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Decision Making in International Supply Chain Investment

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Decision Making in International Supply Chain Investment

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In this paper, supply chain decision-makers where and how to internationally invest into supply chains. I focus on outside institutional factors, and intra-firm behavioral factors that affect where and how they invest. I first review the literature on international investment at large. Later for my part of the research, I conduct a series of semi-structured interviews with international supply chain decision-maker primarily in Denver to better understand their processes. I find that they value business models higher than “hunches”, but also that tacit knowledge and relationships play an important role in their processes.

Document Type

Undergraduate Thesis

Degree Name

B.A. in International Studies and Economics

First Advisor

Dr. Martin Rhodes

Keywords

Supply chains, Decision-making, Tacit knowledge, International finance

Subject Categories

Behavioral Economics | International Business | International Economics | Organizational Behavior and Theory

Publication Statement

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In this paper, supply chain decision-makers where and how to internationally invest into supply chains. I focus on outside institutional factors, and intra-firm behavioral factors that affect where and how they invest. I first review the literature on international investment at large. Later for my part of the research, I conduct a series of semi-structured interviews with international supply chain decision-maker primarily in Denver to better understand their processes. I find that they value business models higher than “hunches”, but also that tacit knowledge and relationships play an important role in their processes.

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SECTION 1: The Set Up

Introduction

It is not hard to see how the items we use every day come from all around the world. Think of the clothes we wear, the food we eat. It is likely that if we look at the product labels of all the items in our living rooms, that we will see items from dozens of countries. Going one step further, it is likely that we will see that many of these items contain smaller parts which come from every corner of the earth. Consider our electronics, cars, and appliances. More than any other time in history, products tend to be a multinational *mélange* of smaller parts. Where do these parts come from? Who put them all together? How did they get to us? The answer is by and through a supply chain.

This is not new information. Supply chains are commonplace in today's world, and they are frequently brought up in the news, especially during the COVID-19 pandemic. What is interesting is not so much the fact that a product is made of many different parts that originate across the earth and found their way to a consumer. It is more the question "Why?". Why are certain parts made where they are? Why are certain countries picked for manufacturing in one area of the supply chain, but not another? Why are goods shipped through this route and not another? The answer comes down to the fact that a group of *people* in a firm make *choices* about each intricate detail of the supply chain that led it to look the way it does. The question then becomes "Why do these people make the choices they do?". I believe there are multiple factors that influence these choices. There is probably a rational process these decision makers follow. This could be an elaborate data-driven business models for how these choices are made

or possibly a system the decision maker has devised over time from experience. There are also outside factors that probably impact these decisions. These could be the political and economic policies or factor endowment of resources of the countries where a firm might be considering adding an element to their supply chain.

This paper will be focused on decision-making processes involved in the allocation of international supply chain investment. These are the intra-firm decision-making processes and outside institutional factors that affect where and how international supply chain decision-makers invest. When studying the effect of these variables, I especially pay attention to how they go about mitigating uncertainty, as certainty is the most important vector in supply chain policy. I do this through a series of semi-structured interviews with decision-makers in this field, primarily in the Denver area. Hopefully, this analysis will help to paint a clearer picture of the process of international supply chain investment.

Statement of Purpose

Before diving into my project, I want to explain my rationale for researching my topic in effort to persuade readers of its importance.

There are three key reasons as to why I believe that research into the intra-firm behavioral factors that affect the allocation of international investment in supply chains is important. The first reason is that it is extremely relevant. During the COVID-19 pandemic, supply chains were hit extremely hard, especially in the United States. As noted in the introduction it has become a topic seen daily in the news. The supply chain meltdown makes my topic interesting. More importantly, people and companies depend on supply chains. The

scale of this dependence renders the decision-making processes behind supply chains worth understanding.

Another reason this research topic is important is because international investment is undertheorized, especially regarding supply chains. Historically, models of international investment were adjacent offshoots of international trade theory. These were Ricardo's Comparative Advantage theory of international trade, Linder's Hypothesis, and notably (as addressed in my literature review) the Heckscher-Ohlin Theorem. Recently, empirical models of finance have come from Behavioral Finance. The focus of these models is usually domestic and tends to be on Wall Street type finance, not cross-border business investment. With all of this in mind, there exists a major gap in the economic literature which I hope to help fill to some extent with my research, creating a better understanding of the world from an economic viewpoint. This brings me to my final reason. Policymakers, be they regulatory or business leaders, need more understanding of the decision-making environment to make better choices regarding international supply chain investment. There have been calls for a reevaluation of supply chain strategy. Decision makers are wondering if there should be more space in supply chain overhauls so they will be less susceptible to shocks. There are also calls to bring supply chains closer to home (IMD 2020), making more of the supply chain domestic via "nearshoring" instead of offshoring. To understand the effects of any new policy, we must first understand how the processes currently work. My goal is to explore these processes, with a focus on the decision-making strategies and variables that matter in international supply chain investment.

Thesis Layout

This project is laid out into seven sections. Following this introductory section, section 2 surveys the existing literature on investment decision-making. Section 3 shows why international supply chain investment is unique among different types of investment and why it is worth exploring the processes behind it. Section 4 explains my research methodology and interview strategy and establishes a number of hypotheses I employ to structure my investigation. Section 5 showcases key findings from my interviews and organizes quotes into three important theoretical groups, discussing their practical implications and how they relate to the existing literature. Section 6 assesses my hypotheses, lays out a few areas for further research, and concludes the project.

SECTION 2: A Survey of the Investment Decision-Making Literature

Before I turn the focus of this project towards supply chains directly, it is first important to review the literature on economic decision-making generally and more specifically that related to international investment. Supply-chains are notably missing from this literature. While some of the theory presented here may be applicable to international supply chain decision-making, one aim of this section is to show that existing theory is insufficient to cover the complexity of decision-making in international supply chain investment.

Economic Decision-Making

Risk and Uncertainty in Investment and Economics

From the very early days of economics, risk, uncertainty, and emotional disposition have been noted as important and sometimes driving factors in economic decision-making (Smith 1761). At the start of modern economics, John Maynard Keynes, in *The General Theory*, placed uncertainty, risk, and emotions front and center, especially with regard to investment (Keynes 1936). Much of Keynes's argument in this seminal work relates to the ways that investment drives the economy. Where capital is allocated today will drive where production takes place is tomorrow, and where production takes place tomorrow will drive where consumption occurs day after tomorrow. Keynes argues that much of this investment is driven by the combination of decision-makers' evaluation of risk and uncertainty, as well as their *animal spirits*. For Keynes *animals spirits* is a proxy word for emotion. Notable behavioral economists have embraced the term and have applied it to cognitive biases and human psychology (Akerlof and Shiller 2010).

Risk and uncertainty are intrinsically important to investment. People and firms have come up with many ways to deal with risk and uncertainty, but at times, it can be overwhelming. This is where Herbert Simon's notion of *bounded rationality* becomes important (Simon 1982). That is, the world can be almost infinitely complex and humans, while relatively rational, have distinct limits on their ability to create rational sense out of things and respond accordingly.

Bounded rationality mirrors the behavioral economics' idea of 'heuristics' in decision-making. Heuristics are a type of cognitive bias and a way of dealing with problems that are too complex for a decision-maker to rationally respond to. If a situation is too complex, people instead respond as if they are faced with a different, though similar problem, that is simpler and less complex. Heuristics have been made famous by Nobel Prize winning Daniel Kahneman (Kahneman 2011). Another area in economics is the economics of information. Pioneered by Joseph Stiglitz, asymmetric information can act as a bound on rationality and can lead to decision-makers making choices that are seemingly suboptimal (Stiglitz 2000). Stiglitz's and Kahneman's contributions to economics provide evidence to confirm Simon's original model of bounded rationality.

The model of bounded rationality, which predated the studies of heuristics and asymmetric information, influenced Simon's theory of firm decision-making in *Administrative Behavior* (Simon 1997) and Cyert and March's notable *Behavioral Theory of the Firm* (Cyert and March 1992). These works later went on to be highly influential in the international business field and are frequently mentioned in the supply chain literature.

Large-scale macroeconomic uncertainty and risk have been modeled mathematically in the areas of trade and financial crisis. It has been found that examples of bounded rationality

and heuristics are present in international trade policy and execution (Freund and Özden 2008). In their work *A Crisis of Beliefs*, Gennaioli and Shleifer quantitatively model the psychological and economic roots of the 2008 global financial crisis (Gennaioli and Shleifer 2018). This work is a landmark study in behavioral macroeconomics and shows that the concepts of Simon, Kahneman, Cyert, and March are not isolated to small scale decision-making, and help us understand economic behavior in the global economy. They are also important for understanding international supply chain decision-making, though they have not yet been applied theoretically to this subject.

Mainstream Economics: The Neoclassical Perspective

Neoclassical economics has historically favored of simpler models in which humans are almost always able to optimize decisions when allocating investments. An important moment in the development of these models was when John von Neumann and Oskar Morgenstern presented the mathematical proofs and assumptions of Expected Utility Theory (Von Neumann and Morgenstern 2007). Included in these axioms are the assumptions and proofs related to rational human economic behavior. Important for our discussion are the axioms of *completeness* and *transitivity*. Explained simply, *completeness* assumes that an individual has a defined set of preferences. *Transitivity* refers to the assumption that preferences are consistent across multiple options. These axioms allowed economists to build models that were concise and consistent, even if lacking empirical validity. These axioms are logically consistent but do not fully account for how people act in the real world. Peoples' preferences are often fluid, not logically consistent within themselves, and dependent on framing and mood. This does not

mean that Von Neuman and Morgenstern's axioms are wrong *per se*. When the writers wrote these axioms, they only stated that individuals will only conform to expected utility theory *if* they also conform to the axioms of completeness and transitivity. A problem arises when other theories build on expected utility theory and do not explicitly recognize the limits of the axiomatic assumptions of Von Neumann and Morgenstern's argument.

The Efficient Markets Hypothesis and the theory of Rational Expectations are more closely tied to international investment decisions. Although these two ideas have had their share of pushback, especially since the 2008 Financial Crisis, they are still two of the most popular theories regarding investment. The Efficient Markets Hypothesis states that asset prices will always reflect all available information (Fama 1970). This would mean that the asset prices within supply chains are all completely determined by agent enjoying access to all available information. Rational Expectations theory similarly states that agents in an economic model will on average act as if they use all available information in making decisions (Muth 1961). So, assuming rational expectations, firms will allocate their investment in supply chains based on what is most advantageous for the company. In other words, what will make them the most money in the timeframe they select. In both theories there is no room for institutional norms, business culture, biases and heuristics, or international cultural differences, all of which are important in decisions made about international supply chains.

Behavioral Individual Level Investment Choice

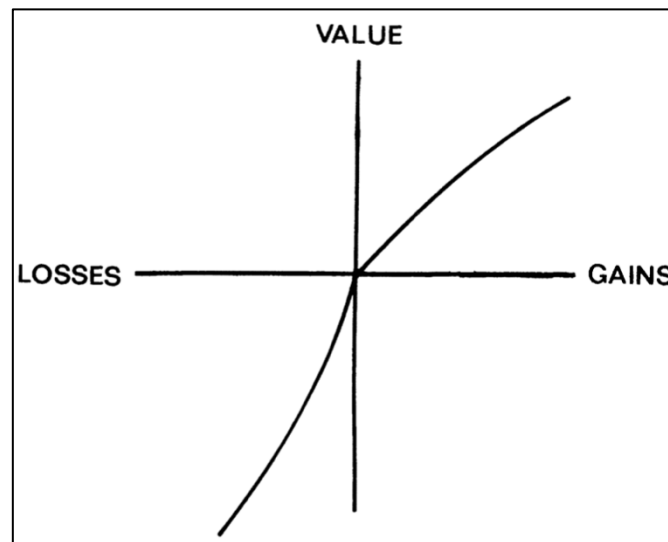


Figure 1: Prospect Theory Value Function

In contrast to mainstream economic models of decision-making, behavioral economic models are built from data. Behavioral economics incorporates psychology to improve the real-world validity of economic models. Prospect Theory (Kahneman and Tversky 1979) is widely credited as the beginning of the behavioral economic movement in decision-making theory. The most important insight of Prospect Theory is its value function, seen in **Figure 1**. In contrast to Expected Utility Theory, the value function is nonlinear and is steeper on the left side of the Y-axis than on the right side. This signifies that losses are weighted heavier than gains, meaning that people are loss averse. Building on this, people generally are also risk averse because they do not see an equivalent change in value between an equivalent loss and gain. This is especially true of mid-level managers in firms as they are more likely to be blamed for losses than they are to be praised for gains (Willman et al. 2002). This has implications for supply-chain

investment decisions. Managers often make supply chain decisions and are blamed if the outcome of these decisions are poor, but not praised if the outcome is profitable. Risk and loss aversion lead to corporate conservatism in investments and would seem to have a direct impact on the allocation of investment in supply chains.

With the above research in mind, there has been alternative behavioral economic research that shows that emotional regulation may have a role in investment decision-making. Emotional regulation refers to people's ability to control their emotions. In "The Psychophysiology of Real-Time Financial Risk Processing" (Lo and Repin 2002), physical correlates of negative emotion are observed in financial investors when they encounter decisions with high levels of risk. In the same study, the researchers noted that those who invested most successfully were those who were also most successful in managing these emotions. This would suggest that emotional regulation has a role in the success of financial investment decisions. Further, in "Thinking like a trader selectively reduces individuals' loss aversion" (Sokol-Hessner et al. 2009), the authors show that when people think of individual investments as a part of a broader portfolio they experience less loss aversion and are more likely to exhibit risk-taking behavior. Extended more broadly, these studies have implications in international supply chain investment decision-making. Prospect Theory suggests that decision-makers in firms are loss averse and may be risk averse in their decisions. The Sokol-Hessner et. al and Lo and Repin studies suggest that Prospect Theory provide useful insights into the way that people handle loss aversion, revealing the influences on their investment strategies and relative success. Behavioral Economics has much to offer to decision-making theory but has not paid particular attention to international contexts – the subject of the next section.

International Investment Decision-Making

The Heckscher-Ohlin Theorem

One mainstream economic model important in international investment is not a theory of investment, but a theory of international trade that has investment allocation implications. The Heckscher-Ohlin (H-O) theorem is a model of international trade that focuses on country factor endowments and product factor intensiveness (Ohlin 1933). In the model there will be two countries, one labor abundant and one capital abundant, two goods, one labor intensive and one capital intensive, and two factors, labor and capital. The labor abundant country will specialize in the production and trade in the product that uses labor intensively. The reverse is the case for capital. The model has been extended further in the factor-price equalization theorem to explain the optimum prices, trade, and investment allocation in any given H-O scenario (Stolper and Samuelson 1941). Although a model of international trade, this explicitly states where production investment will be allocated. In terms of supply chain investment, it would suggest that firms' decisions on where to allocate this investment would largely depend on the relative factor endowment of labor and capital in the country of said investment. While this model's validity has been questioned for many years (Leontief 1953), it is still an important model that is commonplace in mainstream economics.

Behavioral FDI

While the economic literature of behavioral investment and decision-making is immense, the economic literature that specifically focusses on *international* investment

behavior is sparse. Built off a previous capital-difficulty gap model (Heiner 1983), there has been a model theorized that adds behavioral economic elements and also economically models uncertainty (Hosseini 2005). This model has been used in a few tests of FDI investor behavior to see if they exhibit any heuristics in their investing strategies. One study did this by examining the behavior of Turkish investors in Ethiopia (Sözer Oran and Ali 2018). It found that the heuristics herding, representativeness, regret aversion and mental accounting had a statistically significant impact on investor behavior. Another study looked into the methods of Portuguese supply chain FDI managers through surveys to find out if they exhibited heuristics in their investment strategy (Pinheiro-Alves 2011). That study found that the investors did in fact exhibit heuristics in their decision making, but more importantly, found that investors relied more on heuristics and biases when the degree of uncertainty was higher. This confirms aspects of the Heiner model and is consistent with other behavioral economics literature. While these studies are important and interesting to the topic international supply chain decision-making, they do not explain firm decision-making as much as they try to model the observed firm behavior. I will have to turn to another area of the literature to directly explore the decision-making aspects of choice more fully in international investment into supply chains.

International Business Literature

Having reviewed the mainstream understandings of international investment and decision-making, in addition to the behavioral economic underpinnings of decision-making and the view of risk and uncertainty in economics, I will turn to the International Business literature

and how it describes how decision makers make international investment decisions regarding risk and uncertainty.

In the International Business literature, it is frequently noted that there is a heterogeneity in firm risk taking in international investment decisions. A proposed explanation for the phenomenon is that there is both destination country institutional/political risk, and also risk preferences and propensity held by managers that make the investment decisions (Buckley et al. 2016). This suggests that country and outside institutional factors do matter and should be studied but are not the only factor that attract or scare off international investment. It also explains why there are such differences in investment into a single country that, obviously, holds the same level of country-wide risk. If managers have different risk propensities, they will evaluate the destination country risk differently and make different decisions accordingly. Further research shows that the level of risk of a manager's home country plays a role in their risk propensity for investment in other countries. It appears that managers' home country satisfaction in decisions of risk has a positive effect on their controllable (legally-protected) risk propensity, but a negative effect on their propensity of risk is contingent on fundamentally uncertain variables like institutional instability (Buckley et al. 2018).

Focusing in on the managerial decision-making processes, applications from Real Options theory are common in the international business literature related to supply chain decisions. Real Options theory branched out from Expected Net Present Value theory which is an intertemporal decision-making tool for initial investment. It weighs the initial cost of capital investment against expected cash flow (discounted for time and uncertainty). If the total is

positive, it is a good project to undertake. If it is negative, the firm should avoid undertaking the project. If it is zero, then it does not matter either way if the project is undertaken. Real Options theory expands on this and allows for firm options after the initial investment has already happened. For example, a question in Real Options theory could be, "should a firm continue production in a facility, or should they switch production to a different facility?". It has been observed that managerial executives use Real Options theory in supply chain decisions (Hult, Craighead, and Ketchen 2010). It has also been shown that Real Options theory does a better job than older theories in explaining international investment behavior due to its allowance for new and continual options after initial capital investment (Song, Makhija, and Kim 2015). Supply chain organizational knowledge is being shared between firms and industries to improve effectiveness and efficiency (Miles and Snow 2007), and it appears that utilizing Real Options theory is a part of this knowledge.

It has been outlined that there is a need for increased behavioral research in the study of supply chain decision-making (Tokar 2010) as it is imperative for understanding how managers assess risk and how they employ Real Options theory. It is also of note that behavioral factors play a role in external intuitional variables that affect the choice of investment allocation in supply chains. If broadened to include more factor endowments than just labor and capital such as human capital, an extended H-O theorem has been shown to account for much investment in East Asia in the later 20th century and early 21st century (Brooks, Roland-Holst, and Zhai 2008). When looking into risk and uncertainty in international investment in supply chains, it is imperative to study the intra-firm behavioral decision-making processes that affect this investment. This is the gap my research is exploring.

Contract Theory

An additional area of importance in the organizational theory/business and economics literature is contract theory. Each piece of a supply chain can be thought to include two parties. The first party is the buyer. The buyer is usually a firm that is selling some sort of finished or intermediary good. They are the ones investing in the supply chain. The other party is the vendor. The vendor is selling either raw goods or a small portion of the completed good that will be sold by the buyer. A good example of a product a supply chain vendor might sell would be steering wheels to a major car manufacturer or semiconductors to a phone or computer manufacturer. Contracts are important because they are the formal agreement between the two parties regarding the amount and pricing of the good that the vendor sells to the buyer in addition to any specific contingencies that either party may desire to be addressed. Contracts add an element of certainty and predictability in supply chains, but they cannot do this completely. Simon's idea of bounded rationality, Stiglitz's asymmetric information, and Keynes's fundamental uncertainty are all still quite present in the world of contracts, especially international supply chain investment contracts.

Incomplete contracts come into existence because it is usually impractical and probably impossible for contracting parties include all possible relevant contingencies into the contracts they create (Hart and Moore 1988). This is even more likely in an international context where there are countless variables to consider, and uncertainty abounds. Although the reality of the existence of incomplete contracts may seem like an issue at first glance, many in the field argue

that they are often preferable to more rigid contracts in reacting to changes that may occur in raw material pricing or large economic changes. Including strict fixed price controls in contracts can negatively impact the level of collaboration between the vendor and buyer which leads to inefficiency and blockages within supply chains (Morgan, Doran, and Morgan 2018). Zhao, Zhang, and Cheng showed that partially incomplete contracts increased central supply chain productivity because they allowed for renegotiation as real production cost differs from projected production cost (Zhao, Zhang, and Cheng 2020). In this way, incomplete contracts mirror Real Options Theory. They allow for reassessment after an initial decision is made. The optimal decision can change over time as changes in inputs occur or changes in firm goals and direction occur. In a longitudinal case study of a supply chain vendor and buyer, Coltman *et al.* (2009) showed how a large readjustment in the contract between the vendor and buyer led to a more efficient outcome that benefited both parties considerably. In the era of COVID-19, it has only become more obvious that sudden major world changes can occur at any time. Because of this some are arguing that incomplete contracts suit the real world better than stricter contracts (Cummins, Kauffman, and Choi 2021).

SECTION 3: Why are Supply Chains Special?

Part of what is being argued in this project is that international supply chain investment is undertheorized in International Economics because we do not understand the decision-making processes that go into this type of investment. In this section, I argue that international supply chain decision-making is unique compared to that of other types of investment. This is due to several key factors, enabled by its history, that separate it from other types of investment. I will first show how the transformation from localized production to international supply chains allowed for these unique aspects to arise then compare international supply chain investment to other types of investment.

A Brief History of International Supply Chain Decision-Making

To understand the complexities of international supply chains, it is necessary to understand where they came from. In this, we will see how recent a creation the international supply chain system is and how revolutionary compared to its predecessor. . This brief history will help give an understanding as to why decision-making in international supply chains may be novel compared to other types of investment decision-making.

The system of global production before the international supply chain revolution was namely one of production clustered in the Global North with products dispersed globally. This marked a continuation of the colonial trend of industrialization of the Global North and deindustrialization in the Global South (Baldwin 2012) . After WWII, the United States, and later Japan, were the workshops of the world. Due to the complexity of the coordination of largescale manufacturing, its decision-making tended to be localized. A good example is heavy

top-down corporate decision-making in the automotive industry of the United States being localized in the city of Detroit (Liu 2020). Many industries tended to look like this. The decisions were made locally and corporately because the costs of communication and coordination across large distances and many individuals was so great.

A major shift occurred in the 1980's which led to a transformation in global production. This shift was the ICT revolution. It eliminated the main constraining factor keeping supply-chains highly localized - long distance communication costs. This has been called the Second Unbundling of Globalization which for supply chains meant two things: "The ICT revolution made it possible to coordinate complexity at distance" and "the vast wage differences between developed and developing nations made separation profitable" (Baldwin 2012).

This led to the internationalization of supply chains coordinated by "headquarter economies". This means that decisions about procurement and investment were now made by decision-makers who were very far away from where their investments were going. Decisions were also made in a less centralized way. The ICT revolution made it easier for individuals to communicate without as many barriers. This made the delegation of supply chain decisions possible, and supply chain managers and procurement investors became standard positions in manufacturing companies. This means that individuals have large sway in the decisions being made and makes supply chains more comparable to other types of investment. But it is still novel in that is highly complex/uncertain and yet allows for a relatively high level of flexibility. This will be explored thoroughly in this next part of Section 3.

International Supply Chain Investment is Unique

In the following I will show how supply chain investment is unique among several other key types of investment: traditional foreign direct investment, short-term portfolio investment, and long-term debt investment.

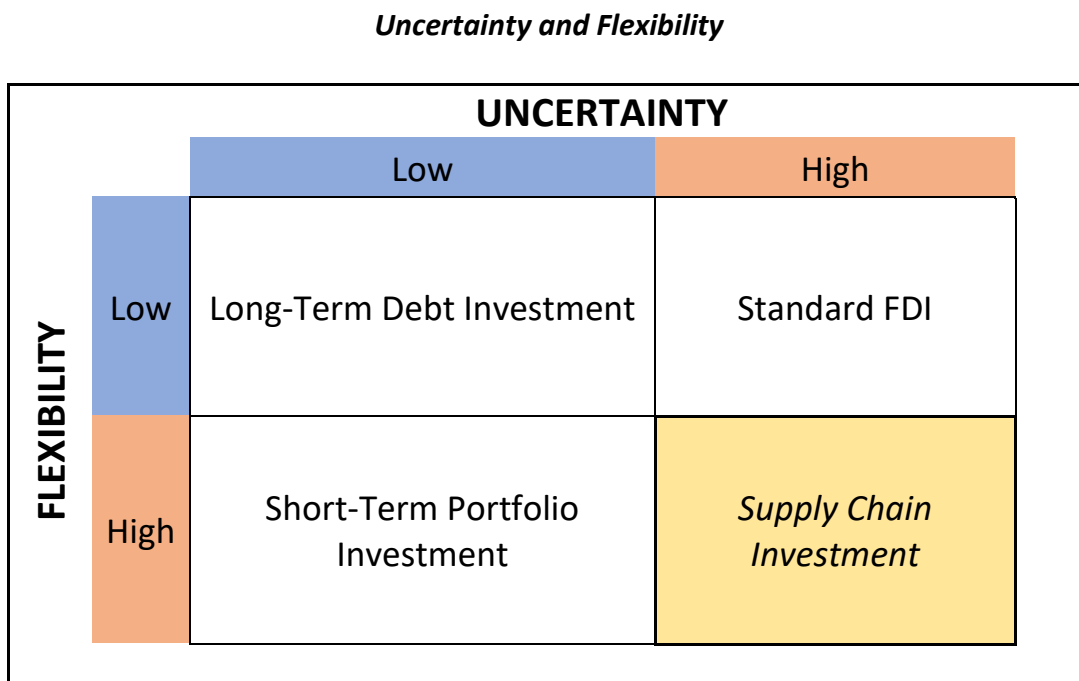


Figure 2: The Uncertainty-Flexibility Nexus

Supply chain investment rests in a special quadrant of the nexus between flexibility and uncertainty. Flexibility, for the sake of this study, means the ability to change the makeup of the investment relatively quickly. It can be thought of as the inverse of “lock-in”. When a long-term debt investment is taken on, a defining characteristic is lock-in. These are commonly corporate or treasury bonds that reach maturation after at least one year, often five or ten years. This is quite different than most short-term portfolio investments, in particular equities. It is not

uncommon to see the make-up of a short-term portfolio drastically change in the matter of a week or even a day. Supply chains see a similarly high level of high flexibility (albeit probably less than short term portfolio investment, but I am speaking relatively), especially when compared to traditional foreign direct investment. When supply chain decision-makers invest, it is usually a procurement investment. They are spending money to add an existing supplier, manufacturer, or distributor into their supply chain. This contrasts with traditional foreign direct investment which looked more like an agreement to simply build a factory in a foreign country. Supply chains shift by adding or subtracting various elements. They have a relatively low level of lock-in, especially compared to traditional FDI.

On the other side of this nexus is uncertainty. While all these types of investments involve some level of fundamental uncertainty, what I mean here by uncertainty is long-run uncertainty about the world. Long-run debt investment largely seeks to separate itself from uncertainty through fixed maturation. Some may take issue with my classification of short-term portfolio investment as having relatively low levels of uncertainty. While it is true that markets can change on a dime and that it can be hard to pick winners in equity, short-term portfolio investment mitigates a large amount of uncertainty simply by being short-term. Next week or tomorrow holds much more certainty than a decade from now. This separates it from foreign direct investment and supply chain investment in that both are more global involving many people and environments, and they are on a longer timetable. These two factors, especially in combination, create relatively high levels of uncertainty for these types of investment. Not to jump the gun, but a quote from the research I conducted summarizes the uncertainty and complexity of supply chain investment well,

“Your topic here is extremely complicated. Starting up a manufacturing investment is extremely difficult. Probably one of the most significant things you can do other than a merger acquisition of a major company. I mean, it's extremely (complicated). It takes years and years and has all these variables that are constantly being adjusted”

Both uncertainty and flexibility affect and constrain the decisions one makes. Supply chain investment sits in a unique quadrant of the uncertainty/flexibility nexus. It sees both high levels of uncertainty and flexibility. It has the advantage of options and many choices, - a characteristic of flexibility - in a similar way to short-term portfolio investment. Yet, it does do with longer-term goals that may be aided by or destroyed by an everchanging world. One of the key differences between supply-chain investment and traditional foreign direct investment versus long-term debt investment and short-term portfolio investment is the goal in mind. For the latter two, both securities, the goal is for the investments themselves to increase in value and bring profit. This is not the case with the former two. The goal for FDI and supply chain investment is to achieve greater long-run profitability to a firm. This latter goal is more complex and opens it up to a greater level of uncertainty. But supply-chain investment is different from traditional FDI in that it has the benefit of a much lower level of lock-in. Investments are rarely static in supply chains. There is room for them to be changed over time.

What does supply chain investment's unique character mean for the decision-making processes involved? I suspect it means we will see either a combination of strategies used by short-term portfolio investment decision makers and by traditional foreign direct investment decision makers. Both have been covered in Section 2 at some level. Much of Behavioral

Economics and Behavioral Finance has focused on short-term portfolio investment. Part of the goal of this project is to see to what degree the strategies of international supply chain investment decision-makers fall in line with this existing field of literature. I suspect that it will to some degree, but that we will also find novel and unique strategies used.

SECTION 4: Methodology

Methodology/Research Design

The methodology for my research is greatly inspired by a study done by (Fenton-O’Creedy et al. 2011). They conducted surveys of securities traders in several London brokerages to see the role of emotion in their decision-making. My research style is similar. I conducted a series of semi-structured interviews with international supply chain decision-makers in the Denver area. Due to the smaller scope of this project, it is an undergraduate honors thesis after all, it is not by any means a comprehensive study. I interviewed five international supply chain decision-makers, primarily based in Denver (one in Sao Paulo) and all working for Denver-based firms. Their roles varied from Vice President to Consultant to Supply Chain Manager. This is not a statistically significant sample, but for the goals and style of my research, I believe this is acceptable. My interviews were based on a series of questions provided to each participant. Many of the questions centered around decision-making processes and tools, but also questions about COVID-19 in supply chains and international variables were included. I felt these were both necessary in understanding their decision-making processes even if they were not strictly decision-making questions. All listed questions were asked in each interview, but conversations varied. The interviews were conversational in nature.

This project should be categorized as exploratory research. The goal in mind is to better understand international supply chain decision-making and to fill the gaps in Economics regarding international supply chains. Before we can go about closing the gaps, we need to know what is even worth researching within international supply chain decision-making.

How I attempt to do this is by listening to how people in the field talk about their decision-making processes and synthesize that into an International Economics and Decision-Making theory perspective. From this, I can find topics that are interesting for further research. I show these areas of interest in Section 5 by organizing quotes into key topic areas and fitting them into groups of ideas. My hypotheses going into the interviews were split into three main groups: that participants would follow “gut feelings” to a significant degree, that participants would rely heavily on data and business models, or that participants would synthesize these two. My last potential hypothesis turned out to be most correct, but the story is more interesting than I imagined.

Formal Questions Asked in Interviews

Participant Information Questions

1. In what industry do you work?

Manufacturing, Tech, Finance, Consulting, Energy, Other (please specify)

2. What is your role is exactly?

E.g., Investor, Investment Advisor, Researcher, Independent Decision Maker, Team Member, Manager, Director, Other (please specify)

Free Response Questions

1. What country level factors play a role in where you would choose to invest or disinvest regarding your supply chain?

2. To what extent do precise cost/quality issues play a role is sourcing adjustment?

3. To what degree does your intuition based on experience inform the decisions you make?
4. To what degree do company norms and policies inform the decisions you make?
5. To what degree do your “hunches” affect your investment choices?
6. How do you evaluate potential risks in your supply chain investment?
7. What do you do to mitigate uncertainty in supply and potential bottlenecks?
8. Is there a need for more flexibility in supply chains? If so, how can this be achieved?
9. Has Covid-19 changed the parameters of how you think about supply chain investment, organization, contracts, and contingencies?

Ranking Questions

1. Rank the following from most to least important in your decision-making process-
Economic Models, Industry Reports, Company Policy, Intuition, Company Norms, Informal Benchmarks, “Hunches”, Past Experience
2. Rank the following country level institutional variables from most to least important regarding international supply chain investment-
Political Risk, Proximity to other parts of supply chain, Similarity to home country, Economic and Tax policy, Environmental Factors, Infrastructure,

SECTION 5: Interviews and Discussion

In this section, I report the findings from the interviews I conducted. I break quotes into three different parts which correspond with a general topic. Part 1 will cover what participants said about outside international factors that affect the choices they make regarding their supply chains. Part 2, the bulk of Section 5, covers their decision-making strategies. This part is broken into three smaller groups: business models/technology, intuition and tacit knowledge, and contracts/relationships. I believe part 2 is the most important piece of this entire project. Finally, it would have been remiss had I not asked participants about COVID-19, so part 3 records their thoughts about how the COVID-19 pandemic has affected international supply chain decision-making.

Part 1: Outside International Factors

Though this project is largely focused on internal decision-making variables that affect the allocation of international supply chain investment, it would be remiss if I did not include a section about how participants talked of external factors that play a role in their investment decision-making processes. Think back to **Figure 2** from Section 3, the nexus of uncertainty and flexibility. The effect of outside international factors is where international supply chain investment is more like traditional FDI than it is to short-term portfolio investment. Government policy, factor endowments, and culture are all factors that have been theorized to influence international investment and trade. In this subsection I cover how participants talked about each of these three factors.

Government Policy

It was clear from the interviews that supply chain decision-makers agree that the government policy of wherever they are considering investing plays a role in how the choice is made. In fact, from the ranking questions, for outside international factors, political risk was consistently ranked in the top three and economic and tax policy was ranked in the top two by four of the five participants. Government policies matter. Consider the following statement made by a participant:

“I think the one thing that affected us the most recently, well besides COVID, was the tariffs. The tariffs that happened several years ago have been the biggest factor outside of COVID here in the last four years. It is very significant. Our business had not seen such massive change in international trade until that happened.”

As the largest factor outside of COVID-19 this signifies something immensely important, although, this same participant noted that there is a degree of relativity in the level of importance of government policies. When asked if natural resources or labor costs and supply are much bigger factors than government policy in general, they responded with

“It depends, right? It depends if you're talking about a country that is strongly opposed to manufacturing. That would probably trump the environmental natural supply chain and labor factors.”

The importance of government policy appears to be dictated by the political direction of the policy. This is understandable. If a particular government is strongly anti-manufacturing or strongly anti-trade/foreign investment, it follows that if it acts on these political leanings, the

policies it enacts will be important for international supply chain decision-makers. The importance of government policy is more a question of relevance. Governments' make all sorts of policies that bear no relevance to international supply chains. When they make policies that are relevant, like the massive increase in US/China tariffs, then they start to increase in importance. It is also worth mentioning that because relevant policies are driven by different local politics, some governments tend to be more important than others,

"If you want to do manufacturing in China, the government is absolutely more important than the private sector. In the United States, it's probably the other way around, and Europe's kind of in between. Developing nations where it's more of focus on the business side."

What kind of government policies did participants single out as ones that will affect their investments? Participants mentioned several explicit government policies such as taxation and business regulation. What they mentioned more were factors that may result from government policy over time. These are factors like number of ports and sophistication of port infrastructure, road infrastructure, airport sophistication and access, and average level of education in the workforce. Participants noted that these latter factors trump explicit government policies. What is interesting is that this inverts the assumptions behind many neoliberal policy recommendations for attracting investment. Low taxes and less regulation may be appreciated by businesses seeking to invest parts of their supply chain into a given country, but these policies are not the critical variables. Infrastructure is far more important to a supply chain investor than a tax break. This may lend credence to more heterodox economic views that suggest that neoliberal structural adjustment policies are not helpful and that may

argue for greater government spending on infrastructure. With this said, there are a few key caveats to this assertion which have to do with factors endowments, considered in the next subsection.

Factor Endowments

The idea that factor endowments are a determinant of trade and investment has its origins in the Heckscher-Ohlin model discussed in Section 3. In their model, labor and capital were the only two factors. Since their model came out in 1933, other factors have been added and seen as important. These include natural resources, knowledge capital, and technological capacities (Stern and Maskus 1981; Carr, Markusen, and Maskus 2001). For this section, I do take a broader view of factor endowments which includes infrastructure. I do not assert that these factors are completely fixed, as policy can play a role in changing factor endowments, but they are relatively fixed, especially from the perspective of an international supply chain investor. I also include physical location as an endowed factor. Participants tended to emphasize endowed factors, especially infrastructure, over short-term government tax or regulatory policy. In particular they emphasized physical location as a key factor. The following quote illustrates the importance of relative factor endowments compared to government policy well,

“There's a lot of things that go into where you want to source your products. In economics they probably tell you things like government. You know, local regulation, labor force, all those types of things... We're always looking for a best cost country. What makes sense for us in terms of raw material availability, local

ports, airports access to ship our stuff around the world, what does that do to our lead time where our customers are huge.”

Note that the participant emphasized the importance of the factor endowment of natural resources and infrastructure over regulation. What is more interesting is the comment about lead time. Participants consistently mentioned proximity towards the rest of their supply chain as a key factor,

“We typically, not always, but typically follow our customers. If they're going to open a new location or expand in the UK, or Russia, we might choose to expand with them, or our competitor may choose to expand with them regardless of some of that political environment there is. There's some limit to the risks the corporation will take, even for any customer, but generally speaking, we aren't going into Serbia, for example, without a customer.”

From this comment, and others that echoed the same sentiment, it is reasonable to say that supply chain decision-making (from an outside international variable viewpoint) may fall into line with an altered version of the Gravity Model of International Trade. It asserts that international trade between countries is determined by the economic size countries and distance between them (Isard et al. 2017). If this were applied to supply chain investment, it may look like asserting that the amount of supply chain investment into a given country from another may be determined in large part by the existing amount of supply chain investment into that country and distance between other parts of the supply chain. Based on the interviews I conducted it would make sense to supplement such a model with relative factor

endowment insights from the H-O model and its successors, and a small amount of weight should be given to tax and regulatory policy.

Culture

It would be remiss if I had not asked participants about international cultural factors that play a role in their decision-making about supply chains. It was clear, generally, that cultural differences did not play a large role in the procurement part of international supply chain investment. Participants cared more about government policy differences than they did about differences in culture,

“There's more interchangeability (in terms of business policy) when you say Czech Republic versus Poland versus Germany. You're not talking a massive (business policy) difference. When you look at New York versus West Virginia, in terms of proximity, very close and yet very different for our business... Cultural differences aren't that big of a factor necessarily because there's more of a difference (in doing business) between New York and West Virginia than Czech Republic and Germany while there's probably a bigger cultural difference between Czech Republic and Germany versus New York and West Virginia.”

The same participant who said the quote above did note that culture does play a role in how policies are formed. Culture can drive politics and politics drive policy. Apart from policies, differences like language, religion, or other key cultural signifiers were not important in the decision-making process. Out of the ranking questions, “similarity to home country” was ranked as least important by every participant.

Another participant mentioned that culture can play a more important role in the management side of international supply chain decision-making,

“A person in Singapore is not going to tell me anything that's going to upset me. Have you heard of the Hofstede matrix¹? So, in practical application, while maybe it's not 100% perfect in every sense, the person from Singapore is simply not going to tell me that (which might upset me). That the pressure in the machine is too high. And this is going to fail. But the young degreed engineer who's taking us through the plant whose drawing it is and whose product it is, is, is sitting there going “But that's what I specified”. He's going to keep trying to run it like that (without adjustment)”

Culture plays a role in how a supply chain manager goes about streamlining their supply-chains. By virtue of this, it may play a slight role in investment decision-making process, but the investors and managers are usually different people, so this is probably not too common. Even the participant who mentioned the quote above downplayed the importance of international cultural differences in the international supply chain decision-making process.

In review of part 1 of Section 5, it appears, from my sampling of participants, that endowed factors are more important than government polices like taxation and regulations, and that these government policies are more important than international cultural differences. Again, of the factor endowments, the most important were infrastructure, which the

¹ “Geert Hofstede, assisted by others, came up with six basic issues that society needs to come to term with in order to organize itself. These are called dimensions of culture. Each of them has been expressed on a scale that runs roughly from 0 to 100” (Geerthofstede.com 2021).

government can play a role in creating and maintaining, and physical proximity to customers and other parts of the supply chain, which the government cannot control.

Part 2: Decision-Making Processes

The previous section focused on outside international factors that play a role in the international supply chain investment decision-making process. This section will cover the strategies and tool that supply chain investment decision makers use. The point is to show how decisions about supply chain investment are made. Based on the interviews I conducted, this section will be broken down into three subsections. The first subsection will deal with how participants talked about the use of business and economic models and technology in their decision-making. The second subsection will cover the role of intuition and tacit knowledge. The final section will show how participants understood the role of contracts and especially relationships in the process of supply chain investment.

Business Models and Technology

This subsection focuses on how participants reported they use strategies and tools in their decision-making process. The most common strategy/tool talked about were business models. Business models were consistently ranked highly in the ranking part of the questionnaire and multiple participants stressed their importance heavily in conversation,

“We use a principle called EVA², which is economic value added. It tells you how quick you can get a return on the invested capital. It not only measures how fast but to what level, so we measure all investments and every purchase, over a certain amount, using the EVA model. So, if we're going to add a warehouse, or we're going to buy 25 new can inspection cameras, or we're going to build a plant in Russia, we're going to still use EVA as the model”

The particular participant who is quoted above stressed the importance of using the EVA model across the board,

“Whether it's a brand-new investment, whether it is a capacity increase, we use it, whether we're looking at buying a competitor, or we're looking at buying a supplier or entering a new business... The same model is used for everything we do... that's how we look at divestitures as well”

The EVA model was mentioned by almost every participant (including those based in another country) as being the most important part of their decision-making process. As a model, it is very similar to the Real Options theory mentioned in Section 2. The only difference is that Real Options Theory has a more concrete way of quantifying if continuing an investment is a good idea compared to the EVA model. With that said, the way participants described how they use the EVA model is interchangeable with Real Options theory. This is especially true because of how they talked of their processes for divestiture.

² “Economic Value Added (EVA) or Economic Profit is a measure based on the Residual Income technique that serves as an indicator of the profitability of projects undertaken. Its underlying premise consists of the idea that real profitability occurs when additional wealth is created for shareholders and that projects should create returns above their cost of capital” (Corporate Finance Institute 2021a)

Other business models were also mentioned as having a role in the decision-making process:

“Six Sigma³ is standardized in our industry, and everybody uses it. It’s basically a structured approach you use to make sure you use data and analysis to make decisions.”

Another participant talked of how they adapt a model developed for other purposes to fit the needs of a supply chain decision-maker:

“Mackenzie has a model which is called a 7S model⁴. I used the theory of their 7S model and convert it to a supply chain model.”

Participants consistently mentioned that models are not just numbers and graphs, but that they encompass a wider range of variables,

“It’s not only quantitative or qualitative, it’s both.”

A common theme among participants was the idea that using models can help mitigate uncertainty. Though it is more of a rule of thumb than a model, the idea of diversification and using many suppliers was universal:

³ “The term Six Sigma refers to a set of quality-control tools that businesses can use to eliminate defects and improve processes to help boost their profits. It was developed by a scientist in the 1980s while he was working at Motorola. Six Sigma is a statistical- and data-driven process that works by reviewing limit mistakes or defects. It emphasizes cycle-time improvements while reducing manufacturing defects to no more than 3.4 occurrences per million units or events. This means that an error generally occurs with a six-standard deviation event from the mean because only 3.4 out of a million events along a bell curve would fall outside of six standard deviations” (Hayes 2021).

⁴ “The McKinsey 7S Model refers to a tool that analyzes a company’s “organizational design.” The goal of the model is to depict how effectiveness can be achieved in an organization through the interactions of seven key elements – Structure, Strategy, Skill, System, Shared Values, Style, and Staff”(Corporate Finance Institute 2021b).

“The first and foremost (strategy for mitigating uncertainty) that comes to mind, is really diversifying with your suppliers. You don't want to use one supplier for 100% of anything.”

Another participant said,

“Never had a have a single source, so work with 80/20 or 70/30.”

Several participants noted that they use technology to mitigate uncertainty. Working with startups is a good way to find new ideas and to make sure that supply chains are streamlined and stay up to date. Technology paired with big data is also incredibly important for supply chain procurement and management. One participant said when talking of procurement data technology:

“(There is) a big matrix of 10 to 20 different factors that go into it when they onboard a supplier: their capabilities, their reputation. They're a kind of volume that they can handle, and it all goes into a big matrix, and they're all different, weighted at different things based on a project”

Another noted:

“There's a lot in terms of software today that does optimization planning and reducing supply chains. All of those are data driven and take current market knowledge from freight forwarding companies... So, they've got the data and it's going to give you accurate lead times etc.”

Related to the last quote above, I made a point of asking participants about the degree to which industry reports affect their decision-making. Most answered in terms of big data which inevitably involves business models and technology. Tech is constantly taking in real time

industry reports and integrating them into specified and contextual models. On the flip side, one participant talked of industry reports in a different and insightful way,

“I value industry reports...They're filled with absolutely crucial information that forms the baseline of what good economic thinking and planning on supply chain should be. If you don't have it, then you're solely reliant on the rumors that you hear, the things you get from the public trade publications, which may be running behind. They may not be giving you alerts fast enough. I think it's an 80/20 thing, where 80% of the people ignore them or they look at them once a week. 20% of the people, they look at it the first thing every day before they ever do anything... They combine that intimate knowledge that they get with the market and, eventually, that builds exceptional experience, skill, hunches, etcetera. A data model in the back of their minds. Yeah, they just automatically know (what to look for). And if they bite in, they go out and deal with it today as opposed to waiting for the data to show up tomorrow.”

This quote will bring us to the next subsection which talks of intuition and tacit knowledge in full. In brief review, supply chain decision-makers express that they value business models and technology highly. All the participants claimed that most of their decision-making comes from business models, in particular the EVA model and Six Sigma. The next section will cover how hunches, a staple study of Behavioral Economics and often the opposite of business models, factor into their decision-making process.

Intuition and Tacit Knowledge

This thesis is primarily an exploratory study focused on a particular group. A hallmark of decision-making and Behavioral Economics research is investigating the role of “hunches”. How much of the process is based off an educated guess versus a more “rational” way of making decisions? For this study, I asked supply chain decision-makers a variety of questions related to hunches. In general, participants were quick to say that hunches played a very small role in their decision-making process,

“There's very little intuition involved there. There might be a slight amount when you talk about the intangibles. You know, I would say. A small percentage. Is based on intuition or speculation. 95 Plus percent is all based on numbers.”

While there is a recognition of intuition in this statement, it is a recognition of a small amount of intuition that would be made in any decision. Another participant put it frankly,

“The most important factor in supply chain is safety. We make important decisions that in a lot of cases are life or death and we make big financial decisions and if you screw up a \$10 million decision, you're going to lose your job. We don't do things based on whims and hunches.”

From these statements, and others that echoed the same sentiment, along with hunches consistently being ranked lowly in the ranking questionnaire, participants clearly did not see hunches or intuition as playing a large role in their decision-making process. This makes sense. Supply chain decision-makers are making a business investment, not a securities investment. They invest to build a better supply-chain for their company, not just to profit off the investment. This is a way that supply chain decision-makers are different from a securities

trader. It appears that supply-chain decision-makers do not rely on hunches as much as business models and data.

There is one key area of investment that participants did mention where intuition must play a role. This is in investment into a new product,

“The innovation side is going is a lot more risky and a lot more intuitive.”

A company can do all the preliminary research it wants to, but it can never know for sure if a new product will sell well. Innovation is indeed riskier and does require a higher level of intuition and reliance on hunches, because unknowns play a bigger role in the decision.

What may be more interesting than the information and conclusions gathered above is that participants often replied to my questions about hunches or intuition with a key distinction. They were dismissive and even hostile to the idea of hunches or intuition as guesswork. They instead brought in a different idea of intuition. Take the following quote,

“Most don't call it intuition; we call it experience. So, what you have is somebody says, well, wait a minute. We have three plants in Phoenix. We don't want to put another plant in Phoenix because 15 years ago there was a massive power outage that affected the western part of that city for 14 hours. That's a good point, right? Yes, that's kind of an intuition thing, but it's more based on experience.”

Intuition based on experience is separate from the idea of a hunch. It can almost be described as background knowledge. This is *tacit* knowledge. The idea of tacit knowledge is attributed to scientific philosopher Michael Polanyi who first wrote about it in his book *Personal Knowledge* and was expanded in *The Tacit Dimension* (Polanyi 1962; 2009). Cambridge Dictionary defines it

as “knowledge that you do not get from being taught, or from books, etc. but get from personal experience, for example when working in a particular organization” (Cambridge Dictionary 2021). It is distinct from hunches because it is not simply whims. It is real knowledge, but very difficult to express. This was clear from the interviews as all participants tried to describe it (without saying tacit knowledge) but came about it in different ways and often struggled to clearly define it,

“There's going to be some degree where the numbers look one way, but we feel like this is still a really good idea. There is some of that, but I don't know that I'd ever call that intuition.”

and,

“There is a feeling- I wouldn't use the word hunch-but I have a feeling here. A feeling that's based on what is in my brain with the experience that I had that- it's difficult for me to put into words- but it's not a hunch. It's a feeling based on what I've lived.”

The participants often acknowledged that tacit knowledge is important, yet it is mostly a jumping off point, or a useful foundation for decisions. They talked of it more as an aid to making decisions than as a key variable that causes them to invest one way or another. Several quotes exemplify this sentiment,

“The foundation of every decision you make as a leader needs to be a function of structured problem-solving using data and costs to make good decisions. Your intuition and experience are important, but it lies on top of the foundation of good, structured problem solving”

Another spoke of how tacit knowledge can be an aid in decision-making,

“The experience helps me know how to react and not to freeze. The experience helps to be confident... You know the market. You know the people. You know what to expect. The fact is that you know how the engine works. Experience helps that.”

A quote that shows tacit knowledge as a start point is the following,

“(Intuition) points you in a direction but not an answer, it's really a jumping off point to investigate something”

Participants claimed that tacit knowledge is an integral factor in their decision-making process, but it is not convincing without data and business models to back it up. It helps them explore new ideas, get a feeling for the market or environment they are investing into, and aids them in the choice making process. In brief review, participants claimed that simple “hunches” do not play an important role in the decision-making process and that data, tech, and business models are more important. They stated that the only area of investment where hunches are more important is into innovation or new markets. Finally, they suggested that tacit knowledge is key, but not convincing on its own.

Contracts and Relationships

One last key important combination of factors that go into international supply chain decision-making is that of contracts and relationships. I included several questions having to do with flexibility in the questionnaire for participants. I thought that this might be a good way to talk about incomplete contracts and that area of economic thought, but the questions about

flexibility just led to conversations about the impact of COVID-19 on international supply chains. These conversations will be covered in part 3. What is fascinating is that my questions about contracts led to an aspect of decision-making I had not considered, relationships.

A consistent theme in conversation with participants is that there are two “levels” to relationships. The first level is the formal contract. This includes the hard numbers and details of what needs to happen in the relationship between supplier and buyer. The main point of this level of contract is protection and clarity:

“The individuals writing the contracts get into the level of detail that creates uniform transparency of understanding.”

This is especially important considering the complexity of international supply chains. Contracts act as a simple way of ensuring that a supplier and buyer have the same baseline understanding of what is going on. Contracts are sometimes thought to be constraining, but from what I gathered from the participants is that there is always some level of flexibility in supply-chain contracts, especially when dealing with commodity prices and shipping rates. Contracts are only the baseline. What is interesting is that participants talked of a second level of contracts.

Relationships are what underly contracts. Formal contracts present clarity and give protection if need be. Informal contracts are the non-legal mutual agreement between buyers and sellers. “Clauses” in these agreements might be the way discourse is handled, a tolerance for flexibility if the job gets done, and an acknowledgement that a supplier and buyer can depend on each other at some level. The following quote summarizes this general idea well,

“There's a need for better contractual relationships. What I work on with my clients is not more onerous, laborious contracts, but better relationships. It's a relationship game. Contracts support a relationship, not vice versa.”

This quote shows an important distinction. Legal contracts, though formal, are the less important of the two levels of contract. Relationships are what help build a better supply chain. One participant put relationships on the same level as business models and data in importance saying,

“You have to be able to make structured, rational, empirical analytical decisions, but you've got to be a really good relationship builder. If you have both, you're going to be successful.”

Participants also noted how good relationships with suppliers acts as a sort of security. If a supplier knows that they will not be dropped at any better offer, the buyer will have leverage in the future if the supplier finds a better deal,

“If somebody tried to bump us down and you had a really good relationship with that supplier, you could pull some strings there to say, “Hey wait a minute I get that you maybe prioritize us lower, but we need you and here's the reason why we have more opportunity for you””.

Good relationships open doors and act as a sense of security. Another participant echoed this,

“You're not trying to screw your supplier; you're trying to have a good relationship so that when the chips are down and you need them, they're there for you. Conversely, some companies nickel and dime... Now (during the COVID-19 Pandemic) they're screwed.”

One last way that relationships were said to be important is that they add another level of data. It is not hard numbers and facts, but a softer type of data which is sometimes important. Rumors, tips, warnings, and inside information can often be important to procurement decision-makers and supply chain managers. This information is not accessible public, only through knowing people well and being trusted by them. One participant described it this way:

“Person to person connectivity to build relationships that surpass data alone with superior insights at a macro level”

In review of this subsection on the impact of contracts and relationships on the decision-making of international supply chain investors, it appears that relationships are of key importance. They are the foundation of contractual relationships. Contracts are only a formal and supporting aspect of a relationship. Relationships provide security in supply chains, open new doors, and allow for access to a different type of data than is readily and publicly available.

Part 3: Flexibility and COVID-19

For a thesis written during 2021-2022, it was obvious that a section related to the COVID-19 pandemic should be included. This section is relatively short and different from the last two, but is necessary, nonetheless. I included several questions in the questionnaire for participants related to COVID-19 and much of the conversations surrounding flexibility are intrinsically linked to the supply chain shock, buildups, and bottlenecks that have occurred since March 2020.

The most common theme across the board regarding participants' views of COVID-19's impact on international supply chains was that it is a temporary issue that exacerbated existing issues in supply chains:

"COVID-19 is kind of opening people's eyes to the importance of supply chains. But you know some of the fundamental problems with supply chain existed before. Shortage of truck drivers, the way manufacturing works, the way sourcing works, the way logistics works, balancing public and private good, impacts on the environment. All these things were wrong (before the pandemic.)"

and,

"The impact of COVID is a trigger for the inability of today's supply chain to do what it needs to do."

When it comes to how participants have changed their strategy due to the pandemic, a few participants, in particular the participant operating in South America, claimed that they have focused their supply chains more domestically, or in foreign countries closer to their home country,

"I tend to have more domestic suppliers closer to me, around the corner, so that we don't have issues with freight or shipping, trucks, country borders. I tend think that everyone is."

When I asked participants questions about flexibility in supply chains, the conversation often turned to issues regarding breakdowns during COVID-19. What participants generally said about flexibility is that supply chains were already quite flexible before the pandemic, but that issues with shipping were already becoming more common; COVID-19 just made them worse:

“Everything today that we do has to have inherent flexibility, and I would say that we were like that before COVID, but we're definitely like that now because there's this whole situation that occurred that no one ever thought of. What's the next thing we haven't thought of?”

Participants also made a point of saying that larger buffers are not the best or only answer to the supply chain crisis. It was also noted that adding more buffers is easier said than done:

“I think they're limited (in terms of flexibility) by their capital.”

A quote that shows a participant's view of the downside of buffers is the following:

“What happens is you get overstocked with goods that no one wants. In a society that values eliminating waste, material waste, I don't see us really getting rid of (nimble supply chains).”

One participant offered an insightful opinion into what they believe the future of supply chain flexibility will look like,

“I think that nimble supply chains, what manufacturers and producers are going to ultimately look at, is being able to convert from doing A to doing B. I'm an alcohol distiller, and next month I'm making hand sanitizer.”

In their view, true flexibility will be in increasing the capabilities of supply chains. If supply chains are capable of multiple purposes, then they will be able to meet demand in a better and more timely way. This will add greater flexibility to the system at large and help mitigate the blockages such as the ones we saw during the COVID-19 pandemic.

In review of participants' views of the impact of COVID-19 on international supply chains and their views on the future of supply chain flexibility, I was able to obtain several insights. The

first was that COVID-19 did not drastically change the supply chain philosophies of participants. It just highlighted the existing problems in international supply chains. Participants claimed that more flexibility in supply chains is a good idea, but companies are limited by capital if they attempt to do this with larger buffers. Finally, participants noted that increased flexibility will come by making supply chains increasingly multifaceted, not from buffers alone.

Section 6: Assessment and Conclusion

In this brief and final section, I do a few things. I first assess the three hypotheses that I presented in Section 4. It is worth noting that these hypotheses were used more as a jumping off point. They informed the type of research I undertook and certainly the questions I asked participants. The nature of this project is exploratory. While I accept and reject different hypothesis, I am not claiming these to be true or untrue across the board or even for the majority of international supply chain decision-makers. In the context of an honors thesis, it was simply not possible to do the type of research necessary to make such claims. I next point out a few areas I believe would be interesting areas for further research into international supply chain decision-making. Finally, I present some conclusions.

Assessment of Hypotheses

In Section 4 I laid out three hypotheses. These were (i) that participants would follow “gut feelings” to a significant degree, (ii) that participants would rely heavily on data and business models, or (iii) that participants would synthesize the two.

I reject the first hypothesis. From the interviews, it was clear that participants were firmly opposed to the idea of recklessly following hunches. Most participants were even hostile to this idea. Whenever they said that they did follow intuition, they qualified it in such a way that it fit the definition of tacit knowledge better than “gut feelings”.

My second and third hypotheses I accept but qualify them both. It was clear from the interviews that data and business models were the most important piece of the decision-making process for all participants. Because of this it is a hypothesis worthy of acceptance. I

qualify it only because other important non-quantitative variables were also quite important to participants. This is where I accept the third hypothesis. It is qualified in that participants did not rely on “gut feelings”, but on intuition characterized as tacit knowledge. Another key area of importance that my hypotheses did not cover is that of relationships. Relationships appear to be the third important piece of international supply chain decision-making.

Areas for Further Research

I believe there are three areas that, after having done this research, I believe would be beneficial to study further. I also believe that an additional *type* of research would be beneficial. My research was based on semi-structured interviews. These produced rich and qualitative evidence of how international supply chain decision-makers understand their own decision-making processes. An important further step would be to examine whether decision-makers truly do behave as they describe, one that empirically studies supply chain decision-makers as they are making real-time decisions.

Moving on to three areas of further research that my study suggests, I have not seen any research that touches on the importance of tacit knowledge in international supply chain decision-making. Tacit knowledge is a subject that tends to be under-studied in decision-making science at large, and in particular, economic decision-making science. A second area of research suggested by my study’s findings is that of the importance of relationships in supply chain decision-making. Do good relationships between suppliers and buyers create better supply chain outcomes? That is a potentially very fruitful research question. Finally, the last area

where further research should be done relates to how has COVID-19 has impacted international supply chain decision-making.

Conclusion

It was clear to me from the outset of this project that international supply chains are an understudied and undertheorized topic in economics and international relations. They have massive implications for both fields, but not much has been written about them, especially regarding decision-making. I am guessing this will change in the coming months and years as supply chains become more visible due to current supply-chain circumstances. The decision-makers I talked with know that supply chains are not well understood by the lay or academic community. Because of this, they were very open and excited to share information about their professional field. One piece of data that I learned from this research process that I did not report in my findings is that supply chain decision-makers tend to be decent people. They thoroughly believe that being decent and considerate is rewarded in their profession and creates better outcomes. The importance of good relationships and being an understanding person was frequently referred to by my interviewees. Good research is supposed to be generalizable. If anything that I uncovered from my research is generalizable, then it is this last key finding. The world at large should learn from it.

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