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High-Tech Industries' Global Resource Utilization and Transaction Cost Economics

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HIGH-TECH INDUSTRIES' GLOBAL RESOURCE UTILIZATION AND TRANSACTION COST ECONOMICS

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I. INTRODUCTION

According to Daniel Kahneman,[1] the Nobel Prize-winning psychologist, judgment and decision-making are distinct processes, and "most of the intuitions. . . were fallacies of judgment rather than decision-making."[2] Kahneman emphasizes the importance of delaying intuitions and "decision, that might be taken within an organization. . . because when you have formed an intuition, you are no longer taking in information."[3] Any international conglomerate with a long history of navigating the complexities of globalization and succeeding in building its global operations and business networks would likely find this point especially relevant. The once-standard cost-reduction strategy of offshoring or outsourcing is now under intensified debate and scrutiny. Relying on intuitions focused primarily on cost-saving, without sufficient information, can lead to adverse effects and has proven problematic in certain instances.

During the COVID-19 pandemic, many companies faced significant overseas supply chain shortages, forcing them to re-examine their global strategies to avoid costly, unplanned events that are nearly impossible to mitigate.[4] More companies are streamlining their offshore operations,[5] or reviewing their options more cautiously, partially driven by policy shifts prioritizing total societal cost and public interest.[6] As "[f]irms do not compete only against global competitors but against their competitors' supply chain,"[7] accurate decision-making and robust long-term planning in creating a reliable global business structure are increasingly crucial. This underscores a greater role for corporate strategists and counsels in vetting major business initiatives such as establishing or expanding

1. Daniel Kahneman, the Israeli-American psychologist and 2002 Nobel Prize laureate in Economic Sciences. *See Daniel Kahneman Facts*, NOBELPRIZE, https://www.nobelprize.org/prizes/economic-sciences/2002/kahneman/facts/ [https://perma.cc/2KVR-655L].

2. Adam Grant, *Daniel Kahneman Doesn't Trust Your Intuition (Transcript)*, TED (Mar. 16, 2021), https://www.ted.com/podcasts/daniel-kahneman-doesnt-trust-your-intuition-transcript [https://perma.cc/DM5T-SV87].

3. *Id*.

4. Glenn McGillivray, *An expert explains: How COVID-19 exposed the fragility of global supply chains*, WORLD ECONOMIC FORUM (July 30, 2021), https://www.weforum.org/agenda/2021/07/covid-19-pandemic-global-supply-chains/ [http://perma.cc/C48C-Y36Q].

5. Abe Eshkenazi, *Reversing Course: The Movement to Reshore Gains Traction*, LINKEDIN (Apr. 17, 2023), https://www.linkedin.com/pulse/reversing-course-movement-reshore-gains-traction-abe-eshkenazi [http://perma.cc/ZAT9-CPFM].

6. *Policy shifts may signal a new chapter in the story of globalization*, WHITE & CASE, https://www.whitecase.com/insight-our-thinking/policy-shifts-may-signal-new-chapter-story-globalization (last visited Mar. 26, 2024) [https://perma.cc/4HQZ-962].

7. CECIL BOZARTH & ROBERT HANDFIELD, INTRODUCTION TO OPERATIONS AND SUPPLY CHAIN MANAGEMENT (Pearson 2013), at 192.

overseas operations and supply chains, where principles of law and economics can be particularly relevant.

As Larry Bossidy and Ram Charan emphasize in their acclaimed number one New York Times Bestseller *Execution*, the selection of the right idea is paramount, as "[no matter how well you execute, the risk of failure increases markedly when the ideas you develop don't fit your existing capabilities, or force you to acquire those capabilities at too high a cost."[8] Most companies recognize that even the most "watertight" supplier contracts cannot fully protect business cases built on aggressive low-cost country outsourcing. Businesses should gather all necessary information and take the time to assess whether they have the capabilities to effectively utilize a global resource overseas. Because when things go egregiously wrong later, "litigation is not a popular strategy for handling supply chain disruptions" due to the cost and complexity.[9]

In most cases, globalization remains a compelling option that outweighs the trend of regionalization,[10] given its centuries of experience.[11] From the earliest exploration by adventurists' voyages to various forms of colonization and, ultimately, globalization, continuous technological revolution in transportation, communication, and computation propelled the geoeconomic progress of humanity.[12] Modern globalization, ignited by the Industrial Revolution was further expanded by the post-World Wars currency and trade agreements that lowered the international trade and investment barrier.[13] The world economy has become "integrated and interdependent," fueled by "market globalization" and "production globalization."[14] Unlike the colonial era, modern demand and supply expansion helped fill the "global resource

8. LARRY BOSSIDY & RAM CHARAN, EXECUTION, THE DISCIPLINE OF GETTING THINGS DONE 214 (2002).

9. *Attorneys: Litigation Not a Popular Strategy for Handling Supply Chain Disruptions*, CORPORATE COUNSEL (Nov. 4, 2021) https://plusai.lexis.com/search/?crid=bf189324-bf73-42fe-bdbb-5c0b00760125&pdsearchterms=LNSDUID-ALM-CORPCM-20211104ATTORNEYSLITIGATIONNOTAPOPULARSTRATEGYFORHANDLINGSUPPLYCHAINDISRUPTIONS&pdbypasscitatordocs=False&pdsourcegroupingtype=&pdmfid=1545874&pdisurlapi=true [https://perma.cc/QR3G-PMEJ]

10. Steven A. Altman and Caroline R. Bastian, *The State of Globalization in 2023*, HARV. BUS. REV. (July 11, 2023), https://hbr.org/2023/07/the-state-of-globalization-in-2023 [https://perma.cc/4LV3-VY9G].

11. Jeffery D. Sachs, *Twentieth-century Political Economy: A Brief History of Global Capitalism*, OXFORD REVIEW OF ECONOMIC POLICY, Vol. 15 NO. 4. 90, 98 (1999), https://www.earth.columbia.edu/sitefiles/file/about/director/pubs/Oxfordreview_winter99.pdf [https://perma.cc/MC2R-QM6K].

12. *Id*.

13. JURGEN OSTERHAMMEL & NIELS P. PETERSSON. GLOBALIZATION: A SHORT HISTORY, 8 (2005), 6-7.

14. CHARLES W. L. HILL, INTERNATIONAL BUSINESS (5th ed. 2005), at 6-7.

space," maximizing economic efficiency and promoting growth across regions, and those that have embraced these opportunities have benefited from transformational industrialization and economic development.

Early attempts at outsourcing date back to the 1970s when large companies began divesting non-core businesses to concentrate on their core business and enhance global competitiveness.[15] Remarkably, "outsourcing was not formally identified as a business strategy until 1989."[16] Decades later, many industries with labor-intensive mass production no longer have any domestic footprint, such as clothing, textiles, or consumer goods manufacturing. "Politically correct or not, the data demonstrates that outsourcing has become a standard practice in most companies today,' says. . . [the] principal and US leader for Deloitte Consulting LLP in Indianapolis."[17] The primary driver behind this type of decision has consistently been cost savings. Consulting firm Bain & Company estimated that companies could save 20% to 60% per unit by leveraging low-cost countries for low-value-added activities.[18] "Depending on the complexity of the production, there are plenty of choices on the map that can offer different levels of high-tech production."[19]According to a firm-created sourcing map (APPENDIX 1), places like Taiwan and Poland are well suited for projects with higher skill requirements, including basic design, drafting, testing and validation, data simulation, and production. On the other hand, suppliers in countries like the Philippines excel in supporting operations involving manufacturing planning, build-to-print production, and a "direct ship" logistics model to the end customers.[20]

Despite its long history, maturity, and cost advantages, some businesses do view globalization as a fallback plan instead of a preferred default, particularly when significant investment risks or contractual liabilities warrant extra caution. Traditional technology manufacturing industries often require substantial operational setups with both tangible investment and intangible efforts. The aerospace industry exemplifies this category, with its stringent qualification requirements and numerous regulatory or administrative safeguards specifically for this important

15. *A Brief History of Outsourcing*, NC STATE UNIV. (June 1, 2006), https://scm.ncsu.edu/scm-articles/article/a-brief-history-of-outsourcing [https://perma.cc/E5ZU-V4SQ].

16. *Id*.

17. Mary Siegfried, *Outsourcing Finds Its Niche*, INSIDE SUPPLY MANAGEMENT, Nov-Dec. 2012, at 23.

18. Till Vestring, Ted Rouse, Uwe Reinert & Suvir Varma, *The Move to Low Cost Country*, (Bain & Company 2005), https://www.bain.com/contentassets/587facb5dc9d4006a8fb2a1cef241f9e/bb_making_move_low-cost_countries.pdf [https://perma.cc/MZ7W-UCH4].

19. *Id*. (*See* Appendix 1. Opportunities to migrate manufacturing costs)

20. *Id*.

sector. As a vital part of the national economy and critical infrastructure related to transportation, this industry generated approximately $900 billion in global transactions based on 2019 pre-pandemic data[21] and remains relatively conservative in its approach to outsourcing. Despite the abundant global resources that could enhance capital allocation to fuel innovation and organic growth, only a relatively small proportion of production activities in this industry are truly outsourced. Another technology sector, the medical equipment industry, exhibits a similar pattern. The $512.29 billion medical devices market is projected to reach $799.67 billion by 2030,[22] but it also reflects a modest percentage range of global outsourcing.

This reluctance to fully embrace globalization can be elucidated through the lens of Transaction Cost Economics (TCE), a cornerstone of New Institutional Economics. In essence, transaction cost refers to various costs that "encompass all of the impediments to bargaining."[23] "Given this definition, bargaining necessarily succeeds when transaction costs are zero."[24] High transaction costs, often perceived as high investment risks, frequently became the rationale behind a conservative strategy against offshoring when mitigation proves impossible or prohibitively expensive. In heavily regulated sectors like aerospace, where flawless execution is paramount, transaction costs can be elevated in all phases of product development and contract life cycle.

Conceivably, the most detrimental outcome is a forced correction, meaning a reversal due to failed offshoring or outsourcing initiatives. This can be particularly costly when undertaken under tight program schedule constraints. Consider the example of an aerospace system supplier that was awarded a major contract based on its plan to outsource design and production to an Eastern European tech center. The initial bid was assembled based on an excellent business case and secured full approval from corporate business development and finance leaders after they carefully examined the cost-saving assumptions and the financial rate of return. However, twelve months later, the supplier's design failed to pass the qualification test. Under mounting time pressure, the redesign effort was rushed through and was unfortunately unsuccessful. Each design

21. *The Aerospace Industry Is Preparing for An Upturn*, Forbes (June 17, 2021), https://www.forbes.com/sites/forbesbusinesscouncil/2021/06/17/the-aerospace-industry-is-preparing-for-an upturn/?sh=2a341bb [https://perma.cc/367S-XAHG].

22. *Medical Devices Market*, FORTUNE BUSINESS INSIGHTS (Dec. 02, 2024), https://www.fortunebusinessinsights.com/industry-reports/medical-devices-market-100085 [https://perma.cc/9ZUP-KG5E].

23. ROBERT COOTER & THOMAS ULEN, LAW & ECONOMICS (6th ed. 2012), at 85.

24. *Id.*

change requires customer approval, causing an overrun of the program budget. The redesign also increased production costs, which were not recoverable from the end customer. Ultimately, the system had to be brought back in-house and re-scoped completely using the existing engineering and production resources. The final cost rendered the program unsustainable before production even commenced.

From the suppliers' perspective, globalization presents challenges related to market entry and sustainability, even if they have already established a presence. Some suppliers may find the complexities of operating in a global market to be overwhelming. While the appeal of global partnerships may attract new players, the realities of navigating through significant difficulties, daunting tasks, and liabilities can eventually force some to exit. Despite these practical hurdles, rapid deglobalizing has not materialized.[25] Most corporations continue to explore low-cost country sourcing options seeking guidance from their strategists and legal counsel. Insights derived from transaction cost economics can help inform the planning process in crucial areas such as risk mitigation, supply chain strategy, and contract selection.

In a world grappling with increasingly scarce resources due to accelerating consumption, global resource utilization will persist in pursuit of net benefits and improved economic efficiency. Any active participant should conduct thorough risk-benefit assessments using the transaction cost framework to identify areas that must be addressed in the specific transactional environment to ensure a successful outcome.

II. BACKGROUND

A. Transaction Cost Economics

From its origins,"[T]he fundamental ideas of Transaction Cost Economics (TCE) . . . emerged in the 1970s to offer a methodology through which to analyze how the governance of economic organization affects economic value."[26] Building upon the framework created by Ronald Coase,[27] the Nobel Prize laureate in economics and author of *The*

25. *Is the world economy deglobalizing?*, J.P.MORGAN PRIVATE BANK (Jan. 24, 2024), https://privatebank.jpmorgan.com/nam/en/insights/markets-and-investing/is-the-world-economy-deglobalizing [https://perma.cc/S94W-83SC].

26. Steven Tadelis & Oliver Williamson, *Transaction Cost Economics*, SSRN (Mar. 12, 2012), https://ssrn.com/abstract=2020176 [https://perma.cc/BGK7-XERK].

27. Referring to Ronald Coase's *The Nature of the Firm* (1937), which introduces the concept of transaction costs to explain the nature and limits of firms.

Nature of the Firm,[28] Oliver Williamson[29] describes that "a transaction occurs when a good or service is transferred across a technologically separable interface. One stage of activity terminates, and another begins,"[30] like the 2"'loss of energy"[31] in friction. In other words, "[t]ransaction costs are costs incurred that don't accrue to any participant of the transaction. They are sunk costs resulting from economic trade in a market. In economics, the theory of transaction costs is based on the assumption that people are influenced by competitive self-interest."[32]

To illustrate, the following sections will examine these primary types of transaction costs within a specific industry. Analyzing from the global suppliers and customers' perspective will highlight and rationalize the risk of a thinning market characterized by participant shortages.

1. Search and information costs. These are the costs associated with looking for relevant information and meeting with agents with whom the transaction will take place. The stock exchange is one such example, as they bring the buyers and sellers of financial assets together. The stockbroker's fee is a type of information transaction cost.
2. Bargaining costs. These are the costs related to coming to an agreement that is agreeable to the parties involved in drawing up a contract. Bargaining costs can either be very cheap, such as buying a newspaper, or can be very expensive, such as trading a basketball player from one team to another.
3. Policing and enforcement costs. These are the costs associated with making sure that the parties in the contract keep their word and do not default on the terms of the contract. In the real world, people often deviate from the contract, and thus, enforcement costs are incurred while governing contracts. Lawyer fees are an example of such a cost.[33]

Williamson identified three "critical dimensions for describing transactions . . . (1) uncertainty, (2) the frequency with which transactions

28. Robert Hahn, *Ronald Harry Coase (1910–2013)*, NATURE (Oct. 23, 2013), https://www.nature.com/articles/502449a [https://perma.cc/8C86-SGBM].

29. *Oliver E. Williamson Facts*, THE NOBEL PRIZE, https://www.nobelprize.org/prizes/economic-sciences/2009/williamson/facts/ (last visited Mar. 20, 2024) [https://perma.cc/DEZ4-8ZFK].

30. Oliver E. Williamson, *The Economics of Organization: The Transaction Cost Approach*, 87 AM. J. OF SOCIO 3, Nov., 1981, at 552.

31. *Id.*

32. CFI, *Transaction Costs, Costs incurred that don't accrue to any participant of the transaction* (Nov. 17, 2019), https://corporatefinanceinstitute.com/resources/economics/transaction-costs [https://perma.cc/3PLD-XUTF].

33. *Id.*

recur, and (3) the degree to which durable, transaction-specific investments are required to realize least cost supply."[34] He argues that greater uncertainty and asset specificity incentivize internalizing transactions to minimize the costs of managing interface complexities and changing circumstances.[35] Instead of relying on external contracts, "large hierarchical organizations don't need contractual agreements because they use organizational policies such as coercion, monitoring, and incentives to maintain control."[36]

To accurately forecast the outcome of globalization, it is essential to fully grasp both the tangible costs and the less visible variables involved.

B. High Entry Barrier and Low Bargaining Leverage Impede Global Participants

The aerospace industry "is often characterized by long product development cycles and complex supply chains, which can demand constant innovation, technology integration, and continuous improvement."[37] Due to the complexity, the industry comprises numerous large or small individual companies operating at various levels of the manufacturing process.[38] Aircraft production, for instance, involves thousands of entities[39] producing everything from raw materials, components, sub-assembly, line removal unit (LRU), major systems (such as propulsion systems, aircraft engines, avionics, electrical systems, air management systems, and fuel systems), to aircraft structural components (fuselage, cockpit, wings, nacelles, and tail).[40] A large commercial passenger aircraft can have millions of components,[41] such as the wide-body Boeing 747, comprising six million parts,[42] with thousands of sub-tier suppliers contributing to its production before it reaches the Original Equipment Manufacturer (OEM) premises for final assembly, testing, and

34. Williamson, *supra* note 30, at 555.

35. *Id.* at 558-559.

36. CFI, *supra* note 32.

37. *2024 aerospace and defense industry outlook*, DELOITTE, https://www2.deloitte.com/us/en/insights/industry/aerospace-defense/aerospace-and-defense-industry-outlook.html (last visited Mar. 20, 2024) [https://perma.cc/PBZ8-L6S2].

38. *How Airplanes Are Made – The Process From Design To Flight*, AERO CORNER, https://aerocorner.com/blog/how-airplanes-are-made/ [https://perma.cc/U5E7-DCKU]

39. *Production, Building aircraft on time and at top quality*, AIRBUS, https://www.airbus.com/en/products-services/commercial-aircraft/the-life-cycle-of-an-aircraft/production [https://perma.cc/9ACS-GPWD].

40. AERO CORNER, *supra* note 38.

41. Joanna Bailey, *Jumbos In The Scrapyard: How A Retired Boeing 747 Is Dismantled*, SIMPLE FLYING (Aug. 11, 2020), https://simpleflying.com/retired-boeing-747-scrapped [https://perma.cc/T42S-BX7W].

42. *Id.*

certification.[43] The extensive coordination in creating an enormous product segregates participating manufacturers into tiers of suppliers (typically Tier 1, Tier 2, and Tier 3).[44] In certain instances, these suppliers generate revenues exceeding those of the OEMs who hold prime contracts with their military or civil end customers.[45] The "icing on the cake" for a supplier in this industry is the long-term business potential associated with aircraft models, which typically have extended lifecycles spanning decades[46] with only periodic equipment upgrades.[47]

Given these characteristics, one might expect fierce competition to enter this market. In reality, the number of suppliers readily prepared to enter the playing field is considerably less than in other industries, even with substantial business volume or technical support incentives.[48] Several factors contribute to this reluctance:

1. Stringent Qualification and Certification: "[M]eeting industry standards and requirements through the qualification and certification of production lines is an arduous process."[49] The new entities are almost always required to obtain industry-specific Quality Management System (QMS) certification to be able to design, develop, produce, or provide services as a supplier.[50] Having an AS9100 standard is a very

43. AIRBUS, *supra* note 39.

44. *Unpacking the Supply Chain Tiers in the Aerospace Industry*, SCIENCETIMES (June 29, 2021), https://www.sciencetimes.com/articles/31988/20210629/unpacking-the-supply-chain-tiers-in-the-aerospace-industry.htm [https://perma.cc/PH27-U54M].

45. *Aerospace manufacturers facing supplier competition*, SIA-PARTNERS, https://www.sia-partners.com/en/insights/publications/aerospace-manufacturers-facing-supplier-competition (last visited Mar. 20, 2024) [https://perma.cc/MLK3-FVLU].

46. "The typical contract life is therefore three to ten years, and the focus is on making this near term contract balance, with accommodations for long term distribution of costs if possible" per Robert Handfield, *Summary of Development and Manufacture Contracts in the Aerospace and Defense Industries*, NC STATE UNIV.: SUPPLY CHAIN RECOURSE COOPERATIVE (Apr. 3, 2019), https://scm.ncsu.edu/scm-articles/article/summary-of-development-and-manufacture-contracts-in-the-aerospace-and-defense-industries#:~:text=The%20typical%20contract%20life%20is%20therefore%20three%20to,for%20long%20term%20distribution%20of%20costs%20if%20possible [https://perma.cc/27CJ-8W5J].

47. Helen Jiang, *Key Findings on Airplane Economic Life*, BOEING (Mar. 2013), https://www.boeing.com/assets/pdf/commercial/aircraft_economic_life_whitepaper.pdf [https://perma.cc/T874-XJKS].

48. Steven A. Melnyk, Kenneth W. Sullivan & Christopher Peter, *Recovering the Domestic Aerospace and Defense Industrial Base*, NDIA (Apr. 2011), https://www.ndia.org/-/media/sites/ndia/divisions/manufacturing/documents/ndia-white-paper-recovering-a-d-industrial-base_final.ashx [https://perma.cc/9VXM-SNBX].

49. DELOITTE, *supra* note 37.

50. *Understanding the AS9100 Standard: A Comprehensive Guide for Aerospace Industry Professionals*, QMII (Nov. 3, 2023), https://www.qmii.com/understanding-the-as9100-standard-a-comprehensive-guide-for-aerospace-industry-professionals/ [https://perma.cc/9SDR-Z47Q].

basic condition of doing business in this industry.[51] And a system like this can take years to implement.[52] Without prior experience or a good consulting team onboard to navigate the progress, this costly first step in order to enter the bargain can be a swift dealbreaker.

2. Lock-in Effect and Long Payback: The industry is known for being "slow in developing alternate sources of supply."[53] Established businesses in outsourcing destinations often wield considerable oligopoly power because "[b]arrier to entry is the obstacles and hindrances that make it difficult for new companies to enter. These may include technology challenges, government regulations, patents, start-up costs, or education and licensing requirements."[54] The substantial investments and long-term contracts characteristic of this industry create a lock-in effect for existing suppliers.[55] The extended payback periods, sometimes lasting years until new aircraft platforms are introduced and certified—the New Product Introduction (NPI) period, can be prohibitive for small to mid-sized enterprises.

3. Human Capital and Intellectual Property: Acquiring the necessary engineering talent for "development, design, testing, production, and maintenance" can be challenging.[56] Aircraft development often requires billions of dollars in

51. *AS/EN 9100 series, Quality management systems for aviation, space and defence*, BSI, https://www.bsigroup.com/en-GB/as-9100-9110-9120-aerospace/ (last visited Mar. 20, 2024) [https://perma.cc/7G82-GZ86].

52. Mark Hammar, *How long does AS9100 implementation take*, ADVISERA (Mar. 26, 2019), https://advisera.com/9100academy/blog/2019/03/26/how-long-does-as9100-implementation-take/#:~:text=While%20the%20duration%20will%20vary%2C%20company%20size%20is,than%200200%20employees%20%E2%80%93%2010%20to%2020%20months [https://perma.cc/6WFZ-WU9M].

53. DELOITTE, *supra* note 37.

54. Barriers to Entry, Obstacles to entering a specific market, CFI, https://corporatefinanceinstitute.com/resources/economics/barriers-to-entry/ [https://perma.cc/V7FR-RES9].

55. Ram Narasimhan, Anand Nair, David Griffith, Jan Stentoft Arlbjørn & Elliot Bendoly, *Lock-in situations in supply chains: A social exchange theoretic study of sourcing arrangements in buyer–supplier relationships*, WILEY (Nov. 24, 2008), https://onlinelibrary-wiley-com.ezproxy.uakron.edu:2443/doi/10.1016/j.jom.2008.10.004 [https://perma.cc/A8W6-89EX].

56. Piyush Chaudhary, *Future of Aerospace Engineering (Design, Development & Production of aircrafts): UPES Expert Faculty*, CAREERS360 (Mar. 03, 2023), https://university.careers360.com/articles/future-of-aerospace-engineering-design-development-production-of-aircrafts-upes-expert-faculty [https://perma.cc/L3EQ-PZXS].

investment.[57] Over a hundred years of Western innovations[58] have generated extensive background intellectual property (IP) associated with many existing fundamental technologies or basic component designs.[59] Additionally, foreground IP is typically generated through joint development with the OEM. New companies often lack access to both types of IP due to limited experience and funding.[60] Corporations are vigilant in preventing technology infringement; a new supplier must have legal resources to safeguard their own IP and avoid infringement issues or controversies.

4. Legal and Financial Liabilities: Legal resources are also crucial for protecting suppliers from business-related legal challenges and the substantial financial liabilities associated with manufacturing aerospace products that impact human life and safety. The landmark case of *Asahi Metal Industry Co. v. Superior Court of California* highlights the potential legal risks for suppliers. In this case, a Japanese supplier faced a lawsuit stemming from a defective part using an Asahi valve that contributed to a fatal motorcycle accident.[61] Asahi had to fend the lawsuit across the globe until the case reached the U.S. Supreme Court.[62] Justices debated on the "availment" requirement and decided that there was no sufficient "reaching in" effort to the market from Asahi to cultivate the market, from a jurisdiction standpoint. However,

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57. *Development Costs for Selected Aircraft*, TRANSPORTGEOGRAPHY.ORG, https://transportgeography.org/contents/chapter5/air-transport/aircraft-development-costs/ (last visited Mar. 20, 2024) [https://perma.cc/6SXV-2GXP]

58. *Aerospace History Timeline*, AIAA, https://www.aiaa.org/about/History-and-Heritage/History-Timeline#1900s (last visited Mar. 20, 2024) [https://perma.cc/X3FU-39XD].

59. *Background Intellectual Property: Everything to Know*, UPCOUNSEL, https://www.upcounsel.com/background-intellectual-property#:~:text=Background%20intellectual%20property%20is%20any%20IP%20that%E2%80%99s%20created%2C,the%20owner%20before%20the%20date%20of%20the%20agreement (last visited Mar. 20, 2024) [https://perma.cc/9RZC-L9CZ].

60. "Foreground IP is intellectual property created during the course of the development agreement. The key issue in any development agreement is the allocation of rights in foreground IP. Foreground IP may consist of new technologies created by a party or it may be a derivative of technology owned by a party", Rahul Kapoor, Shokoh Yaghoubi, *Allocating IP Rights in Development Agreements*, MORGANLEWIS (Nov. 9, 2020), https://www.morganlewis.com/blogs/sourcingatmorganlewis/2020/11/allocating-ip-rights-in-development-agreements#:~:text=Foreground%20IP%20is%20intellectual%20property%20created%20during%20the,a%20derivative%20of%20technology%20owned%20by%20a%20party [https://perma.cc/83DQ-SDSA].

61. Asahi Metal Indus. v. Super. Ct. of Cal., 480 U.S. 102 (1987).

62. *Id.*

it was a close call without a majority opinion.[63] Although the U.S. Supreme Court ultimately ruled in favor of Asahi, the case underscored the potential for disproportionate legal risks for suppliers, even those with limited involvement in the U.S. market.

These factors collectively create a high degree of business uncertainty, leading to elevated transaction costs that new suppliers must manage with sometimes unsophisticated information and limited resources. In some cases, exiting the market may be the more prudent choice for suppliers facing these challenges when they have less to lose.

C. High Hidden Costs and Enforcement Risks Curtail Globalization

For large systems with OEMs controlling all stages of the program as the prime contractors, transaction costs permeate all phases of the product development lifecycle from design, testing, and certification to production and delivery.[64] These costs also extend to non-direct business processes such as bid and proposal, contract negotiation, launch and support, and after-sales activities. When global resource utilization takes the form of direct externalization or subcontracting, impactful "friction" can arise even before a supplier contract is formed or long after the contracted deliverables have been provided.

1. Proposal Accuracy with Sourced Components: All magnificent "flying beasts" start from the drawing boards. Developing complex high-tech products necessitates a multi-tiered supplier network with thousands of supplier bids negotiated among layers of suppliers before ultimately reaching the OEMs. Winning a contract requires the best design and the most competitive price, along with other weighted considerations from "economic, technical, environmental, operability & reliability, and commercial standpoints."[65] The proposal process is a delicate balancing act between securing a program and ensuring profitability. Any unplanned technical or quality issue or development mishap can erode the initial cost assumptions and extend the

63. *Id.*

64. *The life cycle of an aircraft*, AIRBUS, https://www.airbus.com/en/products-services/commercial-aircraft/the-life-cycle-of-an-aircraft (last visited Mar. 20, 2024) [https://perma.cc/9ACS-GPWD].

65. Christine Render, *Technology Selection*, OTC (Jan.1,2016), https://www.ownerteamconsult.com/technology-selection/ [https://perma.cc/YJG7-82N4].

payback period.[66] Conceivably, a seemingly lucrative business case can quickly become unsustainable if the contract value fails to account for potential future expenses.

2. Building a Reliable Supply Chain Strategy: Qualifying a global sub-tier requires a complex and time-consuming search and information acquisition process, with a key focus on ensuring the executability and enforceability of any contracts.[67] Emerging market suppliers eager to enter the market may sometimes commit to a contract without fully comprehending the associated terms and requirements. Enforcing a global contract can be further complicated by regional variations in culture, political system, financial environment, and legal system maturity.[68] Assessing these factors requires specialized expertise, often provided by global management consulting firms such as Kearney. Kearney's seven-step strategic sourcing approach[69] has helped many corporations make informed decisions tailored based on specific commodities, the supply market, and other business-specific key criteria. Other tools created to identify strategies include the Purchasing Chessboard.[70] It "has been proven to work in any industry, for any category, anywhere in the world. [I]t has become the main procurement strategy tool for many of the world's leading companies"[71] Its recommendations include "value chain reconfiguration," "complexity reduction," and "master data management."[72] This evaluation can also be done externally by releasing a benchmarking Request for Information (RFI) to targeted suppliers with more defined response requirements.

66. *See* John Gioia, *Twelve reasons why programs fail*, PMI (Nov. 1996), https://www.pmi.org/learning/library/twelve-reasons-programs-fail-3353 [perma.cc/WJY7-LYMU].

67. *The FAR's Revised Limitations on Subcontracting: What You Need to Know*, PILIEROMAZZA (Sep. 10, 2021), *The FAR's Revised Limitations on Subcontracting: What You Need to Know*, https://www./legalnews/the-far-s-revised-limitations-on-2086939/ [https://perma.cc/7P23-JARP].

68. HILL, *supra* note 14, at 42-53.

69. Jean-Philippe Massin, Strategic Sourcing by A.T. Kearney 2004, SOURCING & PROCUREMENT (last visited Mar. 29. 2024), https://sourcing-and-procurement.com/strategic-sourcing-by-at-kearney-2004/ [https://perma.cc/QFW9-SFH3].

70. KEARNEY, THE PURCHASING CHESSBOARD, https://www.kearney.com/insights/books/the-purchasing-chessboard.

71. *Id*.

72. *Id*.

3. Engineering Capability and Budget Control: Once a multi-year program is launched, OEM engineering efforts will be assigned based on the criticality of the equipment (e.g., the propulsion and power system) and then go down to the list of minor nonfunctioning parts.[73] Product complexity and industry-specific certification and safety requirements influence the lead time for development.[74] Ironically, a small, simple part may still incur significant engineering expenses. A systems approach, where multiple parts in the same category are designed and tested together or analyzed by similarity, is often preferred to optimize engineering costs. Because of the enormous engineering expense, global engineering resource utilization has become increasingly common, particularly in test validation and reliability monitoring, where major IP creation is not involved. However, sourcing indirect labor globally can inadvertently increase transaction costs due to the intangible nature of the effort, making communication and management more challenging. While a global engineering service provider may offer cost savings on engineering labor, these savings can be offset by increased program management expenses required to maintain the project schedule.[75]

4. IP Protection: Monitoring and protecting intellectual property rights is another critical topic. There have been instances where outsourced products were infringed upon by the vendors themselves, sometimes using customer-provided proprietary tooling and equipment.

5. Appropriate Economies of Scale: Finding the right balance between economies of scale and the risk of over-concentration is also crucial. "[T]he cost advantage experienced by a firm when it increases its level of output. . . The greater the quantity of output produced, the lower the per-unit fixed cost. Economies of scale also result in a fall in

73. *See* Certification Reform Efforts, FAA, https://www.faa.gov/aircraft/air_cert/airworthiness_certification/certification_reform (last visited Mar. 29. 2024) [http://rma.cc/KS7P-Q44Q].

74. *Id*.

75. David Burkett, *Does Offshoring Your Development Cost You More in the Long Run*?, LINKEDIN (Jun. 2, 2021), https://www.linkedin.com/pulse/does-offshoring-your-development-cost-you-more-long-run-david-burkett [perma.cc/LQH7-VU9W]; *see also* Andy Nguyen, What is offshore engineering? (Pros, cons, top countries), https://www.timedoctor.com/blog/offshore-engineering/ [http://perma.cc/A4RA-2FJX].

average variable costs with an increase in output."[76] Given the significant upfront investment required, a certain level of business volume is necessary to justify the costs of outsourcing,[77] or dual sourcing, and achieve economies of scale.[78] This challenge can surface later in the program when a number of outsourced platforms end without new platforms to backfill the pipeline.[79] Considering the highly popular commercial-transport single-aisle aircraft only has an annual production rate in the hundreds,[80] ending several programs in a row can display a drastic change to the overall financial picture. Conversely, over-concentration can "significantly increase the risk to quality, safety, business continuity, reputation."[81] Strategic planning and advanced information management tools, such as blockchain technology, can help mitigate these risks by enabling more effective vetting of contractors, vendors, and suppliers.[82]

III. ISSUE STATEMENT

Successful global partnerships hinge on informed decision making by both parties, with a clear understanding of the benefits and risks involved. Tangible factors like a sufficient workforce, matching capabilities, and achievable cost savings are essential considerations.

76. Andrew Loo, *Economies of Scale, Cost benefits from higher output levels*, CFI, https://corporatefinanceinstitute.com/resources/economics/economies-of-scale/ (last visited Mar. 29. 2024) [perma.cc/V4AE-A7JN].

77. "Economies of scale are cost advantages reaped by companies when production becomes efficient. Companies can achieve economies of scale by increasing production and lowering costs. This happens because costs are spread over a larger number of goods. Costs can be both fixed and variable", Will Kenton, *Economies of Scale: What Are They and How Are They Used*, INVESTOPEDIA (June 11, 2022), https://www.investopedia.com/terms/e/economiesofscale.asp [perma.cc/2BWH-KJM5].

78. *See* Sean Ross, *How Do Economies of Scale Work With Globalization*, INVESTOPEDIA (Aug. 27, 2023), https://www.investopedia.com/ask/answers/013015/how-do-economies-scale-work-globalization.asp [perma.cc/MSW8-SU24].

79. *Diseconomies of Scale Definition: Causes and Types Explained*, INVESTOPEDIA (Jan. 01, 2021), https://www.investopedia.com/terms/d/diseconomiesofscale.asp [perma.cc/9QPC-3553].

80. *Orders & Deliveries*, BOEING, https://www.boeing.com/commercial/#/orders-deliveries (last visited Mar. 29. 2024) [https://perma.cc/D2ZP-FPQD].

81. *The Emerging Business of Supply Chain Risk Management*, SUPPLYCHAIN247 (Feb. 5, 2019), https://www.supplychain247.com/article/the_emerging_business_of_supply_chain_risk_management/avetta [perma.cc/VJS9-F2GX].

82. *Changing the Supply Chain Landscape with Blockchai*n, SUPPLYCHAIN247 (Feb. 5, 2019), https://www.supplychain247.com/article/changing_the_supply_chain_landscape_with_blockchain/avetta [perma.cc/D97H-YUSW].

However, in high-tech industries with substantial upfront investments and inherent high risks, transaction costs can be a decisive factor in determining the sustainability of a global venture. Thorough procurement opportunity assessments, long-term planning, and robust risk mitigation strategies are vital to prevent costly outsourcing reversals.

Consider the following scenario (APPENDIX 2[83]): an OEM issued a Request for Quote (RFQ) with a $9 million cost target for the life of the Program (LOP). The "pool" of three emerging market suppliers qualified to bid. They estimated that material and labor (M/L) would cost a total of $4 million. Parts design and testing cost $500,000, with Administrative Expenses (SG&A) around $500,000, resulting in a $4 million Profit before Tax. When there is a large amount of uncertainty in design success, cost control, or SG&A associated with managing the QMS may compel suppliers to add a 50% "buffer" to their cost estimates. This drastically reduced the profit to $1.5 million, potentially shrinking the pool of interested suppliers to just one. With insufficient bidders to foster competition, the OEM may lose its motivation to proceed due to the lack of benchmarks.

Similarly, uncertainties can also reduce the number of OEMs seeking outsourcing. If the same group of suppliers incorporates risks to "cushion" their bid to maintain their $4 million profit, their quoted price increases from $9 million to $11.5 million. This can immediately hinder the OEM's ability to secure internal buy-in for outsourcing. The pool of potential customers diminishes for the same reason. For existing outsourcing arrangements, such cost increases will likely trigger internal budget and strategy reviews for reversal.

Given these realities, proactive measures that can help OEMs and their suppliers assess and control these uncertainties have profound value. While formal Operations Management or Program/Project Management training programs offer valuable tools and frameworks (such as the Project Management Institute's Project Management Professional (PMP) certificate[84] provides a procurement management toolkit including Make-Buy Analysis and Contract Assessment),[85] it is equally important to ensure that these safeguards are enforceable and effective from a legal and economic standpoint. Additionally, approaches aimed at transforming the broader landscape to reduce transaction costs in the long run are essential.

83. *See* Appendix 2. The Effect of "Uncertainty" on the OEM/Supplier Pool

84. PMI, PROJECT MANAGEMENT PROFESSIONAL (PMP) (last visited Mar. 20, 2024), https://www.pmi.org/certifications/project-management-pmp.

85. RITA MULCAHY, PMP EXAM PREP (RMC Publication, 2009).

IV. ANALYSIS

A. The Impact of Transaction Costs on Total Project Value

In today's rapidly evolving business landscape, corporate counsels are expected to contribute not only legal expertise but also strategic guidance on how "to shave costs and handle high-volume transactional processes like corporate filings, contract management, or compliance-related processes."[86] Externalizing business functions and delegating responsibility to a supplier requires heightened due diligence in risk assessment. Search and information costs, as well as policing and enforcement costs, are unavoidable "frictions" in any business transaction.[87] Many businesses lack a formalized approach to itemize transaction costs, often assuming these costs are embedded within general overhead calculations following standard business guidance for the given year. Tadelis and Williamson prescribed a formula for project profitability: Value Surplus = Total Benefit – "Production Costs & Compensation" – "Expected Adaptation Costs".[88] Adaptation costs, according to Tadelis and Williamson, stem from contractual incompleteness or haggling/negotiation, with the two factors inversely related.[89] As "asset specificity increases or when contracts are more incomplete, the relative benefits of hierarchy over markets increase. Furthermore, optimal incentives become weaker".[90] For example, "procurement contracts are often renegotiated because of changes that are required after execution. [T]o bidder markups adaption cost accounts for 7.4-14% of the winning bid."[91] "Certain proxies, such as uncertainty, transaction frequency, asset specificity, opportunism, and so on, are used" for analysis,[92] and there is a "significant relationship between the chosen proxy and organizational governance suffices to make the point clear that economizing on transaction costs is the unifying logic behind various

86. Cristina Faherty, *5 Ways to Tackle Corporate Legal Counsel's Top Concerns*, WOLTERS KLUWER (May 11, 2022), https://www.wolterskluwer.com/en/expert-insights/5-ways-to-tackle-corporate-legal-counsels-top-concerns?cjdata=MXxOfDB8WXww&utm_source=CJ&utm_medium=100357191&utm_campaign=Microsoft+Shopping+%28Bing+Rebates%2C+Coupons%2C+etc.%29&utm_content=12628705&cjevent=b638db03bcb311ee802e3fc00a82b836&cm_mmc=AffiliateLinks-_-CJ-_-LinksClicked-_-SKU [https://perma.cc/VG7M-2KGW].

87. CFI, *supra* note 32.

88. Tadelis & Williamson, *supra* note 26, at 33.

89. *Id*. at 28-29.

90. *Id*. at 33-34.

91. Patrick Bajari, Stephanie Houghton & Steven Tadelis, *Bidding for Incomplete Contracts: An Empirical Analysis of Adaptation Costs*, 104 THE AM. ECON. REV. 1288, 1288 (2014).

92. Ning Wang, *Measuring Transaction Cost: An Incomplete Survey* 4 (Ronald Coase Inst., Working Paper No. 2, 2003).

contractual arrangements of production."[93] In industries like aerospace, complex setup costs, certification challenges, and unplanned inspections by authorities (including the supplier's local government) can significantly impact adaptation costs to be included in the analyzing framework, essentially all the "costs associated with looking for relevant information and meeting with agents with whom the transaction will take place."[94]

1. General Considerations and Example

It has been noted that, "As globalization spreads the division of labor on a global scale, countries that can export labor and production processes that they are relatively less profitable . . . which frees up capital for highly technical, highly productive fields [. . .]."[95] However, not all globalization initiatives yield the desired outcomes. Identifying the right target for transfer is the fundamental step to ensuring "value surplus," which also includes the ability to reject unsuitable projects. Traditionally, the high-level business strategy dictates operational and supply chain strategies and sets their performance targets, with the latter providing "capability feedback" to the business strategy.[96] Maintaining alignment between these strategic levels is essential.

For example, a high-tech company's business strategy incorporated global outsourcing for cost savings to fund next-generation product R&D and chose to outsource a unique system controller classified as "dual-use" (application for both civilian and military applications). While outsourcing such an expensive product may show significant savings on the financial statements due to external economies of scale ("economies of scale enjoyed by an entire industry"[97] as the technology itself is not uncommon) and supplier-specific advantages (e.g., proximity to raw materials, lower labor costs), the stringent regulatory environment surrounding such goods due to their transformable nature for military purposes[98] can drive up transaction costs significantly. These costs may include special licensing research (search and information costs), negotiation to ensure supplier compliance with handling protocols (bargaining costs), and enforcement of compliance measures (policing

93. *Id*.

94. CFI, *supra* note 32.

95. Sean Ross, *supra* note 78.

96. Bozarth & Handfield, *supra* note 7, at 23-31.

97. *Id*.

98. *What are Dual-Use Goods?*, DOW JONES (last visited Mar. 30, 2024), https://www.dowjones.com/professional/risk/glossary/dual-use-goods-definition/ [https://perma.cc/ER2N-C2V6].

and enforcement costs). All these necessary actions can generate a substantial "adaptation cost" that cannot be offset sufficiently by external economies of scale to make outsourcing viable, particularly for firms that lack internal economies of scale ("economies that are unique to a firm"[99] due to the unique compliance requirement for the product).

Rising geopolitical tensions are considered a type of "shock" that has become a primary concern for the global value chain (GVC),[100] interrupting the "adaptation" along with the "environmental risks stem from natural causes while others are anthropogenic (created by human activity), including climate change, environmental pollution, deforestation, erosion of natural habitat, and biodiversity loss."[101]Moreover, "[m]ultinational corporations provide economic connections across the world and thus are disproportionately influenced by global fragmentation and the uncertainty that produces."[102] Consequently, they should assess these risks in the early strategy phase, ideally with a standardized checklist that includes all possible scenarios and is customized based on the location and complexity of the low-cost country sourcing. Certain human-caused aviation catastrophic events may also trigger regulatory policy shifts, potentially leading to significant new design, production, certification, or maintenance-related requirements,[103] altering existing business assumptions, and requiring a change to the adaptation of the offshoring strategy.

According to Williamson, the key transaction cost-driven factors are opportunism, transaction-specific investments in human and physical capital, the efficient processing of information, and the comparative assessment of transaction costs.[104] The business's goal is to reduce the sum of production and transaction costs, as reducing one commonly increases the other.[105] Based on Williamson's Commercial Transaction

99. Loo, *supra* note 76.

100. Etel Solingen, Bo Meng & Ankai Xu, *Rising Risks to Global Value Chains*, WTO, https://www.wto.org/english/res_e/booksp_e/08_gvc_ch5_dev_report_2021_e.pdf (last visited Mar. 30, 2024) [https://perma.cc/DG5F-K3X4].

101. *Id*.

102. *How to Develop Geopolitical Resilience*, MCKINSEY & CO. (Oct. 10, 2023), https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/how-to-develop-geopolitical-resilience?stcr=7F7A5F9CC4044ACEAD59E24C121A03AA&cid=other-eml-alt-mip-mck&hlkid=cc0bd3107ca24e0aa994fd98ca1afb90&hctky=9193776&hdpid=1570b0e9-8a6f-4f3d-b304-ef54b05a56b5 [perma.cc/MX4V-CKSV].

103. David Shepardson, *US FAA Tightens Aircraft Certification Oversight After Boeing MAX Crashes*, REUTERS (Nov. 28, 2023), https://www.reuters.com/business/aerospace-defense/us-faa-requires-key-flight-control-changes-be-deemed-major-2023-11-28/.

104. Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J. OF L.& ECON 213, 233-261 (1979).

105. *Id*. at 245-246. (*See* Appendix 3. Governance Structure v. Commercial Transactions)

matrix (APPENDIX 3), which considers two critical dimensions—transaction frequencies (one-time, occasional, and recurrent) and supplier investments required (nonspecific, mixed, and idiosyncratic), a typical aerospace global supplier will most likely fall into a "Mixed" (Customized Material/Recurrent) transaction category or a "Non-specific" (Standard Material/Recurrent).[106]

Similarly, a typical Sourcing Portfolio Analysis will split the "buy" into four categories based on the level of "Complexity or Risk Impact" and "Value Potential/Expenditure for Buyer" dimensions:

> (1) "Routine" Quadrant (low-spend commodities readily available); (2) "Leverage" Quadrant (expensive but standardized product, usually given to "Preferred" suppliers with track performance); (3) "Bottleneck" Quadrant (low-spend unique requirements that can only be supported by very limited suppliers); and (4) "Critical" Quadrant (same as the "Bottleneck" type but requiring large expenditure).[107]

An aerospace supplier in Williamson's "Mixed" category would fall into the "Critical" portfolio Quadrant, requiring significant expenditure for the Buyer,[108] in addition to proprietary equipment and extensive training and support, "a considerable amount of time negotiating favorable deals and building partnerships with suppliers, as well as preparing contingency plans for supply interruption"[109] could be required.

2. Contract Options and Alignment

Williamson's governance structure matching suggests that typical aerospace transaction types will require either "Market" Governance (Classic Contracting for non-specific transactions) or "Bilateral" Governance (Obligational Contracting, the outside procurement favored by scale-economy considerations, good for steady-state supply with both parties having incentive to sustain the relationship).[110] Due to the high complexity, risk, and expenditure, the "Critical" portfolio Quadrant requires extensive negotiation.[111] In order to manage, per Williamson, the contract can include agreeable admissible dimensions for an adjustment that has the least "opportunism hazard" with "ex-ante assumptions and

106. There could be other types of transactions such as equipment sourcing, happen occasionally, that will not be discussed here, due to relevancy.

107. BOZARTH & HANDFIELD, *supra* note 7, at 203, (adapted from R. MONCZKA, R. TRENT, R AND HANDFIELD, PURCHASING AND SUPPLY CHAIN MANAGEMENT (Cincinnati, OH: Southwestern College Publishing, 2011).

108. *Id.* at 204.

109. *Id.* at 204-205.

110. Williamson, *supra* note 104, at 245-246.

111. BOZARTH & HANDFIELD, *supra* note 7, at 204.

ex-post adjustments for the engineering changes and pricing conditions, etc., without need for court litigation."[112] For example, a contract can include a relevant CPI index[113] accepted by the parties to adjust the price for commodity cost fluctuation to minimize opportunism and the need for litigation.[114]

More specifically, "[t]he risk shared between the buyer and seller is determined by the contract type. Although the firm-fix-price type of Contractual arrangement is typically the preferred type[.]"[115] Fixed-Price Contracts have the following types specifically: Firm Fix Price (FFP, price for goods not subject to change unless scope of work changes); Fixed Price Incentive Fee (FPIF, financial incentive for achieving performance target); and Fix Price with Economic Price Adjustment (FP-EPA, a long-term contract with special provisions that allow adjustments).[116]

There are also Cost-Reimbursable Contracts, including: Cost Plus Fixed Fee (CPFF); Cost Plus Incentive Fee (CPIF); and Cost Plus Award Fee (CPAF), all "involve payments to the seller for all legitimate actual costs") and Time and Material Contract (an open-ended hybrid of Fix-Price and Cost-Reimbursable contracts).[117]

Aerospace suppliers' contract relationships are typically in the "Critical" portfolio Quadrant and require adaptations to be formalized or contractualized. A Fix Price with Economic Price Adjustment (FP-EPA, with other relevant adaptations/conditions) is often the most suitable option, compared to a more open-ended Cost-Reimbursable contract, as it provides cost certainty based on defined work scope while allowing flexibility for reasonable deviations, minimizing the bargaining cost.

The Coase Theorem explains that in a perfect world with zero transaction costs, "rational parties will allocate legal entitlements efficiently," making contracts the "perfect instrument for exchange" with contingency or gap.[118] However, in practice, contracts inevitably have gaps, leaving contractual mechanisms (e.g., extra negotiation) or courts to supply default terms to fill in at the time of dispute and bring the parties back to where they expected, creating incentives for parties to perform.

112. Williamson, *supra* Note 104, at 250.

113. *Consumer Price* Index, U.S. BUREAU OF STAT., CONSUMER PRICE INDEX, https://www.bls.gov/cpi/ (last visited Mar. 30, 2024) [https://perma.cc/EY2X-WXBP].

114. Williamson, *supra* note 104, at 250.

115. PMI, A GUIDE TO THE PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK GUIDE) (2008), at 322.

116. *Id*.

117. *Id*. at 323-324.

118. Vestring & Rouse, *supra* note 18 at 291. *Also see* Ronald Coase, *The Problem of Social Cost*, 3 THE J. OF L. & ECON. 1, 15 (1960).

For a long-term "Relational" contract, disparities in parties' contract experience, legal resources, and legal infrastructure support can lead to an unsatisfactory contract and distrust. A compatible legal system, particularly one grounded in a shared law and economics framework, can foster a more fertile environment for global cooperation.[119] High-tech OEMs should explore strategies to influence and improve the business environment in developing economies to enhance the success of contract negotiation and build long-term partnerships.

3. Risks and Financial Implications

In technology industries, "reversing globalization" or establishing a "second source" will only be raised after repeated supply-chain disruptions or publicized product recalls, such as the pharmaceuticals, electronics, and automotive industries.[120] Both options are extremely costly and challenging. Depending on the situation, it may not always be feasible for industries like aerospace to choose. Organizations advocating for re-shoring often use Total Cost of Ownership (TCO) estimators to assess the total cost of offshoring, including "all relevant factors—overhead, balance sheet, risks, corporate strategy, and other external and internal business considerations to determine the true total cost of ownership."[121] Proactive risk management, which involves identifying, analyzing, and mitigating potential problems throughout the program lifecycle, always has a central role in a Project Management Plan.[122] Its multi-step process typically includes identifying risks, qualitative and quantitative analysis, risk response planning, and monitoring and controlling.[123] While procurement provides input for the risk register and risk-related contract decisions (such as whether to include insurance),[124] the primary focus is often on technical, quality, and internal elements

119. Patrick H. Gaughan, *The Global Benefits of the Law & Economics Framework in Legal Education: Overview (Part 1)*, 54 AKRON L. REV. 891, 892 (2021).

120. Tucker Bailey, Edward Barriball, Arnav Dey, & Ali Sanker, *A Practical Approach to Supply-Chain Risk Management*, MCKINSEY & CO., https://www.mckinsey.com/capabilities/operations/our-insights/a-practical-approach-to-supply-chain-risk-management (last visited Mar. 30, 2024) [perma.cc/5YKF-FSHX].

121. *See Total Cost of Ownership Estimator*, RESHORING INITIATIVE, https://reshorenow.org/tco-estimator/ [perma.cc/UY4G-AA29].

122. *See* Greg Hutchins, *The Next Hot Area*, PMI (Jul. 1, 2002), https://www.pmi.org/learning/library/next-hot-area-supply-chain-management-4495 [perma.cc/RBW4-P25X].

123. PMI, *supra* note 115, at 273.

124. *Id.* at 320.

(organizational and project management itself),[125] schedule, cost, quality, scope, and OEM resources.[126]

Global outsourcing is a complex developmental project by itself. However, emerging market suppliers may lack transparency in their risk management practices. Both OEMs and suppliers may overlook the risks associated with uncontrolled sunk costs, such as the time and effort spent on searching, policing, and remedying disruptions and deviations. A dedicated qualitative and quantitative baseline along with a standard for determining and managing global sourcing risks, such as means to address IP concerns, is necessary.

From a forward-looking perspective, "Supply chains will become more diverse and less concentrated. The McKinsey Global Institute has also noted in a study this year that 'building supply chain resilience can take many forms beyond relocating production,' including using new technologies."[127] Technological advancements have offered some new solutions for risk mitigation. Blockchain technology may be utilized to track IP exposure and misuse of proprietary tooling problems mentioned earlier. "[M]ade up of encrypted block . . . of data stored and chained together, forming a chronological single source of truth that can be shared,"[128] it can be a prime technology for the supply chain with devices such as "RFID tags can more efficiently record and report simultaneously when certain products move throughout the different stages of the supply chain, and what their condition was (temperature, vibration, humidity and so on)."[129] The benefits of advanced tracking technology far outweigh the implementation costs for the aerospace industry, which frequently handles customized high-value materials. Such technology reduces transaction costs associated with manual tracking, policing, or gathering evidence for potential litigation.

The conventional financial models used to support critical business decisions are often investment return projections centric (focusing on Internal Rate of Return/IRR) and fail to capture globalization-related "frictions" for there is no stand-alone category for them. Occasionally, the "frictions" may be vaguely categorized into business overhead, while others might be absorbed into the performance cost of goods sold,

125. *See* Figure 11-4. Example of Risk Breakdown Structure, PMI, *supra* note 115, at 280; "Rida's Process Chart—Risk Management", MULCAHY, *supra* note 85, at 374.

126. PMI, *supra* note 115, at 382.

127. Lord Hague of Richmond, *Reverse Globalisation? It's Much More Complicated Than That*, TENEO (Oct. 23, 2020), https://www.teneo.com/insights/articles/reverse-globalization-its-much-more-complicated-than-that/ [https://perma.cc/TA43-7RF8].

128. Ellen Glover, *5 Uses of Blockchain in the Supply Chain*, BUILTIN (Sep. 22, 2022), https://builtin.com/blockchain/blockchain-in-supply-chain [https://perma.cc/MW2W-QQRT].

129. *Id.*

particularly when they result in defects.[130] The cost incurred for managing unplanned material and labor interruptions and additional program costs to review and approve quality deviations could be extremely high, and it is rarely accounted for as other standard categories of expense, such as product cost or period cost, leading to an incomplete picture of the financial implications.[131] As an option, some failure projecting models, such as the Failure Mode and Effects Analysis (FMEA), can be leveraged to help record some of the high-occurring "costs of surprise."

B. Shaping Potential Long-term Solutions

One of the objectives for business environment improvement is to correct issues that can destabilize the supply base. The global market is sensitive to its environment, particularly the prevailing "political system, economic system, and legal system."[132] Conventionally, the "political system is. . . labeled through two interrelated dimensions: the emphasis on collectivism versus individualism and the degree to which they are democratic or totalitarian."[133] Economists have long contended that political systems that incentivize market economy, respect individual and intellectual property rights, uphold private agreements, and promote technology and education ultimately foster innovation and entrepreneurship.[134] Companies operating in countries with differing views on individualism and democracy may face additional challenges. In the aerospace industry, contracts often span decades. These differences can create uncertainty and impact long-term contract performance and enforcement. An examination of the Global Freedom Status Map (APPENDIX 4)[135] and the globalization industrial maturity mapping[136] reveals a striking alignment: a strong correlation exists between political and economic "freedom" and a nation's industrialization maturity. The "freer" countries are more likely to offer complex products.

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130. BOZARTH & HANDFIELD, *supra* note 7, at 195.

131. "[Two major types of expenses. Expenses that arise in production of a product or service called product cost . . . [P]eriod costs related to marketing the product or service . . . the administrative expense . . . ." K.R. SUBRAMANYAM, FINANCIAL STATEMENT ANALYSIS 83 (McGraw-Hill Education, 2014).

132. HILL, *supra* note 14, at 42-53.

133. *Id.*

134. *Id*.

135. *Global Freedom Status Map* (*See* Appendix 4) —"[A] report that employed the methods of social science analysis to assess the level of freedom in each country in the world, with a numerical score and ranking as Free, Partly Free, or Not Free. The report is known as Freedom in the World." *Our-history*, FREEDOM HOUSE, https://freedomhouse.org/about-us/our-history (last visited Mar. 30, 2024) [perma.cc/7H2T-9TF6].

136. *See*, Vestring & Rouse, *supra* note 18, *infra* Appendix 1 (illustrating Product Complexity and Value Add.

Challenges in cross-cultural business interactions often stem from differing societal norms about trust and commitment. "Geert Hofstede, an expert on cross-cultural differences and management, defines culture as 'the collective programming of the mind which distinguishes the members of one human group from another. . . Culture, in this sense, includes a system of values.'"[137] These cultural values are molded by philosophy, education, language, and social structure.[138] Influenced by their long history and cultural roots, family ties, or close-knit community relationships, many frontier markets prioritize trust within their inner circles. In business dealings with unfamiliar partners, an instinctive distrust of outsiders can undermine the sense of obligation to uphold contractual commitments. For corporations and their suppliers, trust and long-term relationships can be nurtured through: (1) legal education, networking, and partnership and (2) laying a long-term framework for industry-scale alliance.

1. Law and Economics and Legal Education

In contracts between parties from different countries, performance and expectation gaps are the norm due to different legal frameworks and understandings. "A country's laws regulate business practice, define the manner in which business transactions are to be executed, and set down rights and obligations."[139] The three basic types are Common Law (derived from British tradition), Civil Law (prevalent in over 80 countries, including Germany, Japan, and France), and Theocratic Law (based on religious teachings).[140] These systems differ in their approach to contract law or property rights,[141] which can create challenges when disputes arise between parties operating in different systems.

For an emerging market sub-tier, navigating the Western legal process can be challenging and resource-intensive. On the other hand, for OEMs, even when awarded "expectation damages", they may not recover all tangible and intangible losses from contractual breaches, due to their position at a higher contractual tier, where greater contract liability lies upstream. In the long term, initiatives that align the legal and economic infrastructures in their respective markets would benefit all parties involved. "The best way to achieve this is through legal education. In the process, legal education will facilitate a more informed national response

137. HILL, *supra* note 14, at 91.
138. *Id.* at 93.
139. *Id.* at 49.
140. *Id.* at 50.
141. *Id.*

to globalization."[142] Legal education can, very broadly, encompass the creation of continued legal education opportunities, hosting information sessions or networking events, and establishing transient or permanent cross-border legal alliances. All these efforts can help reduce friction and enhance parties' abilities to negotiate, execute, and enforce a robust long-term agreement, ultimately contributing to legal reform. While the motivations and extent of legal reform may vary, it can serve as a "means to undermine the legal oligarchy"[143] and pave the way for a more collaborative and productive future.

While "[l]Law departments historically have undervalued supply chain expertise. . . companies are starting to wake up to the significance of this value in light of the data showing that the average company suffers from contract value leakage equal to roughly 9% of revenues annually."[144] Companies recognize the value of having "expertise in how supply chains relate to business strategies, where true areas of legal risk lie, what data points to collect in contracts for now and the future, how to design appropriate processes. . . ."[145] and employ such expertise to regularly interact with global suppliers, periodically review their program status, align understanding of technical or quality requirements, and proactively communicate law or policy changes to help eliminate potential issues early on.

2. Vertical Integration, Flagship Firms and Tech Alliances

Vertical integration has become an increasingly popular option for managing transaction costs that are too significant for complete externalization or internalization. Airbus, for instance, announced at the 2021 Dubai Airshow its intention to have more Chinese enterprises become its "vertical integration supply chain in China" by having Airbus procure raw materials and parts for its tier-one Chinese suppliers and deliver them to their various locations across the country.[146] Technically, "a firm can be described as vertically integrated if it encompasses two single-output production processes in which the entire output of the

142. Gaughan, *supra* note 119, at 904.

143. THE GLOBALIZATION OF LEGAL EDUCATION: A CRITICAL PERSPECTIVE (Bryant Garth and Gregory Shaffer eds., 2022).

144. Bill Mooz, *Law departments and the agile supply chain (161)*, LEGAL EVOLUTION (May 31, 2020), https://www.legalevolution.org/2020/05/law-departments-and-the-agile-supply-chain-161/ [https://perma.cc/3XCT-L5KM].

145. *Id*.

146. *Airbus building vertical integration supply chain*, DUBAI AIRSHOW (Aug. 26, 2021), https://www.dubaiairshow.aero/airbus-building-vertical-integration-supply-chain [perma.cc/5D5X-KR4P].

upstream process is employed as part or all of the quantity of one intermediate input into the downstream process."[147] This closer integration with the OEMs can alleviate some management challenges suppliers face and ensure adherence to a higher operational standard.

Vertical integration is not a "one size fits all" solution; its suitability depends on the transaction frequency and investment type.[148] The inherent problem with vertical integration is the complexity of implementation and the high cost of reverse.[149] For many high-tech industries, pursuing local integration solely to gain market access may prove to be "shallow and invalid. Objectives like 'reducing cyclicality,' 'assuring market access,' 'moving into the high value-added stage,' or 'getting closer to customers' are sometimes valid, but often not."[150] Alternative governance models, such as the "Flagship Firms," are exemplified by the Canadian-North American automotive cluster (APPENDIX 5).[151]

"A flagship firm is a multinational establishment that has come up with a business network consisting of four major partners: leading providers, clients, competitors, and non-business infrastructures. The prevalence of business networks is common in sectors that have absorbed and employed internalization and globalization."[152] One of the distinctive characteristics of a flagship firm is that "[c]ontrol over all the operations and scope of responsibilities of all the partners is contained under the flagship firm's authority. Members of the network are ensured with heightened trade levels, mutual reinforcements, cooperative undertakings, competitive advantage in both local and international markets, and secured long-range contracts. . ."[153]

This structure provides strategic leadership, process guidance, and business stability due to true organizational integration. The flagship-appointed leadership can bridge the gaps between firms from the asymmetric technical and program experience, unbalanced responsibility, and liability and promote higher confidence in areas like engineering

147. MARTIN K. PERRY, HANDBOOK OF INDUSTRIAL ORGANIZATION 183-255 (Elsevier 1989) at 183-255.

148. ALAN M. RUGMAN, JOSEPH R. D'CRUZ, MULTINATIONAL AS FLAGSHIP FIRMS: REGIONAL BUSINESS NETWORKS (2000).

149. John Stuckey & David White, *When and when not to vertically integrate*, MCKINSEY & CO., https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/when-and-when-not-to-vertically-integrate (last visited Mar. 30, 2024) [perma.cc/Q4G8-V88S].

150. *Id*.

151. RUGMAN AND D'CRUZ, *supra* note 148; *infra* Appendix 5 (Flagship relationships in the Canadian-North American automotive cluster).

152. *6. The Theory of the Flagship Firm*, OXFORD ACADEMIC, https://academic.oup.com/book/9652/chapter-abstract/156745528?redirectedFrom=fulltext (last visited Mar. 30, 2024) [https://perma.cc/4ZEF-4GBB] (Chapter Abstract).

153. *Id*.

workshare and IP Protection due to the increased transparency and control provided by the flagship leader.

Another strategy involves forming technical alliances to address high sunk costs. The automotive industry, for example, is "an asset-heavy and mature industry characterized by high sunk cost."[154] Leading OEMs like Toyota and VW, the largest multinational corporations in the industry "invest heavily in digitalization, connectivity, electric, and autonomous vehicles, . . . trying to catch up with the innovative competitors by forming strategic alliances with other. . .,"[155] to "set the industry standards, share R&D expenditures, and decrease the bargaining power of digital suppliers."[156]

Contrasting to the flagship firm model, this strategy involves an arm's length alliance with peers or suppliers to cope with the high sunk cost and investment required to achieve rapid technological advancements called by the industry. This approach allows companies to maximize their participation payback while minimizing transaction costs and other risks.

C. Predicting the Vulnerability of a Promise

We know that there are "[t]wo fundamental questions in contract law: 'What promise should be enforced?' and 'What should be the remedy for breaking enforceable promises?'[157] In certain circumstances, "not performing a promise can be more efficient than performing,"[158] particularly when parties have unequal bargaining power and financial leverage. Under the game theory, "When making the promise, the future cost of cooperating remains uncertain. The cost of cooperating might be low or high. . . . High costs of performing are an unfortunate contingency that makes breach efficient."[159] Suppose legal systems do not allow for expectation damages or specific performance as remedies; the likelihood of non-performance increases. This poses a substantial threat to OEMs, who rely on such promises to carry out their own contractual obligations. Creating a tailored contract based on a realizable remedy and defining conditions for re-negotiation is imperative to lower the potential for breach. "According to the positive Coase Theorem, private bargaining under zero transaction costs always succeeds in allocating resources

154. TRANSDISCIPLINARITY 217 (Nima Rezaei ed., 2022) (*see* Chapter 10 Disruptions and Competitive Strategies in the Automotive Industry).

155. *Id.* at 219.

156. *Id*.

157. COOTER, *supra* note 23, at 277.

158. *Id.* at 325.

159. *Id.* at 326.

efficiently. . . . Given costly renegotiations, however, the damage remedy for breach of contract has an advantage over specific performance."[160]

Local jurisdictional laws can also influence suppliers' behavior. East or Central European countries have become popular countries of choice for high-tech outsourcing. "Germany and Poland are examples of civil law jurisdictions that do not have a statutory concept of force majeure."[161] In a scenario "where fulfilling contractual obligations will . . . hike in the cost of energy, labour, and materials, . . . the courts can step in to determine how the contractual obligations are to be fulfilled, the amount of any financial entitlement or whether the agreement can be terminated."[162] These legal differences create significant obstacles in the event of contract re-negotiation. In many high-stakes scenarios, a negative outcome may be unacceptable given the enormous investment already made by parties. Furthermore, the contractual outcome can have far-reaching implications, such as military applications under deployment orders or those with other geopolitical-economic significance. By understanding the potential legal ramifications and precedents that may influence future business dealings, corporate counsel can better guide their clients in making informed decisions under challenging circumstances.

V. CONCLUSION

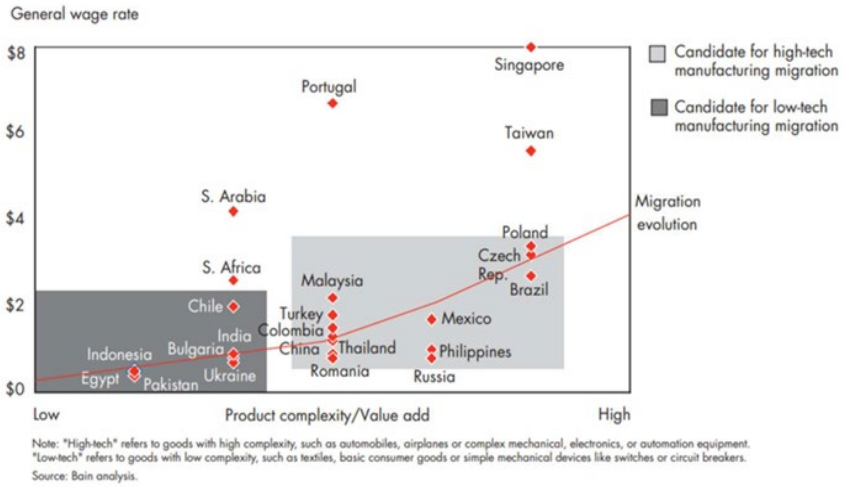
Transaction costs elevated by the uncertainty associated with global outsourcing can be mitigated through a multi-pronged approach. This includes developing a well-informed business and supply chain strategy, adopting an appropriate contractual structure, and implementing a comprehensive risk management plan. Additionally, investing in the regional legal environment and establishing innovative and tailored relationship framework with suppliers will further improve the long-term outcomes. Businesses should be advised of inherent risks, even with contractual safeguards in place. This proactive risk awareness can prevent costly disputes and the need for reactive measures.

160. *Id*. at 328.

161. Matthias Hadding, *The hidden contract risks in your global supply chain*, DENTONS (July 11, 2022), https://www.dentons.com/en/insights/articles/2022/july/11/the-hidden-contract-risks-in-your-global-supply-chain [https://perma.cc/W5WR-V3JJ].

162. *Id*.

APPENDIX 1. OPPORTUNITIES TO MIGRATE MANUFACTURING COSTS [163]

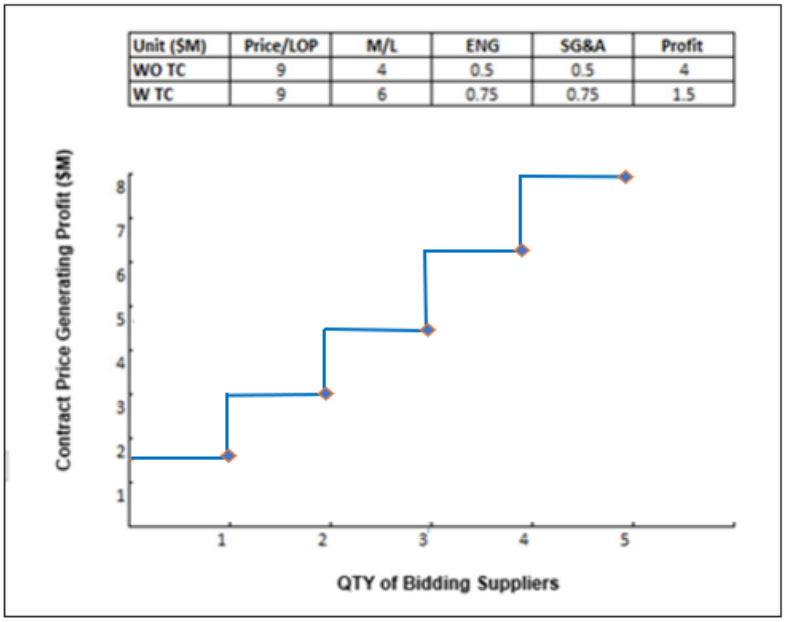


Note: "High-tech" refers to goods with high complexity, such as automobiles, airplanes or complex mechanical, electronics, or automation equipment. "Low-tech" refers to goods with low complexity, such as textiles, basic consumer goods or simple mechanical devices like switches or circuit breakers.
Source: Bain analysis.

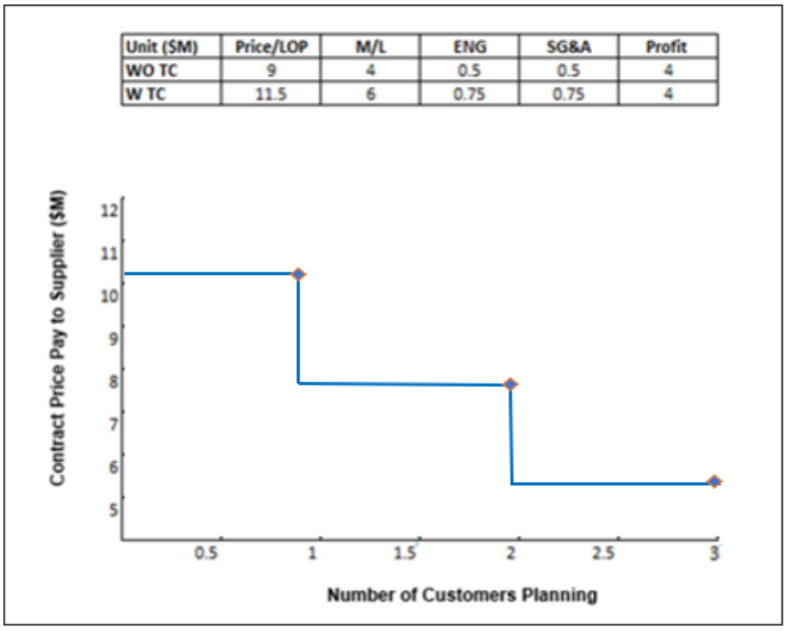
163. Vestring & Rouse, *supra* note 18. Figure adapted from *The Move to Low Cost Country* (Bain & Company 2005).

APPENDIX 2. THE EFFECT OF "UNCERTAINTY" ON THE OEM/SUPPLIER POOL[164]

Unit ($M)	Price/LOP	M/L	ENG	SG&A	Profit
WO TC	9	4	0.5	0.5	4
W TC	9	6	0.75	0.75	1.5

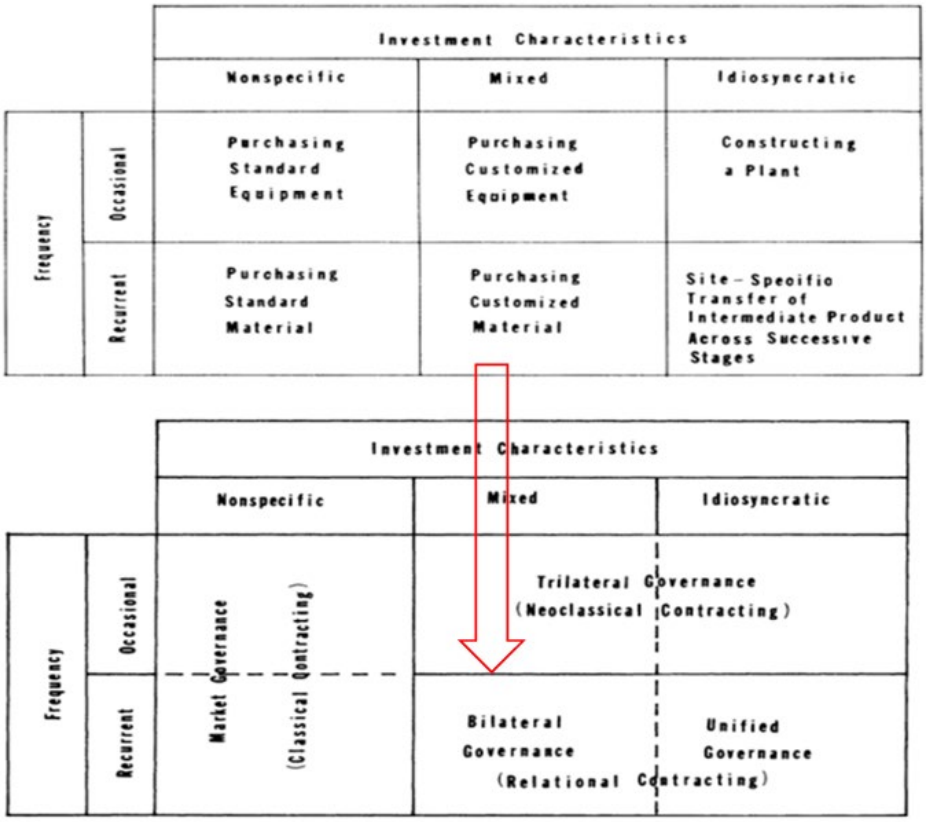


Unit ($M)	Price/LOP	M/L	ENG	SG&A	Profit
WO TC	9	4	0.5	0.5	4
W TC	11.5	6	0.75	0.75	4



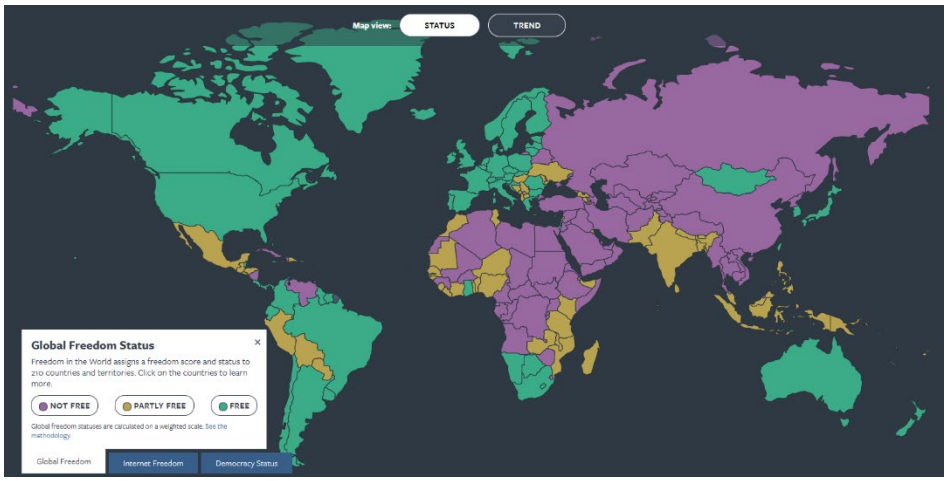
164. *Supra* note 83, an example illustrating the effect of Uncertainty.

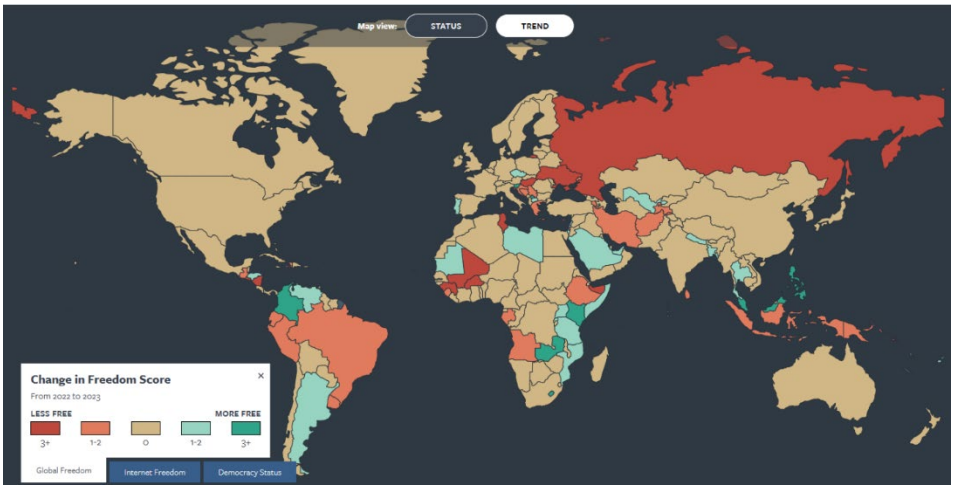
APPENDIX 3. GOVERNANCE STRUCTURE V. COMMERCIAL TRANSACTIONS[165]



165. Williamson, *supra* note 104. Figures adapted from *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J. OF L.& ECON 2 233-261 (1979).

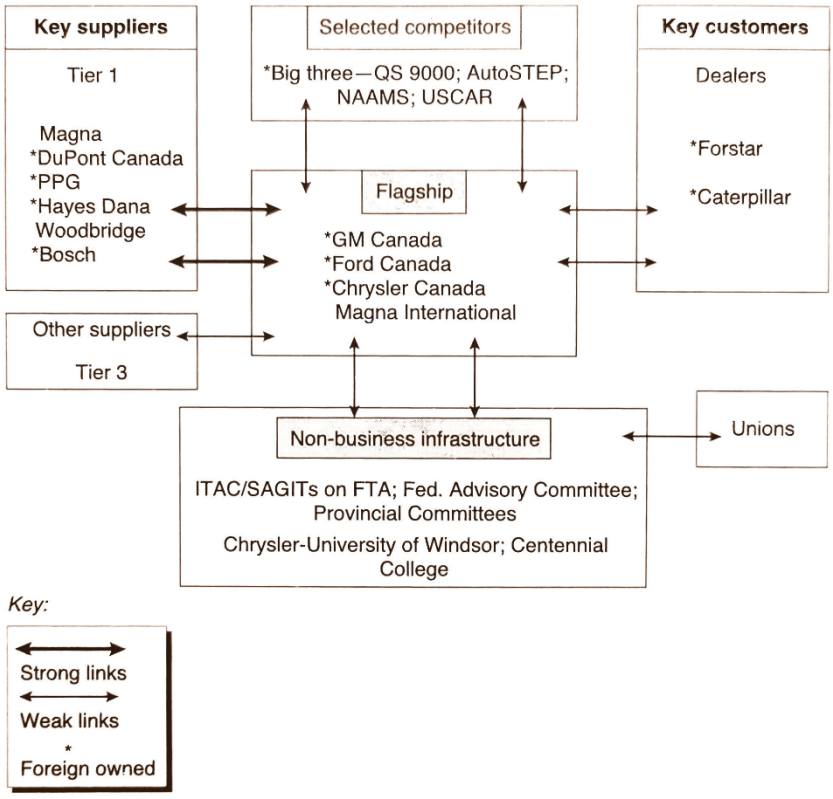
APPENDIX 4. GLOBAL FREEDOM STATUS MAP[166]





166. FREEDOM HOUSE, *supra* note 135. *Map of Freedom 2023 (Status and Trend)*, Freedom House, https://freedomhouse.org/explore-the-map?type=fiw&year=2023 [perma.cc/QY7E-TMN8].

APPENDIX 5. FLAGSHIP RELATIONSHIPS IN THE CANADIAN-NORTH AMERICAN AUTOMOTIVE CLUSTER[167]



167. RUGMAN AND D'CRUZ, *supra* note 151. Figure adapted from MULTINATIONAL AS FLAGSHIP FIRMS: REGIONAL BUSINESS NETWORKS 166 (2000).