

Working Title: Supply Chain Economics: A fresh lens for holistic analysis

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Abstract: Idiosyncratic shocks, such as the Covid-19 pandemic and Russian invasion of Ukraine, are catalysts for wide-spread disruption to economies, firms, and households. We find these crises accelerating pre-existing trends, so it is critical we consider historical contexts. Aging workforces, declining birth rates, promotion of 4-year degrees, stigmatization of blue-collar work, geographically, hyper-concentrated supply chains have all been in the making for decades. Organizations are heavily investing in automation technologies and continuing foreign direct investment in offshore sourcing of critical natural resources. There are real geo-political concerns on this in Africa and Asia, such as dominance in rare earth minerals and semiconductor fabrication. Supply chain management is the management of a network of organizations, internal and external, by which an organization pursues its goals and objectives. Yet neither the social science of economics or decision science of supply chain management proved sufficient to anticipate the depth, breadth, or duration of these disruptions, much less mitigate the damage. So, from those definitions we frame supply chain economics. By combining these concepts, we understand supply chain economics as the systematic study of the production, distribution, and consumption of goods, services, and capital by networks of organizations, internal and external, with which any given organization pursues its goals and objectives.

Supply Chain Economics: A fresh lens for holistic analysis

Introduction:

Idiosyncratic shocks, such as the Covid-19 pandemic and Russian invasion of Ukraine, are catalysts for wide-spread disruption to economies, firms, and households. These crises compound pre-existing trends, so it behooves us to consider historical contexts. Aging workforces, declining birth rates, promotion of four-year degrees, stigmatization of blue-collar work, and geographically concentrated supply chains have all been in the making for decades. Economics is the study of production, distribution, and consumption of goods and services, and creation and transfer of wealth. A supply chain is the network of organizations, internal and external, by which an organization pursues its goals and objectives. Yet neither the social science of economics or decision science of supply chain management proved sufficient to anticipate, much less mitigate the depth, breadth, or duration of the disruptions and damage wrought by Covid-19 or Russian invasion. But by combining these two sciences holistically, we can understand supply chain economics as the systematic study of production, distribution, and consumption of goods, services, and capital by networks of organizations, internal and external, with which any given organization pursues its goals and objectives. This new framework of supply chain economics can facilitate analysis free of dichotomous arbitrary constructs.

Foundational to understanding how/why supply chains operate/ behave as they do is process focus. Adherence to processes (tasks and activities) is necessary for organizations to excel; performance excellence, or quality, is defined as consistency in reaching an organization's goals and objectives. As process focus is integral to supply chain and operations management, supply chain economics is agnostic on how processes are executed and by whom. Whether self-

performed internally, outsourced to third-parties, in whatever combination with capital, technology, and other resources, labor has no primacy beyond that endowed by the organization's controlling stakeholders.

Literature Review:

Though neglected domestically, manufacturing is a critical component of most economies. Extended factory furloughs became commonplace following the onset of Covid-19. (Hufford & Tita, 2020) And of course, business closures and worker lay-offs usually disproportionately impact the less privileged. Pre-pandemic supply chains were severely lacking in geo-diversity in sourcing and supply. Extended supply chains from Asia all involve painful bottlenecks at each point of transfer, warehouses, ports, ships, rail, terminals, trucks. Extreme inflation in logistics costs can negate original labor savings; when a \$2,500 container from Asia costs \$25,000 and three-week transit takes three months, firms adopt inefficient drop-shipping and air freight far exceeding labor savings. (Thompson, 2021) And as economies continue to develop, low-cost offshore sources increasingly consume their own productive output; the U.S. should expect a return to doing the same domestically. Organizations and communities will be stronger, more resilient, with lower risks, when they have sourcing or production in each hemisphere, on each continent even.

Concentration of the U.S. supply base in Asia has been building for seven decades. There were many valid strategic reasons for doing so. Low-cost labor was one, but as economies develop in Asia, that relative wage differential continues to shrink. Frequently, more lax regulatory environments meant less protection for environment and workers; yet stakeholders increasingly agree such predatory opportunism is unacceptable. Sometimes firms offshore

sourcing for access to critical natural resources and there are very real geo-political concerns on this in Asia and Africa right now, such as dominance in rare earth minerals and semiconductor fabrication. (Sheffi, 2023, p.128) Sometimes the strategic driver is downstream in supply chains, in that firms choose to offshore some part of their production processes, in order to gain access to that local market of consumers. (Sheffi, 2020, p.145) If one wants to sell in China or India, one needs to employ in China or India. And of course, those extended supply chains involve potential bottlenecks at each point of transfer. (Sorkin, 2021)

As the U.S. has arguably seen, competition for real resources risks hyper-inflation in supply chains and for citizen consumers. Negative externalities from production to common pool resources are valid cause for concern. Forstater urges “analysis of natural resource inputs and the recycling of the residuals of both consumption and production” and warns of “the ecological triad population explosion, gradual exhaustion of essential material resources, and progressive deterioration of the environment” (Forstater, 2004, p.19) We must not lose sight of the dichotomy of closed loop ecological systems and open loop pecuniary systems and we cannot engage fully, without bringing in both harms and benefits. Which in turn can leave us in a quandary, for who can put a price on quality of human life? Leading to our usual advocacy of net greatest; the microeconomic choices of individuals manifest in the macroeconomy of society.

Formally beginning with Adam Smith’s writings on division of labour (Smith A. E., 1776) and further refined by Henri Fayol’s work on management function (Fayol, 1916) and Frederick Winslow Taylor’s thoughts on scientific management (Taylor, 1916), the blueprint of the industrial revolution became extreme optimization of human labor, at the task level, with management acting to plan, organize, and control. Adam Smith’s division of labor and Henri

Fayol's unity of command had set in motion the dehumanization of labor, that would in turn fuel the mass production assembly lines to come.

The state is concerned with promoting economic growth, full employment, price stability, and trade surplus. Yet, the state may not actually be concerned with the public interest, but instead be captive to, influenced by, or distracted by a private interest or subset of public. Dugger considers the tension between village and equality by asking, "Why should anyone prefer dealing with a person from their own village over a person from another, if other things are the same...it is inconsistent with equality. People of all races, religions, languages, and villages simply cannot be treated equally if Swadeshi means that one's neighbors are preferred over others." (Dugger, 1984, p.444) Many people prefer to do business with those they know, those they easily relate to, those with whom they share common interests. There are conveniences, efficiencies, and savings in dealing locally.

Contemporary supply chain disruptions have been incredibly disruptive to commerce and life. The Covid-19 lockdowns, followed by Russia's invasion of Ukraine, drove bottlenecks in supply that have simultaneously fueled inflation and recession. (Sheffi, 2023, p. 127) But the public likely lacks understanding of why lean operations, including just-in-time inventory, were cemented as best practice for modern enterprises, the goals it pursues, and the benefits it has wrought. (Sheffi, 2020, p. 139) Far beyond cost savings, lean operations seek to eliminate all forms of waste. Yes, this will frequently result in efficiency and cost savings, but thoughtfully pursued, targeted waste includes resource consumption, including raw materials and energy, and by extension, protection of the environment. Lean extends similar respect to stakeholders, including workers, consumers, shareholders, and community members. Lean and kaizen (continuous improvement) supply chain and operations management philosophies codify seven

deadly muda (wastes), including ‘motion’ and ‘transportation’. So yes, it’s wasteful to excessively move things or transport them. It risks their damage and expends potentially needless energy in doing so. But one of the tensions is that those principles need be balanced against economies of scale.

The businesses and industries we study widely embraced principles of quality management decades ago, lauded as lean in the Toyota Production System and statistically consistent in Six Sigma. Deming, Juran, Crosby, Baldrige, Ishikawa, Taguchi, and Taichii Ohno among others, preached that defects were not the fault of the worker, but of the manager. In the pursuit of consistent processes to yield consistent outcomes, management was to carefully recruit, select, and hire workers, fully train, equip, and empower them, and clearly communicate a concise strategic vision. Workers should be encouraged to seek continuous improvements, promote the successes, and report the failures (defects). When defects occur, their root cause should be analyzed, and it would be found to lie with management, not the worker. When outcomes fail to meet the agreed upon goals, we must pursue honest root cause analysis, with repeated queries of “Why?” Where were goals not clearly communicated, stakeholders not engaged, actors not fully vetted, programs not sufficiently funded, or leaders not strategically committed? (Myerson, 2012, p.12)

Discussion:

Today we find greater focus on equity, inclusion, welfare, and those principles often find themselves in conflict with outsourcing of public sector services to the private sector. Resultant private sector profit models likely contribute to inequity in wages and wealth. Hence on-going discussion of whether to effect institutional change in employment with Universal Basic Income

or Federal Job Guarantees. Education, healthcare, and policing are typically the responsibility of state, county, and municipal governments, who clearly cannot deficit spend like the federal government. Yet even with the Federal government as currency-issuer, if we try to purchase too much, we will strain our economy with competition for real resources, resulting in inflation and conflict. If we make too many social promises, we won't run out of money, but we risk outpacing the ability of our workforce to produce goods/services that fulfill those promises. (Kelton, 2020, p.41)

The entrepreneur does not necessarily differentiate labor from other needed resources. Instead, they determine what production processes (including worker skills and input commodities) should be core competency to their endeavor and might outsource remaining processes. Marx faults the entrepreneur for "...his inability to explain commercial profit and its characteristic features..." (Marx, 1894, p.440) Is profit not the enterprise's (entrepreneur's) residual of application of capital (including labor) toward its agreed goals and objectives? Marx speaks of a "...kind of industrial capital. Where they deal with it specifically, as Ricardo does in connection with foreign trade, they seek to demonstrate that it creates no value (and consequently also no surplus-value)." (Marx, 1894, p.442) But it does create value, as capital includes inventory and the ability to hold inventory decouples production from sales/consumption.

Heilbroner bemoans the commoditization of labor, but the capitalist views it as just that, another commodity in which to invest for production, no more necessary than raw materials, energy, physical space, tools, knowledge. While the value of the raw material inputs may be increased through the production process, so is the value of the worker's labor. Unless you commoditize labor and pay for time (and for the potential value-add from unique skill and

knowledge), you are left with labor only gaining value when the worker is provided tools, materials, training, and direction. Capitalist does not confer special status on labor, as different from any other commodity; in this sense a capitalist is a mercantilist. Heilbroner seems to ignore the value adds to the distribution process by the merchant, whether in logistics or facilitating markets. (Heilbroner, 1985, p.66)

Georgescu-Rogen posits “labor is the father and nature is the mother of wealth.” (Georgescu-Rogen, 1993, p.1) But labor is heterogeneous; an entrepreneur’s labor is frequently far more productive than a worker’s, as it is creative/generative and delivers value beyond the capital investment; an entrepreneur can be viewed as a force multiplier against their workers. Georgescu-Rogen oversimplifies in claiming “man can produce only utilities...” (Georgescu-Rogen, 1993, p.2) Man produces utility through novel, creative, innovative combinations of labor and nature. Economic circulation is in an open system, where new value can be created, but the physical constraints of nature’s closed loop system are influential and constraining upon it. “Nothing could, therefore, be further from the truth than the notion that the economic process is an isolated, circular affair—as Marxist and standard analysis represent it. The economic process is solidly anchored to a material base which is subject to definite constraints.” (Georgescu-Rogen, 1993, p.4)

In organizations of various scale, products and services today are largely comprised of fractional labor inputs. How useful are class distinctions rooted in labor processes which may no longer exist? Even setting aside fixed capital investments, individual labor is rarely the majority value-add to an individual product or service, constructing arguments to that end are unhelpful. Labor is intangible, but laborers are not, and labor must be simultaneously consumed; we cannot inventory labor with value-added during conversion, in the same way we can materials. Instead,

it is typically paid for upon input/conversion, because the labor once consumed, is no longer available for use or sale; its value has been sold. The same is said of a raw material; once consumed or converted during the production process, it is no longer available in its original state. But the point of difference is that the material/good has residual tangible value that labor does not. And for contemporary workers, processes continue to increase in capital intensity. When labor has little or no contribution to the incremental value of the goods or service, what claim will it have on any profits from the process?

Heilbroner asserts that the right to organize production is political power, but it seems overreach for the state to supersede an individual's reasonable private property rights, if said individual desires to invest or innovate (negative externalities understood and fully mitigated). (Heilbroner, 1985, p.100-101) The symbiotic relationships frequently found in capitalist societies are not predatory by definition. How would we separate rule of law from capitalism, markets, and democracy itself? Defense of private property rights is intrinsic/precursor to capitalism, and both are intrinsic/precursor to democratic society. Conversely, to oppose capitalism, is to oppose democracy. Collectivism at scale only endures through autocratic rule.

Conclusion:

By stripping away *ceteris paribus* assumptions, supply chain economics provides a more credible framework to investigate what has happened and better predict what can happen in the future, while also engaging current practitioners in a ready and familiar lexicon and taxonomy for making management decisions that operationalize institutional adjustments. The deviations from mainstream and institutional economics begin with the recognition of the critical role of process focus in supply chain and operations management. By holistically defining

organizations as our unit of analysis, we allow for a diversity of legal entities, which likely include a diversity of stakeholders. The combined inputs of these stakeholders will direct the processes used, which will ultimately yield the supply chain, including labor, captive or outsourced, for production of goods and/or services, domestic or offshore.

The complexity of modern organizations, diversity of stakeholders, and potential outcomes of management decisions at the micro level, calls for the more flexible, inclusive framing of supply chain economics. Only then can macro investigations, models, and simulations be constructed or conducted. The pace of change in Industry 4.0 and beyond will increasingly reveal/emphasize the process focus of modern organizations. If/when they choose to sub-optimize by retaining unnecessary labor, such organizations will increasingly be called on to justify those decisions. It remains to be seen how the institutional adjustments will be accepted. The potential near-term displacement of sub-sets of labor with de-skilling will again increasingly cause angst. But in order to investigate fully and contribute to resultant public policy, we need credibility of honest treatment of organizations. And organizations will need to reckon with their own vision, mission, goals, and objectives. To force arbitrary constraints, potentially counter to stakeholders' original goals, will be sand in the gears. There is stark difference between regulations constraining processes to protect life, health, safety, environment, and attempts to direct processes employed (and thereby labor employed) as process selection is guided by volume and heterogeneity of demand. Critically, we rarely and only minimally legislate demand.

Economics is the study of production, distribution, and consumption of goods and services, and creation and transfer of wealth. Supply chain management is the management of a network of organizations, internal and external, by which an organization pursues its own goals

and objectives. Foundational to supply chain management is operations management, the management of an organization's processes to pursue its goals and objectives. Adherence to processes is necessary for organizations to excel; performance excellence, or quality, is defined as consistency in reaching an organization's goals and objectives. When organizations execute consistently, they can leverage that quality for lower costs, greater volume, higher prices, or additional stakeholder good-will.

By combining these concepts, supply chain economics can be framed as the systematic study of the production, distribution, and consumption of goods, services, and capital by networks of organizations, internal and external, with which any given organization pursues its goals and objectives. For idiosyncratic shocks, such as pandemics and war, neither the social science of economics or decision science of supply chain management prove sufficient to anticipate the depth, breadth, or duration of disruptions, much less mitigate the damage. Hence this new theoretical framing.

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