the tariffs" (John). U.S. labor costs, and the fact that many of these industries have not operated domestically for years, remain barriers to reshoring U.S. supply chains.

If the goal, however, was to punish China for its unfair trade practices and to shift supply chains anywhere else, the tariffs seem unable to do so. While countries like India, Malaysia, and Indonesia have been highlighted as possible low labor cost alternatives, our respondents expressed doubt that quality standards could be maintained outside of China or the US. "Our business is primarily B2B and so many of those customers already have tried and true sources. Their customer and retail consumer will not tolerate a variance in materials so we're pretty much tied to our current sources" (Deb). This quote is indicative of the greater circumstance we discovered. Currently, supply chains are too engrained to be easily modified, which makes the risk of quality problems, or a disruption from shifting supply chains, to be perceived as more costly than accepting a marginal increase in costs due to tariffs.

Despite these reasons for not decoupling supply chains, we also wanted to understand other actions or decisions that were being made in response to the disruption. We began to notice three ways in which U.S. Manufacturers are actually responding to the U.S. trade policy. These responses give the appearance of passivity (i.e., not making changes to the supply chain), but they show there are decisions being made in response to the supply chain disruption. The three responses we found were: 1) Intentionally passing costs on to customers; 2) Relying on previous relationships; and 3) Researching a shift in suppliers. These themes are highlighted in Table 2 with representative quotes from various respondents.

The first theme, pass costs on to customers, likely stems from the idea that a general cost inflation has become widely accepted in manufacturing. This theme is noted in the quote from Betty when she says that "we are seeing the price of products rising which obviously we pass along to our end users." This approach will work as long as customers are willing to accept the higher prices for their products. Once customers start to balk at the rising prices, these manufacturers will have to find another way to respond to these cost pressures.

The second theme, relying on previous relationships, may be the most passive of all of the responses. This response likely stems from the fact that shifting suppliers may not be feasible, whether it is due to quality issues, or lack of supplier choice. This is highlighted in the quote by Deb (Leather bag / garments manufacturer). Instead of shifting suppliers, these manufacturers have a reliance on their supply partners. They focus on the long-standing relationships that they have with their customers or suppliers, and do not seek to make changes to their current supply chains.

The final theme, researching a shift in suppliers, was seen in several of the respondent interviews. These manufacturers are attempting to find alternative suppliers, with most looking to shift more domestically. However, there are barriers to switching. As Ben stated, "As far as the suppliers, we are looking into local foundries, but the cost is significantly greater to produce steel products in the United States at the time being." These manufacturers want to shift supply chains, but are hindered, at least for the time being. What we find interesting about this theme is that it is setting up these manufacturers to take a more contingency approach (plan ahead and make changes) if another supply chain disruption occurs in the future.

Table 2
SELECT QUOTES HIGHLIGHTING THREE RESPONSES

Interviewee (Pseudonym)	Industry	Representative Quote
Theme 1: Intentionally pass costs on to customers		
Betty	Safety apparel and workwear	This year there have been some more tariffs and we are seeing the price of products rising which obviously we pass along to our end users. We do purchase both directly from overseas manufacturers and then through distributors as well. We know it's imported products, but we haven't made any changes into how we purchase. There's no hard and fast plan for anything.
Deb	Leather bag / garments	Most of our suppliers probably had enough stock of original material before the tariffs hit. They've moved through a lot of that dead stock or back stock and now they're having to reorder from their suppliers in China so now the tariffs are actually be enforced and hit on whatever containers are getting in now. In September and October there was a flurry of emails saying, "Hey we're going to hold prices as long as we can." But now even in the last week I have four or five [emails] in my inbox from distributors, even if we only buy from them once every five years, saying "You should know next time you order everything's going to go up between 8, 15, 25 percent depending on what it is.
Theme 2: Relying on previous relationships		
Deb	Leather bag / garments	We're a little bit tied to what's available to us. We're a soft goods manufacturer. We cut and sew private label for other large companies. Our business is primarily B2B and so many of those customers already have tried and true sources. Their customer and retail consumer will not tolerate a variance in materials so we're pretty much tied to our current sources. The changes would be if I took on another large retail brand for manufacturing and they had needs that pushed us overseas for sourcing materials. As of right now, that's not going to happen.
Justin	Food Manufacturer	Interviewer - Did you make any changes in 2018 regarding overseas customers? Why or why not? Response: No. I can't think of any. A lot of the international business at this point is going to be based a lot more on a long-standing relationship that we have with a customer. When we say that we sell in Japan what we typically mean is that we have a customer in Japan that does distributor or retails our product for us.
Theme 3: Researching a shift in suppliers		
Ben	Door and Truck parts	We're trying to have other foundries do our casting for us, locally. We have to get all of our tooling redone because we can't get our tooling back from the foundries overseas.

Table 2
SELECT QUOTES HIGHLIGHTING THREE RESPONSES

Interviewee (Pseudonym)	Industry	Representative Quote
		As far as the suppliers, we are looking into local foundries but the cost is significantly greater to produce steel products in the United States at the time being. I kind of see the theory behind this trade war. I read stories all the time about once defunct foundries that are refiring all the time. So, I see a little bit of hope, and I see the long-term goal of it. And if it works as planned it should help everybody. I think in the long run it'll bring a lot of industry back to the United States. In the meantime, at the beginning it's very difficult.
Dave	Plastics	To counter that, we're actually looking to acquire more tool making capability in the United States. On the production side, the issues with China are the added costs and the timing and delivery and whatnot for production parts and we've been given much more opportunity to produce more production parts here in the United States as our customers are OEM customers are looking to resource some other work from China back into the United States. We still use the same suppliers, but we're trying to decrease them. I would say since the trade wars began there's probably at least $500,000 worth of tooling that we otherwise would have sourced in China that we have instead sourced domestically in the United States. We still work with partners that we've worked with in Asia. We've worked with them for 20 years. We'll still maintain a relationship, but the majority of our efforts in the next year are to build our domestic supply base for what was otherwise being sourced in China.
John	Packaging and Shipping	Well they're looking at domestic manufacturing. The problem is there's not a lot of domestic manufacturing options that are viable in place currently. In the long term we'll probably see more of that manufacturing take place in areas that are not impacted by the tariffs. Yeah, probably they're shifting further south into Vietnam and Thailand. I would say it's certainly shifting toward even the North American collaboration between Mexico and Canada. Although we're seeing a lot of tension rising along that Mexican/US Trade relations as well. There's a lot of churn in that process that we're seeing and a lot of it is from our perspective is just educating our customers into what the current state of affairs may be. And then letting them really kind of make their decisions based upon current climate. It's very difficult to forecast based upon what the future agendas may be.

Table 2
SELECT QUOTES HIGHLIGHTING THREE RESPONSES

Interviewee (Pseudonym)	Industry	Representative Quote
Justin	Food Manufacturer	We are exploring the possibility from sourcing from countries that are not subject to tariffs. The item that we can get out of China is a small pinewood box and it's possible to get a pinewood box from a lot of different places in the world. The prospect of looking to other sources for that box is beginning to get more attractive as tariffs on Chinese goods imported in begins to look more likely.

DISCUSSION AND FUTURE RESEARCH

The goal of our survey was simply to prove a hypothesis: will the trade policies that would, on paper, incentivize a shift in supply chains toward countries with lower input costs create actual changes? In the short-term, we can declare that not to be the case. Instead, we discovered the tipping point that would result in changes to a supply chain lies in the combination of both quantifiable cost pressures and the perceived risks of decision makers, resulting in a non-uniform, inelastic response to supply chain disruptions. Further studies could, however, prove that initial hypothesis true. One interviewed manufacturer stated that we should call them in a year, and then they would consider making changes, but they expressed no interest in even thinking about such a decision until that time.

The fact that so few of the survey respondents showed a significant change in their supply chains based on recent changes to U.S. trade policy should be further researched. Possible theories for why should be proven, but at this point our survey and interviews only allow us to speculate on subjective levels of optimism, perceived risk, and nationalism. If, like those manufacturers we interviewed, they believe that these changes are temporary and only need to be waited out, then a similar survey might be performed in future years to determine if the results are still the same. If the new tariffs are still in place, the results might be different as manufacturers realize the permanency of these tariffs. If they are not, then the perception that they were temporary will have justified the lack of changes. Questions regarding these perceptions could also be included. Our survey question asked about their long-term perceived strengths and most respondents expressed optimism toward the future. Proving that perceived optimism justified or false would yield interesting insights.

The goal of a similar survey might be to examine the effectiveness of such trade policies in driving global policy. If the goal of these tariffs was to shrink the U.S.-China trade gap and to convince U.S. manufacturers to shift manufacturing away from China as a way to negotiate better trade agreements, our survey reveals, in the short-term, that this has not been accomplished. Since this insight was not the primary goal of our survey, a more robust survey that focuses on this question could potentially reveal further details. If policy were the goal, then the impact of the Chinese government's modifications of the export VAT and devaluing their

currency in response to the tariffs to support Chinese exporting firms should also be explored. Our survey only revealed the attitudinal impact of these de-facto subsidies, but their actual cost impact and long-term viability could be explored. Tariff alleviating subsidies as a strategy in a "trade war" could be a useful analysis, and its presence, or lack thereof, would certainly impact the decisions of those in private enterprise who could be impacted by such government policy decisions.

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