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# Potential Bottlenecks to Recovery, the Supply Chain Riddle and Credit Risk: What You Should Really Worry About

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# Introduction

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# 1. Preamble



The COVID-19 (coronavirus) pandemic and the risk-fraught economic recovery has riled supply-chain linkages and raised multiple credit risk red flags for many commercial bank lines of business (LOBs). Since February, hardly a day goes by without headlines warning of impending doom to a fledgling economic recovery owing in large part to global value-chain disruptions.

The media-driven “analysis” of supply-related stress does provide useful reporting on what going on, although it fails to afford a workable procedure or tool to address the challenge of the supply chain morass. A few others brashly purport that globalization is either moribund or in serious structural retreat, while some politicians both here and abroad assert that autarky is achievable. Serious analysis suggests otherwise, as such assertions lack quantitative support. Shifting day-to-day views are myopic, narrowly focused, and simply scatter pieces of the supply chain puzzle.

There are several factors that frame our analysis.

1. Much like during the initial stages of the coronavirus fog-of-war, decision makers are preoccupied by near real-time information overflow. As such, they often struggle to distinguish between cyclic vs. structural adjustments, and what credit risk factors are transitory against those that will likely influence credit risk beyond the short-term.

2. Transitory factors can lead to a bullwhip effect with multiplicative resonance through a supply chain resulting in overcapacities that are difficult to unwind.<sup>1</sup> Many companies will push on the production gas pedal, restocking inventories on the belief that today’s swelling demand will persist. This demand miscalculation will then be transmitted and amplified along the supply chain, with orders to suppliers most distant from the point of sale far removed from the realities of the end-market. This will create numerous, latent single points of failure, being non-redundant parts of a risk system that, if dysfunctional, cause the entire system to collapse. What a nightmare for risk management professionals!

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<sup>1</sup> Ted Stank, Tom Goldsby and Lance Saunders, “Commentary: Caution—Bullwhip Effect Ahead,” Wall Street Journal, June 14, 2021





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# 1. Preamble

3. Commercial banks may lack a procedure to cope with shocks and establish priorities based on their exposures to prioritize what is actionable.

There is a dearth of decision tree algorithms, and an acknowledgment that in times of unprecedented shocks, expert judgment<sup>2</sup> and qualitative right-brain analysis<sup>3</sup> should prevail. Models and grading systems fail when documented history and performance data provide little help, or solace.

4. Concentration risk<sup>4</sup>, and the correlations that exist between credit, operational, market and liquidity risk, seem to be left at the wayside given the distraction of the supply gap phenomenon and the lack of organizational infrastructure to incorporate shocks into the fabric of a decision-making culture. As such, the Enterprise Risk Management (ERM) framework, which has become increasingly popular since the financial crisis, can be compromised. After all, the ERM framework at its core models probability as opposed to assessing the potential impacts of risk factors, thus necessitating the use of right-side brain judgmental factors.

5. Finally, many of us have somehow forgotten about risk factors prior to the pandemic. This involves neglecting key risk indicators (KRIs) that are seemingly unrelated to the supply chain shortages but will help uncover which supply gaps are more persistent as compared with those that are transitory. This is a question of causality<sup>5</sup>, not necessarily correlation. *Indeed, supply chain issues are an important part of the story, but they cannot be analyzed in isolation of potent KRIs.*

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<sup>2</sup>In his presentation at the “Validation of Credit Rating and Scoring Models: A Workshop for Managers and Practitioners, OCC Modeling and Analysis,” February 2-3, 2006, Washington, DC., Mark Levonian stated: “Traditional credit rating and scoring methods may be used, or ‘models’ may be less explicit (for example, ratings assigned using expert judgment).”


<sup>3</sup>Daniel H. Pink, “A Whole New Mind: Why Right-Brainers Will Rule the Future,” Penguin Group, 2006

<sup>4</sup>For a comprehensive analysis of this issue see Rick Buczynski and Kent Kirby, “Worried About the End of the Credit Cycle? Concentration Risk Revisited,” RMA Journal, May 2019.

<sup>5</sup>A correlation between factors, does not necessarily suggest that the change in one factor is the cause of the change in the values of another factor. Causation signifies that one factor or event is the result of the occurrence of another factor or event, defining a causal relationship between the two factors/events. KRI’s are casual to KPIs.



## 2. Objectives and Core Issues



Our objective is to assist commercial banking clients in their quest to seek safe and sound lending, centering on risk management (identifying, monitoring, and mitigating risk) while uncovering solid lending opportunities at a time of considerable uncertainty.


We are not brave enough to engineer a specific algorithm or present a solution, but rather suggest a procedural, commonsense, framework to address the current challenge, while introducing some tools IBISWorld has developed in this context.

There are several core issues that will be examined.

- How (and why) did the massive excess capacity created by the coronavirus lockdowns vanish into worldwide shortages so quickly?
- What are the KRIs that define bottlenecks, the industries they affect, and what industries are interrelated along the supply chain? This is about *all* significant potential bottlenecks to recovery *not just* global value-chain bottlenecks. Or, putting it another way, what are the driving risk factors that influence credit risk?
- Which industry sectors/subsectors are most impacted and their degree of vulnerability, and how might these resonate through the supply chain? In other words, what specific industries (lines of business) are most at risk and why? We will identify risk clusters that have common attributes.
- Finally, what are transitory vs. more permanent forces, and cyclical vs. structural trends? In short, what is the potential duration of the KRI forces we have identified?



## 3. How Did We Get Here? Have We Forgotten the Basics?



### 3.A Macro-Data Pointed to an Economic Slowdown Prior to the Pandemic

Several key economic indicators signaled that economic adjustment, in the form of a palpable slowdown, was already underway before the pandemic struck. To name a few, consider:

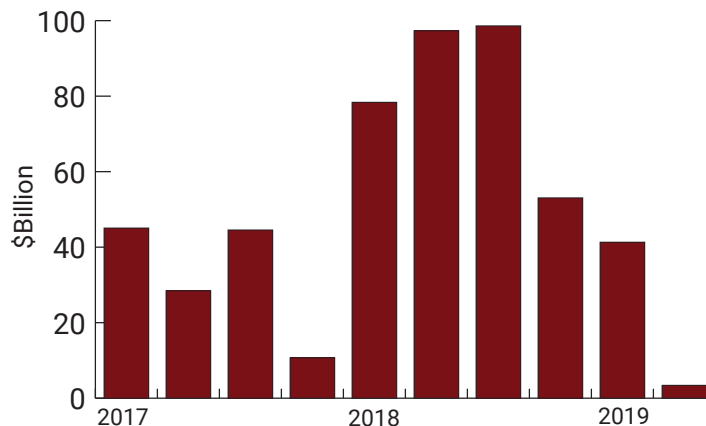
- In the final quarter of 2019, real personal consumption expenditures slowed at a seasonally adjusted annual rate (SAAR) of 1.6%, with durable goods purchases plummeting by 12.5%.
- Gross private domestic investment dropped by 3.7%, a figure that would have been much more dire had residential housing not grown at a 5.8% clip.
- Imports of goods declined by 9.4% in the quarter.
- Industrial production in manufacturing was eroding since the final quarter of 2018.
- Private inventories were building up rapidly prior to the pandemic (see Figure 1) and the inventory to sales ratio started rising in mid-2018, reaching 168.0% by April 2020.

### 3. How Did We Get Here? Have We Forgotten the Basics?



FIGURE 1:

Change in Private Inventories (SAAR)



We were clearly at the end of the credit cycle in late-2019. Several presentations at the October 2019 RMA Annual Risk Management Conference<sup>6</sup> discussed strategies dealing with a downturn and the risk of sacrificing credit quality, a common end-of-cycle phenomenon. At the time, commercial lending, including both commercial and industrial (C&I) and commercial real estate (CRE) loans had grown by more than 15.0% since end-2016. This build-up is often symptomatic of lending sprees at a cycle's end, no doubt encouraged by obligors anxious to stockpile cash in our low cost of borrowing world.

As noted by Abrahams and Buczynski in a paper written at the tail end of the 2008-09 financial crisis<sup>7</sup>: "The severity of the financial debacle finds its roots in the lending process itself and in what most have come to accept as the inevitable economic cycle in which it operates. Indeed, the lending profession repeatedly finds itself in a cycle that lags the economic cycle. In boom times, lenders seek out riskier segments (volume for volume's sake), increasing a bank's risk appetite beyond reasonable limits." 3B. Miscalculations Spawned Supply Shortages Forewarning of Inflationary Pressures

<sup>6</sup> Two sessions directly dealt with this issue: "Are you ready for the Cycle Change? Key Considerations Going into the Downturn," Bill Loftus, Ed Schreiber, and Duane Elmer, "Preparing for the Downturn While Positioning for Recovery," Rick Buczynski, Kent Kirby and Dev Striscsek and "Is Your Balance Sheet Ready for the End of the Credit Cycle?" Mohit Ramani and George Buchanan.

<sup>7</sup> Clark Abrahams and Rick Buczynski, "A Prescription for Balanced Lending: We Can Steer Clear of Another Great Recession," RMA Journal, February 2011





## 3. How Did We Get Here? Have We Forgotten the Basics?

### 3.B Miscalculations Spawned Supply Shortages Forewarning of Inflationary Pressures

What happened in early-2021 is well-chronicled<sup>8</sup> by many authors and experts, including the inflationary pressures they induced<sup>9</sup>. As such, we will spend limited time discussing this as our primary purpose is to plan a forward-looking plan to identify, monitor and mitigate risks.

To be sure, coronavirus's unprecedented shock caught everyone napping. And, driven by government stimulus programs and households awash with cash, the rapid recovery caught everyone napping again. What was going on?

The massive inventories accrued prior to the crisis were depleted by more than \$350.0 billion during the first half of 2020 as production tanked worldwide in nearly every sector. But, as the economy rocketed back mid-2020, owing to stimulus programs and the Federal Reserve's historically easy monetary policy reminiscent of Milton Friedman's "Helicopter Money," demand/supply gaps began to emerge, albeit sly. The so-called "V-Shaped" recovery was apparently cemented as lockdowns, social distancing/essential business policies were unwound. (And let us not forget abrupt, massive shifts in demand brought about by the pandemic; for example, the surge of electronic goods as people retreated to their home offices.)

Many key raw materials and intermediate goods necessary to fill the gap were nowhere to be found. A shortage of shipping containers and bottlenecks at ports made matters worse. Regardless, many of these seemingly force majeure pressures are now limping away.

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<sup>8</sup> See: Lucia Mutikani, "Supply Chain Bottlenecks Amid Roaring Demand Slow U.S. Manufacturing," Reuters Business, May 3, 2021, Hanna Ziady, "The Perfect Storm Making Everything You Need More Expensive," CNN Business, June 9, 2021, and Alan Beattie, "Will Coronavirus Pandemic Finally Kill off Global Supply Chains?" Financial Times, May 28, 2020.

<sup>9</sup> <https://www.thestreet.com/investing/supply-chain-bottlenecks-dominate-inflation-talks>



## 3. How Did We Get Here? Have We Forgotten the Basics?

### 3.C Stress Points Prior to Coronavirus: Still Alive and Kicking?

Those familiar with the “Rogue Waves” article published in the February 2020 RMA<sup>10</sup> Journal will see that many of the combustible risk factors we identified prior to the pandemic are kindling for the next downturn. Many of these remain unresolved.

In fact, many have been exacerbated by coronavirus and the policy responses warranted by the pandemic. These constitute serious bottlenecks to a sustainable economy recovery and serve as a prelude to the following sections of this report.

Here is our short list of economic risk topics we will lean upon as pertaining to the “Rogue Waves” paper.

- Labor shortages
- Trade tensions
- Overly stimulative fiscal/monetary policies
- Monumental rise in government, household, and corporate debt
- Federal deficits/debt, interest rate risk
- Chasing the dragon of higher yields in a low interest world
- Retail apocalypse and CRE risks

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<sup>10</sup> Consult Part 7 of the Flying Blind into the Next Recession series, Rick Buczynski, Kent Kirby and Dev Strischek, “Before You Wave Goodbye to this Cycle, Look Out for Economic Rogue Waves,” RMA Journal, February 2020



## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

Below we compile a “Beware of” list that defines relevant KRIs.

If we were regulators, we might frame this as: “What are you doing about this risk factor? Are you aware of it and the potential impact on your risk appetite, limit policies, dual risk system metrics?”

We might frame this a tad more delicately if we were a bank, talking to a client about an increase in a line of credit: “Have you noticed that your exposures are vulnerable to... What are your plans to address this?”

So, here it is. The “beware of list.” Many are powerful, latent forces that have apparently drifted off the radar screen amid the coronavirus fog-of-war.

### 4.A Beware of Labor Market Shortages/ Talent Gaps for Skilled, Semi-skilled Workers

There is an abundance of published anecdotal evidence portending worrisome sectoral labor shortages that may restrain economic growth, with many of these propagating supply chain disruptions. For example, did you know that the average age of an American welder is 67? Even before the onset of the pandemic, skilled labor shortages were curbing a revival in furniture manufacturing and there was a scarcity of short- and long-haul truck drivers. The recent 4th of July weekend gasoline shortage scare is not due to a lack of gas, but rather a paucity of qualified drivers to carry the load.

By late-2019, there were more employers looking for workers than the number of available unemployed. The gap—which exceeded 1.4 million workers in October 2019—was more structural than cyclical and was related to a dearth of skilled trade workers. *Since this factor is structural in nature, it is very likely to persist for an indeterminate, unpredictable period of time.*<sup>11</sup>

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<sup>11</sup>See Heidi Shierholz, “U.S. Labor Shortage? Unlikely. Here’s Why,” Working Economics Blog, Economic Policy Institute, May 4, 2021. This op-ed rightfully attests that “...recruitment intensity is cyclical. It tends to be stronger when the labor is strong, and weaker when the labor market is weak.” However, this thesis has little relevance to structural labor talent gaps that are germane to credit risk analysis.



## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

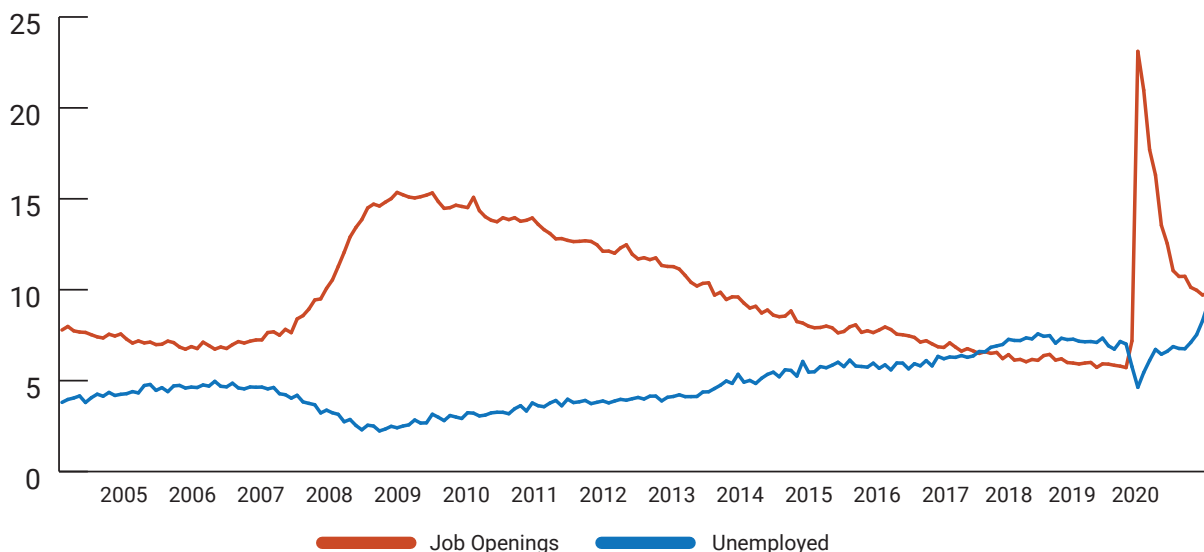
Recently, people are quitting jobs at the highest rate in over two decades. We believe this is temporary as wages in July were up substantially; more on this below.

There is a more troublesome labor market factor that is inescapable: 2.6 million people have retired since the pandemic hit. *This is a more permanent bottleneck and reflects a continuing decline in the size of the labor force.* In July of this year, the labor force participation rate was 61.6%, down from 63.3% just prior to coronavirus and 66.0% a couple of months before the onset of the Great Recession.

Check out Figure 2. This clearly illustrates the labor shortage at the end of 2019.

FIGURE 2: America has an Employment Gap in Trade Workers Pre-Coronavirus

Nonfarm Job Openings vs. Unemployed (Millions)





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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

Worker training is germane to resolving skill gaps, but it can be time-consuming and expensive.

Note that Figure 2, while clearly depicting the mounting labor demand/supply gap at a macro-level before the pandemic, also reveals an inflection point as coronavirus reared its head in March 2020. So, *be advised that recent data is probably useless for uncovering fundamental labor shortages as official data is littered with inestimable noise.*

A recent Dallas Federal Reserve report<sup>12</sup> using employment-to-population ratios confirmed the tightness of the labor market prior to the pandemic, suggesting that the coronavirus-induced “slack” in employment has narrowed substantially. However, the study only employed demographics data, thus masking chronic sectoral gaps.

What does all this mean?

*The central challenge for credit risk managers is to identify which sectors are prone to risks associated with worker skill gaps that cannot be easily resolved by market forces like wage inflation/bonuses or more intense recruitment. In other words, where are the talent gaps? Worker training is germane to resolving skill gaps, but it can be time-consuming and expensive.*

So where are the labor shortages?

In many instances there are multiple factors that disrupt end-markets: consider both production and logistical bottlenecks. A year ago, logistics behemoth DHL “warned the supply chain industry that more must be done to combat the growing

talent gap crisis in the sector<sup>13</sup>.”

<sup>12</sup> <https://www.dallasfed.org/research/economics/2021/0706>

<sup>13</sup> <https://supplychaindigital.com/logistics-1/dhl-warns-supply-chain-sector-over-looming-talent-gap-crisis>





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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

And to paraphrase the February 2020 RMA paper, “Consider supply-chain disruption risk if borrowers dependent upon intermodal transportation and just-in-time inventory strategies. The construction sector’s tightening labor market is creating difficulties among small- and medium-sized building firms as jobs go unfilled, making delivering projects on time more difficult. Shortages are also prevalent in very high-skilled areas, such as for STEM workers (science, technology, engineering, and mathematics) and in health care.” *These developments are not transitory and will likely persist beyond 2022.*

Some labor shortages at the lower skill end should evaporate as unemployment benefits are scaled back and wages rise. These include businesses thwarted by social distancing policies, like brick-and-mortar retail, restaurants, and the hospitality industry. This suggests a return to some semblance of normalcy relatively soon even as many establishments in this cluster are currently scurrying to hire. Regardless, there are other risks in these sectors we will entertain below.

Airlines are an interesting case. In June, American Airlines had to reduce the number of flights because of labor shortages in many areas like catering and fuel services, but this is not likely to persist for long. Nonetheless, hiring high-skilled employees like pilots and mechanics is a persistent long-term issue that cannot be overlooked as airlines are preparing for a mounting surge in demand in coming months. According to a recent report<sup>14</sup>, “While the pandemic alleviated the pilot shortage almost overnight a year ago, the shortage could reemerge within nine months and grow worse over the decade... In fact, the study estimates that the global demand for pilots on Jan. 1, 2022, will be 326,594 versus a supply of 316,435; by 2029, the study predicted, those numbers will be 416,709 and 357,214, respectively—a nearly 60,000-pilot shortfall.”

You can fly a plane without catering, but not without pilots or fuel for that matter.

<sup>14</sup><https://www.ainonline.com/aviation-news/business-aviation/2021-03-23/study-predicts-pilot-shortage-will-return-2022>



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

### 4.B Beware of Innate Supply Chain Vulnerabilities

This risk factor primarily affects industries requiring investment and/or supplier switching to eliminate supply/demand gaps. There are at least four core characteristics one must identify to disentangle this gestalt. (1) Which industries are capital-intensive, (2) Which are experiencing chronic under-capacity, (3) Which cannot easily secure substitute suppliers and (4) Which are entangled in complex supply chains and practicing just-in-time (JIT) delivery<sup>15</sup>.

Keep in mind a few basics while accessing the supply chain vulnerabilities of an industry, line of business, or a specific borrower:

- Producers/sellers with complex global value chains (like autos) are most vulnerable.
- Those with less complex supply chains are less exposed, although are typically lower value-added industries that are subject to other risks. Think of textiles, garments, toys. Regardless, even if a company has less complex supply chains, exposure to seasonality factors can be a colossal force; consider sales leading into the December holiday season. Though seasonal forces are “temporary” they are recurring blows in many industries where a knock-out punch need not require much force. So, ponder the potential consequences of your “seasonally exposed” borrowers that have been recipients of government pandemic aid programs that are fading away!
- It can be expensive to find alternative suppliers.
- On-shoring, near-shoring costs are often prohibitive.

<sup>15</sup>For a discussion of JIT see: <https://www.rmahq.org/pandemic-economics-what-bankers-must-do-to-manage-covid-19s-shock-and-awe-attack/>



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

- In many cases, there is a lack of substitutes, where the poster child is again car/truck manufacturing related to the recent chip shortage.
- There can be contractual stickiness that inhibits supplier-switching.

There are several noteworthy examples. The first: *a chip is not just a chip*.

Consider special purpose microprocessors such as graphics processors<sup>16</sup> that are used in display devices such as smartphones, computers, and gaming consoles. Demand for these and other processors that support high-tech segments like cloud infrastructure has been strong in recent years much at the expense of legacy technologies that are used in automotive and industrial market segments. This explains, in part, the current chip shortage that has plagued the auto industry. This gap is likely to persist until prices adjust and capacity is built up<sup>17</sup>. However, there is a reluctance to invest in legacy technologies that have unattractive return on investment. It is therefore very likely that this shortage will impede car and truck production and their suppliers well into 2022, perhaps even longer. The recent spike in coronavirus cases in Malaysia, a key link in the semiconductor supply chain, is further jeopardizing output.

The situation for auto manufacturers is also challenged by the complexity of their supply chains and dependence on JIT production. Interestingly, Toyota, which invented the JIT process, eased back from this strategy following the 2011 earthquake and had sufficient inventories of parts, including semiconductors, enabling them to meet the recent surge in vehicle demand at the expense of their American counterparts. Until now. Even forward-looking Toyota announced it would cut global production by 40.0% in mid-August, finally succumbing to the scarcity of chips.

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<sup>16</sup> <https://www.electricaltechnology.org/2020/05/types-of-microprocessors.html>

<sup>17</sup> <https://www.techrepublic.com/article/the-global-chip-shortage-what-caused-it-how-long-will-it-last/>



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

We are not as concerned with shortages and heightened prices of most raw materials. Despite shocking spikes in many commodity prices earlier this year, the global market seems to be adjusting, at its typically fickle, unfathomable pace. Hoarders have let go of speculatively held stocks, and China recently started selling some of its metal reserves, including copper, aluminum, and zinc, along with various other metals. And OPEC and Russian-led oil producing finally allies agreed to gradually lift quotas in mid-July through end-2022 in order to stem the rise in crude oil prices resolving an earlier rift on production quotas between Saudi Arabia and The United Arab Emirates.

Nonetheless, there are longer-term concerns given China's (and other nations, like India) insatiable appetite for energy and raw materials which will require huge investments, though this issue is not in the scope of this report.

Shortages of many intermediate goods like resins and lumber may linger for several months, although prices for the latter have dropped off substantially of late. Resin production, like polyethylene and polypropylene, suffered this year as a surge in demand was not matched by supply. There were several factors<sup>18</sup>, including weather, shortages of key inputs, challenges of securing supplies from overseas producers and difficulties hiring workers.

Indeed, plastics and resins are critical to the manufacturing food chain as seen in Figure 3. Although there are various views on how long shortages will persist, barring further shocks, we believe markets should stabilize in the next few quarters.

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<sup>18</sup> <https://www.creationtech.com/resin-shortages-a-perfect-storm/>



FIGURE 3: Selected Key Suppliers/  
Buys for Plastic and Resin  
Manufacturers



Source: myIBISWorld.com, IBISWorld Concentration Risk Tools





## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

One final observation on the topic of supply chains. Perhaps, the most ubiquitous.

As part of China's Belt and Road Initiative, Xi Jinping's government is encouraging companies to create supply chains. So, JIT practices and global-value chains are not disappearing. But will American manufacturers be regionalized out and, as such, marginalized? According to a recent Council on Foreign Relations report<sup>19</sup>, "...China's Belt and Road Initiative (BRI)...is Chinese President Xi Jinping's signature foreign policy endeavor and the largest ever global infrastructure undertaking, far surpassing the Marshall Plan. Under the auspices of BRI, Chinese banks and companies have devoted billions of dollars to funding and building roads, power plants, railways, ports, and telecommunications infrastructure in dozens of countries." (A side comment, the BRI is starting

to get some pushback, as, unlike the Marshall Plan, it comes with conditions and consequences. Some global "beneficiaries" are "politely" declining to become engaged.)

Admittedly, these are probably longer-term concerns that will not influence risk decisions now. But, if you are a bank, corporate or government policymaker, this should be on your radar screen before your submarine needs to raise its periscope.

Will American manufacturers be regionalized out and, as such, marginalized?

<sup>19</sup> Jacob J. Lew, Gary Roughead, Jennifer Hillman and David Sacks, "China's Belt and Road: Implications for the United States," Independent Task Force Report No. 79, Council on Foreign Relations, 2021



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

### 4.C Beware of Industries that are Dependent on External Markets for Exports and/or Imports

We all know about the recent surge in international shipping costs and a scarcity of shipping space and containers. Understandably an annoyance, but normalcy will return, obviously subject to a possible coronavirus resurgence.

The global trade in goods (intermediate and final) and materials will continue on its journey forward. The momentum is unstoppable. The globalization glue is impermeable<sup>20</sup>. From our perspective, the intermodal/logistics labor shortage barriers we highlighted above are considerably more menacing.

Our ongoing worry involves trade tensions that existed prior to the pandemic that remain serious impediments for bank obligors that have exposures to trade. Recall the mantra of “trade wars” that predated the coronavirus. Improving relations that the current administration has with Europe and much of Asia are a relief for some, but trade relations are likely to remain fluid given the worldwide trend of increasingly nationalistic policies.

Nonetheless, relations with China will continue to remain tense. Conflicts with China encompass much more than trade disputes. Along with the trade practices the U.S. has deemed unfair, including China’s subsidizing its export enterprises and purported currency manipulation, there are long-held concerns over the theft of intellectual property, and the forced transfer of American technology to China for firms operating there. Alleged cyberattacks by China are woven into the fabric of US/ China relations. And Sino-American relations add to the complexity of supply chain risks and the People’s Republic’s BRI.

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<sup>20</sup>See James Manyika, Jonathan Woetzel, and Richard Dobbs, “No Ordinary Disruption: The Four Global Forces Breaking All the Trends,” Perseus Books, 2015



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

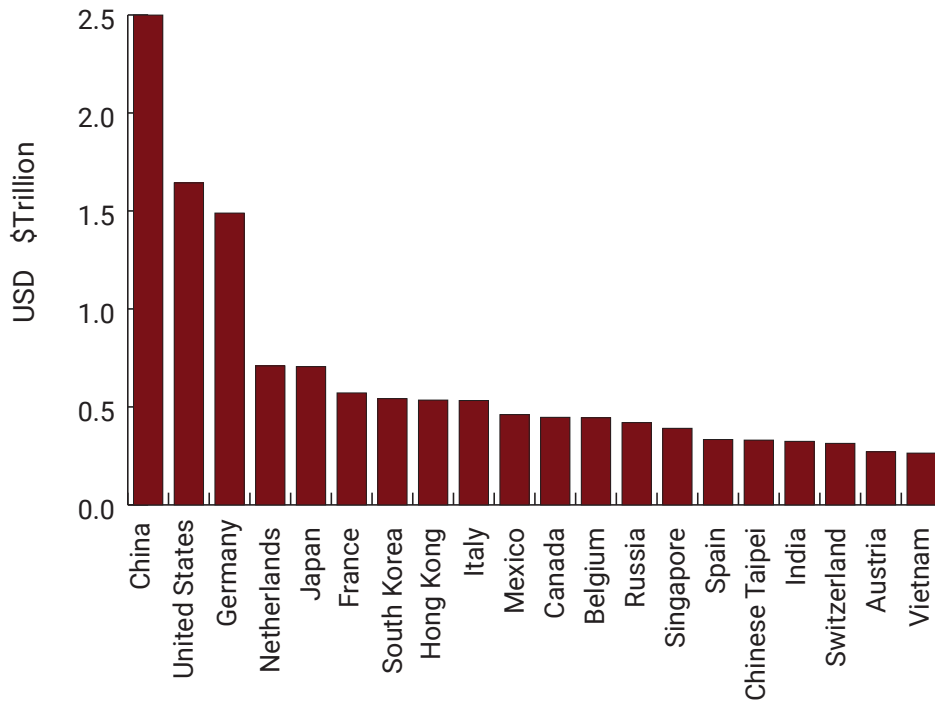
To put this into perspective, China is our third-largest export market, followed by neighboring Canada and Mexico. On the other hand, goods bought from China lead the pack, followed closely by America's NAFTA cohorts. According to recent Census data, Canada, Mexico, and China each separately comprise roughly 14.0% of total trade with the US. Granted, most trade figures are distorted by value chains and do not reflect value-add, they unambiguously illustrate the importance of trade, and yes American exports, to this analysis.

So, let us not be dismissive of exports due to America's decades-long trade deficits. Figures 4 and 5 should be self-explanatory. There are both risks and opportunities associated with trade which cannot be glossed over.



FIGURE 4: The US does Indeed Export Goods, Mostly High Valued Added

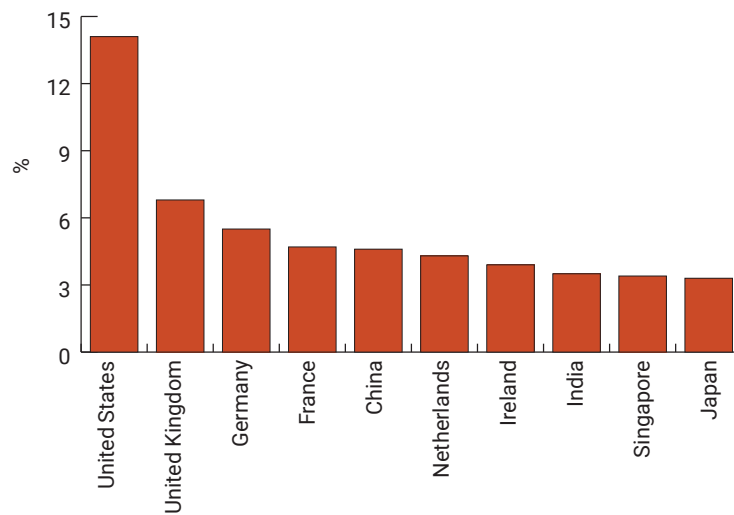
Top Merchandise Exporters (2019)



Source: WTO-UNCTAD

FIGURE 5: America Leads in Service Trade, High Value-Add

Percent Share of World Trade in Services (2018)



Source: WTO-UNCTAD



Table 1 ranks the topmost vulnerable US exporting industries, where a complete list is available for IBISWorld clients.

TABLE 1: Major American Goods Exports Vulnerable to Trade Rifts and/or Fragile Overseas Demand

6-digit NAICS (2017)	Industry	Exports/Revenue Ratio (%)	Exports (\$BN 2019)
111920	Cotton Farming	83.8	6.3
322110	Wood Pulp Mills	77.5	5.9
111140	Wheat, Barley & Sorghum Farming	71.4	7.0
335991	Power Conversion Equipment Mfg	62.7	10.4
334413	Semiconductor & Circuit Mfg	59.7	28.7
333242	Semiconductor Machinery Mfg	59.3	10.4
331491	Nonferrous Metal Rolling & Alloying	56.7	6.0
333612	Engine & Turbine Mfg	48.9	24.0
334220	Communication Equipment Mfg	48.2	13.8
111110	Soybean Farming	47.6	18.9
333120	Construction Machinery Mfg	47.5	14.5
111331	Fruit & Nut Farming	44.2	12.1
325180	Inorganic Chemical Mfg	42.1	14.2
332911	Valve Mfg	41.9	14.1
335921	Wire & Cable Mfg	41.3	5.8
333316	Copier & Optical Machinery Mfg	40.9	10.3
325194	Organic Chemical Mfg	38.7	39.6
325211	Plastic & Resin Mfg	38.2	38.4
336411	Aircraft, Engine & Parts Mfg	37.4	101.8
333914	Pump & Compressor Mfg	33.4	10.2

Source: myIBISWorld.com, IBISWorld Industry Data Wizard





The Table 2 list should not be surprising. Sourcing out low value-add manufacturing processes have been underway since the beginning of recorded history.

TABLE 2: America's Import Dependence

6-digit NAICS (2017)	Industry	Exports/Revenue Ratio (%)	Exports (\$BN 2019)
339930	Toy, Doll & Game Mfg	97.2	20.8
334112	Computer Peripheral Mfg	96.3	31.2
316210	Shoe & Footwear Mfg	96.0	27.5
334111	Computer Mfg	95.9	75.7
315240	Women/Girl/Infant Apparel Mfg	95.5	47.1
315220	Men's & Boys' Apparel Mfg	95.0	34.2
316998	Leather Good & Luggage Mfg	93.5	18.0
339910	Jewelry Mfg Mf	90.3	37.9
334220	Communication Equipment	87.4	111.4
335210	Vacuum/Fan/Small HH Appliance Mfg	82.8	14.3
327110	Ceramics Mfg	81.3	4.5
336111	Car & Automobile Mfg	80.3	185.6
335991	Power Conversion Equipment Mfg	79.3	18.7
315280	Costume & Team Uniform Mfg	76.1	2.3
325910	Ink Mfg	74.0	9.0
114111	Fishing	73.5	16.0
315110	Hosiery Mills	72.4	2.4
339920	Gym & Exercise Equipment Mfg	70.9	2.6
334413	Semiconductor & Circuit Mfg	65.7	42.7
313210	Textile Mills	59.8	32.0

Source: myIBISWorld.com, IBISWorld Industry Data Wizard

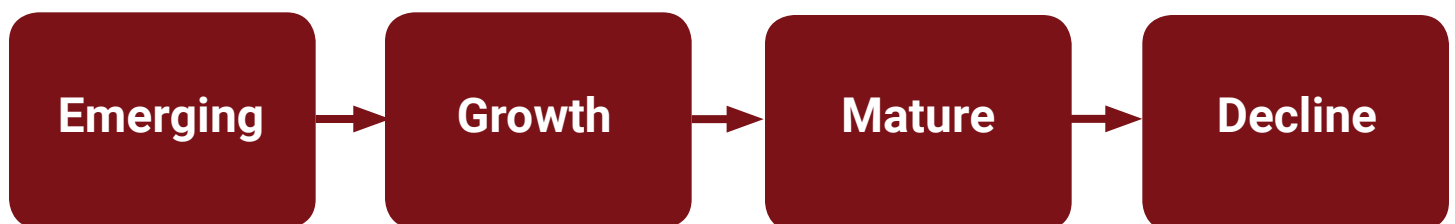
## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

There is one more chapter to the story regarding the chip scarcity issue, and Sino-American relations. China accounts for 80.0% of rare earths imports to America, an economic and potential national security threat<sup>21</sup>. Rare earth elements are used in components in high technology devices, including smartphones, digital cameras, computer hard disks, LED lights, flat screen televisions, computer monitors, and electronic displays. Moreover, some are used in clean energy and defense technologies. Finding rare earths is not the issue; processing them is. Additionally, there are environmental concerns. Talk about a serious supply chain risk! IBISWorld has been alerting clients in private seminars and webinars on this matter for years. If there is a serious, rarely discussed bottleneck that is likely to endure, consider rare earths.

### 4.D Beware of Businesses that are in the Emerging or Decline Phase of the Industry Lifecycle

The stage of an industry's life cycle, as per Figure 6, can be highly correlated with the incidence of delinquencies and loan defaults. Beware of emerging industries where rapid technological change can be hard to analyze. In this world of quickly evolving high-tech innovation, life product cycles can be extremely short. Moreover, bandwagons of lenders chasing what appear to be exciting opportunities discover the unpleasant reality that a "Wisdom of Crowds<sup>22</sup>" often degrades into a ship of fools. The dot-com boom/bust is an excellent example.

FIGURE 6: The Four Stages of an Industry's Life Cycle



<sup>21</sup> See <https://www.fpri.org/article/2020/10/chinas-monopoly-on-rare-earth-elements-and-why-weshould-care/> and <https://www.cnbc.com/2021/04/17/the-new-us-plan-to-rival-chinas-dominance-in-rare-earth-metals.html>.

<sup>22</sup> James Surowiecki, "The Wisdom of Crowds," Anchor Books, 2005



And be cautious regarding late-cycle industries, those in the declining phase of their life cycles; consult Table 3.

TABLE 3: Selected Major Industries in Decline

6-digit NAICS (2017)	Industry	Revenue (\$BN 2019)
425120	Wholesale Trade Agents & Brokers	534.6
423430	Packaged Software Wholesale	293.6
454110	Mail Order	172.0
452210	Department Stores	136.4
424940	Tobacco Products Wholesale	136.3
517311	Cable Providers	103.7
336111	Car & Automobile Mfg	100.9
443141	Consumer Electronics Stores	99.1
323111	Printing	84.9
454390	Direct Selling Companies	67.5
312230	Cigarette & Tobacco Mfg	50.4
334419	Circuit Board/Electronic Comp Mfg	50.2
424120	Office Stationery Wholesale	43.3
313210	Textile Mills	41.9
448210	Shoe Stores	40.7
423420	Copier & Office Equipment Wholesale	39.8
453991	Small Specialty Retail Stores	38.9
511130	Book Publishing	27.8
511120	Magazine & Periodical Publishing	26.9
443142	Computer Stores	26.5

Source: IBISWorld



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

In this context, there are risks associated with the Paycheck Protection Program and Main Street Lending Program as these may have thrown a temporary life jacket to some businesses in decline. Consider the likes of department stores, shopping, and strip malls. And small retail “mom and pop” establishments that traffic-driven anchors have kept afloat in the past. If anything, the ongoing trend toward online purchasing, including restaurant home deliveries, has accelerated during the pandemic and much of this shift in market share is permanent.

As the “retail apocalypse” and “Amazon effect” march on many of America’s shopping malls are a clear casualty of the retail retrogression. Regarding CRE risks, reconfiguring existing shopping malls is not easy or cheap. Many already have been demolished; others reconfigured into medical clinics, video gaming hubs, megachurches, fitness centers, and even homeless shelters. If the pandemic-induced work-from-home shift is pervasive in certain sectors, this will further compromise CRE risk profiles.

### 4.E Beware of Industries that are Notoriously Volatile

As many bankers know, volatility (or should we say, the lack of predictability of an industry’s performance) is often the bane of risk management, truly a wild card. Overlooking this risk factor is serious risk management malpractice. Even if a line of business has been performing well, even perhaps for several years, if it is inherently volatile it can turn on a dime. To paraphrase what a retired Federal Reserve official told us years ago about intrinsically volatile likes of business, “By the time a bank recognizes a problem, it’s too late. The freight train has struck. The carnage is complete. Time to mobilize your workout agreement staff.”

See Table 4 for some selected examples of highly volatile industries. A full list is available to IBISWorld’s premium clients.



TABLE 4: Selected Highly Volatile Industries

6-digit NAICS (2017)	Industry	Volatility Rank Order*
236116	Apartment & Condo Construction	100.0%
111110	Soybean Farming	99.7%
238340	Tile Installers	99.4%
423310	Lumber Wholesaling	99.1%
238310	Drywall & Insulation Installers	99.0%
327390	Precast Concrete Mfg	98.9%
424910	Farm Supplies Wholesaling	98.7%
327310	Cement Mfg	98.3%
212210	Iron Ore Mining	98.1%
327331	Concrete Pipe & Block Mfg	98.0%
333111	Tractors & Agricultural Machinery Mfg	97.7%
517311	Cable Providers	97.4%
111920	Cotton Farming	97.1%
213111	Oil & Gas Field Services	96.9%
561510	Travel Agencies	96.3%
237210	Land Development	96.1%
112111	Beef Cattle Production	95.9%
236115	Home Builders	94.7%
111140	Wheat, Barley & Sorghum Farming	94.0%
327320	Ready-Mix Concrete Manufacturing	92.4%

Source: IBISWorld's Industry Early Warning System

\*Note: Rank ordering based on 2006-21 IBISWorld Industry Risk Rating Scores





## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

Commodity-based industries and those related to construction are notoriously volatile as are the industries linked through their supply chains. Recall the housing crisis that precipitated the financial crisis and Great Recession. The crash in housing starts not only struck the volatile home-building industry, but also countless industries related through the supply chain, like painting, electrical and carpentry contractors, land developers, sand/gravel mining wood paneling, hardware and woodworking machinery manufacturing, and lumber wholesaling. That is the short list.

Just another side note: PD models, we all know the third parties that provide them, totally break down in the case of commodity-based industries. They simply cannot handle the volatility, and this degrades

model performance and output analysis. PD models use proxies. Proxies are impotent. Companies that become reliant/dependent on such models find them a two-edged sword and have to come up with alternatives to address this; curiously, often being “expert judgement.”

*So, always remember that current performance is not necessarily related to historic volatility. They can be, and often are, mutually exclusive. A key is to track grading migrations over time, not just recent KPIs. Our more astute banking colleagues have passed this advice on to us, and now to you.*

Current performance is not necessarily related to historic volatility. A key is to track grading migrations over time, not just recent KPIs.



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

### 4.F Beware of a Potpourri of Intertwined KRIs Related to Public Policy

In section 3C above, we identified some vital KRIs that existed PRIOR to the coronavirus. None of these have been resolved, and many of these stress forces have percolated quietly, gaining girth, spreading their own furtive virus.

We need to quit blaming the pandemic for everything, using it as an excuse which inhibits investigating the root causes of credit risk.

The array of these intermingled risk elements is either directly or indirectly related to government policies. Without going into details, here is the storyline's synopsis:

- Interest rates (both nominal and inflation-adjusted) have been extremely low since at least the mid-2000s, finding their genesis during Alan Greenspan's tenure at the Fed.
- Extremely low interest rates for nearly two decades have expanded the risk appetite of the entire American economy, not just the banking sector, having created a collective insatiable hunger for more cheap debt.
- Lenders and other investors continue to chase the dragon of higher, yet riskier yields. Consider Figure 7 where noninvestment grade spreads have actually dipped *below* pre-coronavirus margins that were already quite scary. The red bar in this figure represents the onslaught of the health crisis. *Alarm bells are ringing.*



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

- Fiscal policy has been disproportionately expansionary in recent years, driving total US government debt up to approximately \$29.0 trillion, which does not include unfunded Social Security and Medicare commitments. This is roughly 130.0% of our GDP.
- Consumers have joined the borrowing orgy, as credit card debt has surged in recently.
- An inflation debate has emerged pitting the Fed's position that inflation is due to "largely transitory factors" against former Treasury Secretary Lawrence Summer's cautionary voice suggesting that heavy government spending can trigger damaging, widespread price rises. According to the Labor Department, consumer prices rose by 5.4% in July compared to a year earlier, the largest increase in thirteen years.
- Department, consumer prices rose by 5.4% in July compared to a year earlier, the largest increase in thirteen years.
- Many other economists are concerned that inflationary pressures will stubbornly linger, forcing the Fed to raise interest rates sooner and to a greater degree than expected<sup>23</sup>.

*By the way, as of this writing, the Federal Reserve Board has yet to announce a clear consensus on what might trigger and define future monetary policy actions. And the ongoing bipartisan pressure to strip the Fed of the central bank's independence adds, in our opinion, another twist to the risk story. Add this to your watch list!*

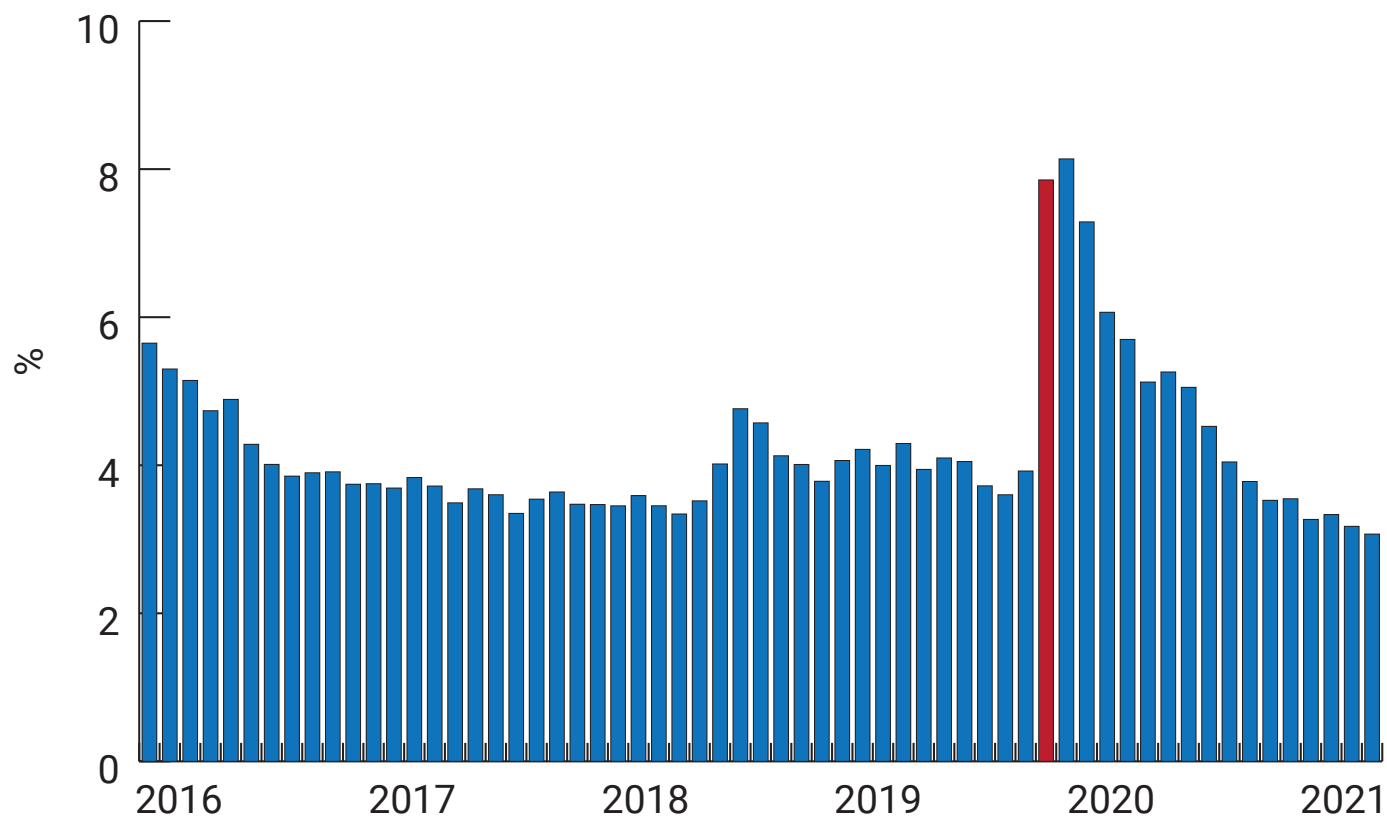
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<sup>23</sup> See The Economist, July 10-16, 2021, pages 22-24 and [https://www.wsj.com/articles/higher-inflation-is-here-to-stay-for-years-economists-forecast-11626008400?mod=article\\_inline](https://www.wsj.com/articles/higher-inflation-is-here-to-stay-for-years-economists-forecast-11626008400?mod=article_inline)



FIGURE 7: The Stress-Laden Quest for Returns Reignited

## US High Yield Index Option-Adjusted Spread



Source: ICE BofA US High Yield Index Option-Adjusted Spread, Percent, Monthly, Not Seasonally Adjusted, via <https://fred.stlouisfed.org/series/BAMLH0A0HYM2#0>



## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

The combination of these factors suggests that interest rate and credit risks are becoming more acute. One might even conjecture that in order to mitigate the risk-taking suggested in Figure 8, interest rates must rise. However, the correlation between interest rate risk and credit risk has seemingly broken down. One only needs to look at the yields in the High Yield Debt markets to see the evidence. Investors are taking on additional risks (in some cases significant additional risk) without a commensurate increase in return. We wonder if this phenomenon is being accounted for in a bank's risk appetite calculations.

And there is more...

With interest rates so low for so long, our economy may have become addicted to cheap money where even modest increases in rates might be the funeral pyre that ignites the next recession and turns assets into ashes. For banks, tier 1 and tier 2 assets could be vulnerable to a Chernobyl-like meltdown. Although this might be a low probability event, the impacts are serious and should not be dismissed.

Moreover, let us not forget knock-on effects. It is not simply direct lending, as noted above, but indirect lending as well. For example, extending financing to a company in which its major source of revenue is a company that has taken on massive levels of debt. We fear that many bankers have forgotten (or chose to ignore) downstream effects. In addition, those with wealth management operations are accepting increased fiduciary risk

as they expose clients to these types of instruments as part of the portfolio selection/balancing process.

The correlation between interest rate risk and credit risk has seemingly broken down.





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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

All entities holding substantial amounts of debt should expect greater debt-servicing costs in a higher interest rate world. We are especially troubled by small and mid-market obligors that live on small margins, may have to hold inventories, and need cheap, ongoing short-term financing. There are millions of these borrowers fitting this profile. This cluster is not only exposed to even slightly higher interest rates, but also access to liquidity in a downside scenario.

And what about changes in lending needs as the world adjusts to the new supply chain balance configurations? For example, think of Just-in-Time inventory management being supplanted by Just-in-Case.

Finally, there is the issue of private investment in machinery, equipment, industrial infrastructure, and training (CAPEX) that is hyper-sensitive to interest rates and the economic cycle. CAPEX is key to solving many of the more permanent supply-gap challenges we entertained in sections 4A and 4B.

### 4.G Beware of the Ultimate of Downside Risks: The Coronavirus and its Variants

For those of you that are thinking we are totally out of the woods, we have one word for you: Complacency.

Remember what many pundits were saying more than a year ago; the coronavirus would be in retreat by late-summer; the summer of 2020! Such predictions proved to be facile.

Many states and countries are sadly under-vaccinated while social distancing practices are being relaxed in many areas. People are traveling in droves. The Delta variant taunts. Are there other viruses mutating surreptitiously now?



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## 4. Key Risk Indicators that can Create Bottlenecks, Jeopardize an Economic Recovery and Stress Credit Risk

Many of us watched the Euro 2020 Championship at a packed Wembley Stadium in London. Got us thinking, again, about the risks going forward.

Evidence of these risks were reflected in August's sharp decline in nonfarm job creation as another of the pandemic's waves has come onshore. America added only 235,000 jobs in August compared with 1.1 million in July and 962,000 in June. Although the reduction in hirings was broad-based, restaurants and bars were particularly hard hit.



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## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

Sector 4 offered a framework for identifying core risk factors by category. In this section we strive to quantify the intensity of each category for NAICS-based industries employing as much official data as possible. Our ultimate goal is to engineer an actionable procedure that can be used as a risk management tool, serving as a guidance for safe and sound lending.

Admittedly, there are limitations in proxying risk factor intensities and challenges in appraising their probable duration. As such, many of our conclusions are judgmental. Nonetheless, the methodology we propose should provide a foundation to analyze risks associated with bottlenecks and supply chain risks.

### 5.A Methodology and Summary Results

Table 5 presents the basic results of this study. For each NAICS industry IBISWorld covers, we define a risk intensity metric for each of six risk categories using a 1 through 9 (low to high) scale constructed in similar fashion to our Industry Risk Rating scoring system<sup>24</sup>. We employed pre-pandemic figures owing to severe data distortions that began in early-2020.

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<sup>24</sup>Information regarding IBISWorld's Industry Risk Rating Service is available upon request.



**TABLE 5: Bottleneck Risk Factor Intensities**

Industry 6-digit NAICS	Industry Description	Labor Shortage	Supply Chain	Trade Dependence	Life Cycle	Industry Volatility	Other KRIs	Average Risk
111110	Soybean Farming	2.20	7.78	3.09	5.0	8.97	4.94	5.3
111120	Oilseed Farming	2.20	6.99	1.91	5.0	8.05	4.94	4.8
111150	Corn Farming	2.20	6.08	1.00	5.0	6.80	4.26	4.2
111140	Wheat, Barley & Sorghum Farming	2.20	7.05	4.28	5.0	8.46	5.63	5.4
111211	Vegetable Farming	5.05	6.39	2.38	5.0	1.00	4.72	4.1
111310	Orange & Citrus Groves	7.57	5.30	2.76	5.0	2.70	4.72	4.7
111331	Fruit & Nut Farming	4.35	7.13	4.54	5.0	1.35	4.26	4.4
111421	Plant & Flower Growing	5.67	4.47	1.00	9.0	5.47	2.88	4.7
111910	Tobacco Growing	6.27	8.27	6.88	9.0	8.69	6.58	7.6
111920	Cotton Farming	6.67	7.78	4.01	5.0	8.74	6.08	6.4
111930	Sugarcane Harvesting	7.15	4.33	1.00	9.0	4.51	3.81	5.0
111940	Hay & Crop Farming	6.56	5.35	1.00	5.0	4.27	4.49	4.4
112111	Beef Cattle Production	2.20	5.29	1.00	5.0	8.63	3.81	4.3
112120	Dairy Farms	2.60	9.00	1.00	5.0	6.93	3.81	4.7
112210	Hog & Pig Farming	6.33	4.68	1.00	5.0	4.05	3.81	4.1
112310	Chicken Egg Production	2.20	4.38	1.00	5.0	5.54	3.81	3.7
112320	Chicken & Turkey Meat Production	2.20	3.95	1.00	5.0	1.61	3.81	2.9
112410	Sheep Farming	2.20	3.65	1.00	9.0	4.54	3.81	4.0
112511	Fish & Seafood Aquaculture	7.04	7.78	2.90	5.0	1.53	3.58	4.6
112910	Beekeeping	3.22	7.43	1.90	1.0	2.31	3.66	3.3
112920	Horse & Other Equine Production	2.20	8.09	2.68	5.0	3.36	4.41	4.3
113110	Timber Services	2.76	6.40	1.00	5.0	6.03	4.07	4.2
113310	Logging	5.67	5.96	1.00	5.0	6.19	7.98	5.3
114111	Fishing	6.32	7.05	5.17	5.0	4.94	5.97	5.7
114210	Hunting & Trapping	7.13	3.60	1.00	5.0	2.69	2.82	3.7
115111	Crop Services	4.26	5.00	1.00	1.0	4.32	4.45	3.3



115210	Livestock Production Support Services	6.61	3.80	1.00	5.0	1.14	5.00	3.8
115310	Forest Support Services	7.16	1.00	1.00	5.0	7.94	3.94	4.3
211120	Oil Drilling & Gas Extraction	7.11	7.97	2.80	5.0	6.50	5.30	5.8
212111	Coal Mining	4.23	8.27	1.78	5.0	7.52	4.26	5.2
212210	Iron Ore Mining	7.53	6.57	1.41	5.0	8.83	5.15	5.7
212221	Gold & Silver Ore Mining	6.86	5.66	1.00	5.0	8.99	5.14	5.4
212230	Copper, Nickel, Lead & Zinc Mining	4.36	7.78	1.95	5.0	7.35	4.26	5.1
212291	Molybdenum & Metal Ore Mining	3.86	7.05	5.71	5.0	8.68	4.49	5.8
212311	Stone Mining	6.88	4.38	1.00	5.0	2.56	6.92	4.5
212321	Sand & Gravel Mining	4.42	6.39	1.00	5.0	6.64	8.86	5.4
212391	Mineral & Phosphate Mining	4.86	8.09	1.60	5.0	6.55	8.79	5.8
213111	Oil & Gas Field Services	2.69	6.40	1.00	5.0	8.72	5.66	4.9
221112	Coal & Natural Gas Power	4.60	3.40	1.00	5.0	6.44	5.82	4.4
221113	Nuclear Power	7.16	3.40	1.00	5.0	3.09	5.59	4.2
221111	Hydroelectric Power	5.23	3.40	1.00	5.0	1.00	3.81	3.2
221115	Wind Power	3.40	3.40	1.00	1.0	3.01	3.81	2.6
221114	Solar Power	3.40	3.40	1.00	1.0	1.00	3.81	2.3
221121	Electric Power Transmission	6.56	4.80	1.00	5.0	3.18	3.81	4.1
221210	Natural Gas Distribution	5.20	3.40	1.00	5.0	6.50	5.56	4.4
221310	Water Supply & Irrigation Systems	5.78	3.40	1.00	5.0	5.42	3.81	4.1
221320	Sewage Treatment Facilities	4.59	3.40	1.00	5.0	4.82	3.81	3.8
221330	Steam & Air-Conditioning Supply	2.87	3.40	1.00	5.0	5.72	6.50	4.1
236115	Home Builders	3.66	3.80	1.00	5.0	8.52	4.35	4.4
236116	Apartment & Condominium Construction	6.61	3.80	1.00	5.0	9.00	4.96	5.1
236117	Housing Developers	5.72	3.80	1.00	5.0	6.73	3.54	4.3





236118	Remodeling	6.24	2.40	1.00	5.0	8.30	1.00	4.0
236210	Industrial Building Construction	6.11	5.20	1.00	5.0	4.04	3.16	4.1
236220	Commercial Building Construction	6.00	6.60	1.00	5.0	5.27	7.83	5.3
236220	Municipal Building Construction	6.00	6.60	1.00	5.0	5.27	7.83	5.3
237110	Water & Sewer Line Construction	5.74	3.80	1.00	5.0	5.30	3.75	4.1
237120	Oil & Gas Pipeline Construction	3.20	2.40	1.00	5.0	3.33	4.73	3.3
237130	Transmission Line Construction	6.65	3.80	1.00	5.0	2.92	3.54	3.8
237210	Land Development	4.97	2.20	1.00	9.0	8.65	5.23	5.2
237310	Road & Highway Construction	4.78	6.40	1.00	5.0	4.80	3.93	4.3
237990	Bridge & Elevated Highway Construction	2.25	5.00	1.00	5.0	8.61	4.98	4.5
237990	Heavy Engineering Construction	2.25	5.00	1.00	5.0	8.61	4.98	4.5
238110	Concrete Contractors	6.91	3.80	1.00	5.0	8.19	5.33	5.0
238120	Steel Framing	6.89	5.20	1.00	5.0	6.10	7.77	5.3
238130	Wood Framing	7.33	2.40	1.00	5.0	8.21	6.34	5.0
238140	Masonry	6.64	6.60	1.00	5.0	8.50	4.04	5.3
238150	Glass & Glazing Contractors	6.81	5.20	1.00	5.0	8.54	8.87	5.9
238160	Roofing Contractors	6.96	2.40	1.00	5.0	6.32	5.53	4.5
238210	Electricians	5.51	3.80	1.00	5.0	8.34	5.22	4.8
238220	Heating & Air-Conditioning Contractors	5.65	5.20	1.00	5.0	7.77	4.28	4.8
238220	Plumbers	5.65	5.20	1.00	5.0	7.77	4.28	4.8
238290	Elevator Installation & Service	6.16	3.80	1.00	5.0	1.59	8.47	4.3
238310	Drywall & Insulation Installers	7.41	5.20	1.00	5.0	8.91	4.56	5.3
238320	Painters	5.07	2.40	1.00	5.0	8.40	4.96	4.5
238330	Flooring Installers	7.13	3.80	1.00	5.0	7.76	7.28	5.3
238340	Tile Installers	7.30	5.20	1.00	5.0	8.95	3.88	5.2
238350	Carpenters	7.31	5.20	1.00	5.0	7.25	5.50	5.2



238390	Building Finishing Contractors	7.30	2.40	1.00	5.0	6.88	5.94	4.8
238910	Excavation Contractors	6.10	3.60	1.00	5.0	6.21	7.45	4.9
238910	Demolition & Wrecking	6.10	3.60	1.00	5.0	6.21	7.45	4.9
238990	Paving Contractors	4.00	3.80	1.00	5.0	7.04	5.24	4.3
238990	Swimming Pool Construction	4.00	3.80	1.00	5.0	7.04	5.24	4.3
238990	Fence Construction	4.00	3.80	1.00	5.0	7.04	5.24	4.3
311111	Animal Food Production	2.95	3.30	1.00	5.0	3.14	3.16	3.1
311211	Flour Milling	2.79	5.73	1.33	5.0	6.20	3.11	4.0
311221	Margarine & Cooking Oil Processing	2.20	6.26	1.50	5.0	5.36	3.99	4.1
311230	Cereal Production	3.94	5.35	1.00	5.0	2.09	4.91	3.7
311314	Sugar Processing	3.57	5.66	1.00	9.0	7.10	5.66	5.3
311340	Candy Production	6.42	5.73	1.07	5.0	2.06	2.38	3.8
311351	Chocolate Production	6.51	5.12	1.41	5.0	3.55	2.88	4.1
311411	Frozen Food Production	6.70	6.03	1.00	5.0	1.00	2.85	3.8
311421	Canned Fruit & Vegetable Processing	4.89	6.34	1.05	5.0	1.00	5.64	4.0
311511	Dairy Product Production	2.50	6.34	1.00	5.0	1.98	3.81	3.4
311520	Ice Cream Production	5.95	3.30	1.00	5.0	3.95	4.76	4.0
311611	Meat, Beef & Poultry Processing	6.15	5.73	1.00	5.0	6.86	3.21	4.7
311710	Seafood Preparation	6.52	5.38	1.00	5.0	1.00	3.76	3.8
311811	Bread Production	3.04	4.33	1.00	5.0	3.05	1.97	3.1
311821	Cookie, Cracker & Pasta Production	3.03	4.33	1.00	5.0	7.14	1.83	3.7
311830	Tortilla Production	5.69	6.40	1.00	5.0	5.53	3.81	4.6
311911	Snack Food Production	3.02	3.30	1.00	5.0	1.00	3.80	2.9
311920	Coffee Production	2.20	2.20	2.13	5.0	3.22	3.21	3.0
311920	Tea Production	2.20	2.20	2.13	5.0	3.22	3.21	3.0
311930	Syrup & Flavoring Production	2.88	3.40	1.00	5.0	1.00	3.21	2.7



311941	Seasoning, Sauce and Condiment Production	3.90	5.73	1.00	5.0	1.00	1.78	3.1
311991	Baking Mix & Prepared Food Production	5.78	7.43	1.24	5.0	2.41	2.46	4.1
312111	Soda Production	3.94	3.60	1.00	5.0	4.46	2.70	3.4
312112	Bottled Water Production	4.04	6.99	1.00	5.0	1.86	2.05	3.5
312111	Juice Production	3.94	3.60	1.00	5.0	4.46	2.70	3.4
312120	Breweries	2.20	6.99	1.20	5.0	1.00	4.99	3.6
312130	Wineries	4.41	6.39	1.24	5.0	1.00	5.70	4.0
312140	Distilleries	2.20	6.08	2.05	1.0	2.29	2.65	2.7
312230	Cigarette & Tobacco Mfg	4.04	3.65	1.00	9.0	6.71	2.98	4.6
313210	Textile Mills	4.20	7.08	3.87	9.0	2.14	3.30	4.9
314110	Carpet Mills	3.40	6.34	1.44	5.0	5.92	2.56	4.1
315110	Hosiery Mills	2.88	6.78	3.82	9.0	2.67	3.06	4.7
315190	Apparel Knitting Mills	2.49	6.60	1.00	9.0	5.11	3.89	4.7
315210	Cut and Sew Manufacturers	5.16	5.20	1.00	9.0	1.00	3.11	4.1
315220	Men's & Boys' Apparel Mfg	3.48	7.08	6.72	9.0	3.34	5.90	5.9
315240	Women's, Girls' and Infants' Apparel Mfg	6.39	6.78	7.00	9.0	1.88	7.98	6.5
315280	Costume & Team Uniform Mfg	3.89	5.74	3.88	9.0	3.77	3.16	4.9
316110	Leather Tanning & Finishing	3.75	6.35	4.05	9.0	8.78	5.79	6.3
316210	Shoe & Footwear Mfg	2.93	6.78	5.71	9.0	2.50	4.07	5.2
316998	Leather Good & Luggage Mfg	5.32	6.78	6.63	9.0	3.28	8.07	6.5
321113	Sawmills & Wood Production	3.14	5.43	1.22	5.0	7.74	4.54	4.5
321211	Wood Paneling Mfg	3.35	5.61	1.11	5.0	7.85	4.30	4.5
321911	Millwork	4.82	4.34	1.00	5.0	6.52	4.53	4.4
321920	Wood Pallets & Skids Production	6.72	4.34	1.00	5.0	5.02	7.83	5.0
321991	Prefabricated Home Mfg	6.58	2.03	1.00	5.0	6.86	4.71	4.4
321999	Wood Product Mfg	5.05	6.78	2.33	5.0	6.68	5.72	5.3



322110	Wood Pulp Mills	5.46	7.43	6.31	5.0	6.59	5.63	6.1
322121	Paper Mills	2.60	5.30	1.00	9.0	7.62	5.65	5.2
322130	Paperboard Mills	4.17	4.70	1.06	5.0	3.54	4.74	3.9
322211	Cardboard Box & Container Mfg	4.00	4.03	1.00	5.0	1.00	6.07	3.5
322220	Coated & Laminated Paper Mfg	4.92	7.43	1.86	9.0	3.84	5.92	5.5
322230	Office Stationery Mfg	3.32	4.57	1.00	9.0	8.41	5.68	5.3
322291	Sanitary Paper Product Mfg	3.75	6.70	1.35	5.0	3.50	4.72	4.2
322299	Paper Product Mfg	3.59	4.77	2.18	9.0	5.80	6.63	5.3
323111	Printing	4.05	6.34	1.00	9.0	7.89	3.81	5.3
323111	Quick Printing	4.05	6.34	1.00	9.0	7.89	3.81	5.3
323120	Printing Services	3.44	2.34	1.00	9.0	2.73	3.81	3.7
324110	Petroleum Refining	4.53	6.26	1.05	5.0	8.39	5.20	5.1
324121	Asphalt Mfg	4.75	3.95	1.00	5.0	4.06	7.21	4.3
324191	Lubricant Oil Mfg	5.23	5.00	1.00	5.0	8.48	5.38	5.0
325110	Petrochemical Mfg	7.14	4.93	1.00	5.0	8.55	5.31	5.3
325120	Oxygen & Hydrogen Gas Mfg	3.92	6.69	1.00	5.0	4.14	6.11	4.5
325130	Dye & Pigment Mfg	5.81	6.09	4.59	9.0	8.60	9.00	7.2
325180	Inorganic Chemical Mfg	6.62	6.70	3.40	5.0	4.09	7.25	5.5
325194	Organic Chemical Mfg	5.48	8.39	3.57	5.0	6.12	9.00	6.3
325211	Plastic & Resin Mfg	7.32	7.13	2.67	5.0	7.86	5.87	6.0
325220	Synthetic Fiber Mfg	4.94	6.70	3.15	9.0	4.58	7.27	5.9
325311	Fertilizer Mfg	4.72	5.43	2.13	5.0	7.26	4.26	4.8
325320	Pesticide Mfg	4.92	8.70	1.58	9.0	8.64	5.65	6.4
325411	Brand Name Pharmaceutical Mfg	3.88	5.00	2.92	5.0	2.55	5.42	4.1
325411	Generic Pharmaceutical Mfg	3.88	5.00	2.92	5.0	2.55	5.42	4.1
325411	Vitamin & Supplement Mfg	3.88	5.00	2.92	5.0	2.55	5.42	4.1
325510	Paint Mfg	2.88	5.43	1.00	5.0	7.34	7.89	4.9
325520	Adhesive Mfg	5.62	5.73	1.00	5.0	5.95	6.10	4.9



325611	Soap & Cleaning Compound Mfg	2.36	5.73	1.63	5.0	4.89	3.79	3.9
325620	Cosmetic & Beauty Products Mfg	4.24	5.73	1.83	5.0	5.75	5.35	4.6
325910	Ink Mfg	8.05	4.77	4.65	9.0	5.03	4.26	6.0
325920	Explosives Mfg	4.38	5.13	1.58	5.0	6.99	4.26	4.6
325991	Chemical Product Mfg	4.45	5.73	1.52	5.0	6.08	6.17	4.8
326111	Plastic Film, Sheet & Bag Mfg	3.20	6.03	1.94	5.0	3.32	6.39	4.3
326121	Plastic Pipe & Parts Mfg	5.59	4.70	1.00	5.0	6.81	4.82	4.7
326130	Laminated Plastics Mfg	3.59	6.40	1.00	5.0	6.75	7.90	5.1
326140	Polystyrene Foam Mfg	2.54	6.40	1.00	5.0	2.74	5.58	3.9
326150	Urethane Foam Mfg	2.76	3.30	1.00	5.0	6.62	6.05	4.1
326160	Plastic Bottle Mfg	4.35	4.70	1.00	5.0	6.83	3.83	4.3
326191	Plastic Products Miscellaneous Mfg	3.75	6.03	1.53	5.0	6.07	4.09	4.4
326211	Tire Mfg	3.50	6.78	3.10	5.0	4.15	3.06	4.3
326220	Hose & Belt Mfg	3.15	6.17	4.13	5.0	5.84	8.31	5.4
326291	Rubber Product Mfg	5.26	4.77	1.31	5.0	2.76	4.83	4.0
327110	Ceramics Mfg	6.21	7.08	5.94	5.0	8.37	5.51	6.4
327120	Clay Brick & Product Mfg	4.76	6.03	2.06	5.0	5.24	6.53	4.9
327211	Glass Product Mfg	3.48	5.38	1.78	5.0	7.71	8.22	5.3
327310	Cement Mfg	3.88	5.61	1.00	5.0	8.85	7.40	5.3
327320	Ready-Mix Concrete Mfg	3.72	5.00	1.00	5.0	8.32	6.28	4.9
327331	Concrete Pipe & Block Mfg	3.40	6.03	1.00	5.0	8.82	3.13	4.6
327390	Precast Concrete Mfg	6.37	4.04	1.00	5.0	8.90	6.48	5.3
327410	Lime Mfg	4.83	5.66	1.00	5.0	4.75	6.03	4.5
327420	Gypsum Product Mfg	6.73	3.72	1.00	5.0	8.07	4.15	4.8
327910	Abrasive & Sandpaper Mfg	4.23	7.08	2.37	5.0	8.42	8.28	5.9
327991	Mineral Product Mfg	4.97	5.73	1.28	5.0	3.15	6.33	4.4
331110	Iron & Steel Mfg	5.31	5.73	1.29	5.0	8.18	5.61	5.2





331210	Metal Pipe & Tube Mfg	2.89	6.34	1.89	5.0	7.56	4.26	4.7
331221	Steel Rolling & Drawing	3.68	5.00	1.00	5.0	4.19	7.15	4.3
331313	Aluminum Mfg	4.39	6.34	1.68	5.0	8.58	7.14	5.5
331410	Nonferrous Metal Refining	2.61	8.70	9.00	9.0	7.44	5.60	7.1
331420	Copper Rolling, Drawing & Extruding	2.23	5.30	1.12	5.0	6.29	4.01	4.0
331491	Nonferrous Metal Rolling & Alloying	3.69	6.78	6.64	5.0	6.38	5.38	5.6
331511	Ferrous Metal Foundry Products	7.03	6.03	1.00	5.0	6.65	7.60	5.6
331523	Nonferrous Metal Foundry Products Mfg	6.09	5.20	1.00	5.0	7.49	5.14	5.0
332111	Metal Stamping & Forging	3.27	5.30	1.61	5.0	7.55	9.00	5.3
332215	Hand Tool & Cutlery Mfg	3.57	6.47	3.60	9.0	1.00	6.16	5.0
332311	Structural Metal Product Mfg	4.04	6.03	1.00	5.0	8.23	8.03	5.4
332321	Sheet Metal, Window & Door Mfg	5.16	2.34	1.00	5.0	7.02	8.75	4.9
332410	Boiler & Heat Exchanger Mfg	3.28	5.38	1.85	5.0	4.99	7.17	4.6
332420	Metal Tank Mfg	3.76	5.38	1.08	5.0	7.19	4.26	4.4
332431	Metal Can & Container Mfg	4.89	5.30	1.00	9.0	7.17	4.17	5.3
332510	Hardware Mfg	3.49	7.43	3.83	5.0	4.44	5.98	5.0
332613	Wire & Spring Mfg	4.07	5.07	1.86	5.0	4.40	6.94	4.6
332710	Machine Shop Services	4.49	5.20	1.00	5.0	5.23	6.40	4.6
332721	Screw, Nut & Bolt Mfg	3.81	5.73	1.32	5.0	6.61	8.95	5.2
332811	Metal Plating & Treating	4.26	6.40	1.00	5.0	7.86	9.00	5.6
332911	Valve Mfg	4.22	5.74	3.57	9.0	4.76	6.50	5.6
332994	Guns & Ammunition Mfg	3.86	5.12	1.53	5.0	4.48	4.07	4.0
332991	Ball Bearing Mfg	2.98	7.13	3.73	5.0	5.77	7.85	5.4
333111	Tractors & Agricultural Machinery Mfg	3.98	5.73	2.16	5.0	8.79	3.65	4.9



333120	Construction Machinery Mfg	7.38	8.04	4.68	5.0	5.78	6.32	6.2
333131	Mining, Oil & Gas Machinery Mfg	5.02	7.74	1.77	5.0	7.61	5.20	5.4
333243	Woodworking Machinery Mfg	5.72	6.60	3.61	5.0	6.53	6.77	5.7
333249	Plastics & Rubber Machinery Mfg	6.92	6.47	4.08	5.0	5.66	5.84	5.7
333242	Semiconductor Machinery Mfg	7.99	6.47	4.06	5.0	8.10	5.63	6.2
333243	Printing/Paper/Food/Textile/Other Machinery Mfg	5.72	6.60	3.61	5.0	6.53	6.77	5.7
333316	Copier & Optical Machinery Mfg	3.97	5.44	3.86	5.0	4.22	9.00	5.2
333413	Heating & Air Conditioning Equipment Mfg	4.36	4.77	2.06	5.0	4.53	7.55	4.7
333511	Metalworking Machinery Mfg	3.49	5.74	2.26	5.0	5.50	8.95	5.2
333612	Engine & Turbine Mfg	6.05	7.74	4.93	5.0	6.95	9.00	6.6
333611	Wind Turbine Mfg	6.81	6.40	2.19	9.0	8.86	4.26	6.3
333914	Pump & Compressor Mfg	3.85	5.32	3.13	5.0	4.97	7.88	5.0
333921	Forklift & Conveyor Mfg	5.97	4.04	1.69	5.0	7.51	9.00	5.5
333991	Power Tools/Other General Purpose Machinery Mfg	5.90	6.40	3.82	5.0	6.97	8.08	6.0
334111	Computer Mfg	5.97	6.78	6.98	5.0	2.89	8.40	6.0
334112	Computer Peripheral Mfg	4.86	6.05	8.51	9.0	6.23	6.25	6.8
334210	Telecommunication Networking Equipment Mfg	5.49	7.08	1.81	9.0	8.24	3.35	5.8
334220	Communication Equipment Mfg	3.93	7.08	6.12	9.0	8.27	5.65	6.7
334290	Alarm, Horn & Traffic Control Equipment Mfg	4.49	6.47	1.62	5.0	8.25	7.33	5.5
334310	Audio & Video Equipment Mfg	3.89	6.78	4.16	5.0	8.43	3.97	5.4
334413	Semiconductor & Circuit Mfg	6.66	5.20	5.71	5.0	5.18	6.51	5.7



334419	Circuit Board & Electronic Component Mfg	5.22	6.47	2.94	9.0	2.97	4.26	5.1
334413	Solar Panel Mfg	6.66	5.20	5.71	5.0	5.18	6.51	5.7
334511	Navigational Instrument Mfg	5.91	4.77	2.13	5.0	4.49	7.19	4.9
334510	Medical Device Mfg	7.34	6.17	2.46	1.0	1.00	4.96	3.8
334614	Recordable Media Mfg	6.82	6.78	7.27	9.0	3.90	4.30	6.3
335110	Lighting & Bulb Mfg	3.90	6.47	2.22	5.0	5.23	5.53	4.7
335121	Lighting Fixtures Mfg	7.31	6.17	2.99	5.0	5.86	4.74	5.3
335210	Vacuum/Fan/Small Household Appliance Mfg	2.20	6.17	5.09	5.0	1.00	2.96	3.7
335220	Major Household Appliance Mfg	2.20	6.17	2.94	5.0	3.88	5.53	4.3
335311	Electrical Equipment Mfg	4.38	6.47	3.81	5.0	8.14	9.00	6.1
335911	Battery Mfg	4.62	6.47	4.35	5.0	4.91	4.94	5.0
335921	Wire & Cable Mfg	6.04	6.40	4.56	5.0	1.91	8.47	5.4
335931	Wiring Device Mfg	4.24	6.17	3.21	5.0	7.20	9.00	5.8
335991	Power Conversion Equipment Mfg	7.12	6.17	6.38	5.0	4.59	8.10	6.2
336111	Car & Automobile Mfg	6.89	8.04	6.05	9.0	7.91	5.80	7.3
336112	SUV & Light Truck Mfg	3.40	8.27	1.00	5.0	3.87	5.13	4.4
336120	Truck & Bus Mfg	4.33	6.47	1.98	5.0	6.14	5.84	5.0
336211	Truck, Trailer & Motor Home Mfg	4.44	4.65	1.21	5.0	6.41	6.40	4.7
336310	Automobile Engine & Parts Mfg	3.53	6.40	2.80	5.0	7.38	5.77	5.1
336320	Automobile Electronics Mfg	3.89	7.74	3.10	5.0	8.59	5.25	5.6
336330	Automobile Steering & Suspension Mfg	4.81	7.74	1.80	5.0	2.79	6.05	4.7
336340	Automobile Brakes Mfg	5.27	7.01	2.48	5.0	6.17	7.78	5.6
336350	Automobile Transmission Mfg	3.75	8.04	2.40	5.0	3.40	5.09	4.6
336360	Automobile Interior Mfg	6.11	6.34	1.07	5.0	8.45	6.55	5.6



336370	Automobile Metal Stamping	4.30	3.91	1.00	5.0	4.85	4.93	4.0
336390	Auto Parts Mfg	3.80	7.43	2.31	5.0	5.26	4.38	4.7
336411	Aircraft, Engine & Parts Mfg	5.09	7.43	3.07	5.0	2.42	4.74	4.6
336414	Space Vehicle & Missile Mfg	3.91	4.16	1.00	5.0	7.88	4.83	4.5
336510	Train, Subway & Transit Car Mfg	6.40	7.13	1.20	5.0	8.13	8.37	6.0
336611	Ship Building	5.93	3.07	1.00	5.0	6.39	7.17	4.8
336612	Boat Building	6.51	4.65	1.38	5.0	8.03	3.55	4.9
336991	Motorcycle, Bike & Parts Mfg	7.57	6.05	3.10	5.0	1.86	4.31	4.6
336992	Tank & Armored Vehicle Mfg	5.01	6.39	1.00	5.0	8.94	4.99	5.2
336999	ATV, Golf Cart & Snowmobile Mfg	3.51	5.12	1.00	5.0	5.15	6.14	4.3
337110	Cabinet & Vanity Mfg	4.26	3.68	1.00	5.0	7.77	4.94	4.4
337121	Household Furniture Mfg	5.07	6.78	3.17	9.0	1.01	3.00	4.7
337211	Office Furniture Mfg	3.28	5.07	1.44	5.0	4.66	7.23	4.4
337910	Mattress Mfg	3.50	5.07	1.00	5.0	2.77	3.54	3.5
337920	Blind & Shade Mfg	7.18	6.78	2.03	5.0	6.74	7.66	5.9
339112	Medical Instrument & Supply Mfg	6.19	4.77	2.97	5.0	2.26	4.49	4.3
339115	Glasses & Contact Lens Mfg	3.52	6.17	3.69	5.0	1.00	5.83	4.2
339910	Jewelry Mfg	4.78	6.17	8.90	9.0	7.80	3.32	6.7
339920	Athletic & Sporting Goods Mfg	4.08	3.80	2.57	5.0	1.00	4.72	3.5
339920	Gym & Exercise Equipment Mfg	4.08	3.80	2.57	5.0	1.00	4.72	3.5
339930	Toy, Doll & Game Mfg	8.41	6.17	7.15	5.0	1.00	4.12	5.3
339940	Art & Office Supply Mfg	6.05	6.78	2.61	9.0	4.13	5.18	5.6
339950	Billboard & Sign Mfg	6.40	3.07	1.00	5.0	4.84	7.67	4.7
423110	Automobile WhSale	5.22	9.00	1.00	5.0	3.58	1.00	4.1
423120	Auto Parts WhSale	4.32	7.86	1.00	5.0	2.22	5.26	4.3
423130	Tire WhSale	2.74	8.28	1.00	5.0	5.68	5.49	4.7



423140	Used Car Parts WhSale	6.85	7.02	1.00	5.0	4.93	6.36	5.2
423210	Furniture WhSale	4.64	8.28	1.00	5.0	6.35	5.05	5.1
423220	Home Furnishing WhSale	6.43	7.86	1.00	5.0	7.82	4.94	5.5
423310	Lumber WhSale	3.74	8.28	1.00	5.0	8.92	5.78	5.5
423320	Stone, Concrete & Clay WhSale	3.80	8.22	1.00	5.0	6.57	7.68	5.4
423330	Roofing, Siding & Insulation WhSale	2.59	8.64	1.00	5.0	6.14	3.13	4.4
423390	Manufactured Home WhSale	4.53	7.44	1.00	5.0	8.56	6.66	5.5
423410	Camera & Film WhSale	2.20	7.44	1.00	9.0	1.50	5.00	4.4
423420	Copier & Office Equipment WhSale	4.60	7.44	1.00	9.0	1.89	7.15	5.2
423430	Computer & Packaged Software WhSale	2.34	8.28	1.00	9.0	1.83	4.02	4.4
423440	Restaurant & Hotel Equipment WhSale	4.86	7.44	1.00	5.0	5.57	6.02	5.0
423450	Medical Supplies WhSale	5.74	7.44	1.00	1.0	1.65	4.97	3.6
423460	Glasses & Contacts WhSale	3.54	7.86	1.00	5.0	3.72	3.30	4.1
423490	Laboratory Supply WhSale	2.20	7.44	1.00	1.0	6.28	3.81	3.6
423510	Metal WhSale	4.06	8.22	1.00	5.0	7.46	5.14	5.1
423520	Coal & Ore WhSale	2.37	9.00	1.00	5.0	7.28	3.81	4.7
423610	Electrical Equipment WhSale	4.28	7.86	1.00	5.0	3.75	7.67	4.9
423620	TV & Appliance WhSale	6.54	7.86	1.00	5.0	5.05	2.20	4.6
423690	Electronic Part & Equipment WhSale	3.83	7.86	1.00	5.0	1.00	3.47	3.7
423710	Tool & Hardware WhSale	3.72	7.44	1.00	5.0	4.57	6.34	4.7
423720	Plumbing & Heating Supplies WhSale	2.97	8.28	1.00	5.0	6.43	6.35	5.0
423730	Heating & Air Conditioning WhSale	3.76	7.86	1.00	5.0	7.16	5.41	5.0
423740	Refrigeration Equipment WhSale	5.43	8.28	1.00	5.0	7.07	7.74	5.8





423810	Construction & Mining Equipment WhSale	4.94	8.22	1.00	5.0	6.98	7.24	5.6
423820	Farm, Lawn & Garden Equipment WhSale	3.62	8.28	1.00	5.0	4.95	4.48	4.6
423830	Industrial Machinery & Equipment WhSale	3.48	8.28	1.00	5.0	7.01	9.00	5.6
423840	Industrial Supplies WhSale	3.47	7.86	1.00	1.0	7.23	8.04	4.8
423850	Janitorial Equipment Supply WhSale	3.49	8.28	1.00	5.0	1.00	5.82	4.1
423860	Aircraft/Marine/Railroad Transport Equip WhSale	5.25	8.64	1.00	5.0	6.47	3.35	5.0
423910	Sporting Goods WhSale	6.10	7.86	1.00	5.0	2.78	2.70	4.2
423920	Toy & Craft Supplies WhSale	6.27	7.44	1.00	5.0	6.37	5.33	5.2
423930	Recyclable Material WhSale	6.08	8.22	1.00	5.0	7.47	6.73	5.7
423940	Jewelry & Watch WhSale	3.84	7.44	1.00	5.0	3.51	2.43	3.9
424110	Paper WhSale	2.20	8.64	1.00	9.0	6.77	3.81	5.2
424120	Office Stationery WhSale	4.68	8.28	1.00	9.0	2.46	6.39	5.3
424130	Paper Bag & Disposable Plastic Product WhSale	2.92	8.28	1.00	5.0	1.37	5.29	4.0
424210	Drug, Cosmetic & Toiletry WhSale	3.07	8.28	1.00	1.0	4.72	2.74	3.5
424310	Piece Goods, Notions & Other Apparel WhSale	2.48	7.86	1.00	9.0	3.60	5.33	4.9
424320	Men's & Boys' Apparel WhSale	4.85	7.86	1.00	5.0	5.14	5.10	4.8
424330	Women's & Children's Apparel WhSale	3.93	7.86	1.00	5.0	4.64	5.64	4.7
424340	Footwear WhSale	5.47	7.44	1.00	5.0	1.00	2.70	3.8
424410	Grocery WhSale	3.58	8.28	1.00	5.0	4.45	6.08	4.7
424420	Frozen Food WhSale	5.08	8.64	1.00	5.0	7.22	3.18	5.0
424430	Dairy WhSale	4.30	8.64	1.00	5.0	3.43	3.81	4.4
424440	Egg & Poultry WhSale	2.29	8.28	1.00	5.0	1.00	3.81	3.6
424450	Confectionery WhSale	3.27	8.28	1.00	5.0	1.05	2.98	3.6



424460	Fish & Seafood WhSale	4.21	8.28	1.00	5.0	5.32	3.81	4.6
424470	Beef & Pork WhSale	5.80	8.28	1.00	5.0	1.00	5.96	4.5
424480	Fruit & Vegetable WhSale	4.73	8.28	1.00	5.0	1.77	5.33	4.4
424490	Soft Drink, Baked Goods & Other Grocery WhSale	3.89	7.86	1.00	5.0	1.00	2.15	3.5
424510	Corn, Wheat & Soybean WhSale	2.29	9.00	1.00	5.0	7.95	3.81	4.8
424520	Cattle & Hog WhSale	6.18	9.00	1.00	9.0	7.65	3.81	6.1
424610	Plastics WhSale	4.66	7.86	1.00	5.0	7.95	9.00	5.9
424690	Chemical WhSale	5.52	7.86	1.00	5.0	5.41	6.57	5.2
424710	Gasoline & Petroleum Bulk Stations	4.70	9.00	1.00	5.0	8.81	4.99	5.6
424720	Gasoline & Petroleum WhSale	5.38	9.00	1.00	5.0	7.68	5.32	5.6
424810	Beer WhSale	3.51	7.44	1.00	5.0	7.83	2.15	4.5
424820	Wine & Spirits WhSale	2.35	8.28	1.00	5.0	1.00	3.25	3.5
424910	Farm Supplies WhSale	5.59	8.64	1.00	5.0	8.88	3.81	5.5
424920	Book, Magazine & Newspaper WhSale	3.06	8.28	1.00	9.0	1.00	5.00	4.6
424930	Flower & Nursery Stock WhSale	6.11	8.28	1.00	9.0	3.59	2.43	5.1
424940	Cigarette & Tobacco Products WhSale	6.57	8.28	1.00	9.0	7.31	4.28	6.1
424950	Paint WhSale	6.20	7.86	1.00	5.0	6.46	7.32	5.6
425120	Wholesale Trade Agents and Brokers	2.43	7.86	1.00	9.0	3.81	7.10	5.2
441110	New Car Dealers	3.08	8.28	1.00	5.0	3.04	4.20	4.1
441120	Used Car Dealers	5.28	8.28	1.00	5.0	1.23	1.48	3.7
441210	Recreational Vehicle Dealers	4.84	7.86	1.00	5.0	7.05	5.48	5.2
441228	Motorcycle Dealership and Repair	6.77	8.28	1.00	5.0	4.50	4.17	5.0
441228	Bicycle Dealership and Repair	6.77	8.28	1.00	5.0	4.50	4.17	5.0
441222	Boat Dealership and Repair	6.21	7.44	1.00	5.0	5.94	4.25	5.0
441310	Auto Parts Stores	5.59	7.02	1.00	5.0	1.00	3.17	3.8



441320	Tire Dealers	5.96	8.28	1.00	5.0	2.04	3.08	4.2
442110	Furniture Stores	4.72	8.28	1.00	5.0	4.87	4.83	4.8
442210	Floor Covering Stores	6.24	8.28	1.00	5.0	8.22	3.93	5.4
442291	Home Furnishings Stores	2.45	8.28	1.00	5.0	1.11	3.60	3.6
443141	Consumer Electronics Stores	3.47	8.28	1.00	9.0	1.00	1.87	4.1
443142	Computer Stores	6.24	7.86	1.00	9.0	1.14	3.02	4.7
443142	Camera Stores	6.24	7.86	1.00	9.0	1.14	3.02	4.7
444110	Home Improvement Stores	2.20	7.44	1.00	5.0	6.34	1.00	3.8
444120	Paint Stores	6.78	8.28	1.00	5.0	7.59	1.32	5.0
444130	Hardware Stores	4.31	8.28	1.00	5.0	6.25	1.00	4.3
444190	Lumber & Building Material Stores	4.47	7.44	1.00	5.0	7.79	5.03	5.1
444210	Lawn & Outdoor Equipment Stores	4.45	8.28	1.00	5.0	4.63	3.20	4.4
444220	Nursery & Garden Stores	2.36	8.64	1.00	5.0	2.33	1.74	3.5
445110	Supermarkets & Grocery Stores	5.91	8.28	1.00	5.0	1.95	2.19	4.1
445120	Convenience Stores	5.54	8.28	1.00	5.0	1.95	2.15	4.0
445210	Meat Markets	5.69	7.86	1.00	5.0	3.25	3.25	4.3
445220	Fish & Seafood Markets	6.31	7.86	1.00	5.0	8.09	2.70	5.2
445230	Fruit & Vegetable Markets	3.93	8.28	1.00	5.0	1.00	3.25	3.7
445291	Specialty Food Stores	7.19	7.02	1.00	5.0	1.00	3.85	4.2
445310	Beer, Wine & Liquor Stores	3.12	8.28	1.00	5.0	1.80	2.15	3.6
446110	Pharmacies & Drug Stores	2.85	8.28	1.00	5.0	1.00	2.89	3.5
446120	Beauty, Cosmetics & Fragrance Stores	5.32	7.02	1.00	5.0	4.60	1.14	4.0
446130	Eyeglasses & Contact Lens Stores	3.09	7.86	1.00	5.0	1.00	3.59	3.6
446191	Health Stores	3.37	7.44	1.00	5.0	1.07	2.70	3.4
447110	Gas Stations with Convenience Stores	4.80	8.64	1.00	5.0	6.84	5.71	5.3
447190	Gas Stations	2.20	8.64	1.00	5.0	3.97	3.02	4.0



448110	Men's Clothing Stores	5.77	8.28	1.00	5.0	1.64	4.16	4.3
448120	Women's Clothing Stores	5.53	8.28	1.00	5.0	1.00	1.87	3.8
448130	Children's & Infants' Clothing Stores	6.03	7.86	1.00	5.0	1.00	1.87	3.8
448140	Family Clothing Stores	5.33	7.86	1.00	5.0	1.43	2.15	3.8
448190	Lingerie, Swimwear & Bridal Stores	3.12	7.86	1.00	5.0	1.62	1.60	3.4
448210	Shoe Stores	2.89	8.28	1.00	9.0	2.60	1.87	4.3
448310	Jewelry Stores	5.84	8.28	1.00	5.0	5.44	1.60	4.5
448150	Handbag, Luggage & Accessory Stores	6.75	7.02	1.00	5.0	2.02	3.88	4.3
451110	Sporting Goods Stores	4.12	8.28	1.00	5.0	1.23	2.15	3.6
451120	Hobby & Toy Stores	2.83	7.86	1.00	9.0	1.00	1.60	3.9
451130	Fabric, Craft & Sewing Supplies Stores	2.20	8.28	1.00	9.0	1.75	2.15	4.1
451140	Musical Instrument & Supplies Stores	3.80	8.28	1.00	9.0	1.84	1.60	4.3
451211	Book Stores	6.39	8.28	1.00	9.0	2.07	5.72	5.4
443142	Record Stores	6.24	7.86	1.00	9.0	1.14	3.02	4.7
452210	Department Stores	4.12	8.28	1.00	9.0	6.26	2.70	5.2
452311	Warehouse Clubs & Supercenters	5.48	7.44	1.00	5.0	2.38	4.46	4.3
452319	Dollar & Variety Stores	2.44	7.86	1.00	5.0	5.65	1.35	3.9
453110	Florists	4.70	7.86	1.00	9.0	3.79	6.20	5.4
453210	Office Supply Stores	6.02	7.86	1.00	9.0	2.98	6.84	5.6
453220	Gift Shops & Card Stores	6.60	8.28	1.00	9.0	3.99	2.54	5.2
453310	Used Goods Stores	4.33	7.44	1.00	5.0	5.85	3.07	4.4
453910	Pet Stores	5.91	8.28	1.00	1.0	1.20	2.15	3.3
453920	Art Dealers	2.51	7.02	1.00	5.0	3.39	4.87	4.0
453930	Manufactured Home Dealers	6.86	7.86	1.00	5.0	2.58	4.80	4.7
453991	Small Specialty Retail Stores	6.18	7.44	1.00	9.0	5.17	3.02	5.3
454110	E-Commerce & Online Auctions	2.20	7.80	1.00	1.0	8.16	2.70	3.8
454110	Mail Order	2.20	7.80	1.00	1.0	8.16	2.70	3.8



454210	Vending Machine Operators	6.78	8.64	1.00	9.0	3.82	5.24	5.7
454310	Fuel Dealers	4.87	8.28	1.00	5.0	6.70	4.86	5.1
454390	Direct Selling Companies	2.20	7.86	1.00	9.0	7.13	6.42	5.6
481111	International Airlines	7.03	7.80	1.00	5.0	3.96	4.46	4.9
481111	Domestic Airlines	7.03	7.80	1.00	5.0	3.96	4.46	4.9
481211	Charter Flights	5.65	3.60	1.00	5.0	1.00	4.50	3.5
482111	Rail Transportation	2.61	3.40	1.00	5.0	7.73	8.53	4.7
483111	Ocean & Coastal Transportation	5.39	9.00	1.00	5.0	5.98	9.00	5.9
483211	Inland Water Transportation	2.86	3.40	1.00	5.0	5.89	6.99	4.2
484110	Local Freight Trucking	4.91	3.60	1.00	5.0	7.60	8.03	5.0
484121	Long-Distance Freight Trucking	2.88	3.60	1.00	5.0	6.02	7.05	4.3
484210	Moving Services	4.34	3.80	1.00	5.0	6.59	3.75	4.1
484220	Local Specialized Freight Trucking	4.95	5.00	1.00	5.0	7.29	9.00	5.4
484230	Tank & Refrigeration Trucking	3.83	5.00	1.00	5.0	3.94	7.35	4.4
485111	Public Transportation	4.80	9.00	1.00	5.0	3.68	5.02	4.8
485510	Scheduled and Charter Bus Services	5.19	3.60	1.00	5.0	1.17	4.01	3.3
485310	Taxi & Limousine Services	2.50	6.40	1.00	1.0	8.28	6.24	4.2
485410	Public School Bus Services	6.90	5.00	1.00	5.0	1.97	2.13	3.7
486110	Oil Pipeline Transportation	3.15	3.40	1.00	5.0	7.98	4.25	4.1
486210	Gas Pipeline Transportation	3.55	3.40	1.00	5.0	4.39	5.73	3.8
486910	Refined Petroleum Pipeline Transportation	3.78	3.40	1.00	5.0	5.14	4.04	3.7
486990	Organic Chemical Pipeline Transportation	2.20	3.40	1.00	5.0	4.42	6.30	3.7
487110	Sightseeing Transportation	6.49	2.20	1.00	5.0	2.61	2.81	3.4
488111	Airport Operations	5.20	9.00	1.00	5.0	1.31	3.05	4.1



488190	Aircraft Maintenance, Repair & Overhaul	6.45	3.80	1.00	5.0	7.08	2.97	4.4
488210	Rail Maintenance Services	4.64	2.40	1.00	5.0	1.00	3.43	2.9
488310	Port & Harbor Operations	5.12	2.20	1.00	5.0	7.50	9.00	5.0
488320	Stevedoring & Marine Cargo Handling	7.36	1.00	1.00	5.0	6.32	9.00	4.9
488330	Tugboat & Shipping Navigational Services	4.89	2.20	1.00	5.0	1.74	8.27	3.9
488390	Dry Docks & Cargo Inspection Services	3.08	2.20	1.00	5.0	3.27	9.00	3.9
488410	Automobile Towing	4.71	3.60	1.00	5.0	2.88	5.85	3.8
488490	Toll Roads & Weigh Stations	6.14	3.60	1.00	1.0	2.80	1.76	2.7
488510	Freight Forwarding Brokerages & Agencies	4.95	3.80	1.00	5.0	4.08	7.47	4.4
488991	Freight Packing & Logistics Services	7.65	5.20	1.00	5.0	6.77	9.00	5.8
491110	Postal Service	3.15	6.60	1.00	9.0	4.18	8.18	5.4
492110	Couriers & Local Delivery Services	3.94	3.80	1.00	1.0	6.95	7.43	4.0
493110	Public Storage & Warehousing	4.15	1.00	1.00	5.0	1.82	7.00	3.3
493120	Refrigerated Storage	4.30	2.20	1.00	5.0	5.08	7.24	4.1
493130	Farm Product Storage & Warehousing	3.25	3.80	1.00	5.0	3.03	3.81	3.3
493190	Specialized Storage & Warehousing	3.98	1.00	1.00	5.0	1.00	4.26	2.7
511110	Newspaper Publishing	5.93	5.20	1.00	9.0	4.62	3.12	4.8
511120	Magazine & Periodical Publishing	2.95	2.40	1.00	9.0	2.19	2.75	3.4
511130	Book Publishing	3.62	2.40	1.00	9.0	1.41	5.72	3.9
511140	Database & Directory Publishing	4.25	7.80	1.00	9.0	8.76	5.38	6.0
511191	Greeting Cards & Other Publishing	6.87	6.60	1.00	9.0	5.12	5.48	5.7
511210	Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
511210	Operating Systems/ Productivity Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7





511210	Database, Storage & Backup Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
511210	Business Analytics & Enterprise Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
511210	Design, Editing & Rendering Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
511210	Video Game Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
511210	Security Software Publishing	7.20	1.00	1.00	1.0	1.00	5.02	2.7
512110	Movie & Video Production	7.31	2.40	1.00	5.0	2.37	4.68	3.8
512110	Television Production	7.31	2.40	1.00	5.0	2.37	4.68	3.8
512120	Movie & Video Distribution	5.89	2.40	1.00	9.0	3.52	2.98	4.1
512131	Movie Theaters	6.76	7.80	1.00	5.0	4.10	2.48	4.5
512191	Video Postproduction Services	4.81	3.80	1.00	5.0	1.00	4.03	3.3
512250	Independent Label Music Production	2.93	2.40	1.00	5.0	4.31	2.98	3.1
512250	Major Label Music Production	2.93	2.40	1.00	5.0	4.31	2.98	3.1
512230	Music Publishing	5.71	2.20	1.00	5.0	1.93	2.43	3.0
512240	Audio Production Studios	2.65	1.00	1.00	5.0	2.83	3.84	2.7
515111	Radio Broadcasting	6.87	2.20	1.00	5.0	5.59	4.55	4.2
515120	Television Broadcasting	4.57	4.80	1.00	5.0	3.91	6.07	4.2
515210	Cable Networks	5.32	3.40	1.00	5.0	1.28	4.56	3.4
517311	Cable Providers	4.48	4.80	1.00	9.0	8.77	3.47	5.3
517311	Satellite TV Providers	4.48	4.80	1.00	9.0	8.77	3.47	5.3
517311	Wired Telecommunications Carriers	4.48	4.80	1.00	9.0	8.77	3.47	5.3
519190	Internet Service Providers	3.23	4.80	1.00	1.0	1.46	4.64	2.7
517311	VoIP	4.48	4.80	1.00	9.0	8.77	3.47	5.3
517312	Wireless Telecommunications Carriers	3.40	3.40	1.00	5.0	4.68	3.12	3.4



517410	Satellite Telecommunications Providers	5.87	4.80	1.00	5.0	3.70	3.56	4.0
517911	Telecommunications Resellers	7.14	2.20	1.00	5.0	2.23	4.91	3.7
517919	Radar & Satellite Operations	7.18	2.40	1.00	1.0	1.00	4.09	2.8
518210	Data Processing & Hosting Services	6.40	2.40	1.00	1.0	3.16	5.19	3.2
519110	News Syndicates	3.78	6.60	1.00	9.0	5.74	4.50	5.1
519130	Search Engines	8.23	3.40	1.00	1.0	2.82	5.83	3.7
519130	Internet Publishing and Broadcasting	8.23	3.40	1.00	1.0	2.82	5.83	3.7
522110	Commercial Banking	6.22	2.40	1.00	5.0	7.43	7.43	4.9
522120	Savings Banks & Thrifts	6.54	1.00	1.00	9.0	1.00	5.07	3.9
522130	Credit Unions	6.62	1.00	1.00	1.0	7.15	4.23	3.5
522190	Industrial Banks	6.53	2.20	1.00	5.0	2.47	6.62	4.0
522210	Credit Card Issuing	4.59	3.80	1.00	5.0	8.51	3.62	4.4
522220	Auto Leasing, Loans & Sales Financing	2.20	2.20	1.00	5.0	3.19	6.13	3.3
522291	Real Estate Loans & Collateralized Debt	4.59	1.00	1.00	5.0	2.87	4.36	3.1
522310	Loan Brokers	7.13	1.00	1.00	5.0	8.33	1.67	4.0
522320	Credit Card Processing & Money Transferring	7.41	1.00	1.00	5.0	1.32	7.46	3.9
522390	Loan Administration/ Check Cashing & Other Services	7.38	1.00	1.00	5.0	5.45	3.64	3.9
523110	Investment Banking & Securities Dealing	3.87	1.00	1.00	5.0	3.49	7.61	3.7
523120	Securities Brokering	6.32	1.00	1.00	5.0	1.66	4.85	3.3
523130	Commodity Dealing and Brokerage	6.51	1.00	1.00	5.0	4.03	7.21	4.1
523210	Stock & Commodity Exchanges	6.87	3.40	1.00	5.0	4.28	5.13	4.3
523910	Venture Capital & Principal Trading	4.38	1.00	1.00	5.0	7.24	5.08	4.0
523920	Portfolio Management	5.14	1.00	1.00	5.0	2.35	4.68	3.2
523930	Financial Planning & Advice	2.57	1.00	1.00	5.0	1.68	3.26	2.4



523991	Custody, Asset & Securities Services	7.23	6.60	1.00	5.0	1.44	6.19	4.6
524113	Life Insurance & Annuities	5.76	3.40	1.00	5.0	5.00	4.69	4.1
524114	Health & Medical Insurance	2.68	5.00	1.00	1.0	1.00	4.75	2.6
524126	Property, Casualty and Direct Insurance	4.40	1.00	1.00	5.0	1.00	6.41	3.1
524130	Reinsurance Carriers	2.20	2.20	1.00	5.0	1.68	5.54	2.9
524210	Insurance Brokers & Agencies	6.70	1.00	1.00	5.0	2.34	6.04	3.7
524291	Third-Party Administrators/ Insurance Claims Adjusters	6.92	1.00	1.00	5.0	2.59	4.82	3.6
525110	Retirement & Pension Plans	2.20	9.00	1.00	5.0	4.26	8.57	5.0
525120	Health & Welfare Funds	2.75	3.40	1.00	5.0	1.00	5.87	3.2
525190	Workers' Compensation & Other Insurance Funds	2.20	2.40	1.00	5.0	1.50	7.47	3.3
525910	Open-End Investment Funds	2.20	2.20	1.00	5.0	1.00	6.57	3.0
525920	Trusts & Estates	2.67	1.00	1.00	1.0	5.93	5.76	2.9
525990	Real Estate Investment Trusts	6.76	3.40	1.00	5.0	2.51	4.67	3.9
551112	Private Equity, Hedge Funds & Investment Vehicles	2.62	2.20	1.00	5.0	6.16	4.31	3.5
531110	Apartment Rental	6.07	3.40	1.00	5.0	8.70	5.41	4.9
531120	Commercial Leasing	5.17	3.40	1.00	5.0	5.60	3.67	4.0
531130	Storage & Warehouse Leasing	6.51	3.40	1.00	5.0	2.52	1.74	3.4
531190	Land Leasing	7.22	3.40	1.00	5.0	1.70	3.01	3.6
531210	Real Estate Sales & Brokerage	7.64	1.00	1.00	5.0	8.36	4.14	4.5
531311	Property Management	6.47	2.40	1.00	5.0	8.00	5.88	4.8
531320	Real Estate Appraisal	7.11	1.00	1.00	5.0	4.55	6.45	4.2
531390	Real Estate Asset Management & Consulting	4.82	3.40	1.00	5.0	8.87	2.09	4.2
532111	Car Rental	6.71	7.60	1.00	5.0	3.93	3.56	4.6



532120	Truck Rental	6.31	4.80	1.00	5.0	3.67	6.91	4.6
532210	Consumer Electronics & Appliances Rental	5.45	4.80	1.00	5.0	8.73	2.50	4.6
532281	Formal Wear & Costume Rental	6.74	5.00	1.00	9.0	5.77	5.19	5.5
532282	DVD, Game & Video Rental	7.15	7.80	1.00	9.0	6.89	4.76	6.1
532310	Tool & Equipment Rental	4.70	3.40	1.00	5.0	7.58	3.03	4.1
532411	Heavy Equipment Rental	3.00	3.40	1.00	5.0	8.31	4.07	4.1
532420	Computer & Printer Leasing	4.83	3.40	1.00	9.0	2.13	3.39	4.0
532490	Industrial Equipment Rental & Leasing	4.95	3.40	1.00	5.0	8.06	9.00	5.2
533110	Intellectual Property Licensing	5.14	3.40	1.00	5.0	4.78	6.49	4.3
541110	Law Firms	6.75	1.00	1.00	5.0	3.00	5.06	3.6
541191	Conveyancing Services	7.29	1.00	1.00	5.0	3.07	8.19	4.3
541214	Payroll & Bookkeeping Services	5.16	1.00	1.00	5.0	1.00	7.27	3.4
541211	Accounting Services	6.39	1.00	1.00	5.0	5.68	5.54	4.1
541213	Tax Preparation Services	5.25	1.00	1.00	5.0	1.00	5.61	3.1
541310	Architects	6.75	2.40	1.00	5.0	5.99	9.00	5.0
541320	Landscape Design	8.07	2.40	1.00	5.0	7.37	6.42	5.0
541330	Engineering Services	5.55	2.40	1.00	5.0	7.97	7.78	5.0
541350	Building Inspectors	5.66	2.40	1.00	5.0	2.64	7.76	4.1
541360	Geophysical Services	3.79	3.80	1.00	9.0	6.90	4.89	4.9
541370	Surveying & Mapping Services	7.38	2.40	1.00	5.0	4.02	7.39	4.5
339116	Laboratory Testing Services	4.22	1.00	1.00	5.0	3.46	8.08	3.8
541410	Interior Designers	5.19	5.20	1.00	5.0	7.41	6.08	5.0
541420	Industrial Designers	4.40	5.20	1.00	5.0	4.41	5.19	4.2
541430	Graphic Designers	2.85	5.20	1.00	5.0	5.39	6.79	4.4
541490	Fashion Designers	3.40	1.00	1.00	5.0	4.21	3.19	3.0
541511	IT Consulting	6.12	2.40	1.00	1.0	1.00	7.03	3.1



541611	Management Consulting	6.98	2.40	1.00	5.0	5.33	9.00	5.0
541612	HR Consulting	5.56	3.80	1.00	5.0	4.81	9.00	4.9
541620	Environmental Consulting	5.69	2.40	1.00	5.0	1.00	5.69	3.5
541690	Scientific & Economic Consulting	5.12	3.80	1.00	5.0	1.00	6.17	3.7
541713	Scientific Research & Development	8.06	3.80	1.00	5.0	8.12	3.96	5.0
541810	Advertising Agencies	5.56	3.80	1.00	5.0	6.41	9.00	5.1
541820	Public Relations Firms	3.26	1.00	1.00	5.0	5.50	8.06	4.0
541830	Media Buying Agencies	3.68	3.80	1.00	5.0	6.48	8.86	4.8
541840	Media Representative Firms	2.52	1.00	1.00	5.0	3.12	7.10	3.3
541850	Billboard & Outdoor Advertising	2.58	2.20	1.00	5.0	6.79	8.38	4.3
541860	Direct Mail Advertising	5.62	3.80	1.00	9.0	2.24	5.14	4.5
541870	Print Advertising Distribution	2.67	3.80	1.00	9.0	5.62	7.32	4.9
541890	Promotional Products	2.88	3.80	1.00	5.0	5.71	6.79	4.2
541910	Market Research	7.30	2.40	1.00	5.0	3.06	7.21	4.3
541921	Photography	2.65	2.40	1.00	5.0	1.55	5.14	3.0
541930	Translation Services	2.81	2.40	1.00	1.0	1.00	8.40	2.8
541940	Veterinary Services	6.75	1.00	1.00	1.0	3.37	3.22	2.7
541990	Credit Counselors, Surveyors & Appraisers	4.49	1.00	1.00	5.0	1.00	3.96	2.7
561110	Human Resources & Benefits Administration	4.50	2.40	1.00	5.0	4.35	6.34	3.9
561210	Correctional Facilities	2.77	3.60	1.00	5.0	2.53	4.85	3.3
561311	Employment & Recruiting Agencies	3.08	3.80	1.00	5.0	5.90	7.00	4.3
561320	Office Staffing & Temp Agencies	6.90	6.60	1.00	5.0	5.35	5.64	5.1
561330	Professional Employer Organizations	4.27	5.20	1.00	1.0	7.06	7.58	4.4
561410	Document Preparation Services	3.23	3.80	1.00	9.0	4.23	4.22	4.2



561421	Telemarketing & Call Centers	5.55	5.20	1.00	5.0	1.71	7.10	4.3
561431	Business Service Centers	5.32	2.40	1.00	9.0	4.17	5.19	4.5
561440	Debt Collection Agencies	5.00	1.00	1.00	5.0	5.29	2.18	3.2
561450	Credit Bureaus & Rating Agencies	7.68	1.00	1.00	1.0	8.49	4.79	4.0
561510	Travel Agencies	5.41	6.60	1.00	5.0	8.67	6.66	5.6
561520	Tour Operators	2.54	6.60	1.00	5.0	3.31	3.38	3.6
561591	Convention & Visitor Bureaus	3.02	5.20	1.00	5.0	4.33	6.14	4.1
561611	Security Services	6.73	2.40	1.00	5.0	5.96	5.48	4.4
561621	Security Alarm Services	4.61	3.80	1.00	1.0	7.68	6.36	4.1
561710	Pest Control	5.27	1.00	1.00	1.0	1.05	3.00	2.1
561720	Janitorial Services	5.04	2.40	1.00	5.0	3.57	5.50	3.8
561730	Landscaping Services	6.10	3.80	1.00	5.0	4.77	6.03	4.5
561740	Carpet Cleaning	6.07	1.00	1.00	5.0	1.79	1.12	2.7
561910	Packaging & Labeling Services	5.53	6.60	1.00	5.0	1.39	5.80	4.2
561920	Trade Show and Conference Planning	5.93	6.60	1.00	5.0	3.42	4.30	4.4
562111	Waste Collection Services	5.00	3.60	1.00	5.0	4.67	5.14	4.1
562211	Waste Treatment & Disposal Services	3.22	6.40	1.00	5.0	6.68	9.00	5.2
562910	Remediation & Environmental Cleanup Services	5.08	2.40	1.00	5.0	6.92	4.75	4.2
562920	Recycling Facilities	6.20	3.60	1.00	5.0	5.38	6.46	4.6
562991	Portable Toilet Rental & Septic Tank Cleaning	6.47	3.60	1.00	5.0	4.69	7.02	4.6
611110	Public Schools	5.12	6.60	1.00	5.0	4.30	3.81	4.3
611110	Private Schools	5.12	6.60	1.00	5.0	4.30	3.81	4.3
611210	Community Colleges	4.36	7.80	1.00	5.0	7.92	3.49	4.9
611310	Colleges & Universities	6.02	2.20	1.00	5.0	1.73	3.17	3.2
611310	For-Profit Universities	6.02	2.20	1.00	5.0	1.73	3.17	3.2





611430	Business Coaching	4.60	2.40	1.00	1.0	2.49	5.45	2.8
611410	Business Certification & IT Schools	7.54	5.20	1.00	5.0	1.19	4.12	4.0
611511	Trade & Technical Schools	5.21	2.20	1.00	5.0	1.38	2.18	2.8
611610	Fine Arts Schools	4.68	5.00	1.00	1.0	1.02	2.92	2.6
611620	Sports Coaching	4.49	1.00	1.00	5.0	1.00	2.43	2.5
611630	Language Instruction	2.84	5.20	1.00	5.0	1.77	4.99	3.5
611691	Tutoring & Driving Schools	3.94	3.80	1.00	5.0	3.41	2.75	3.3
611710	Testing & Educational Support	6.74	2.40	1.00	1.0	1.92	2.43	2.6
621111	Primary Care Doctors	5.05	1.00	1.00	5.0	5.63	4.14	3.6
621112	Specialist Doctors	3.68	1.00	1.00	5.0	5.41	3.63	3.3
621210	Dentists	4.52	1.00	1.00	5.0	1.00	2.72	2.5
621310	Chiropractors	5.84	1.00	1.00	9.0	1.47	5.00	3.9
621320	Optometrists	6.02	1.00	1.00	5.0	2.18	4.27	3.2
621330	Psychologists, Social Workers & Marriage Counselors	2.95	2.40	1.00	1.0	2.20	4.88	2.4
621340	Physical Therapists	3.23	2.40	1.00	1.0	2.32	5.19	2.5
621391	Podiatrists	4.29	1.00	1.00	5.0	1.00	4.88	2.9
621399	Alternative Healthcare Providers	4.97	1.00	1.00	1.0	1.00	2.01	1.8
621410	Family Planning & Abortion Clinics	7.30	3.80	1.00	5.0	2.65	5.25	4.2
621420	Mental Health & Substance Abuse Clinics	6.87	3.80	1.00	1.0	2.25	4.25	3.2
621491	Emergency & Other Outpatient Care Centers	7.55	1.00	1.00	1.0	2.94	3.86	2.9
621511	Diagnostic & Medical Laboratories	4.60	2.40	1.00	1.0	1.00	4.74	2.5
621610	Home Care Providers	6.74	3.80	1.00	1.0	3.66	4.10	3.4
621910	Ambulance Services	6.56	2.40	1.00	1.0	2.91	4.97	3.1
621991	Blood & Organ Banks	5.50	5.20	1.00	1.0	2.40	5.61	3.5
622110	Hospitals	5.92	3.60	1.00	5.0	4.36	4.37	4.0
622210	Psychiatric Hospitals	6.94	5.20	1.00	5.0	1.00	4.01	3.9



622310	Specialty Hospitals	6.82	1.00	1.00	1.0	2.68	4.69	2.9
623110	Nursing Care Facilities	5.94	1.00	1.00	5.0	1.00	4.42	3.1
623210	Residential Intellectual Disability Facilities	5.74	3.80	1.00	1.0	1.00	4.37	2.8
623220	Mental Health & Substance Abuse Centers	7.05	2.40	1.00	1.0	3.73	5.93	3.5
623311	Retirement Communities	6.17	3.60	1.00	1.0	4.90	2.06	3.1
623990	Orphanages & Group Homes	5.36	3.80	1.00	9.0	7.70	4.69	5.3
624110	Adoption & Child Welfare Services	5.60	6.60	1.00	5.0	1.00	4.07	3.9
624120	Elderly & Disabled Services	5.98	5.20	1.00	1.0	1.00	3.63	3.0
624190	Family Counseling & Crisis Intervention Services	6.93	5.20	1.00	5.0	1.29	3.27	3.8
624210	Community Food Services	5.77	5.00	1.00	5.0	1.00	2.63	3.4
624221	Community Housing & Homeless Shelters	5.84	2.40	1.00	5.0	5.81	3.98	4.0
624230	Natural Disaster & Emergency Relief Services	6.37	3.60	1.00	5.0	1.00	4.49	3.6
624310	Job Training & Career Counseling	6.33	6.60	1.00	5.0	5.05	2.90	4.5
624410	Day Care	7.46	2.40	1.00	5.0	6.05	3.52	4.2
711130	Musical Groups & Artists	3.64	5.20	1.00	5.0	2.01	2.27	3.2
711211	Sports Franchises	5.73	5.20	1.00	1.0	2.86	1.60	2.9
711212	Racing & Individual Sports	2.29	6.40	1.00	5.0	1.52	4.30	3.4
711310	Concert & Event Promotion	3.92	6.60	1.00	5.0	1.00	3.35	3.5
711410	Celebrity & Sports Agents	5.54	2.40	1.00	1.0	5.32	4.74	3.3
711510	Performers & Creative Artists	4.02	2.40	1.00	5.0	3.69	2.38	3.1
712110	Museums	5.69	4.80	1.00	5.0	1.57	3.91	3.7
712120	Historic Sites	5.79	7.80	1.00	5.0	3.30	3.30	4.4
712190	National Parks & Other Nature Institutions	5.34	7.80	1.00	5.0	2.16	2.54	4.0



713110	Amusement Parks	3.21	7.80	1.00	5.0	5.87	5.60	4.7
713120	Arcade, Food & Entertainment Complexes	7.72	3.80	1.00	5.0	2.85	1.32	3.6
713210	Non-Hotel Casinos	5.44	2.20	1.00	5.0	3.76	5.12	3.8
713290	Lotteries & Native American Casinos	6.08	4.80	1.00	5.0	7.40	8.22	5.4
713910	Golf Courses & Country Clubs	5.59	7.80	1.00	5.0	1.32	4.23	4.2
713920	Ski & Snowboard Resorts	7.22	3.60	1.00	5.0	4.96	2.80	4.1
713930	Marinas	6.31	3.40	1.00	5.0	3.23	2.94	3.6
713940	Gym, Health & Fitness Clubs	3.70	3.60	1.00	5.0	1.16	2.16	2.8
713950	Bowling Centers	6.78	5.00	1.00	9.0	4.24	1.87	4.6
713990	Golf Driving Ranges & Family Fun Centers	3.61	2.20	1.00	1.0	1.22	1.87	1.8
721110	Hotels & Motels	6.11	6.40	1.00	5.0	5.21	6.05	5.0
721120	Casino Hotels	5.21	7.80	1.00	5.0	6.23	6.87	5.4
721191	Bed & Breakfast & Hostel Accommodations	4.20	5.00	1.00	5.0	5.20	6.87	4.5
721211	Campgrounds & RV Parks	4.96	2.20	1.00	5.0	3.45	2.78	3.2
722511	Chain Restaurants	6.58	5.20	1.00	5.0	4.37	7.25	4.9
722511	Single Location Full-Service Restaurants	6.58	5.20	1.00	5.0	4.37	7.25	4.9
722513	Fast Food Restaurants	6.92	5.20	1.00	5.0	2.96	7.07	4.7
722515	Coffee & Snack Shops	5.25	6.40	1.00	5.0	5.56	7.01	5.0
722310	Food Service Contractors	6.36	6.60	1.00	5.0	5.06	7.34	5.2
722320	Caterers	5.67	2.40	1.00	1.0	3.21	6.73	3.3
722330	Street Vendors	2.39	3.60	1.00	1.0	7.53	6.53	3.7
722410	Bars & Nightclubs	6.97	6.60	1.00	5.0	5.51	7.15	5.4
811111	Auto Mechanics	5.88	2.40	1.00	5.0	1.00	4.63	3.3
811121	Car Body Shops	7.22	3.80	1.00	5.0	7.32	3.68	4.7
811192	Car Wash & Auto Detailing	6.28	3.60	1.00	5.0	5.69	6.45	4.7
811191	Oil Change Services	5.44	3.80	1.00	5.0	3.63	5.25	4.0



811211	Electronic & Computer Repair Services	7.39	3.80	1.00	9.0	2.05	3.18	4.4
811310	Machinery Maintenance & Heavy Equipment Repair Services	6.89	3.80	1.00	5.0	8.01	9.00	5.6
811411	Appliance Repair	7.61	5.20	1.00	5.0	4.12	4.95	4.6
811420	Furniture Repair & Reupholstery	5.64	2.40	1.00	5.0	1.10	2.12	2.9
811430	Shoe Repair	5.59	2.40	1.00	9.0	1.00	4.45	3.9
812111	Hair & Nail Salons	7.23	5.20	1.00	5.0	3.10	4.62	4.4
812191	Weight Loss Services	5.92	6.40	1.00	5.0	1.25	2.98	3.8
812199	Hair Loss Treatment & Removal	7.63	2.40	1.00	1.0	3.64	3.51	3.2
812199	Tanning Salons	7.63	2.40	1.00	1.0	3.64	3.51	3.2
812210	Funeral Homes	4.77	1.00	1.00	5.0	1.00	2.70	2.6
812220	Cemetery Services	5.91	2.40	1.00	5.0	1.00	2.43	3.0
812310	Laundromats	6.55	3.40	1.00	9.0	1.08	5.46	4.4
812320	Dry Cleaners	6.76	3.80	1.00	9.0	2.28	2.63	4.2
812331	Industrial Laundry & Linen Supply	4.82	2.40	1.00	5.0	6.56	6.10	4.3
812910	Pet Grooming & Boarding	3.48	2.40	1.00	1.0	3.86	2.91	2.4
812921	Photofinishing	2.40	5.00	1.00	9.0	2.15	3.25	3.8
812930	Parking Lots & Garages	7.00	1.00	1.00	5.0	6.11	6.43	4.4
812990	Dating Services	7.13	2.20	1.00	1.0	8.96	3.25	3.9
813110	Religious Organizations	4.14	2.20	1.00	5.0	1.00	4.17	2.9
813211	Donations, Grants & Endowment	4.81	3.60	1.00	5.0	1.00	7.65	3.8
813311	Conservation & Human Rights Organizations	6.15	5.20	1.00	5.0	1.26	3.88	3.7
813410	Civic, Social & Youth Organizations	6.71	6.40	1.00	9.0	1.59	3.85	4.8
813990	Homeowners' Associations	6.13	5.00	1.00	5.0	7.67	3.70	4.7
814110	Maids, Nannies & Gardeners	7.80	6.60	1.00	5.0	6.30	3.18	5.0

Source: IBISWorld



## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

The columns in Table 5 are defined as follows, left to right:

- 6-Digit NAICS code for the Industry: This can be used to exact internal user data.
- Industry Description: Text identifier of an industry.
- Labor Shortage Risk: We used IBISWorld propriety data, 2014-19, wage/employee and wages/revenue ratios. We built a labor index using percent ranks with 0.7 and 0.3 weights, respectively. This serves as a proxy for labor market tightness (shortages). In turn, a STEM Adjusted Labor Score was calculated by assigning 5 to non-STEM industries and 9 to STEM industries and applying 0.7 and 0.3 weights to the labor index and STEM scores, respectively.
- Supply Chain Risk: To reflect potential vulnerability to supply chain risks we utilized three of IBISWorld's propriety measures: the degree of an industry's globalization, capital intensity, and profit. Capital intensity reflects the notion that industries in this category may require investment to diversity supply sources, i.e., they have high switching costs. Profit is perhaps less obvious in its implication. In short, industry profitability is a marker of relative strength in the value chain where higher profit implies greater control over pricing. The base line profit numbers are segmented into quintiles and designated 1-9 scores (with 9 representing the lowest values). Profit provides scalar (weighting metric) on the globalization and capital intensity figures for industries that participate in import/export markets, and replaces globalization for industries not involved in international trade. For globalization we calculated a composite score using our degree and trend metrics (0.7 and 0.3 respective weights). For capital intensity we assigned low = 1, medium = 5, and 9 = high. These values are scaled by the profit score using weights of



## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

0.8 and 0.2. The total supply chain index is computed using globalization/profit and capital intensity weights of 0.7 and 0.3, respectively. The core classifications of this data are determined by IBISWorld's team of industry researchers. Since these metrics do not fully account for the "bullwhip effects" on wholesale and retail trade, adjustments were made to NAICS 42, 44, and 45.

- **Trade Dependence Risk:** We used IBISWorld data for 2019 adding the ratios of imports/domestic demand to exports/revenue compiling and index as a proxy for an industry's trade exposure. We used the same scoring methodology used in calculating IBISWorld's Industry Risk Rating scores. Core data is based on multiple official sources. This factor may be correlated with the supply chain, but not necessarily as this depends on relative exposures. For example, should an obligor export product overseas, though not be reliant on suppliers overseas, they are not vulnerable to global value-chains, but are indeed exposed to trade-related risks.
- **Life Cycle Risks:** Industries in decline should be avoided like the plague. We assigned growth industries = 1, mature industries = 5, and industries in the decline phase of their live cycle = 9. Again, this data is determined by IBISWorld's team of industry researchers.
- **Industry Volatility:** The bane of risk management professionals. We used IBISWorld's Industry Early Warning System which calculates the variation of NAICS-granular risk over-the-cycle; i.e. from 2006 to 2021.





## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

- Other Key Risk Indicators: We decided to amalgamate these forces using IBISWorld's Industry Risk Scenario Builder<sup>25</sup>, running a moderate stagflation scenario to assess the sensitivity of each NAICS-based industry to macroeconomic downside risks.
- Average of all Risks: This a simple average of risk columns. One should red flag an industry if this metric exceeds 5.5.

### 5.B A Stepwise Algorithm

Remember that the results displayed in Table 5 should be considered a guideline or starting point for analysis owing to limitations on the application of proxy data and the fact that each bank has a unique composition in its commercial portfolio. As such, expert judgment needs to play a central role.

Below see our recommended sequential steps:

1. Using NAICS codes as a mapping table, exact data on exposures for each industry in Table 5. In cases where this level of granularity is unavailable, roll-ups or line-of-business (LOB) data can be used. It is best to segregate the data by both total outstanding loans and commitments (credit lines). This process will enable the setting of priorities facilitating the identification of concentrations and a examination of bank policies like limit setting, risk pricing and capital/liquidity planning.
2. To provide a historical perspective on performance and risk appetite, augment the data to include KPIs like delinquencies, probability of default, exposure at default, charge-offs, and net losses. The longer the time series the better, as long as data quality is not compromised.

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<sup>25</sup>Information regarding IBISWorld's Industry Scenario Builder applications is available upon request.



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## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

3. Depending on the results generated in steps 1 and 2, assess which risk factors are most relevant for each industry, roll-up or LOB. We strongly advise that you not dismiss the volatility and life cycle metrics as these are potentially overwhelming risk factors. Again, although supply chain and trade exposure risk may indeed be correlated, there may be occasions when a group of obligors may generate a substantial amount of income through exports but are not heavily dependent on supplies from overseas producers.
4. Cross reference STEM Industries as many of these suffer from persistent labor shortages. This cuts both ways as industries haunted by labor shortages are also those that are promising “advanced industries” as described by the Brookings Institution<sup>26</sup>. See Table 6.

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<sup>26</sup> <https://www.brookings.edu/research/americas-advanced-industries-new-trends/>



TABLE 6:

Industry 6-digit NAICS	Industry Description	Industry 6-digit NAICS	Industry Description
211120	Oil Drilling & Gas Extraction	335921	Wire & Cable Mfg
212210	Iron Ore Mining	335931	Wiring Device Mfg
212221	Gold & Silver Ore Mining	335991	Power Conversion Equipment Mfg
212230	Copper, Nickel, Lead & Zinc Mining	336111	Car & Automobile Mfg
212291	Molybdenum & Metal Ore Mining	336112	SUV & Light Truck Mfg
221112	Coal & Natural Gas Power	336120	Truck & Bus Mfg
221113	Nuclear Power	336211	Truck, Trailer & Motor Home Mfg
221111	Hydroelectric Power	336310	Automobile Engine & Parts Mfg
221115	Wind Power	336320	Automobile Electronics Mfg
221114	Solar Power	336330	Automobile Steering & Suspension Mfg
221121	Electric Power Transmission	336340	Automobile Brakes Mfg
325110	Petrochemical Mfg	336350	Automobile Transmission Mfg
325120	Oxygen & Hydrogen Gas Mfg	336360	Automobile Interior Mfg
325130	Dye & Pigment Mfg	336370	Automobile Metal Stamping
325180	Inorganic Chemical Mfg	336390	Auto Parts Mfg
325194	Organic Chemical Mfg	336411	Aircraft, Engine & Parts Mfg
325211	Plastic & Resin Mfg	336414	Space Vehicle & Missile Mfg
325220	Synthetic Fiber Mfg	336510	Train, Subway & Transit Car Mfg
325311	Fertilizer Mfg	336611	Ship Building
325320	Pesticide Mfg	336612	Boat Building
325411	Brand Name Pharmaceutical Mfg	336991	Motorcycle, Bike & Parts Mfg
325411	Generic Pharmaceutical Mfg	336992	Tank & Armored Vehicle Mfg
325411	Vitamin & Supplement Mfg	336999	ATV, Golf Cart & Snowmobile Mfg
325910	Ink Mfg	339112	Medical Instrument & Supply Mfg
325920	Explosives Mfg	339115	Glasses & Contact Lens Mfg
325991	Chemical Product Mfg	339910	Jewelry Mfg
327110	Ceramics Mfg	339920	Athletic & Sporting Goods Mfg
327120	Clay Brick & Product Mfg	339920	Gym & Exercise Equipment Mfg
327910	Abrasive & Sandpaper Mfg	339930	Toy, Doll & Game Mfg
327991	Mineral Product Mfg	339940	Art & Office Supply Mfg



331110	Iron & Steel Mfg	339950	Billboard & Sign Mfg
331313	Aluminum Mfg	511210	Software Publishing
331511	Ferrous Metal Foundry Products	511210	Operating Systems/Productivity Software Publishing
331523	Nonferrous Metal Foundry Products Mfg	511210	Database, Storage & Backup Software Publishing
333111	Tractors & Agricultural Machinery Mfg	511210	Business Analytics & Enterprise Software Publishing
333120	Construction Machinery Mfg	511210	Design, Editing & Rendering Software Publishing
333131	Mining, Oil & Gas Machinery Mfg	511210	Video Game Software Publishing
333243	Woodworking Machinery Mfg	511210	Security Software Publishing
333249	Plastics & Rubber Machinery Mfg	515210	Cable Networks
333242	Semiconductor Machinery Mfg	517311	Cable Providers
333243	Printing/Paper/Food/Textile/Other Machinery Mfg	517311	Satellite TV Providers
333316	Copier & Optical Machinery Mfg	517311	Wired Telecommunications Carriers
333612	Engine & Turbine Mfg	517311	VoIP
333611	Wind Turbine Mfg	517312	Wireless Telecommunications Carriers
333914	Pump & Compressor Mfg	517410	Satellite Telecommunications Providers
333921	Forklift & Conveyor Mfg	517911	Telecommunications Resellers
333991	Power Tools/Other General Purpose Machinery Mfg	517919	Radar & Satellite Operations
334111	Computer Mfg	518210	Data Processing & Hosting Services
334112	Computer Peripheral Mfg	519130	Search Engines
334210	Telecommunication Networking Equipment Mfg	519130	Internet Publishing and Broadcasting
334220	Communication Equipment Mfg	541310	Architects
334290	Alarm, Horn & Traffic Control Equipment Mfg	541320	Landscape Design
334310	Audio & Video Equipment Mfg	541330	Engineering Services
334413	Semiconductor & Circuit Mfg	541350	Building Inspectors
334419	Circuit Board & Electronic Component Mfg	541360	Geophysical Services
334413	Solar Panel Mfg	541370	Surveying & Mapping Services
334511	Navigational Instrument Mfg	541511	IT Consulting
334510	Medical Device Mfg	541611	Management Consulting
334614	Recordable Media Mfg	541612	HR Consulting



335110	Lighting & Bulb Mfg	541620	Environmental Consulting
335121	Lighting Fixtures Mfg	541690	Scientific & Economic Consulting
335311	Electrical Equipment Mfg	541713	Scientific Research & Development
335911	Battery Mfg	621511	Diagnostic & Medical Laboratories

Source: The Brookings Institution, IBISWorld



## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

### 5.C Key Observations and Commentary

Labor shortage and supply chain risk factors are the most challenging to qualify. Much of the current dilemma is related to the aftermath of pandemic forces, but we are more interested in chronic skill-gaps than those that will self-resolve. In essence, do not confuse temporary labor shortages with longer-term skill-gaps.

For example, we think any perceived shortages in leisure and hospitality are likely to dissipate as recent data shows that weekly earnings in this sector have increased by 14.4% this July compared with a year earlier. As such, we believe that self-correction is underway.

And, according to the Labor Department's July report, "...employment in leisure and hospitality increased by 380,000. Two-thirds of the job gain was in food services and drinking places (+253,000)...Despite recent growth, employment in leisure and hospitality is down by 1.7 million, or 10.3 percent, from its level in February 2020."

Below is a short list of major industries where skill-gaps and labor shortages are likely to persist:

- **Agriculture:** Labor shortages in agriculture are nothing new and with increased competition from other sectors hungry for workers, like warehousing and hospitality, the situation is becoming more acute. Long-term solutions involve the controversial debate over the Farm Workforce Modernization Act<sup>27</sup> and the handling of undocumented workers. The bill, which was introduced in March, would allow for up to 20,000 workers to be employed year-around. The program is currently limited to seasonal labor. The legislation is far from garnering bipartisan support, so uncertainty remains.

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<sup>27</sup> <https://civileats.com/2021/04/05/a-path-to-citizenship-is-on-the-horizon-for-undocumented-farm-workers/>





## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

- **Oil and Gas:** In late-2014 oil prices began to erode rapidly, prompting the oil and gas industry to sharply reduce its workforce.<sup>28</sup> Boom and bust cycles followed, and given ongoing volatility, many workers in this sector simply altered their career paths. Climate change policy initiatives create further disincentives to seek employment in this sector. President Biden's cancellation of the Keystone XL pipeline project on his first day in office is a case in point. This factor has ripple effects to the industry's key suppliers; companies involved in oil and gas field services, metal pipe tube manufacturing, and pump and compressor producers.
- **Construction:** The labor shortage in construction finds its roots in the housing bust during the Great Recession?<sup>29</sup> Although this industry has rebounded, many employees have retired with a dearth of younger skilled workers available to take up the slack. Competition from high-paying STEM worker segments is further diluting the potential pool of labor. The situation is not limited to the many contractors linked to the home building market. In fact, one has to wonder if the bipartisan infrastructure plan will face labor bottleneck down the road. We will investigate this in a forthcoming study.
- **Manufacturing:** Factories are struggling to fill positions of both highly skilled staff and semi-skilled laborers. See Figure 8. We suspect this predicament is chronic, even for the case of unskilled, entry-level workers. Many manufacturers are confronted by intense competition from warehouse and distribution centers as the e-commerce explosion continues to drive up wages. Nonetheless, we may be at the verge of a monumental shift in hiring practices where adopting on-the-job training programs as recruitment enticements may soon

<sup>28</sup> See <https://www.propelleraero.com/blog/how-to-adapt-to-the-skilled-labor-shortage-in-construction/> and <https://eyeonhousing.org/2020/02/top-challenges-for-builders-cost-availability-of-labor-in-2019-2020/>

<sup>29</sup> <https://www.usrisk.com/2020/03/the-state-of-the-labor-shortage-in-the-oil-gas-sector/>



## 5. Bottlenecks and Supply Chain Risk Intensity: Results and Actionable Recommendations

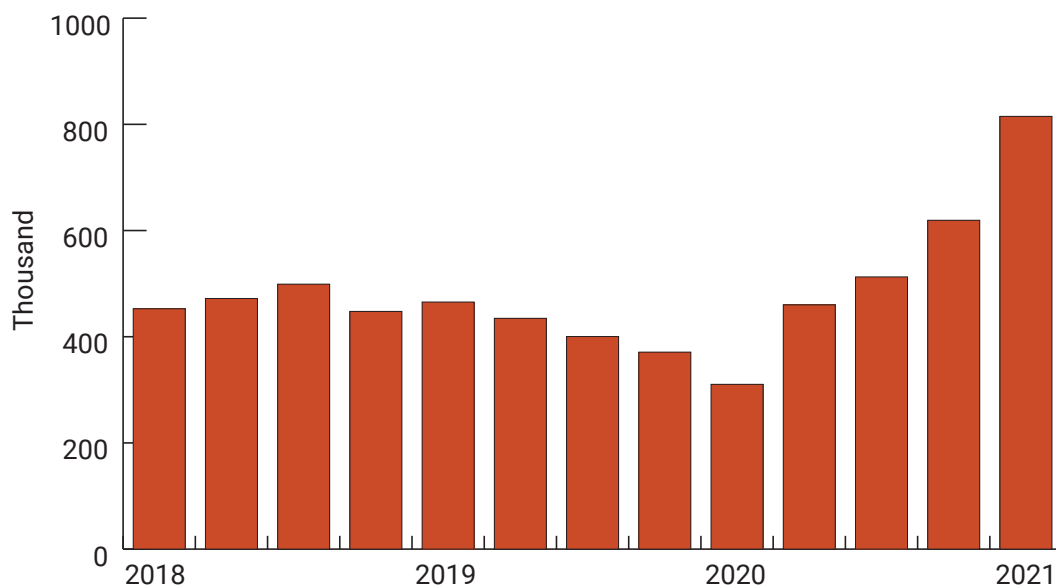
become widespread as the demand to upskill intensifies.<sup>30</sup>

Although American companies are well behind our European peers in worker training, the momentum is shifting, and this may transcend to other sectors.

- **Other Industries:** Other key industries with potentially chronic labor shortages include freight packing and logistics services, commercial banking<sup>31</sup>, hospitals, nursing care facilities and a wide array of industries in the 2-digit NAICS category professional, scientific and technical services that is largely populated by STEM workers. Although our wage-based index does not red flag the trucking industry, there is clearly a shortfall of drivers so we expect pay hikes and bonuses that will help reduce the gap. This trend was underway well before the pandemic.

FIGURE 8: Worker Shortages in Manufacturing are an Oft-Ignored Bottleneck

Job Openings in Manufacturing



<sup>30</sup> <https://hechingerreport.org/facing-a-white-collar-worker-shortage-american-companies-look-for-a-blue-collar-solution/>

<sup>31</sup> Allissa Kline, "In 'War for Talent,' Bank Employees Gain Upper Hand," American Banker, August 01, 2021



## 6. Non-Commercial Bank Applications of this Report

The objective of this study transcends the credit risk purview of commercial banks, as IBISWorld serves many other verticals that should benefit from our analysis as summarized in section 5.

Here are a few suggestions.

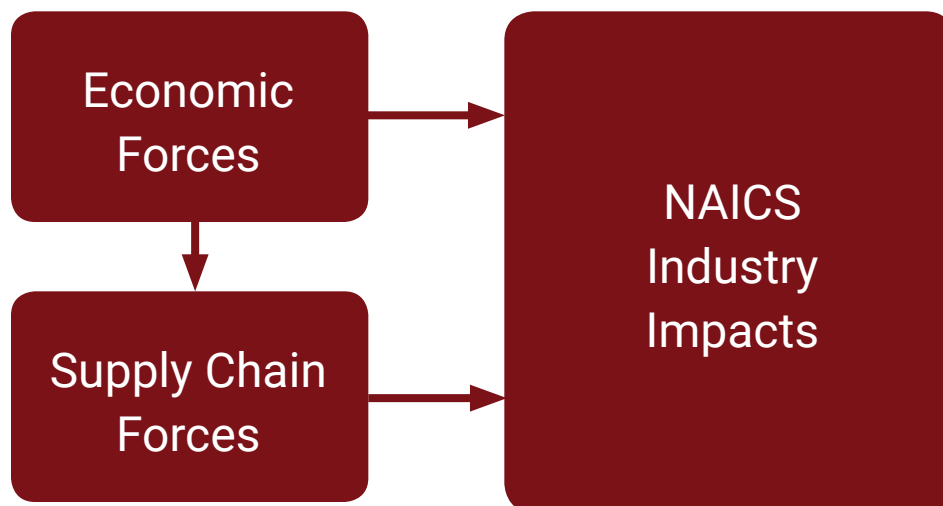
- Procurement departments of major corporations need to identify potential third-party vendor risks in a holistic fashion.
- Finance departments of companies will need to adjust their approach assessing the financial fitness of customers and suppliers.
- Investment banks must evaluate near- and longer-term risks associated the supply chain conundrum.
- Insurance companies with significant commercial client exposures need to differentiate between short- and longer-term forces on their asset/liability positions given emerging risks related to value chain stress.
- Manufacturers subjected to the risks summarized in section 5 need to reexamine their strategic plans, in particular, supplier switching costs.
- Advisory firms need to afford a granular, industry approach otherwise counsels are inconsequential. One size does not fit all.
- Equipment leasing/lending companies must analyze how latent risks can shatter their business plans and threaten the value of their physical asset holdings.
- Business schools can use this study as a paradigmatic, real-world example on how to strategize a course sidestepping an unanticipated shock.



## 7. Epilogue

The core objective of this study was to identify risks and assess the potential impacts of bottlenecks to an economic recovery along with the implications of supply chain stress. Analyzing the recent supply chain muddle cannot ignore interrelated forces. See Figure 9.

FIGURE 9: Supply Chain Issues and Economic Factors are Intertwined



The myriad of economic forces that existed prior to the pandemic not only impact industries directly, but also exert pressure on the supply chain which in turn affects industry performance and risk as well. Failing to recognize these potent indirect forces can lead to poor decision making.

Table 5 is available to our clients via IBISWorld's website.





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