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## EXECUTIVE SUMMARY

Supply Chains complex, span national and geographical boundaries and operate in an increasingly variable and risky environment. Today, *supply chains compete*, and *nations compete* through their supply chains. Key supply chain decisions and designs are made by **individual** executives and companies based on meeting corporate objectives while navigating national laws and managing business risk. Over the course of the past thirty years, through a variety of economic Neo-Liberal philosophies and “short-termism” corporate strategies designed to maximize short-term results and increase stock prices, our supply chains have been *designed and “Built to Break”*.

In the process we have ignored National Security and risk and exported entire supply chains and US jobs and created hollow communities and significant income inequality in companies. This, coupled with increased industry concentration, has resulted in fragile supply chains with *increase of points of failure and dangerous “chokepoints”* for our critical supply chains – where supply disruptions could trigger potentially catastrophic effects. As a result, we have given China extraordinary power over our security, economy and the average American’s standard of living. We are in a vulnerable situation and, effectively, in the midst of a supply chain war that is every bit as important as a physical war.

The US government has now broken with and moved away from the Neo-Liberalism of the past and has taken a number of powerful and timely steps and actions to address this broad issue. This is not enough and *much more needs to be done*.

There are several legislative areas that we should consider addressing National Security and Economic vulnerabilities and meet our national goals. They are:

### ***Continue the Funding of US Manufacturing, Capabilities and Infrastructure***

The Government has made a great start with programs such as the CHIPS and Science Act, the Infrastructure Investment and Jobs Act, and restrictions on the export of certain technologies to China but years of neglect in policy and investment in our critical supply chains and National Security have left us vulnerable. We must expand these to a broader range of critical components, products, supply chain infrastructure and large scale supply chain initiatives .

***Define and Map the Critical Products for National Security, Economy and Health*** While necessary, the current definitions are not enough. The definition must be broadened to include the spectrum of supply chains and technologies (for example, food, renewable energy products, aircraft, and automobiles), that are critical to our economy and National Security. Many of the risks lie upstream in the supply chain. Disruption of our critical supply chains would very likely cause a cascading effect of industry disruptions, some of which would be very hard to contain and recover soon. Disruptions in industries such as semiconductors and pharmaceuticals could, in a worst case scenario, bring the country to a standstill.

### ***Set and Mandate Sourcing Parameters and Guidelines – with our Allies***

We must develop and implement resilient supply chains that identify and mitigate risk. Given the complex and interconnected nature of today's supply chains, it is obvious that we cannot do this alone, and it should be developed in cooperation with our allies. We certainly cannot expect individual companies do it on their own. *We must* mandate and encourage diversified sourcing for critical components and products, as well as provide and mandate sourcing parameters and “guardrails” that include China and other adversarial countries, along with acceptable alternatives (such as re-shoring or friend-shoring). Such mandates should have “teeth” for companies that ignore these mandates or try and circumvent them. We are not playing on a “level playing field” or a “flat world”.

### ***Emphasize Supply Chain Technology Security***

We have already made an excellent start through the restrictions of the sales and transfer of critical technologies to China, but we must do more. We must continue these efforts and not water them down under pressure from domestic companies. In addition, we must ensure that the investigative process into foreign investments in US technology companies is comprehensive and rigorous. Finally, we must evaluate and review Government policies that put US Supply Chains at a competitive disadvantage.

### ***Focus on Talent and Skill Sets***

Building up our manufacturing capability and capacity requires supply chain talent and skill sets. The other side of this coin involves restricting the access of our adversary in obtaining such skill sets and using those skill sets to penetrate our critical industries. To this end, we must encourage and resource STEM Education in schools, vocational schools and Universities, while also restricting hiring and access to our own critical technology development and research.

### ***Provide Finance & Tax Assistance***

Financial incentives and financing are what enables and encourages companies and industries to re-shore and friend-shore from China, and to help small and medium-sized businesses (where much of our innovation takes place) to run their operations, and to enable job creation. To achieve this, we must provide tax incentives and enable Supply Chain financing in the form of low-cost loans for small and medium-sized businesses in the US.

### ***Set up Public-Private Partnerships and Enlist the Private Sector for Management skills:***

We must harmonize the needs of the private and public sectors for critical Supply Chains in today's increasing complex and changing environment, and the government has to assume some the costs of increased resilience. Such Public-Private Partnerships will help leverage the “whole of country” to meet our goals, while recruiting part-time and short-term skill sets will be a critical aspect of getting leading edge management concepts, innovation and experience into critical supply chains, the Government and Department of Defense.

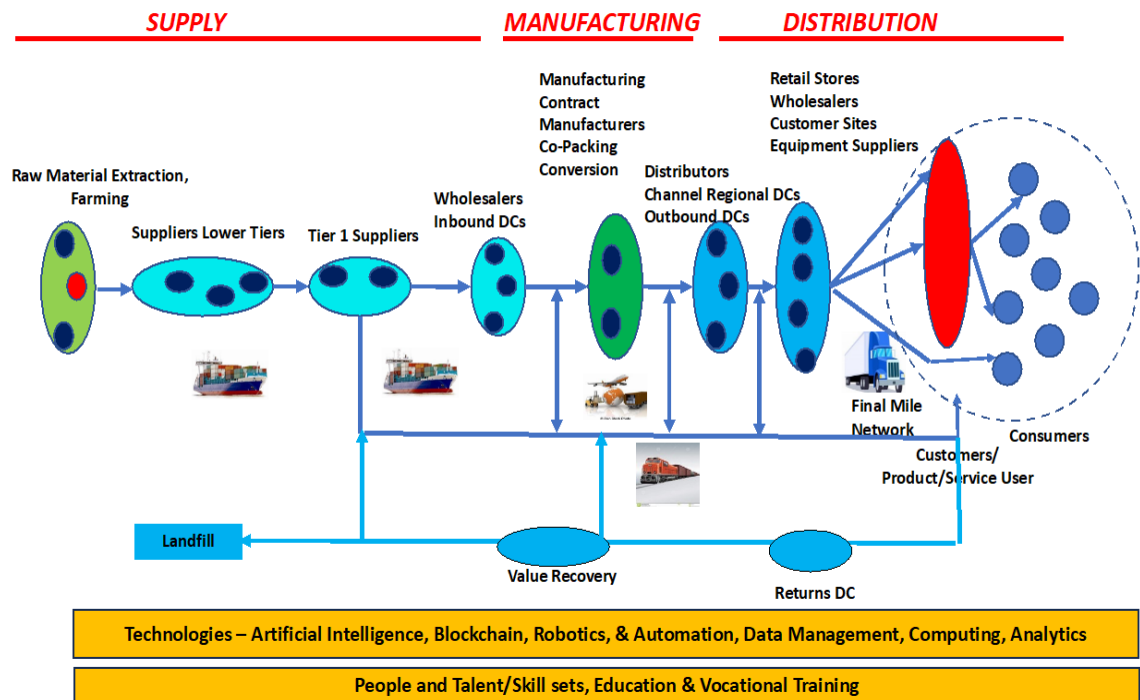
## INTRODUCTION:

### **Definition of Supply Chains for this Discussion:**

Supply Chains are what drive the international movement of goods, services, cash and people from the point of first supply to the end consumer and back to re-use and ultimately, landfill—or, more succinctly put, from “dust to dust”.

**Figure 1** is a simplified depiction of a global supply chain. It includes Sourcing & Procurement, Logistics (warehousing, materials handling and transportation), assembly & manufacturing, delivery, order management, planning & Inventory management, customer management and the returns and disposal process. The technologies core to the Supply Chain include Artificial Intelligence, Blockchain, Data Management, Analytics, Robotics and Automation.

**Figure 1: The End-to-End Global Supply Chain**



The global supply chain is complex, spans national and geographical boundaries, requires several logistics modes and crosses multiple trade, customs, tax and regulatory regions. Furthermore, today’s business and global supply chain environment is variable and risky and can best be described by the old US Military term VUCA - volatile, uncertain, complex and ambiguous. More than ever, it has become obvious that individual companies do not compete with each other – *supply chains compete*, and *nations compete* through their supply chains. This

is particularly true when it comes to the end-to-end supply chains of **critical** raw materials, manufacturing and logistics capabilities and capacity, talent and finished goods products.

The objectives of the global supply chains are several, and include:

- satisfy multiple stakeholders in terms of sustained growth and profit, working capital needs.
- be “good citizens” in their communities.
- consider National Security (economic and military) in their decisions.
- be resilient and secure.

Key Supply Chain decisions and designs are made by individual executives or management teams based on meeting corporate objectives while managing risk. They are based on financial conditions, costs of capital, market conditions and trends, government policies, laws and spending. They sometimes include National Security and Sustainability constraints. However, they are always decisions that are made by individual companies. As a result, this discussion is from a business supply chain perspective, and not from a macro-economic or academic one.

***“Built to Break” – the Situation:***

Over the course of the past thirty years, through a variety of business and international trends, economic philosophies, government policies and individual executive actions, our supply chains have been designed to minimize costs and working capital, maximize growth and maximize share price – all, theoretically, over a sustained time period. In order to achieve this, executives developed strategies based on a few critical trends and assumptions:

- off-shoring and out-sourcing, looking for the lowest production costs, foreign government incentives and subsidies, and labor stability (mainly to China, which offered all of these)
- low taxes
- market access
- just-in-time systems that minimized inventory through the supply chain.
- The assumption of a stable global economy where supply was based on economics and flowed smoothly in a “flat world”, while competition would keep costs down, increase capacity and improve service in key infrastructure areas such as containerized shipping.

*But the last few years have shown that these assumptions were wrong, and it became obvious that many of our critical supply chains were designed and “Built to Break”, (a term first put forward by Barry Lynn in 2012).*

In the process we have ignored National Security and risk. Our supply chains were fragile, and disruptions in supply led to shortages of everything from medical supplies to consumer goods and semiconductor chips. We have exported entire supply chains and US jobs under false assumptions and promised benefits of globalization. Probably the most dangerous result of this

approach to supply chain design, coupled with increased industry concentration (in terms of size, capacity, ownership of distribution and market power), has been the *increase of points of failure and dangerous “chokepoints”* for our critical supply chains – where disruption could trigger potentially catastrophic effects - and, most importantly, giving China extraordinary power over our security, economy and the average American’s standard of living.

The US government, over the past few years, has broken with and moved away from some of the economic philosophies of the past and has taken a number of steps and actions to address this broad issue, including investments in critical industries, capacity and infrastructure. These have been powerful and timely. The investments and focus, however, concentrated on a few industries that were identified as important to National Security. This is not enough. The list of industries must be expanded, and the situation needs to be looked at holistically, with all the attendant interdependencies, and we must address the costs of resilience and who pays for it. *In short, much more needs to be done.*

It is becoming apparent that we are in the midst of a supply chain war that is every bit as important as a physical war. This testimony seeks to provide, from a business and supply chain ground level view, the rationale and actions needed.

## **MAJOR TRENDS AND ISSUES IMPACTING SUPPLY CHAINS**

A good way to address the issue of how U.S. corporations are addressing National Security vulnerabilities is to discuss the major supply chain trends, issues and government policies impacting the development of supply chain strategies and designs. From a business executive perspective, I have highlighted six important and inter-related ones, which can serve as guidelines to policy.

### ***1. A Lack of Defining and Mapping the Critical Products for National Security, Economy and Health***

Historically, we have not defined or mapped the supply chains for our critical products. Part of the reason is that we have never had to do this. The Center for a New American Security (CNAS)’s project on Securing America’s Critical Supply Chains (part of their U.S. National Technology Strategy project) has developed a framework that helps determine these critical supply chains, with one of the key goals being the identification of the supply chains “where known vulnerabilities pose excessive risks to a country’s well-being.” This is a landmark project but still appears to narrowly define “well-being” as defense-related, addressing strategic and critical materials, innovation, talent, cyber-security, manufacturing technologies, and small business. The “critical focus areas” include categories such as Castings & Forgings, Missiles and Munitions, Energy Storage & Batteries, Strategic & Critical Rare Earth Elements and Microelectronics.

*While necessary, the current definitions are not enough.* The approach must be broadened to include the supply chains (products, capabilities, materials) and technologies that impact health

(PPEs, antibiotics, Active Pharmaceutical Ingredients), food, renewable energy products, aircraft, and automobiles, amongst others. The definition of “Critical Products” cannot be restricted to just some overall end products or a few components. Some of the more dangerous, often-overlooked risks lie upstream in the supply chain (refer to **Figure 1 – Supply**, including Tier 1 Suppliers, Lower Tier Suppliers and Raw Materials). There must be a rigorous method to assessing this, determining vulnerability, sourcing, capacity, structuring and the time to execute.

Such an analysis must include the true effects of disruption. Critical supply chain disruption causes a cascading effect of industry disruptions. Some of these disruptions would be very hard to contain and it would be difficult to replace these lost supplies soon (for instance, setting up semiconductor fabs and pharmaceutical manufacturing facilities). For instance, the semiconductor supply shortage which started in 2020 impacted industries from automobiles to communications. A stoppage of semiconductor supply (a major disruption), brought on by a China-Taiwan blockade and a North Korea aggression against South Korea and Japan, for example, would have far worse effects. For a start, the primary industries affected would include automobiles, heavy trucks, aircraft, computers, consumer electronics, weapons systems, networking, guidance and navigation, construction equipment, and industrial machinery. These would, in turn, impact the secondary and tertiary industries such as freight, maintenance and services, tourism, retail, construction, manufacturing, petroleum products, media, toys, food and the operations of infrastructure (traffic lights, signals, air traffic control, etc.). Quantifying this impact on the economy is a mind-numbing exercise, with one conclusion being that a semiconductor supply shut-off could bring the economy and part of the National Security capability to a standstill. In a similar fashion, the loss of Active Pharmaceutical Products (APIs) and antibiotics could be devastating to our health, economy and military capability. Similar scenarios could be built for food, medical equipment, and supplies. Equally importantly, this analysis must map out the supply chains to the bottom of the Bills of Material for every critical product and system, the sources, diversification and risks of disruption.

## **2. *National Trade Policies Assuming Free Trade and a Level Playing Field***

Neo-Liberalism has been defined as “a policy model that encompasses both politics and economics. It favors private enterprise and seeks to transfer the control of economic factors from the government to the private sector. Many neoliberal policies concern the efficient functioning of free market capitalism and focus on limiting government spending, government regulation, and public ownership” (Investopedia.com). This has been the economic philosophy adopted by many Western countries over the past several years, and assumed:

- a level playing field in terms of national rules, regulations, tariffs and taxes (remember Ronald Reagan’s statement “free trade is, by definition, fair trade”)
- a smooth and seamless flow of goods and services across national and geographical boundaries, unencumbered by national issues and economics.
- competition would foster innovation, lower costs and increase service.
- movement of capital, capabilities and jobs to the lowest cost regions to provide the cheapest goods.

The first three were quite false while, unfortunately, the fourth was all too true because it was allowed to take place with little or no consideration for National Security. This approach resulted in:

- a mass export of US manufacturing jobs
- a hollowing out of traditional communities and a loss of social cohesion
- a lowering of wages and large income equality between senior executives compensated on stock price and everyone else and, very importantly.
- a loss of critical manufacturing, engineering and supply chain skills and technologies.

Furthermore, this mindset has resulted in three additional sets of factors:

- The imposition of laws and reporting regulations on companies with international operations that puts them at a disadvantage against companies from China and, in particular, those controlled by the Chinese government. Many of these were crafted with little regard for the competitive position of US companies on the international environment. These laws requiring reporting to policy adherence encompass everything from Conflict Minerals and social issues to environmental impact.
- The ignoring of STEM and Supply Chain disciplines by universities as they were not viewed as core US capabilities, and the elimination of Vocational Education & Training for similar reasons.
- Investment and control by China and Chinese companies in US technological companies, coupled with the “dumping” of Chinese products to the US.

It has now been recognized that this approach is self-defeating to the broader population and to our National Security. The movement away from this Neo-Liberal perspective started in the previous administration with the tariffs on many Chinese goods and has continued in this administration with restrictions on the export of technologies to China and investments in manufacturing and infrastructure. But a lot more needs to be done.

### ***3. “Weaponization” and Concentration of the Supply Chain***

Countries such as China have long recognized that control over global supply chains can be a political, economic and military weapon and, as such, they have worked to “weaponize” their supply chains. This has led to explicit strategies to control raw materials, the manufacture and supply of critical components and processes, turning the “traditional trapezoid” supply chain into a “diamond” supply chain. The differences between the traditional “trapezoid” global supply chains and the “diamond” supply chains and the movement from one to the other is shown in **Figure 2**.

For example, China’s initiatives, (including its aggressive \$1 trillion Belt and Road Initiative) to capture private, corporate, and national assets across the global supply chain is succeeding in many areas and has put our critical supply chains at risk. The willingness of the Chinese to use

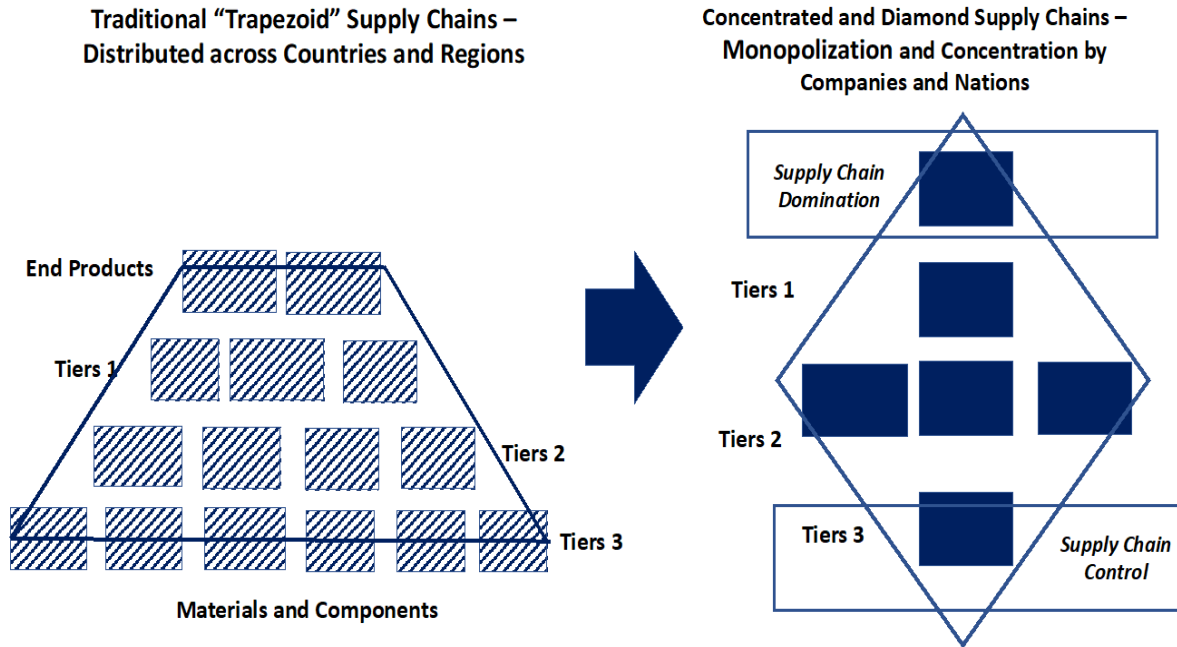


this as a weapon has manifested itself in several ways, including the Rare Earth threats to Japan, supply cut-offs of gallium, germanium and related compounds to the US and its allies, and the coercion of electronics companies to accept Chinese political control of communication. Historically, China has used many informal methods to pressure western firms to agree to their social, political and intellectual property demands – these have included arranging boycotts (a major one because of a “lack of respect for customers in the Chinese market”), action against executives, actions against market access, covert rules against removing capital equipment and enforcement of unclear rules. While these still exist, they have been augmented by more direct methods based on increasing supply chain control.

The results are clear. China controls the current supply and manufacture of electric car batteries and the critical elements needed (cobalt, lithium and nickel), Active Pharmaceutical Ingredients (APIs) for the manufacture of pharmaceuticals, antibiotics, polysilicon for solar cells and Rare Earth Elements (17 elements collectively called REEs) used in defense systems, communications and electronics (in 1993, 38% of the supply of REEs were produced in China and 33% were produced in the US. We then began to outsource its mining, production and processing, and, by 2011, China controlled 97% of REEs).

However, the development of the “diamond” supply chain, controlled by a few entities, has also been greatly helped by the actions of individual companies to offshore and drive up stock values, and the US Government’s reluctance to enforce anti-trust and anti-monopolization legislation over the last several years. This has resulted in a high degree of concentration in many critical industries and domination by a few firms. The key tactics used are Mergers & Acquisitions (including the new evaluation of vertical integration), domination of distribution channels and loss-leading pricing by larger firms. The most obvious examples of the results are the defense industry, pharmaceuticals, food, meat, electronics and media (including social media). In some of these, though, this concentration, coupled with off-shoring, has led to “chokepoints” of critical supply chains in China and areas within the Chinese sphere of influence. This means that our critical supplies can be stopped or disrupted very easily.

## Figure 2: Supply Chain Structures



The US, while not embracing the entire “whole of country” approach, could and should develop and fund Public-Private partnerships for Supply Chain Technology and structure development. Initiatives such as the CHIPS and Science Act (with over 460 statements of interest from companies around the world) and the Infrastructure Investment and Jobs Act will prove to be enormously successful but must be expanded to other critical industries – electronics, communication and networking, defense-related industries, pharmaceuticals, renewable energy materials, mining and component manufacturing, to name a few. This includes not allowing the mining of critical elements in the US to be stopped by various interest groups.

**It is a tremendous start**, made even more so by the recent announcement mandating reporting and restricting private equity investments and US Venture Capital into Chinese companies in semiconductors and microelectronics, quantum information technologies and artificial intelligence systems. This has been coupled with the creation of an “outbound investment” review group and capability to ensure that foreign investments do not impact National Security. The Foreign Investment and National Security Act is probably applied well to Defense contractors but given the increasing dependence on commercial companies and technologies and the spectrum of other critical industries, should be expanded and strengthened.

China is pouring huge amounts into its own chip industry as part of its “Made in China 2025” plan which seeks 70% self-sufficiency in semiconductors by 2025 (\$73 billion thus far in funding, not including grants, equity investments and low-interest loans, which exceed \$50 billion).

However, there are some strong challenges towards successful implementation. Some are obvious while others may be directional and cause some apprehension.

- Talent and Recruiting: US chipmakers are struggling to fill key positions, and it's taking them over twice as long as other industries to hire technical personnel.
- Exemptions, which have been given to some major semiconductor firms, may dilute the impact.
- Impact on US equipment and technology companies who count China as a major market (For instance, Applied Materials cut its 4<sup>th</sup> quarter projections by \$400 m, and the CEO of Nvidia warned of "enormous damage" to American companies if they were prevented from selling advanced chips to China – including chips critical to the development of Artificial Intelligence), and they may apply pressure to grant more exemptions.
- Retaliation risks by China in terms of essential products such as minerals, rare earths, EV batteries and pharmaceuticals,
- Impact on US citizens, green card and visa holders who work for Chinese firms or supply services to Chinese firms impacted.
- Commercial consumer products that are non-essential and which rely on low-end chips, where US companies may lose supply and revenue. This category can include fund managers who want to get client returns on China investments.
- It's currently taking a long time for the government to release the funding – it may be an inefficient process run by people who do not understand the speed of relevance and the speed of business.
- The fear that non-business and social conditions that may be imposed as a requirement for the funding.

The administration must hold firm and prioritize National Security over non-critical commercial company interests. It must extend these restrictions, as it is currently doing and, very importantly, launch mitigation plans around other critical products aside from high technology.

#### **4. *"The Financialization of the Supply Chain"***

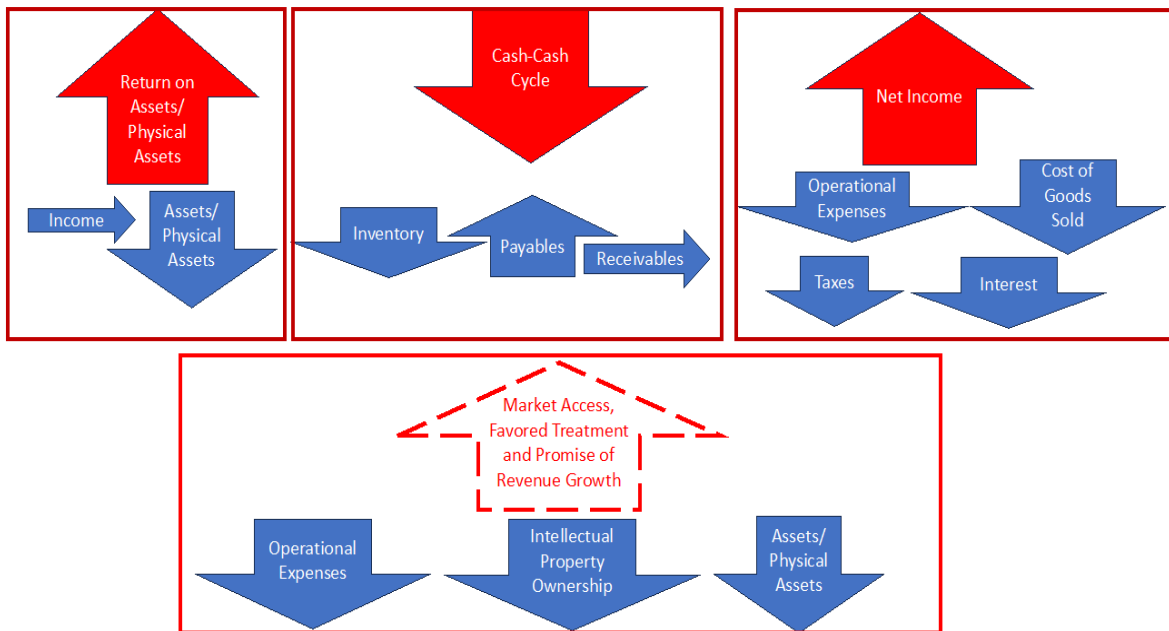
This is an insightful concept introduced by Rana Foroohar of the Financial Times to describe the supply chain management strategies adopted by many companies to drive up market value. It was driven by three intersecting trends – first, the "short-termism" driven by the emphasis on quarterly results from Wall Street, second, the increasing number and scale of compensation schemes for senior executives based on short-term stock prices and, third, the assumption that the business environment would be stable with few disruptions and risks. This led to a number of supply chain strategies based on short-term results rather than long-term success. Among these (and some of these were mentioned earlier) were:

- Lowest possible unit costs through low-cost material and labor, and cheap products – leading to mass outsourcing and off-shoring. Outsourcing physical production assets also results in an Increase in Return on Assets number.

- Location and operations in countries that would provide low taxes, guaranteed labor stability, low costs of operation, and other direct and indirect financial benefits.
- Reduced Cash-Cash Cycles through lowest possible inventory through the adoption of “Just-in-Time” Supply Chain systems, and sourcing from low-cost and smaller off-shore suppliers who could be persuaded to increase accounts payable.
- Outsourcing information technology, white collar and support jobs to low-cost countries to reduce Operational Costs.
- Giving away Intellectual Property and transferring technology to China in exchange for financing, favorable treatment or local market access.
- The increasing lengthening and complexity of supply chains as companies have sourced farther afield to get the lowest cost materials and components.

These strategies resulted in dramatic short-term results – increased cash flow from operations, improved returns on assets (the assets having gone overseas), increased sales (through low prices) and profit margins – leading to higher stock prices and executive compensation for senior executives. The rationale behind these strategies is simply depicted in **Figure 3**.

**Figure 3: "Financialization of the Supply Chain"**  
*Engineering the Balance Sheet and Financials*



The other side of the coin was dramatic in both the short and longer term, and I have referred to some of these in an earlier section:

- Export of jobs, closing of basic industries and hollowed communities
- Lower wages

- Loss of Intellectual Property and technology through government theft or corporate theft, or company executives just giving it away in exchange for financing, favorable treatment and market access
- Export of engineering, technology, manufacturing and supply chain capabilities
- Lack of attraction for STEM and Supply Chain education studies in universities
- Elimination of vocational schools
- An adoption of the “low-cost, throw-away” culture, and
- Reduction in National Security.

## **5. Management of Risk**

The major challenge facing supply chain executives today is the identification, assessment and management of risk. This was not so critical in an era when supply chains were simple in structure and the impact of crises were local. Today’s global supply chains, however, are complex, lengthy, often concentrated, multitier interconnected networks that are highly vulnerable to a wide range of risks and disruptions. There has been a massive increase and variability of risks over the past few years that have disrupted, and promise to disrupt, global supply chains, and the impacts of these disruptions can be significant:

- Retaliation for Government restrictions on technology transfer to China and tariffs on Chinese-made products
- Pandemics and the threat of future ones
- The emergence of a new primary strategic adversary – China – one which has territorial and global ambitions
- Major global and local conflicts, and the threat of major conflicts – Russia-Ukraine, China-Taiwan, North Korea, India-Pakistan, Middle East and Iran, to name a few
- Concentration in critical infrastructure industries such as shipping that can result in increased costs and capacity shortage
- Climate Change-fueled disasters, including droughts, floods and storms – disrupting shipping, mineral and food supplies
- Supply Disruption Risks
- Disruption of raw materials in regions such as Africa, owing to the increased and seemingly successful influence of China and Russia
- And, last, the increasing awareness of consumers and companies regarding the sourcing, climate and social impacts of the products they buy.

### *Identifying and Evaluating Risks*

The question often asked is “Where does the United States face the largest risks of supply chain disruptions from actions by China’s government?”. This should be expanded to include the allies of the Chinese government. These include Russia, North Korea, Iran, many of the Arab states and many of the African states. If we look at this expanded definition, there are several areas of risk that we must consider:

- Pharmaceuticals and APIs from China
- Energy supplies from the Arab states and the Gulf
- Semiconductors from China, Taiwan, South Korea
- Electronics from China, Taiwan, Vietnam and Japan
- Raw materials, rare earth minerals and minerals from China, Africa and Southeast Asia
- Fertilizer from Russia.

The assumption here is that, despite the heavy Chinese economic influence in the EU, that will not be one of the risk areas.

The risks have to specifically identified and evaluated in terms of alternate sources readily available, time and cost to ramp-up production, current diversification, likelihood and impact.

### *De-Risking and De-Coupling Sourcing Strategies*

The realization that China is the major adversary of today and the future, and the “whole of country” Chinese approach to politics, military and technological/ weapons development (this involves the integration and control of Chinese companies and capabilities with the Chinese government and military) has prompted the US government to impose restrictions, over the past few years, on Chinese investments in US companies, the export of US technologies to China and selected exports to the US by Chinese companies. This, coupled with the Chinese aggression towards Taiwan, actions in Southeast Asia and policies in Hong Kong, as well as a belligerent North Korea, along with Chinese industrial and social policies, have convinced many companies that locating and sourcing in China poses a major supply chain risk.

This trend has been encouraged by the Government investments in industry capability and infrastructure, such as the CHIPS and Science Act and the Infrastructure Investment and Jobs Act (IIJA), and the re-invigorated Government actions against industry concentration. Companies have now realized that managing risk is a critical part of their operations. A recent report (Everstream) listed China sourcing as the chief risk facing supply chains in 2023. Companies and governments are addressing this through a strategy commonly known as “de-risking”. De-risking is the strategy to reduce dependence on a single country, source of risk or concentration. It involves a combination of initiatives:

- supply chain regionalization and “stratification” (not all supply chains are treated the same way!), including the establishment of “hubs” – linking sources of supply, manufacturing and customers
- hedging inventory to guard against supply disruption
- vertical integration to assure supply
- diversification of sources of supplies
- moving away from risky countries entirely. This last is called “de-coupling”. De-Coupling from China is seen by some in industry (and some in the EU who view this as an anti-China engagement strategy with implications for investing in Chinese technology stocks) as an extreme measure and, in some cases, not even possible – the Chief Executive of

Raytheon, for instance, recently said “We can de-risk but not de-couple”, citing their several thousand suppliers in China – a situation resulting from off-shoring to reduce costs).

The government has also started to catalog and encourage the issues of supply chain operations and sourcing location – ranging from location and sourcing in adversarial (China) and potentially adversarial nations, allies and friends (“ally-shoring and friend-shoring”), near spheres of influence (“near-shoring”) and, of course, for critical products and components, “re-shoring”, or locating and sourcing in the US. It can be a complex process, with multiple options and one that needs careful planning, risk and cost analysis, prioritization and urgency.

Several industries are moving quickly to de-risk away from China. Fashion and apparel manufacturers, for instance, are pulling back from China, and 61% recently said that China is no longer their top supplier country. Companies such as Samsung, Hasbro and Adidas have moved to Vietnam and India, while Volvo (owned by a Chinese company) has located a new factory in Slovakia. A recent risk survey conducted by Willis Towers Watson found that 95 percent of multinationals are now concerned about the risk of doing business in the Indo-Pacific (read, China), up from 62 percent just two years ago.

#### *Efforts To Combat De-Risking and Restrictions:*

Chinese companies and the government are now using various strategies to side-step and circumvent our National Security safeguards. These include investments and locating operations in third countries such as Mexico, Canada (thus undermining US efforts for nearshoring) and Vietnam, and regions such as Europe and Africa. Some major companies, rather than move away from Chinese influence, are asking their suppliers and manufacturers to move to other countries – such as India and Vietnam – and provide the appearance of moving away from China.

The Chinese government is keenly aware of the impacts, both current and potential, of de-risking on their economy, social cohesion and political power. They launched a big push against de-risking initiatives during the June 27-29 World Economic Forum (WEF) “Summer meeting” in Tianjin, China, trying to convince western executives that de-risking is “politicizing” business, and that individual Multi-National Companies (MNCs) should be allowed to decide on the individual and unrestricted sourcing strategies that best suit them.

Incidentally, many of these MNCs are also those that have helped create, and prosper in, this environment through strategies of “engineering the balance sheet and financials”. These include the companies (manufacturing, distribution and entertainment) and major funds whose profits are dependent on China. Some have actively complied with Chinese rules and policies (indeed, invested even more heavily) on technological surveillance and censorship to obtain favored terms and market access. While the concepts of Jack Welch, a pioneer in offshoring in 1998 (“Ideally “you’d have every plant you own on a barge to move with currencies and changes in the economy.”) and Milton Friedman (whose shareholder primacy views shareholders being the

only group to which the firm is socially responsible), may have been appropriate in another day or age, today's complex environment, technology advances, National Security needs, sustainability mandates and stakeholder perspective demands something much more and direct.

Addressing the often-conflicting issues of National Security and economic well-being with "globalism and free-trade" issues will require government policies that may not prove popular among some who advocate unfettered free trade and capitalism. These are discussed in the last section of this testimony.

#### **6. *The Need for Talent and Skills Management:***

A critical issue facing commercial and defense supply chains today is a lack of talent in various supply chain disciplines – engineering, technology, management, quantitative analysis and systems-thinking. This has been variously attributed to a lack of resources invested by universities and the educational system, a lack of emphasis by schools and universities, and a focus on the growth of liberal arts and social-type studies in universities and schools. This situation has resulted in a shortage of talent and skillsets, lower numbers of graduates and test scores compared to countries such as China and India, and a drive by our universities to recruit students (and faculty) from these countries to increase tuition revenue. While this may be a good idea for the universities and general economy, it also allows Chinese students – a few of whom may be under the control of their government or families in China – access to our research and jobs in our critical industries.

An often-overlooked part of the educational spectrum are vocational schools. These were a victim of the "China Shock" to US labor. Neither universities nor schools teach supply chain manufacturing skills in professions that include computer technicians, welding, machining, robotics and automation and equipment maintenance. Industry is now slowly taking it into their own hands and expenses to set up and train employees in these skills, and these skills are sorely needed if supply chain manufacturing and jobs are to return to this US.

It is critical that the government directs its resources, grants and loan funding to the universities and schools into these disciplines and less into the liberal arts and social studies areas.

An additional area in talent management is the current skillsets and personnel running major government programs such as the CHIPS and Science Act, the Department of Transportation, business areas of the Department of Defense, etc. The current force and set of personnel may not always be aware of, nor operate, at the efficiencies and speeds required in today's environment – the "speed of relevance" and the "speed of business". Rather than seconding executives from industry, it may be equally effective to set up Business Advisory Boards or Fixed Term appointments of, say, retired executives who can provide expertise and guidance.



## **RECOMMENDATIONS FOR LEGISLATION:**

The discussion of these six trends and factors, and their impacts on our National Security and Economy suggest several legislative actions that could be taken. These have been categorized into seven areas and include:

### ***Continue the Funding of US Manufacture, Capabilities and Infrastructure***

*The Government has made a great start (the CHIPS and Science Act and the Infrastructure Investment and Jobs Act) but years of neglect of emphasis and investing in our industry and National Security have left us vulnerable. More needs to be done across an expanded range of critical components, products, supply chain infrastructure and large scale supply chain initiatives.*

### ***Definition and Mapping of Critical Supply Chains***

*We must define what's critical for National Security and economic well-being and identify and understand our vulnerabilities and chokepoints.*

- Develop and launch a central government initiative that expands the definition of critical supply chains – products, material and capabilities – and maps them end-to-end in terms of volume, sources, diversification, capacity, capability and risks. We need to understand the interwoven nature of global supply chains and guard against unintended consequences. “Critical” cannot include products such as consumables, toys, apparel which are good for some companies and consumer satisfaction but have little bearing on National Security and the economy. Rather, they must include categories such as defense, technology, electronics, pharmaceuticals, medical products, raw material and minerals and core energy-related products. *This is critical for identifying vulnerabilities and “chokepoints” in these supply chains and developing mitigative actions and policies.* Analyses of these “chokepoints” must be comprehensive, encompass all tiers of the supply chain, and include all major types of disruptive risk, as well as chokepoints within the US and our allies.

### ***Sourcing Parameters and Guidelines***

*Given the complex, multi-national and interconnected nature of today's supply chains, we must develop and implement resilient supply chains. We cannot do this alone, and it should be developed in cooperation with our allies. Furthermore, individual companies will not do this on their own.*

- Mandate and encourage diversified sourcing for critical components and products.
- Mandate and specify sourcing parameters and “guardrails” to include China and other adversarial countries, friend and ally-shoring potentials and near-shoring acceptable alternatives. There should be consequences for the executives responsible for locating manufacturing, conducting sole or primary sourcing of critical products and materials in China and other adversarial countries, or deliberately sourcing with Chinese companies

located in friendly or nearby countries in attempts to circumvent US security considerations.

### **Supply Chain Technology Security**

*Many of the critical technologies are essential for the development, design and management of complex supply chains. These technologies include Artificial Intelligence/Machine Learning, Robotics, Warehouse Automation, Blockchain, Data Management, Advanced Computing and Analytics.*

- Ensure that the investigative process into foreign investments is rigorous in terms of sources, ownership and financing of products and materials. Without such rigor, these investments could present easy access to US markets (for companies such as Huawei) and investment into US technology companies.
- Carefully evaluate and continue restrictions, and expansion of restrictions, on technology transfer to China in exchange for finance and market access
- Evaluate and review Government reporting and compliance policies that put US Supply Chains at a competitive disadvantage.

### **Talent**

*Building up our manufacturing capability and capacity requires supply chain talent and skillsets. The other side of this coin involves restricting the access of our adversary in obtaining such skill sets and using those skill sets to penetrate our critical industries. It is critical here that we do not arbitrarily make policies that will cut off the flow of talent and co-operation among countries for **research** in terms of areas of “global well-being” such as health, medicine, food production, climate change and renewables.*

- Monitor and have caps (in some fields, restrict) on university recruiting of students from China in Supply Chain Engineering, Technology and Research
- Encourage and resource STEM Education in schools, vocational schools and Universities.
- Develop, implement rules, guidelines on hiring engineers from countries such as China for **selected critical products and industries**.

### **Finance & Tax**

*This is what enables and encourages companies and industries to return to the US and our allies, to help small and medium-sized businesses to run their operations. Small and Medium-sized business are the ones that innovate, and we must support a range of critical industries.*

- Evaluate the tax code to encourage US firms to re-shore from China.
- Encourage local manufacturing location for Job creation and retention in exchange for tax breaks and financing.
- Enable Supply Chain (Working Capital, Operating Expenses, Capital Expenses) financing in the form of low-cost loans for small and medium-sized businesses in the US.

### ***Development & Management***

*The Government and the Department of defense cannot operate on its own in today's increasing complex and changing environment. We must harmonize the needs of the private and public sectors for critical Supply Chains and the government has to assume some the costs of increased resilience. Public-Private Partnerships help leverage the "whole of country" to meet our goals, while recruiting part-time and short-term skill sets is a critical aspect of getting leading edge management concepts into important areas.*

- Set up and fund Public-Private Partnerships and structures to develop next-generation supply chains and for the development of Supply Chain technologies (e.g., Artificial Intelligence/Machine Learning, Blockchain, Visibility) and application for commercial and defense use, Cyber-Security and the logistics structures necessary for streamlining, and increasing competition in, the logistics process.
- Set up Advisory Boards and Short-Term appointments of senior and retired executives from industry and academia to help in the analysis, oversight and management of these initiatives to lend speed, efficiency and a broader business vision to what is developing to be a war fought with supply chains.

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