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Reshoring and its impact on Transportation Infrastructure & US Economy

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16. Abstract Reshoring is expected to have a tremendous impact on the United States (US) economy and on the utilization of the existing transportation infrastructures of the country. It is an immense need to identify the potential companies in the US that will bring their manufacturing operations back in the US and to identify the impact on US economy and transportation. The change in location and subsequent alteration in product supply chain due to reshoring will cause changes in infrastructure needs to address issues such as capacity constraints, delays, and congestions.			
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Final Report

CFIRE Research Initiative

Reshoring and Its Impact on Transportation Infrastructure and US Economy

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CFIRE Research Initiative: Reshoring and Its Impact on Transportation Infrastructure and US Economy

FORWARD

This report provides a valuable resource to assist in making informed choices about reshoring and its potential impact on transportation networks and economy in the CFIRE region to foster economic development of the region. This CFIRE Research Initiative "Reshoring and Its Impact on Transportation Infrastructure and US Economy" was conducted by researchers from the University of Southern Mississippi, University of Memphis, University of Alabama – Huntsville, and University of Wisconsin – Madison under the direction of CFIRE executive management team. This document will be of particular interest to individuals and companies who plan and evaluate reshoring decisions and freight flows through the CFIRE region. Other audiences for this document include policymakers, US manufacturing companies, transportation professionals, researchers and students in related fields.

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EXECUTIVE SUMMARY

The phenomena of bringing back the previously off-shored manufacturing to the US, known as Reshoring has sparked noteworthy attention in recent years. Reshoring Initiatives have been sparked by a number of factors since the great economic recession including loss of jobs, quality of the outsourced products, increasing operating cost in the out-sourced countries, social and environmental compliance, political instability, intellectual property loss and huge trade gaps. However, the real possibilities, preparedness and implications of reshoring have raised significant debate and discussion. This research is an enriched resource of literature from well-known researchers and their different perspectives on possibilities and challenges of reshoring. The industries and out-sourced countries that should be on the very first spotlight of reshoring are presented in this research. The distribution of reshored manufacturing within different states/regions of US is proposed in this research. Moreover, the analysis presented modeled the impacts of reshoring on transportation systems, supply chains, employment levels, and business models across the CFIRE regions.

In the last few decades offshoring has clearly changed the global manufacturing landscape. This has not only changed the manufacturing location but also transformed the ocean shipping, onshore and inland intermodal services and the entire supply chain network of the globe. This has cost the US millions of jobs and declined manufacturing's share of US GDP. However, the financial crack down at the beginning of last decade, has changed the world economy. The unemployment rate in US was hitting its peak and labor cost in the Asian countries was increasing. These two dynamics are still very dominating factors shaping the world manufacturing location. After decades of offshoring trend, many US companies started reshoring their manufacturing. Big corporations like Apple, Google, and Ford have announced their plans to bring back part of their offshore production to US, while the large retailer Walmart has committed to purchasing more of the goods it sells on its shelves from manufacturers located in the US. These decisions resemble facts which show the appeal of offshoring is weakening. Even though labor costs in the Asian countries are still lower than in the US, in totality the appeal of US manufacturing is very prominent and obvious. On the other-hand developing countries like China are still leading the world manufacturing, and the US is still the largest importer on the globe. But there is no doubt that reshoring has drawn enough public attention for further research and its applicability for US manufacturing. Many survey-based studies have been conducted to quantify the benefit and feasibility of reshoring. Moreover, researchers have also tried to identify the forces that influencing reshoring decision and further implications. This research paper has briefly compiled and built upon some of these important research efforts to present the facts, figures and forces driving the reshoring phenomena.

Other than the low labor costs, other factors such as financial incentives, currency controls, and the clustering of its manufacturing base made China an oblivious destination for manufacturing. But China's advantages are shrinking such that within the next decade the cost of operating in China and cost of operating in US will be almost the same. Macro-economic dynamics across different countries play an important role when deciding where to site manufacturing assets and activities. For example, while China has a large workforce and potential consumer base due to the size of its population, the US currently has a larger economy with more capable consumers, an efficient workforce, and sustainable domestic energy resources. These macro-economic indicators are measured by well-established organizations, are published on regular basis, and are extracted from reports of different widely accepted organizations such as the United Nations, the World Bank, and the US Census Bureau. The macro-economic scenario of a country conveys information about the strength of the country on a particular factor that can drive the decision of manufacturing location, while the factor itself carries various weights for different industries. The importance labor cost plays for small electronics may not plays the same weight for car manufacturing. The importance of different factors for a particular industries and the strength of a particular country are taken into account to create a 'Reshorability Index'. This Index will provide a comparative benefit if a currently outsourced product is manufactured back in the US from a particular country.

The employment issue is one of the most important public concerns when it comes to reshoring. The US' manufacturing base widely varies depending on location and worker specialization. This research indentified both areas of industrial concentration (employment levels) and industrial specialization (location quotients) for 16 manufacturing NAICS codes: 15 industry subsectors and one industry group. The area under analysis covers 1,241 counties of 15 states between the western Great Lakes Region and the Gulf Coast Region, and along the inland river system of the Mississippi and Ohio rivers. This research identified potential hot-spots for industrial reshoring by measuring the industrial concentration (emploment level) and specilaization (location quotients) for each of the county-industry pairs. Two different sets of data were used in this research:the US Census Bureau's 2013 County Business Pattern (CBP) dataset and Esri's 2013 US Business Location and Business Summary dataset. In particular, location quotients were constructed to compare industrial activity betweeb counties and the total US economy.

Reshoring will have a phenomenal impat on trade and transportaion across the US. It will re-shape domestic and international business. To measure the impact on the transportation system, data from the FAF4 (including freight tonnage and value from 8 international trade regions and 132 domestics zones by commodity type and transportation mode) was utilized to estimate the new freight distribution patterns after reshoring has taken place. In particular, potential reshoring freight volumes were extracted from the imported freight volume from East Asia and then redistributed on the domestic zones in the US. From the 43 commodities classified by SCTG (Standard Classification of Transported Goods), only the manufacturing commodities are considered in this research. The targeted region for relocating reshoring has been compared by considering different scenarion. The 'Fratar Trip Distribution Technique' was utilized to estimate the expected OD matrix while a transportation model was developed to estimate the minimum total transportation costacross four different scenarios. The analysis focused on 17 target commodities. The results show that the Savannah port is expected to be the biggest East Coast import port servicing the study area

The economic impact on the overall supply chain of reshoring is presented in this research. Manufacturing brought back to the US will impact the supply chain's demand for local production of logistics services in the port of entry region and elsewhere geographically. This research evaluates the economic and supply chain impact of 15 states along Mississippi river basin where 63 companies reshored during 2010-1015. This paper utilizes the input-output economic modelling tool, EMSI, on a preselected region comprised of several states. The location of the industry, and the number of new job openings are considered as inputs and the data is collected from reshoring initiatives database. About 39 industries from CFIRE region are considered in this research. This scenario analysis shows that reshoring companies will have 13,043 direct jobs. The aggregate effect on jobs amount of 64,795 new jobs which represent around 2 percent of total manufacturing jobs. The analysis also showed that 75 percent of the supply chain regional demand can be satisfied within the regions and rest 25 percent can be imported from the nearby ports. Using USITC data reveals that the supply chain will shift to the North-Eastern, South-Eastern and Eastern ports. Current economic tools such as EMSI and IMPLAN do not have national in-region and out-region data, that limited the research to critical industries and area. A more compresensive research is suggested for better undestanding about the impact of reshoring. However, this research provide significant insight of the current expected changes in supply chain and transportation as an implication of reshoring.

CHAPTER 1: Introduction

1.0 Introduction

1.1 Background

In previous decades, the US and other industrialized countries' companies transferred (a.k.a. offshored) manufacturing operations (or other business processes) to low labor-cost countries, mainly in Asia. This offshoring and outsourcing trend (i.e. handing a business process to an external service provider) towards low-cost manufacturing destinations, combined with enhanced ocean shipping and improved onshore and inland intermodal services, constituted one of the most significant changes in manufacturing and supply chain strategy around the world. Offshoring, gradually, transformed the global manufacturing environment, in which fixation on low cost labor was and most probably still is, a dominant motive for the manufacturing location decision. This offshoring phenomenon was followed by a decline of U.S. manufacturing and its share in the nations' GDP, but also by millions of lost jobs this sector, traditionally, offered.

However, after nearly a quarter of a century the offshoring trend seems to have reached an inflection point. Recent announcements from several companies (e.g., Apple, Google, Caterpillar, Ford etc.) regarding their plans to move (reshore) part of their offshored production back to the U.S., gave reshoring mass public attention and signaled a paradigm shift.It appears that while wages in low cost countries remain lower than those in the U.S. (despite having dramatically increased during the last decade), the total cost difference for producing a unit abroad versus producing it domestically has shrunk making offshoring not as appealing as used to be. Even the most pessimistic should agree that while those examples might be just exceptions verifying the offshoring rule, reshoring decisions have become fact. Publicity on the phenomenon, as well as the realistic need for better understanding of global sourcing and manufacturing trends in general led many researchers in the U.S. and around the world, to further study and investigate the reshoring manufacturing phenomenon, its potential, and applicability. Survey based studies were conducted to identify the main factors (a brief list of such factors is listed in table 1.1), companies take into account in order to make a manufacturing location decision and their perception of attractiveness. Furthermore, in order to better capture the reshoring phenomenon and quantify potential reshoring benefits, various researchers tried to provide decision makers with more elegant evaluation tools, cost estimation models as well as to give a definitional background and framework analysis of the location decision.

Surveys revealed that U.S. based companies have begun to take under consideration new sourcing destinations as offshoring production to traditional low cost countries like China is not as profitable as it used to be. At the same time, other sourcing options, like Bangladesh, are already experiencing wage increases while also lacking infrastructure, production quality, and most of all the abilityreach the necessary production scales in order to be viable substitutes. Besides production costs, other explicit or implicit costs and risks include transportation and supply chain costs (e.g., disruption, complexity related, etc.), hidden costs (e.g., political uncertainty, corruption, intellectual property theft, etc.) and various other costs. Also considered is the growing trend that urges the production or supply of a good to be produced as close as possible to the demand for that good. These trends which have led U.S. based companies to consider relocating production through reshoring, nearshoring (relocating manufacturing to a country that is close to the U.S.) or onshoring (relocating manufacturing operations, that would otherwise be offshored, to U.S. States in which production cost is lower than that of the State in which the company is based)will be thoroughly examined within the context of this review.

Table 1.1: Factors and challenges that affect the location decision (in decreasing order of importance)

Factor/Challenge
Labor costs
Capacity, customer approval, localizing of supply
Availability of skilled labor
Quality and consistency
Local government regulations
Transportation - cross border
Personnel management/Labor law
Security of personnel
Transportation - in country
Customs regulations
Security of products
Warehouse site location
Corruption
Currency risk (exchange rates)
Tax issues
Other
Availability of equipment

Note: Data adopted from Finley et al. 2014

Surveys reveal that apart from the drivers that relate to the inability of the offshore location to remain a competitive option (like those previously mentioned), there is an increasing appeal of U.S. itself as a manufacturing location. Improved speed to market, reduced energy cost, political stability, lower freight costs, less complex and easier to manage supply chains, improved customer service, etc., were the most attractive advantages expected from reshoring/nearshoring. However, the vast majority of relevant research suggests that there is a number of challenges that all stakeholders and policy makers will will have to consider in order to induce reshored manufacturing activity in the future. Such challenges include a lack of skilled personnel and the need for educational reforms that will provide a skilled workforce to the manufacturing sectors, a more attractive taxation and regulatory environment, and other incentives that can attract offshored production back to the U.S.

Table 1.2 provides an indicative list of companies that announced their reshoring intentions or that already reshored production. The full list that contains 362 reshoring cases, 231 “transplant” (non-U.S. companies that were attracted to locate their production in U.S.) and 213 cases of companies that were “kept from offshoring” is given in Appendix A.

From the companies listed in table 2, Apple for example announced that the new Mac Pro will be assembled in Texas. The investment was estimated at $100 million, and besides the final assembly in TX components and parts will be manufactured in FL, IL, KY, and MI. Apple’s reasoning for this decision was based on the rising wages abroad and the lower energy costs in U.S. In similar manner, General Electric invested $800 million to renovate facilities in Appliance Park (Louisville, KY) where appliances like water heaters, refrigerators, washers and dryers are produced. This investment will create 1,300 manufacturing job openings for the production of appliances once produced in China. General Electric indicated that tax incentives and IP risks led to this decision, and noted the fact that the lower Chinese production cost (30 percent lower) is actually 6 percent more expensive than producing in U.S. when considering inventory and delivery costs. Furthermore, the company estimates that the ease of design collaboration with the workers will reduce the retail price by 20 percent.

In addition to reshoring case studies, interesting examples of production activities that were "kept from offshoring" exist. Such an example is the BOEING 777X in Puget Sound, WA, a saving of 20,000 direct and indirect jobs. BOEING's decision was based on reasons like skilled workforce, satisfactory labor negotiations, the existing manufacturing infrastructure, government incentives ($8.7 billion in tax breaks) etc. Finally, another interesting case that could be considered as a form of reshoring is that of direct foreign investments or "transplants". Such an example is the assembly line of AIRBUS A320 in Mobile, Alabama, an investment of $600 million that will lead to 1,000 new jobs by plant completion (planned for 2015). Cooperation between all government levels, infrastructure and availability of skilled workforce were the main drivers for AIRBUS's decision to invest in AL.

Note: All case studies presented here were adopted from the "Reshoring Initiative" website)

Table 1.2: Indicative list of companies that announced reshoring intentions or that already reshored part of their production back

Apple	IBM
AT&T	Motorola
Boeing	Nike
Caterpillar	Oracle
Dell	Otis Elevator
Dewalt	Starbucks
Ford	Whirlpool
GE	Xerox Corp.
GM	BOEING (kept from offshoring)
Google	AIRBUS ("transplant")

Source: The Reshoring Initiative[1] Blog (Published: December 2014)

Within the context of this study an effort has been made to provide definitional and framework establishing studies, as well as modeling efforts of the costs involved with the location decision, aiming to support decision makers with a consistent methodology and background on their relative, current or future, projects. Accordingly, reports that various consulting organizations have conducted and articles by industry professionals are presented in order to give an, as possible, up-to-date and in-depth perspective on the reshoring phenomenon while urging all interested counterparts in the reshoring topic to further investigate sources as the reshoring phenomenon is ongoing and increasingly attracts the attention of the industrial and research community.

It appears that the total cost difference, for producing in low cost countries versus producing domestically, is not as appealing as used to be in the past. Besides the manufacturing cost, various other factors lead more and more U.S. companies reconsidering their manufacturing strategies in terms of location and while offshoring production is still

[1] "The Reshoring Initiative" (2010), an industry-led effort to bring manufacturing jobs back to the United States. The initiative works with U.S. manufacturers to help them recognize their profit potential as well as the critical role they play in strengthening the economy by utilizing local sourcing and production. <http://www.reshorenow.org/>

the main choice, reshoring decisions (however few when compared to the offshoring) are a fact that cannot pass unnoticed.

The next chapter provides an analytical review of each study, in which the reader can find more information on the relative publications. In this chapter all studies are subcategorized into "survey" and "other" types of studies, presented in alphabetical and chronological order.

2.0 Literature Review

2.1 Main Bullet Points from Literature

The results of the literature review are summarized by the bullet points below.

- Noticeable reshoring trend of U.S. companies
- Reshoring trend at a very early and evolutionary state to produce safe assumptions
- Reshoring must convince that "it is more than a public relations stunt"
- The assumption that reshoring will begin in 2015 is incorrect as it is already taking place
- One of the greatest challenges of reshoring is finding skilled employees
- Skilled employees shortages in U.S. are localized and only five of the fifty largest manufacturing centers of the nation – Baton Rouge (LA), Charlotte (NC), Miami (FL), San Antonio (TX) and Wichita (KS) – have significant or severe skills gaps
- It appears that in a globalized environment an economy can justify high wages only in return of high skill levels
- The retirement of aging workers followed by a future heightened demand, could cause serious skilled labor shortages in the near future
- Companies considering outsourcing production systems to the countries with low labor costs strongly hold to examine decisive effects like variable manufacturing costs thoroughly
- Manufacturing is not migrating from China as rapidly as most experts expect, despite rising wages at nearly 20 percent a year
- It will take more than just equalizing labor costs with China and other developing countries to lure manufacturers back to the U.S.
- Wages and productivity are two most significant factors that are causing many American, and even some foreign companies, to consider moving their manufacturing operations to U.S.
- Labor costs and currency rates are not the sole enablers of reshoring manufacturing success. Other factors (e.g., talent availability/skill level, market accessibility, regulations, intellectual property protection, etc.) drive manufacturers' location decisions
- Average wage in China increased by 150 percent from 1999 through 2006
- Manufacturing cost advantage of China over the U.S. is shrinking fast
- Chinese currency appreciated 30 percent in the last decade relatively to the U.S. currency
- China seems to have "largely run its course" and no other low-cost country appears to have the characteristics in order to become the "new China"
- Bangladesh has experienced 80 percent growth in wages in 2011 alone
- Offshoring activity decelerated recently as its appeal began to wane accounting for 56,000, or about one-quarter of manufacturing jobs created in the past year
- Companies lag the general trend of supply rebalancing based on demand location in manufacturing despite making significant efforts in various stages of production
- U.S. Government should reform taxes and other costs (e.g., tariffs, duties, healthcare) and minimize regulatory burdens to increase attractiveness of reshoring

- Domestic location attractiveness will influence reshoring desirability in a positive way. If the domestic location is attractive, and the firm is acting rationally, then the firm should find itself in a desirable position to engage in reshoring
- Canadian initiative on reshoring takes a broader perspective than its American counterpart
- Corruption, or the threat of losing intellectual property to counterfeiters in countries with little respect for patents and contracts can be a factor for reshoring
- Even if all landed and hidden costs are identified, there are still business risks that must be considered when offshoring production
- Reduction of labor costs is the most important single motive for production offshoring activities of manufacturing companies
- Off-shoring and out-sourcing may be necessary to maintain price competitiveness but it may not necessarily be the perfect solution
- Companies expecting reshoring of production facilities back to the U.S. must consider the following seven factors: Transportation and Energy Costs, Exchange Rates, U.S. Demand, U.S. Talent, Availability of Capital, Tax and Regulatory Climate and U.S. Labor Costs
- U.S. remains a large market and still generates significant global demand
- U.S. and Mexico follow, in terms of attractiveness, the pattern of "Rising Global Stars"
- Security in Mexico remains a significant concern while U.S. as a manufacturing location is gaining interest for its proximity to end-markets, stable politics, rule of law and excellent transportation.
- Even though manufacturing companies and operations are coming back to the U.S., the jobs created are not enough to counter what has been lost
- Manufacturing is now going through a genuine transformational period
- The steady changes in wages, productivity energy costs, currency values and other factors in Latin America, Eastern Europe and most of Asia, are redrawing the map of global manufacturing cost competitiveness
- Many U.S. companies are re-examining their decisions about their preferred manufacturing location
- Total Cost of Ownership (TCO) Estimator help the firms to calculate all costs associated with sourcing parts, components and finished products from different locations

2.2 Survey Based Studies

Kinkel et al., (2009) found managerial implications for a systematic location planning process. Analysis of the manufacturing off-shoring and reshoring activities of 1663 German manufacturing companies showed that production offshoring has currently lost momentum. On the other hand, reshoring of once offshored manufacturing capacity is also a quantifiable phenomenon. Every fourth to sixth offshoring activity is followed by a reshoring activity within the following 4 years, mainly due to lack of flexibility and quality problems at the foreign location. A deeper, qualitative analysis in 39 German manufacturing companies showed that not all companies pay sufficient attention to qualitative factors crucial for success and competitive advantage to their location decisions. The survey also showed that production offshoring is still a relevant phenomenon, although it has lost importance in recent years. As for the decision to engage in global sourcing activities, the reduction of labor costs is the most important single motive for production offshoring activities of manufacturing companies.

Bishop (2011) presented a study on the feasibility of reshoring garment production from China to the U.S. Eighty-six individuals were surveyed (senior executives, consultants, technology suppliers, academics, and government officials throughout the textile and apparel supply chain in the United States and China). According to survey results many companies, even Chinese apparel manufacturers, are in search of new sourcing destinations, but the choices in Asia are not as promising as in the past, in terms of wages (i.e., Bangladesh, most frequently cited by interviewees, has experienced 80 percent growth in wages in 2011 alone), they lack infrastructure, quality of production and/or scale to be viable replacements of China. While product cost, financial and political uncertainty, transport costs etc., rise and

available capacity in China declines, the author indicated that garment production can be reshored back in the U.S. if companies understood the benefits of reshoring and employ such strategies as lean enterprise models, efficient processes and technologies, stakeholder willingness to engage and identify opportunities/co-develop solutions and finally employee productivity stimulation

Ferreira and Heilala (2011) discuss how companies are lagging the general trend of supply rebalancing based on demand location in manufacturing despite making significant efforts in various stages of production. Many manufacturers have included a key element in their strategy to match supply with demand location more closely by onshoring or nearshoring manufacturing and supply. Although offshoring will continue to play a role in the supply location strategy of companies, it will be largely done in the context of chasing the demand location. This new trend of moving more supply closer to demand location appears to be a new shift for many manufacturers. The paper also presents results from a survey of executives across a variety of manufacturing industries. Nearly half (49 percent) of survey respondents reported facing issues with cycle or delivery time, and 46 percent have experienced product quality concerns as a result of offshored manufacturing and supply operations. 61 percent of respondents reported considering matching supply location with demand location more closely by onshoring or nearshoring manufacturing and supply. The study's findings reveal the beginning of a trend reversal that, over the past decade, found companies relocating their manufacturing and supply operations to lower-cost areas only to re-import those goods to meet regional, demand requirements. A shift to onshore or nearshore manufacturing operations appears to be here to stay as manufacturers look for the next level of competitive advantage.

Kaushall et al. (2011) assessed the findings on a sector-by-sector analysis, along with a survey of 200 manufacturing executives and experts. According to the authors labor costs and currency rates are not the sole enablers of reshoring manufacturing success and other factors (talent availability/skill level, market accessibility, innovation, regulations, intellectual property protection, scale of operations, barriers to entry and exit) drive manufacturers' location decisions. The studies revealed that the U.S. has a much more productive manufacturing base than many people think and that U.S. factories produced (at the time of the study) approximately 75 percent of the products the nation consumed. A series of smart actions by business leaders, educators and policy makers could lead to a push of that figure to 95 percent. Alternatively, neglecting U.S. manufacturing could lead this output to fall by half (40 percent of the U.S. demand; a "point of no return" for the authors).

Weinnman (2011) analyzed the results of a BDO LLP[2] survey (fourth annual BDO Technology Outlook Survey) of 100 chief financial officers (CFOs). According to the findings, 35 percent of U.S. technology companies were outsourcing services or manufacturing in 2011 representing a 43 percent decrease from 2009 and a slight decline from 2010. Furthermore, from the companies that did not outsource at that time (the rest 65 percent), the majority (58 percent) would not consider outsourcing overseas, choosing either U.S. (25 percent), Canada (13 percent) or indicated no plans to outsource al all (20 percent). Other major findings of the survey were related to new regulations on U.S. industry environment, such as: (i) the Research and Development (R&D) permanent tax credit proposed by the Obama administration – where 71 percent replied that it would positively affect their company, (ii) the Revenue Recognition Rule as proposed by the Financial Accounting Standards Board (FASB) – where 23 percent of the replies were neutral and 45 percent were positive, and (iii) the convergence of Generally Accepted Accounting Principles (GAAP) with International Financial Reporting Standards (IFRS) – where 68 percent of the replies were neutral while 20 percent were positive. Among those companies, 53 percent outsourced manufacturing, 43 percent IT services and programming, 38 percent outsourced R&D, 26 percent distribution and 12 percent outsourced call or help centers. As manufacturing could either be labor and/or capital intensive, it was the most common among outsourced activity. Finally, when asked (only those that were already outsourcing at that time) to choose one country where they would

[2] Binder Dijker Otte & Co. LLP

consider outsourcing to in the future, India surpassed China as the leading location of preference – for the first time since 2008.

Goodwill (2012) reports that the Canadian initiative on reshoring takes a broader perspective than its American counterpart as it looks beyond a costing methodology at government programs, education and training and takes the view of a balanced economy with strong resource and service industries and strong manufacturing. Results from a recent survey[3] indicate that 61 percent of larger companies are considering bringing manufacturing back to American soil. The article listed a number of major corporations that are reshoring at least some of their manufacturing back to the U.S., including Caterpillar, General Electric, Ford, NCR and Master Lock.

Simchi-Levi (2012) reported a significant shift in manufacturing footprint based on a U.S. re-shoring survey of members of the MIT forum for Supply Chain Innovation and of the Supply Chain Digest community. 33.6 percent of respondents stated that they are "considering" bringing manufacturing back to the U.S., while 15.3 percent of U.S. companies responded that they are "definitively" planning to reshore to the U.S. The latter percentage is significant enough to indicate we are in the middle of a transformation from a global manufacturing strategy, where the focus is on low cost countries, to a more regional strategy, where China is for China, U.S. (or Mexico and Latin America) is for the Americas and Eastern Europe is for European markets. The author states that this trend has picked up pace in the last few years not only because of job loss in the U.S., but also because the economics that made offshoring attractive in the first place have changed due to oil price, labor costs, automation and risk factors. The study concludes that manufacturing is now going through a genuine transformational period, driven particularly by the changes mentioned in the previous sentence. The author views these findings as an opportunity for U.S. companies and policy makers to accelerate reshoring and return the country to an era of manufacturing growth.

Sirkin et al. (2012) conducted an online survey of 106 U.S.-based manufacturing executives with selective phone follow-up. Virtually all of the respondents work for companies that make products for both for U.S. & non-U.S. consumption and manufacture in the U.S. and overseas. Findings showed that 37 percent of U.S.-based manufacturing executives (companies with sales>$1B) plan to or are actively considering bringing back production from China to the U.S. Nearly half of respondents (companies with sales greater than $10B) consider reshoring to the U.S. Over 40 percent of respondents in many tipping-point categories (i.e. rubber and misc. plastic, industry and commercial machinery, electronic and other electrical equipment and components, computer equipment, fabricated metal products, and transportation equipment) consider reshoring to the U.S. China's low-cost position displays signs of erosion. Most important factors driving location decisions are favorable to the U.S. or trending in that direction. Overall, manufacturing in the U.S. is viewed as an increasingly attractive option by survey respondents.

Ellram et al. (2013) examined what factors affect organizations' perception of the attractiveness various regions can have as locations for owned manufacturing facilities by using data from an electronic survey (319 usable surveys out of 3,303 participants), administered by ResearchOne in August 2012, and through an explanatory factor analysis, developed factors that drive manufacturing location decisions. The relationship between the location decision drivers and the movement of manufacturing into or out of a region as well as an overall perceived risk of a region were modeled by multiple regression analysis. Findings of the study indicated that various factors have differential effects across regions, but it also appeared that organizations are beginning to look at manufacturing location decisions through a broader lens, giving more weight to supply chains, as well as strategic issues. At that time of the study the results for reshoring manufacturing back to North America, as given by multiple regression analysis of several factors and risks perceptions, showed a relative cautiousness of the respondents in terms of related costs, supply chain interruption, and government (tax and trade related) policy risks etc... Three theoretical prepositions as perceived from an internalization perspective were developed to better understand the current state of manufacturing location decisions: (i) Factors affecting a region's attractiveness for movement of manufacturing change significantly over

[3] Details about the survey are not discussed in the article

time, with government trade policies increasingly considered as a differentiator; (ii) Supply chain-related factors are becoming more important in manufacturing location decisions; and (iii) Companies are increasingly moving beyond cost savings to consider impact on total cost, profitability, and customer value creation when determining preferred regions for manufacturing locations.

Sirkin et al. (2013) published a report on the U.S. skill gap and the effects of possible manufacturing-skill shortages in, what they define as the U.S. "*Manufacturing Renaissance*". The key findings of the report were based on job vacancies and wage data analysis, as well as on a BCG[4] survey of 100 companies with U.S. manufacturing operations. A current shortage of 80,000 to 100,000 highly skilled manufacturing workers was estimated- a number that represents about 11 percent percent of the nation's total manufacturing workforce and roughly 88 percent percent of its highly skilled workforce. These shortages were found to be localized with only five of the fifty largest manufacturing centers of the nation – Baton Rouge (LA), Charlotte (NC), Miami (FL), San Antonio (TX) and Wichita (KS) – having significant or severe skills gaps. Generally, the research found little evidence of a meaningful and persistent skills gap in most parts of the U.S., including in its most important manufacturing zones. On the other hand, findings have shown a passive behavior of companies in recruiting and developing skilled workers, which, in addition to the retirement of aging workers as well as a future heightened demand, could cause serious skilled labor shortages in the near future. The research predicted a projected future gap of a potential 875,000 shortfall – in machinists, welders, industrial machinery mechanics and industrial engineers – by 2020, (based on BLS data and projections of demand growth), unless all stakeholders become more proactive in addressing manufacturing skill gaps and in planning for future HR needs.

Finley at al. (2014) presented the results from a web-based survey of 143 senior executives from manufacturing and distribution businesses that sell into the U.S. market, representing more than 13 different industries. The companies surveyed utilized, on average, nine locations outside the U.S. to meet U.S. based demand. The survey revealed a number of factors and challenges (Table 1.3) that companies face (or expect to face) when nearshoring is adopted.

Table 1.3: Factors and challenges (in decreasing order of importance)

Factor/Challenge	Survey Response
Labor costs	44%
Capacity, customer approval, localizing of supply	36%
Availability of skilled labor	33%
Quality and consistency	30%
Local government regulations	29%
Transportation - cross border	16%
Personnel management/Labor law	16%
Security of personnel	14%
Transportation - in country	13%
Customs regulations	13%
Security of products	11%
Warehouse site location	10%
Corruption	10%
Currency risk (exchange rates)	8%
Tax issues	8%
Other	8%
Availability of equipment	4%

Note: Data adopted from Finley et al. 2014

[4] Boston Consulting Group LLP

The survey showed that 40 percent of respondents felt an unavoidable increase in foreign market demand would reduce the capacity to serve U.S. demand. Furthermore, the survey showed only 33 percent of the respondents expecting increase in foreign demand planned to increase capacity in the U.S. to meet the increased demand in the U.S. The decision to reshore/nearshore remains important, with 81 percent of respondents claiming the decision was important to their company. 99 percent stated the importance of making reshoring/nearshoring decisions is the same or higher as last year. 41 percent saw reshoring/nearshoring as an opportunity and among them, 86 percent have or expect to in 2-3 years. 50 percent of the surveyed companies had reduced or expected to reduce total landed costs more than 6 percent as a result of reshoring/nearshoring, vs. 58 percent in 2013. Improved speed to market, lower freight costs and improved customer service were the most attractive advantages expected from nearshoring (see table 1.4). Respondents further stated that the U.S. Government should reform taxes and other costs (e.g., tariffs, duties, healthcare) and minimize regulatory burdens to increase attractiveness of reshoring.

Table 1.4. Biggest advantages expected from a nearshoring decision

Advantage	2013	2014
Improved speed to market/lower inventory (in-transit) costs	71%	67%
Lower freight costs	75%	59%
Customer service improvements/ proximity to customer	42%	42%
Fewer supply disruptions	35%	30%
Import duty and tax benefits	27%	27%
Better quality control	21%	19%
Time zone advantages (easier management coordination, etc.)	31%	18%
Lower input costs (e.g., natural gas, raw materials)	17%	13%
Improved intellectual property security	14%	12%
Shrinking wage gap	22%	7%
Other	8%	7%

Note: Data adopted from Finley et al. 2014

In 2014, Arlbjørn et al. discussed the phenomenon of reshoring manufacturing and based their analysis on results from a survey of Danish companies. They argued for research on antecedents, motivators and barriers of the use of globalization strategies, automation to maintain production jobs and ambidexterity to cope with supply chain design. This note differentiates between offshoring and outsourcing manufacturing from an ownership perspective. This research postulated novelties to present research within this area in terms of a clear separation of globalization strategies and an explicit distinction in company size. They proposed three areas as the focus of future research for the above mentioned relevant issues. The first was to follow the paths and investigate the various uses of globalization strategies with a differentiation strategy (along firm size and industry). The second was to explore how and to what extent automation can maintain jobs in the home country. The third was to investigate how ambidexterity as a dynamic capability serves as a predecessor to cope with the dynamics of globalization strategies and supply chain design.

Kinkel, (2014), employed German data from the European Manufacturing Survey (EMS) in order to provide empirical evidence on issues addressed posed by Fratocchi et al. (2014). The author also described German reshoring activities dynamics over the past 15 years and depicted motivational differences among two main reshoring modes. He then examined further implications for global value chains and local manufacturing modes and proposed future research directions. The author identified two modes of reshoring: “captive reshoring” (reshoring of a company’s own foreign production activities) “outsource reshoring” (reshoring from foreign suppliers) activities. Data analysis showed that the reasons for reshoring differentiate in magnitude per mode. Such reasons could be quality, flexibility/ability to supply, transport/logistics costs, availability qualified personnel, labor costs, know-how loss, proximity to home base and R&D, with most important quality and flexibility for both modes, and coordination for captive and transport/logistics costs for outsource reshoring respectively. Analysis of the EMS data of 2006 showed that “in the years 2004 to 2005, only around 12,000 manufacturing jobs were sourced back to Germany per year, whereas in the same time around 86,000 manufacturing jobs were offshored per year”. Furthermore, the author indicated that

reshoring initiatives alone are not capable of restoring competitiveness for high-wage countries as reshoring involves re-learning of once outsourced competencies, thus "catching up" instead of leading and maybe it could be easier to focus on building up capabilities for the next generation products or technology. Further, based on other contemporary results, the author indicated that "companies are continuing to internationalize their activities, but with greater sensitivity to critical factors than in the past", while at the same time they assess the potentials of their home-base.

Martinez-Mora and Merino (2014) analyzed offshoring and outsourcing in the footwear industry cluster in the province of Alicante where the main part of the Spanish footwear sector is concentrated. The study was based on interviews with the directors of the industry's leading companies. Results revealed that this phenomenon is a response to changes in both the economic climate (wage differentials have decreased) and changes in the market which is demanding smaller batches in shorter time frames. reshoring They showed that the reshoring strategy is widely adopted by all companies that previously applied offshoring processes in both the dress shoe and in sports foot wear segment. They also mention, however, the reasons for reshoring are not the same and do not have the same implications for the offshored production in all cases. The different reshoring strategies observed can be explained by 3 main reasons: 1st, the volumes that are outsourced abroad; 2nd, the type of product that is offshored; and 3rd, the improvement in distribution. Finally, they showed that reshoring in the foot wear industry does not constitute a correction of prior misjudgments.

Sarder et al., (2014) presented an analysis on the viability of reshoring versus outsourcing for specific types of industries. A survey of eleven companies (including heavy manufacturing like shipbuilding, power transformer manufacturing, chemical manufacturing, glass manufacturing, office supplies merchandize etc.), was analyzed and eight factors were identified as important in the reshoring decision (customer retention, ease of doing business, policy regulations, labor cost, product quality, logistics cost, proximity to customers, and tax -federal & state- implication, incentive/subsidy etc.). Each factor's relative importance was graded (from ¼ for extremely irrelevant to 4 for extremely relevant) by each company. These values were further analyzed revealing that most of the business factors promote reshoring, while factors like cheap labor cost and quality of products may lead toward outsourcing. Federal regulations and tax incentive were also identified to play a significant role in reshoring decisions.

2.3 Other Studies:

Bock (2008) introduced a new approach of a detailed mixed-model assembly line balancing. The approach provided a direct comparison of the estimated variable manufacturing costs by generating a country-dependent line layout for all competing locations. Several test series with various country configurations were performed to validate the efficiency of the balancing approach and derive general implications for management. First, by attaining improvement rates of up to 40 percent percent, the capability of a Tabu-Search algorithm for finding appropriate line layouts was proven. Second, as the main result, the complexity of the variant program was identified as a crucial factor for offshoring decisions since it substantially affects variable manufacturing costs. This was particularly proven for countries with low worker skills, which attract offshoring/nearshoring through exceptionally low labor costs. Hence, companies considering outsourcing production systems to those countries are strongly holding to examine these decisive effects thoroughly. Regarding these effects, offshoring becomes very promising for manufacturing processes characterized by a moderate variant complexity level. Computational tests revealed that the complexity of the variant program has a significant impact on cost reductions attainable by offshoring. Particularly, companies that consider offshoring to a country that provides only low worker skills should examine these dependencies thoroughly. Note that since these offshore countries provide exceptionally low wage levels, many companies are attracted and thus have to face this problem.

Head et al. (2008) investigated the extent to which service trade had managed to overcome the obstacles created by geographic distance and institutional differences. They modeled the ''international market for services'' and generated a gravity-like model for service trade. They estimated their model using data from 65 countries over the period 1992–2006. They concluded that physical distance, differences in time zones, languages, and legal systems, all raised the costs of employing foreign-service workers. The theoretical model and estimates of distance effects, enabled

calculations of a wage premium a firm would be willing to pay (that could be up to four times more when selecting a nearby location of approximately 100 km) to avoid the costs associated with remote provision of services. However, distance effects for most services showed a substantial declining trend which if continued would endanger jobs of local service workers.

Fratocchi et al. (2011) published a literature review study aiming to analyze the relevance of reshoring as a managerial phenomenon, to identify and classify its motivations and to highlight some research questions. The effective diffusion of reshoring in the business world was examined by analyzing data presented in prior research but also evidence collected with respect to 87 western companies, which moved their manufacturing activities back in the country of origin. In addition, they presented literature relevant to the set of causes which seemed to motivate the emergence of reshoring and proposed a set of questions for future research, suggesting that a multidisciplinary and multi-methodological approach should be adopted.

Hopp and Kapuscinski (2011) addressed the quality of education and its effects on national manufacturing capability. It appears that in a globalized environment an economy can justify high wages only in return of high skill levels. According to the authors education in the U.S. must be improved with the revitalization of industrial arts curriculum, but also with quality improvement in schools, followed by effectiveness in engineering and vocational guidance and an expanded learning access.

Grichnik and Pellan (2011) analyzed the example of France to show that U.S. is not alone facing the challenges in its manufacturing sector. France (from 1999 to 2009) moved from a positive trade balance (U.S.$25.4 billion) to a deficit (U.S.$30.1 billion) that took 30 percent of the country's manufacturing jobs with it.. The difference between France and U.S. was that the former lost manufacturing to Germany and the latter to China.

Simchi-Levi et al. (2011) also noticed the trend of production repatriation by various U.S. companies and tried to analyze whether the phenomenon was the entry to a new era for U.S. manufacturing or an exception to a largely irreversible offshoring trend. The study provided an analysis of the shifting business environment at that time and of what the authors consider as the most influential drivers for manufacturing location decision (Taxation, Change in Demographics and Supply Chain challenges). The taxation effect analysis was based on the assessment of three different production scenarios (producing in U.S., offshoring 50 percent of production in Mexico and offshoring all production in Mexico and Poland). These three scenarios showed that the "effective" taxation dropped significantly when production was offshored (39.25 percent, 33.18 percent and 25.93 respectively). The "Change in Demographics" factor was then examined by assessing survey data, given by 287 manufacturing executives in 17 different types of industries. The data analysis revealed that within the next three years from the time of the study, the projected shift in regional demand shares would drop for North America, Western Europe, and Japan and increase for Asia and Latin America. According to the authors this would be followed by a shift in the regional supply shares, as supply follows demand in order to meet what the authors call "close to customer issues" (providing custom products, responding effectively to customer requests, etc.). In similar manner the correlation between projected supply shifts and regional taxation was tested revealing a consistency between high taxation rates and decline in supply growth or the exact opposite for low taxation regions, with only exception India where high taxation and high supply growth was observed. Lastly, the authors analyzed the effect various supply chain challenges can have on the manufacturing location decision. According to the authors the enabling factor for offshoring or outsourcing manufacturing, was the low oil price that the market experienced since the mid 1990's. Eventually, this parameter changed and transportation costs became far more important relative to inventory. At that point, three cost-optimization realities appeared: (i) Regional distribution centers and (ii) Moving sourcing and production closer to demand, became more attractive, while (iii) Supply chain flexibility became more critical. Conclusively, the authors suggested that U.S. government, industry and academia should pool resources for rebuilding the U.S. manufacturing competitiveness.

Sirkin et al. presented a study in 2011, indicating that manufacturing cost advantage of China over the U.S. is shrinking fast. The analysis concluded that rising Chinese wages (average wage in China increased by 150 percent from 1999 through 2006), higher U.S. productivity and workforce flexibility, with higher investments in automation, a weaker

U.S. dollar and other factors could virtually close the manufacturing cost gap between U.S. and China for many goods consumed in North America and slash China's labor cost advantage to 39 percent in 2015 from 55 percent at the time of the study. According to the authors "labor accounts for a small portion of a product's total manufacturing costs and the savings gained from outsourcing can drop to single digits for many products". They noted that companies should reassess their global supply networks and re-analyze costs in total (i.e., transportation, duties, supply chain risks, industrial real estate etc.) and not just focus on factory wages. Excluding the Asian markets and for products with high labor content, China according to the author "should no longer be treated as the default option".

Wright et al. (2011), suggested wage increases in China should make multinational companies (MNCs) rethink their manufacturing and sourcing strategies. The economic growth has intensified competition for skilled labor within China, among multinational and local companies and as a result, wage levels have risen, particularly in China's urban areas, affecting manufacturing costs, with varying impact across industries and product categories. For companies with a strong manufacturing base in China, this labor costs increase might not affect significantly end prices and margins; which means that changing of manufacturing and sourcing strategies may not be needed. "Assuming a minimum wage increase of 30 percent such firms may see only a 1 to 5 percent drop in profit margins". According to the authors, though, companies should look beyond China's labor cost advantage and focus on operational excellence strategies in designing their supply chain operating models. Key characteristics of each manufacturing location can be productivity levels, stability of infrastructure, socio-political forces, environmental sustainability and product life cycles.

McMeekin & McMackin (2012) published a report where major key facts and relative historical data are presented on outsourcing as well as reshoring trends in the recent years. Major companies (GE, Caterpillar, NCR, Coleman, etc.) that decided to reshore part of their production back to the U.S. and data about reshoring considerations among large manufacturing companies' executives are presented throughout the report along with regions in the U.S. with the highest manufacturing growth (see table 1.5). Finally, the report suggest that reshoring trend shows that U.S. workers and locations can be competitive in the global market place, just as other countries regions and workforce did in the past, impacting the U.S. manufacturing sector and urge policy makers to understand the dynamics of the phenomenon and position their region to take advantage of the opportunities. According to the authors, "the communities that can offer the sweet spot of lower labor costs, attractive business costs, a favorable business environment and a pool of skilled workers will truly ride the reshoring wave the farthest".

Table 1.5: Highest Manufacturing Growth U.S. Regions

Seattle –Bellevue – Everett, WA
Oklahoma City, OK
Salt Lake City, UT
Houston – Sugar Land – Baytown, TX
Warren – Troy – Farmington Hills, MI
Cincinnati – Middletown, OH-KY-IN
San Antonio – New Braunfels, TX
Austin – Round Rock – San Marcos, TX
Fort Worth – Arlington, TX
Milwaukee – Waukesha – West Allis, WI

Atkinson (2012) indicated that rising wages and other forces are steadily eroding China's once-overwhelming cost advantage as an export platform for North America. The article mentions that 40 percent of job shops (within the U.S.) reported getting at least one new contract that was previously sourced to a foreign supplier. The author claims that the assumption that reshoring will begin in 2015 is incorrect as it is already taking place. The article further states that one of the greatest challenges of reshoring is finding skilled employees.

Dolega (2012) in a special report in TD (Toronto-Dominion) Economics argued that offshoring activity decelerated recently as its appeal began to wane accounting for 56,000, or about one-quarter of manufacturing jobs created in the

past year. The appeal of offshoring has been gradually eroding due to a myriad of factors including rapidly rising wages abroad, an appreciating Chinese currency, and volatile transportation costs. Furthermore, offshoring advantages are being increasingly undermined by domestic benefits stemming from intellectual property protection, flexibility of tighter supply chains, trend toward mass-customization, and access to less expensive natural gas from shale formations across the United States. Some of the factors that are providing American manufacturing with a competitive edge, and may end up tipping the scales for some previously offshored industries include the following: i) rise of wages in developing countries ii) escalation of currency shifts iii) cost of freight, and iv) final quality control units. Finally, the report suggests that recent years have yielded advances in hydraulic fracturing or 'fracking' technology resulting in a significant increase in proven natural gas reserves embedded in shale formations across North America. This has led to a sharp divergence of natural gas prices between the U.S. and the rest of the world possibly lowering manufacturing costs in the former.

Janssen et al., (2012) reported that by 2013, the total landed cost of manufacturing in China will be only 16 percent lower than that of the U.S., and companies will be pursuing sites in other developing nations (e.g. India, Thailand, Vietnam, and Brazil) as a low-cost alternative to China. According to the Hackett Group, the cost differential between other developing nations and the U.S. is as much as 20 percent and as long as the majority of manufacturers (85 percent) consider cost as the main driver in site selection, manufacturing is likely to remain offshore.

Lee et al. (2012) developed an accounting framework to assess the extent to which out-sourcing and off-shoring have transformed U.S. corporate financials. It tries to portray that off-shoring and out-sourcing may be necessary to maintain price competitiveness but it may not necessarily be the perfect solution. The study presented hypothetically how earnings capacity can be improved as a result of outsourcing and offshoring. Making various assumptions (e.g. the firm's capital/asset intensity remains constant), the study found that return on capital/assets would increase from 18 to 25 percent. It also suggested that outsourcing and offshoring might deliver a higher cash margin and a higher return on capital for shareholders, thereby increasing the probability of wealth accumulation as stock prices increase. The study also revealed that U.S. foreign affiliates retain 4–5 percent less of their total income after paying all external expenses out of the total income relative to their U.S. parent companies. This finding suggests that offshore operations of U.S. parent firms tend to outsource a greater share of the financial value chain. It was also found that U.S. firms offshored an increasing proportion of their global sales, profits and assets into overseas markets to take advantage of lower labor costs. The study demonstrated how accounting numbers grounded in a nature of expenses format can be employed to deconstruct the financial performance of U.S. parent companies and their majority-owned foreign affiliates. The accounting numbers indicate that U.S. foreign affiliates tend to outsource a higher proportion of their total financial value chain relative to their parents in the U.S.

In 2012, McCutcheon suggested that manufacturers' fixation on low wage workers drove many companies to relocate overseas and it will take more than just equalizing labor costs with China and other developing countries to lure them back to the U.S. Companies expecting reshoring of production facilities back to the U.S. must consider the following seven factors: Transportation and Energy Costs, Exchange Rates, U.S. Demand, U.S. Talent, Availability of Capital, Tax and Regulatory Climate and U.S. Labor Costs.

McCutcheon et al. (2012) published a report on the U.S. manufacturing resurgence potentials. The authors focused and provided data on the factors that make reshoring of manufacturing as well as research and development (R&D), an attractive choice, but also factors that could be an obstacle for such a decision. Amongst reshoring driving factors currency, energy, and transportation costs were identified as those making the U.S. highly attractive for reshoring. At the same time, big local market demand, labor cost (especially in southern right-to-work states, combined with precipitous labor cost growth of off-shore manufacturing), relative strength/skills of U.S. labor and availability of capital (lower cost and/or easier credit for commercial/industrial lending demand – as compared to 2009 financial crisis and after), were factors considered as relatively attractive for reshoring. On the other hand, taxation and regulatory climate are the main factors making the U.S. unattractive for manufacturing. In the general conclusions of the report it is pointed out that re-transplanting production, and in some cases R&D, back to the U.S. may not be the

best choice for all industries. Reshoring will most likely be an advantageous move for heavy (energy/transportation reliant) (i.e., metals and chemicals industries) and a less persuasive strategy for light (i.e., labor reliant) manufacturers.

Nash-Hoff (2012) suggested that reshoring initiatives alone won't turn the tide. Additive manufacturing, 3-D printing, artificial intelligence, and nanotechnology also factor heavily into the economic comeback. The key factors (shown in table 1.6) for returning manufacturing to America have been quality problems, rising labor costs, intellectual property theft, rising shipping costs, long lead times for product delivery from Asia, and the cost of inventory for the larger lots you have to buy from Asia to get the cheaper prices. Additive manufacturing allows for building parts with very complex geometries without any sort of tools or fixtures, and without producing any waste material. 3D printing is turning product design into reality for a fraction of the cost of past manufacturing technologies. The reshoring initiative takes direct action by helping U.S. manufacturers realize that local production and sourcing often reduce their total cost of ownership of purchased parts and tooling. The initiative also trains suppliers to demonstrate to these manufacturers the economic advantages of local sourcing.

Table 1.6: Key Factors for manufacturing to return to the U.S.

1. Additive manufacturing
2. 3-D printing
3. Artificial intelligence
4. Nanotechnology
5. Quality problems
6. Rising labor costs
7. Intellectual property theft
8. Rising shipping cost
9. Long lead times for product delivery from Asia
10. Cost of inventory for the larger lots

Fine (2013) considers that the future trend of supply chains will be "*Intelli-sourcing*". The author, based on an example of an end-to-end supply chain managing company, argues that the future trend is on a holistic approach where location is only one of the parameters considered by companies. He argues that cost, although an important parameter, is not the only factor for sourcing resources and that "*combination of local knowledge and global networks, but also the ability to forge relationships in the supply chain can enable cost reduction*" will be the strong components of sourcing strategies for companies.

Garza (2013) presented a model specifying firms that can successfully engage in reshoring. Prior research had examined several aspects of outsourcing, offshoring, and offshore outsourcing that can positively affect firm performance. This study suggested that the new phenomenon of reshoring is occurring primarily due to the same reasons (e.g., location attractiveness and external aggregate costs) that made offshoring attractive to firms. Overall, the study suggested that domestic location attractiveness will ultimately influence reshoring desirability in a positive way. If the domestic location is attractive, and the firm is acting rationally, then this framework suggests that the firm should find itself in a desirable position to engage in reshoring.

Gray et al. (2013), attempts to clarify the reshoring phenomenon by: (a) defining what reshoring is and is not; (b) explaining why the reshoring phenomenon should not be examined in isolation but rather as a reversion of a prior offshoring decision; (c) describing how the reshoring phenomenon might evolve as societies, worldwide, place increasing emphasis on the environmental impact of business decisions; and (d) articulating a plausible scenario in which reshoring eventually hampers employment in Western nations (in the case today's emerging economies become tomorrow's demand centers). According to the authors, and from the perspective of reshoring as a location decision problem, analytical models cannot incorporate all costs in international location decisions. As analysis on reshoring is below the level of the plant (at the product or component level), public secondary data will be difficult if not impossible to obtain unless surveys are done at the firm level. Standard surveys would face decision biases while use of controlled experiments would prevent capturing both the rich context and the path-dependency of location

decisions. Without such types (i.e., rich) of data from multiple large companies the authors believe that in-depth case studies are necessary to facilitate an understanding of the context and drivers of past and current offshoring decisions.

A study by Imberman (2013) suggests that American manufacturing executives who overcome organizational inertia and take five steps[5] to become more competitive can benefit from the "reshoring" trend because of rising labor costs in the Far East, fluctuating foreign exchange rates, and logistical difficulties that can make some Pacific Rim suppliers too costly and uncertain for domestic original equipment manufacturers. The study mentions that the supply chain of most OEMs (Original Equipment Manufacturers) in the automotive, agricultural and construction equipment industries, consumer durable suppliers, and makers of office and medical equipment are long and convoluted. Growing prosperity has created an era of rising expectations that China's repressive regime has been unable to throttle entirely. Highly regimented factories, low wages and 80-hour workweeks have led to unrest, strikes, riots and suicides. Moreover, adverse publicity about poor working conditions, child labor and worker suicides caused American companies like Nike and Apple to insist that suppliers improve pay and working conditions. The study suggests that reshoring trend has been growing for other reasons, as well. For one, it can be difficult to communicate typical business information– engineering change orders, invoices, shipping instructions, product specifications or quality problems – halfway around the world across a dozen different time zones. Also, many American companies have seen innovation suffer when engineering and R&D facilities are kept home while manufacturing moved to the Far East. Finally, the study suggests that a third reason, corruption, or the threat of losing intellectual property to counterfeiters in countries with little respect for patents and contracts can be a factor for reshoring.

Lund et al. (2013) published a report in which they tried to identify the "*game changers*" – catalysts that can induce productivity, boost GDP and generate jobs by 2020 in the U.S. They arrived at the assumption that five fields could increase growth and place U.S. on a faster growth trajectory: i) shale gas and oil production, ii) knowledge-intensive goods manufacturing, iii) big data analytics to raise productivity, iv) increased investment in infrastructure with emphasis on its productivity, and v) a more effective system of talent development in both K-12 and post-secondary education. According to the authors each one of these five "*game changers*" has the opportunity to at least boost the annual GDP by a minimum of $150 billion by 2020 and provide even more positive impacts by 2030. Startups, renewable energy, and the reshoring of manufacturing (commonly offered as solutions that can accelerate the current weak recovery) were also initially considered, but the authors finally selected the five pre-mentioned fields in an attempt to identify the opportunities with the greatest potential for rapid economic impact. According to the authors, by the time this report was released,, half a million net new jobs had been created in U.S. manufacturing since 2010, but this rebound could not necessarily add up to a broad-based reshoring trend as nearly 80 percent of the jobs created were concentrated in just four industries that together make up one-third of U.S. manufacturing employment. Additionally, these companies responded in such manner not because of more attractive/competitive conditions in the U.S., but due to local demand growth in the previous years.

Selko (2013) claims that even though manufacturing companies and operations are coming back to the U.S. the jobs created are not enough to counter what has been lost (although right national policies could remedy this issue). The author claims that companies plan to reshore manufacturing operations to the U.S and firms believe there is increased movement of production back to the U.S.; mostly because of the cost of labor increase, transportation costs, supply chain issues, lead times, quality and intellectual property protection. Another factor the author presents is a more complete assessment of manufacturing costs with findings in favor of a U.S production base. Some manufacturers are bringing back specific lines while others are turning to domestic suppliers. The author concludes that the big question that looms over reshoring is whether or not it will result in the replacement of the 5.5 million manufacturing jobs that were lost in the last decade.

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[5] i) conduct an external market survey, ii) conduct an internal survey of their own costs and productivity, iii) conduct development programs for senior managers, iv) develop a cadre of first-line supervisors, and v) generate employee cooperation.

Trojano (2013) analyzed the reshoring phenomenon of U.S. firms based on data from 2006 through 2013. The main motives pushing the American companies to bring manufacturing back home were highlighted for both small and medium enterprises (SMEs) as well as for big multinational companies and the behavioral differences between those two economic entities were underlined. The research was the product of a collaboration of six universities in Italy (Catania, L'Aquila, Udine, Bologna, Modena and Reggio Emilia), aiming to identify the business case of reshoring and creating a database with significant results of statistical validity for Italian as well as other countries companies, that relocated their manufacturing operations around the world and then brought them in their country of origin or a different one). The study concluded that there is a possibility of a noticeable reshoring trend of U.S. companies, but stated that the phenomenon was at a very early and evolutionary state to produce safe assumptions and should most probably be further studied and analyzed to verify the momentum. The analysis of nearshoring in Central and Southern American countries (areas historically considered target of U.S. companies' foreign investments)) should also be further studied to verify the reshoring trend.

Szakonyi (2013) discusses advantages and disadvantages of reshoring for U.S. manufacturing companies (table 1.7). The research suggests that reshoring production to the United States will mean less import volume for container lines and reduce empty container repositioning for exports. Moreover, the resurgence of U.S. manufacturing, boosted by cheaper natural gas prices and rising Chinese labor costs, will reduce the nation's trade deficit, and strengthen the U.S. dollar and, ultimately, increase import demand. He also suggests that emerging markets like China and Southeast Asia are looking for good quality products manufactured in the United States. It is expected that the Trans-Pacific Partnership and the Trans-Atlantic Trade and Investment Partnership shall further boost trade among the U.S. and its partners. The shale and oil boom in the U.S. are key to the reshoring trend, as cheaper electricity should increase production competitiveness of glass, aluminum, plastics and rubber products, iron and steel, and feedstock. The U.S. government promotion of exports is further driving reshoring whereas China is losing its manufacturing edge, fueling the reshoring to U.S trade because of rising land prices, wages and the Renminbi value. Finally, reshoring may also benefit from increasing industrial land prices in coastal China.

Table 1.7: Advantages and Disadvantages of Reshoring for U.S. Manufacturing Companies

Pros	Cons
• Reduces total cost of ownership • Improves quality and consistency of inputs • Reduces risk • Eliminates the waste and instability caused by offshoring • Strengthens companies' ability to respond quickly to customers' demands • Brings jobs back • Helps balance budgets • Motivates recruits to enter the skilled manufacturing workforce • Strengthens the industrial base	• It is not an easy task • It is a time consuming process

Barrentine and Whelan (2014) report that there is evidence that reshoring production is increasing and that multiple factors affect U.S. manufacturers decision to consider moving production back home. The paradigm of a growing number of companies (e.g., Apple, GE, Google etc.) that have brought some level of production back to the U.S. supports these assumptions, but at this point, and while companies add production in the improving U.S. economy, they still continue to add production overseas as well. The authors examine the driving factors that could induce reshoring and they organize them under three main categories: (i) landed cost, (ii) hidden cost and (iii) risk management related factors. The landed cost between the developing world and the U.S. is shrinking and relevant studies (Boston Consulting Group) estimate that total production costs for manufacturing in China and the U.S. might converge by 2015. This convergence can be attributed to the low cost of energy in the U.S. (boom of domestic natural gas production), the appreciation of Chinese currency (30 percent appreciation in the last decade) relatively to the U.S.

currency, the higher cost of managing remote suppliers or production facilities and the higher costs associated with elongated supply chains. The hidden cost is mostly associated with the higher corruption levels in offshoring destinations such as China, Malaysia, India and Mexico. Illegal payments, deliberate omission of quality processes, theft of intellectual property and violation of human resource laws, can also be driving factors for a company's decision to reshore its production. But even if all landed and hidden costs are identified, there are still business risks that must be considered when offshoring production. Such risks can be associated with much longer lead times, the lack of quality oversight, intellectual property theft, but also with environmental issues or worker rights related scandals that can seriously harm a company's public relations. The authors recommend a project plan or a transition model for companies that consider the reshoring option, in order to factor in all related costs but also be aware of the difficulties they will confront (i.e., supplier credit refusal, liquidation challenges depending on the local legislation, unawareness in how the host country will react etc.). Conclusively, the authors indicate that in the near future reshoring must convince that "it is more than a public relations stunt". The major trend is that of losing manufacturing plants and employment, but competitive incentives and benefits can make the reshoring option promising.

Brooks (2014) suggests that manufacturing isn't migrating from China as rapidly as most experts expect, despite rising wages at nearly 20 percent a year. One reason the migration has slowed is that few countries with the cost-benefit of luring manufacturing away from the Asian giant have the ability to provide a one-stop shop across a wide range of product categories. The author notes that although less complex products such as textiles, apparel and footwear gradually are moving to locations such as Bangladesh, Vietnam and India, China is and will remain the dominant source for most goods. With traditional low-cost locations raising their own minimum wages rapidly, the cost differential is rapidly closing. As labor makes up only a small portion of the overall cost of a product, other costs often outweigh the benefit lower labor costs bring. In many cases, that means the total landed cost of some products is either washed away or increases (for products such as toys). Further complicating any major shift is that many countries are still far behind China in factory standards, low corruption and high quality. Moreover, China's exports by value are still rising and therefore, no country is capable of replacing China at the moment and hence there is no major relocation trend.

According to Danna (2014), there are a number of global and domestic economic factors that are causing many American, and even some foreign companies, to consider moving their manufacturing operations to American soil. The two most significant are wages and productivity. A decision to move a company's manufacturing back to the U.S. offers its own set of challenges. It takes time to build a manufacturing facility and train workers. This can easily take a couple of years and a considerable investment in capital. In the meantime, one still has to be producing the goods needed to meet customer demand. The very first things to consider when deciding to choose a domestic outsource partner to smooth your company's reshoring transition is their size and experience in your particular industry.

Fratocchi et al., (2014) investigates whether reshoring represents a new or an established business/operations concept. Current empirical evidence is discussed, arguing that the turn of off-shored manufacturing is becoming an important issue in firm's production and purchasing strategies. Building on existing research, the paper identifies open questions and an agenda for research is proposed organized around four key points: i) motivations for reshoring, ii) the value chain activities involved, iii) the home/host countries specificities determining the reshoring decision, and iv) the modes of entry into (and subsequently exit from) the host country.

King published an article in 2014, addressing the topic of reshoring high-value manufacturing (e.g., electronics) back to the U.S. According to the author any shift of high-value manufacturing back to North America will be minimal as supporting "value chains" no longer exist in many sectors. Based on a new report by Macquarie, Equities Research, the author concludes that countries that run significant trade deficits for a decade or more in a given industry are unlikely to host high-value manufacturing back from Asia-Pacific locations. Other key indicators of the diminishment of a country's "value chain" are presented including the consistent loss of market share in global trade of final products as well as components, and a flattening or declining flow of license and management fee net exports. The author states that even though the reshoring of higher-value goods production might prove difficult, more success could be found in other sectors as the combination of the U.S. strength in commodities and relatively low unit labor costs can increase

U.S. competitiveness in more traditional industries such as crude materials, metals, agribusiness, chemicals and petrochemical cycles.

Moser et al., (2013) suggested that less imports and more exports should occur in order to reduce the U.S. trade deficit sufficient to increase the nation's GDP by several percentage points. He suggested that instead of depending on a strategy of increasing exports, increasing domestic production by reshoring manufacturing of products consumed in U.S. would displace imports and increase the range of goods to be exported. According to the author, over the past decade, about six million manufacturing jobs were lost, partially due to offshoring. Offshoring was the result of multiple factors that led to a decline of U.S. competitiveness. Some of the factors like low wages and lack of regulation in developing countries could not be controlled, and ultimately recruited foreign investment and provided companies with strategic growth markets. Other factors encouraged offshoring, such as U.S.'s poor basic education system; its weak skills-training programs; its high corporate-tax rates; its lack of a VAT that can be rebated to exporters and charged to importers; companies' simplistic sourcing decisions; and their underinvestment in automation technology, quality systems and lean management and production techniques. Moreover, email and teleconferencing enabled efficient communication between the U.S. and factory managers abroad. The effectiveness of sending product designs and manufacturing-process specifications to foreign factories via the Internet, together with the upsurge of cheap container shipping, strengthened the case for offshoring. The author also mentioned that the main error made by companies when they offshore production was focusing solely on low labor rates and product prices. He points out that poor recruitment and training of a skilled manufacturing workforce has become the most important controllable factor influencing U.S. offshoring and reshoring trends. Moreover, the U.S. is the target market for exports from all foreign countries and companies. The author mentions that U.S. companies are still trying to understand the hidden costs related to offshoring. He mentions about a new tool called the Total Cost of Ownership (TCO) Estimator, devised by the Reshoring Initiative™, which help the firms to calculate all costs associated with sourcing parts, components and finished products from different locations. He approves that when companies understand the true costs of offshoring, they shall offshore less and reshore more. After using the Reshoring Initiative's TCO analysis program on data from various companies, it is found that about 25 percent of the production that has departed overseas might come back to the U.S. if companies consider factors other than purchase price or landed cost while making sourcing decisions. The author suggests that bringing work not back to the U.S., but to a neighboring country (like Mexico) is becoming popular. He says that near-shoring to Mexico offers companies labor rates similar to those of China together with lower hidden costs. He points out that according to a Reshoring Initiative analysis, about 50,000 manufacturing jobs are created due to reshoring since early 2010 and it accounts for about 10 percent of approximately 500,000 manufacturing jobs added in the U.S. economy from the January 2010 low through September 2012. Moreover, many published surveys also confirm the reshoring trend.

In a briefing addressed to the European Union (EU) parliament members and staff, Needham (2014) presented the topic of reshoring manufacturing production from formerly low cost countries back to the EU and the potential of substantially reversing the significant migration phenomenon of EU production that took place from 1980 through 2000. China (the, once, main offshoring destination) seems, according to the author, to have largely run its course and no other low-cost country appears to have the characteristics in order to become the "new China". Nevertheless, there has been little evidence of reshoring from China so far (despite the rising costs, labor discontent and a government less friendly towards foreign enterprises). Thus, mass returns of manufacturing jobs that left decades ago, appear unlikely not only for EU, but for all developed countries. The briefing provides a historical background of the manufacturing production migration phenomenon from developed nations to other low cost countries like China (which witnessed its exports increasing nearly fivefold from 2000 to 2009 and its world share for 3.9 percent to 9.7 percent). The rational for reshoring manufacturing production is then reasoned by the need for job creation, the relatively higher pay that manufacturing jobs provide (than those of the service sector), the manufacturing perspective as a key innovation, intellectual property and high-value jobs agent (through research and development funding) and the potential for increased exports and reduced imports. Products most likely to be reshored could be heavy machinery (or those with high transportation costs), goods subject to frequent consumer demand changes (where proximity to the end market is needed) and products subject to safety issues/concerns. According to Needham, the key element for the

reshoring decision is the total landed cost (the set of end-to-end supply chain costs to transform raw materials into a ready to sell product), which can include various expected, but also unexpected costs. Finally, in the context of EU actions to support industrial production the author refers to the EU's target to reverse manufacturing's declining share of GDP, increasing it from 15 percent to above 20 percent after 2020 – where it was 15 years ago.

Pearce (2014) studied to find the reasons of the five factors that encourage U.S. companies to make the decision on where they should manufacture in order to optimize their gross profits. The factors are increasingly competitive U.S. labor costs; increasing productivity of the U.S. workforce; increasingly competitive domestic production costs; incentives from federal, state, and local governments; and improved synchronization of production with other business functions. With cost advantages from manufacturing in Asia and Mexico deteriorating, U.S. firms are reassessing the option of domestic outsourcing to remain globally competitive. The challenge in evaluating international versus domestic outsourcing strategic options lies in that first-movers are extremely and intentionally vague about how they reach their decisions.

Sarder and Nakka (2014), proposed a "reshorability index" to identify, analyze and evaluate the impact of various factors (labor costs, lead time, proximity to customers, energy consumption, flexibility/ease of doing business, quality, logistics costs) on reshoring decisions. The reshoring index measured the probability of ten NAICS manufacturing industries in adopting reshoring strategies. A higher value on the reshorability index indicated reshoring unwillingness (higher benefits attained due to outsourcing), while a lower value on the reshorability index indicated willingness to reshore production. Findings showed that the reshorability index was higher for machinery (highest), transportation equipment, computers, chemicals, petroleum/coal producing industries and lower for plastic/rubber, paper, food and textile (lowest) manufacturing industries.

Sirkin et al., (2014) published a report on the shifting economics of global manufacturing. According to the authors the steady changes in wages, productivity energy costs, currency values and other factors in Latin America, Eastern Europe and most of Asia, are quietly but dramatically redrawing the map of global manufacturing cost competitiveness. In order to understand this phenomenon, they analyzed manufacturing costs (using data from 2004 and 2014) for the world's leading exporting economies along four key dimensions: (i) manufacturing wages, (ii) labor productivity, (iii) energy costs, and (iv) exchange rates. Based on these costs a Manufacturing Cost Competitiveness Index for each country was developed. The index revealed four distinct patterns of change in cost competitiveness: (i) Under Pressure –Economies traditionally regarded as low cost manufacturing destinations that have seen their competitiveness erode as a result of a combination of factors, (ii) Losing ground – Traditional high cost countries that were relatively expensive a decade ago and continued to lose ground resulting in 16 to 30 percent cost gaps relative to the U.S., (iii) Holding Steady – Countries that their manufacturing cost competitiveness from 2004 to 2014 held steady relatively to the U.S., (iv) Rising Global Stars – U.S. and Mexico are the only two countries that follow this pattern mostly due to low wage growth, sustained productivity gains, stable exchange rates and a big energy cost advantage. The authors conclude that there are profound implications that the manufacturers with operations in different countries should consider and approach the world with a fresh mind-set. Their sourcing and manufacturing investment decisions should be based on a more current and sophisticated understanding of competitiveness, rather than a low versus high cost approach which is rather outdated.

In an interview for Insight magazine in 2014, H. Sirkin (managing director of BCG) predicted that the U.S. manufacturing renaissance will lead to the creation of 5 million new jobs in both manufacturing and energy by 2020. Many companies chose to establish their manufacturing operations in southern and Midwestern states because of better labor conditions there, thanks to a more flexible workforce and a lower cost of living. According to Sirkin goods made in the U.S. are of better quality than those made in low-cost countries. Models show that only about 20-25 percent of the products that are reshored will move to U.S. Automation can help make manufacturing sectors more competitive. He also mentioned that more and more small and midsize businesses have started exporting their products to foreign countries as manufacturing in the U.S. has gotten more cost competitive.

Tate et al., (2014) indicated that many U.S. companies are re-examining their decisions about their preferred manufacturing location. They tried to evaluate some of the trends that exaggerated whether U.S. based companies bring their production back to the U.S. or relocate it to different locations. They provided some key factors that affect manufacturing location decisions, the importance of these factors, and how the importance has changed over time. This study established that 40 percent of the companies observed a trend towards reshoring their industries to the U.S. They also mentioned that the companies place an increasing importance on customer suggestions of locations and how this location could help enlarge into new customer markets. They specified that it seems the phenomenon of offshoring to low-cost regions shall continue. They also mention that the level of investment in a low cost region will be very different if the business strategy is based only around profit on the shorter-term lower cost of manufacturing in order to help developed markets in comparison with an attempt to develop the lower manufacturing cost markets into future consumer markets.

Tate, (2014), indicated that economic crisis, increasing importance of sustainability, and growing customer expectations for elasticity and improved cost performance lead firms to reexamine the appropriate shoring decision. The author added some perspective to this shoring debate with respect to U.S. In this paper, she tries to answer some of the important questions and address some important points on reshoring option for a U.S. company. She mentions that cost of technology and flexibility in innovation and easier to manage product changes makes U.S. an attractive option that some low cost labor countries.

Tirschwell (2014) suggested that for nearshoring “the headline is bigger than the story”. According to Tirschwell at the moment “no container line suggest that its trans-Pacific volumes are eroding because of production moving to Mexico”, but this might change in the next years as many companies are considering to relocate manufacturing to Mexico. Security in Mexico remains a significant concern while U.S. is gaining interest as a manufacturing location, because of its proximity to end-markets, stable politics, rule of law and excellent transportation.

Van den Bossche et al. (2014) published an article addressing the reshoring dilemma. Based on recent reshoring cases, their study attempts to provide reasoning on the reshoring phenomenon and its driving factors (i.e., delivery time improvement, total cost of ownership, quality improvement etc.) motivating companies to reshore. According to the authors, the reshoring decision is not solely based on location and companies should consider different business scenarios/cases, macroeconomic and industry trends perspectives, a list of “readiness” factors along with a list of benefits that the location can provide to the company.

In a report by Yusen Logistics (2014), a third party logistic provider that helps navigate cross-border challenges, it mentions that Mexico is the new suitable manufacturing region since the cost has started to increase in Asia and massive goods are being transported to and from Mexico. It is mentioned that around $216.3 billion is exported to Mexico from U.S. and $277.6 billion is getting imported from the same. The report also mentions the factors on how the third party service providers can help in solving the logistics problem and it also gives various factors on how to choose the right service provider.

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Chapter 2: Assessing Reshorability of US Manufacturing Industries

1.0 Abstract

2.0 Introduction

According to Oxford dictionary the word 'reshoring' was originated in the early 21st century matching to the pattern of 'offshoring'. Reshoring refers to the practice of transferring a business operation that was moved overseas back to the country from which it was originally relocated. Reshoring can help to rebalance in the economy, create new jobs and cut trade deficit [1]. In this research paper, we will define a 'Reshorability Index'- which will indicate the advantage of getting manufacturing back to US for a particular industry from a specific country.

China was the obvious destination for manufacturing over last decades due to its overwhelming advantage of cheap labor, incentives, currency control and cluster manufacturing base. China's advantage however is gradually shrinking, and in the coming five years the cost of operating in China will be close to that of in the US (Boston Consultancy Group) [2]. Although the decision is not that straight forward. China has a huge population of 1.35 billion compared to the US population of 318 Million [3]. But US has higher GDP of $17 Trillion compare to Chinese GDP of $10 Trillion [4]. China has a GDP growth rate of 7.4 percent compared to US's 2.4 percent [4], which makes China as the future potential consumer market. But USA has a consumer market which is more capable than China, US per capita income is $54,629 while China is only $7,593[4]. Total export value across the world is $18,301 Billion of which 64 percent is manufacturing. US is still the second highest exporter of the world contributes, 8.4 percent of the world export next to China 11.7 percent. US is the highest importer of the world 12.3 percent, while China is the second (10.3 percent). US export to China is 7.7 percent of its total export and US import from China is 12 percent of its total import [5]. China has a bigger workforce but its unemployment rate is less than USA (4 percent at China, 5.1 percent at) [6]. All these macro-economic pictures paint a complex math of reshoring. In this paper, we have accumulated the well accepted micro and macro-economic indicators to depict the reshorability of different US industries.

While the low cost of labor was and still is one of the most competitive factors for China, the US workforce is more efficient. The average wage rate in China is increasing at a 17 percent rate faster than in the US [2], while the efficiency of USA is five times more than China [7]. Cost saving from labor will be decreased to 39 percent (2015) from 65 percent (2000) in China [2]. 74 percent of the industries who have taken manufacturing back to USA think that access to skilled labor is one of the most influential factors of reshoring while only 17 percent of whom have offshored think this is the reason for offshoring [8]. Increasing wage rates in China and skilled labor in the US will leave China only with 10-15 percent cost advantage to the US [2] in next five years. And if we consider the logistics cost, then China will be no more cost effective than USA manufacturing in five years.

Moreover, energy costs more in China than in the US. Hourly cost to run an industrial boiler with electricity at USA is $2000, while $10,548 in Germany and $2500 in China [7]. US still manufactures nearly 75 percent of what it consumes [9]. All this factors reveals that manufacturing is coming back to USA. Our research finding also comply with those micro and macro-economic facts. Recent survey of BCG showed that more one third of the large manufacturer are thinking to manufacture at US for the goods consumed in US market. [10]

The World Economic Prospect Survey by UNTCAD [11] completed an analysis on the importance of different factors (including but not limited to cost, quality, reliability, proximity to customers, regulation and intellectual property right protection) on selecting location for different industries. Here in the paper we accumulated different economic data points which correspond those factors. We have worked with three types of factors, location factors (from UNCTAD), reshoring factors, and sub-factors which influences the reshoring factors (from Global Competitiveness Index by Global Economic Forum [12], the Logistics Performance Index by World Bank [13], the Global Energy Competitiveness Index by KPMG [14], and the Business Environment Index by Economist Intelligence Unit [15]). The factors which are not taken from the Global Competitive index is converted to a scale of 1-7 to keep a similar scale across the data from different sources. We used a min-max concept to scale up the data. We relate all these factors by using weighted average method to get a competitive advantages of the US over China. The score for location advantage is related to a 3-digit NAICS code. These scores for 3-digit NAICS codes is applied for all the relevant 4-digit and 6-digit NAICS code. Logistics cost (Customs Insurance and Freight) of importing from China is retrieved from the US census database [16]. After the logistic cost is incorporated, the score of US and China is compared to develop the Reshorability Index. This index represents the relative advantage of manufacturing at USA than China. The same procedure is applied to other countries: India, South Korea and Japan.

In this paper we have considered 9 different types manufacturing industries (3-digit NAICS code: 311, 312,321, 325, 327, 331, 334, 335, and 336). These includes 48 different types of 4-digit NAICS code and 205 different types of 6-digit NAICS codes. The industries under this research represent 56 percent of total US import from China.

4.0 Methodology

There are socio-economic factors (sub-factor) which influence the location decision for manufacturing. These factors are related to reshoring factors which drive the reshoring decision. In these research we have identified 44 sub-factors, which are influencing 13 location factors related to 8 reshoring factors.

4.1 Step 1: Selecting Socio-economic Factors

These are well accepted indicators of countries' socio-economic factors published by the United Nations, World bank, World Economic Forum, KPMG, US census, US department of Commerce, and Boston Consultancy Group's Economic Intelligence Unit etc...

All the indicators were Normalized under a 1-7 scale with Mini-Max formula:

$$\text{Normalized Score} = 6 * \frac{Country\ Score - Minimum\ Score}{Maximum\ Score - Minimum\ SCore} + 1 \quad (1)$$

Table 4. Importance of locational factors, by industry, 2009–2011
(Per cent of all responses for each industry)

Sector/industry	Presence of suppliers and partners	Follow your competitors	Availability of skilled labour and talents	Cheap labour	Size of local market	Access to international/ regional markets	Growth of market	Access to natural resources	Access to capital market (finance)	Government effectiveness	Incentives	Quality of infrastructure	Stable and business-friendly environment	Total
Primary	**8.8**	**2.9**	**9.4**	**4.1**	**10.5**	**7.6**	**9.9**	**19.3**	**1.8**	**7.0**	**0.6**	**7.0**	**11.1**	**100**
Manufacturing	**10.1**	**5.0**	**8.1**	**6.5**	**17.5**	**10.0**	**15.8**	**3.4**	**2.4**	**4.0**	**2.9**	**6.1**	**8.1**	**100**
Chemicals and chemical products[a]	9.5	2.9	5.1	5.5	18.2	12.4	18.6	6.2	0.7	4.4	1.5	5.1	9.9	100
Electrical and electronic equipment	10.9	6.3	8.9	7.8	17.1	10.9	19.1	1.0	2.0	2.8	2.6	5.3	5.9	100
Food, beverages and tobacco	12.6	7.3	6.6	4.6	18.5	9.9	16.6	0.7	6.6	2.6	2.6	4.6	6.6	100
Motor vehicles and transport equipment	9.8	7.0	6.0	7.4	17.7	8.8	12.6	2.8	2.8	3.7	6.5	7.4	7.4	100
Other heavy industry[b]	9.5	2.5	6.9	7.9	16.7	8.8	13.9	8.8	2.5	5.4	0.9	6.3	9.8	100
Other manufacturing	8.8	8.8	8.8	7.7	17.6	6.6	6.6	-	4.4	8.8	3.3	7.7	11.0	100
Pharmaceuticals	9.6	9.6	9.6	2.7	17.8	15.1	16.4	-	2.7	6.8	1.4	4.1	4.1	100
Professional equipment	10.2	3.3	13.5	5.8	17.5	8.8	16.8	1.1	0.7	2.2	4.4	7.7	8.0	100
Services	**9.5**	**3.7**	**8.6**	**3.7**	**17.5**	**9.2**	**17.5**	**1.5**	**5.1**	**5.8**	**1.8**	**6.8**	**9.2**	**100**
Business services	10.3	2.6	12.1	10.3	15.5	12.9	16.4	-	2.6	4.3	3.4	4.3	5.2	100
Electricity, gas and water	11.9	-	5.2	2.2	13.3	5.2	11.1	5.9	8.9	8.1	-	13.3	14.8	100
Other services	11.8	1.4	10.9	2.2	19.6	6.5	19.6	0.7	4.3	8.7	4.3	2.2	8.0	100
Trade	11.7	8.1	9.0	2.7	17.1	9.9	19.8	0.9	3.6	3.6	1.8	5.4	6.3	100
Telecommunications	5.4	2.7	6.8	2.7	25.7	10.8	27.0	-	6.8	4.1	-	2.7	5.4	100
Transportation	1.3	10.4	6.5	1.3	16.9	13.0	14.3	-	3.9	3.9	-	13.0	15.6	100
Total	**9.9**	**4.5**	**8.3**	**5.6**	**17.1**	**9.6**	**15.9**	**4.0**	**3.0**	**4.7**	**2.5**	**6.3**	**8.6**	**100**

Source: UNCTAD survey.
[a] Excludes pharmaceuticals.
[b] Includes metals and metal products, non-metallic mineral products, and wood and wood products.

Location Factors	Sub-Factors	US	China
Presence of Suppliers and Partners		5.39	4.39
	Local supplier Quantity	5.5	5.1
	Local Supplier Quality	5.6	4.5
	Prevelance of forign owenership	5.1	4.5
	Buyer shophistication	4.5	4.3
	Regulation of secuirity exchange	5	4.4
	State of cluster development	5.4	4.6
	Extend of marketing	6.2	4.5
	Production process sophistication	6.1	4.1
	Value chain breadth	5.4	4.3
Follow your competitor		5.73	4.33
	Effectiveness of anti-monopoly policy	5.1	4.5
	Nature of competitive advantage	5.6	3.9
	Intensity of local competition	5.9	5.4
	Legal Right	6.3	3.5

Reshoring Factors	Factors influence location decision
Labor Cost, Availability & Skill	Labor Cost
	Availability of Skill labour and talent
Availability of natural resources	Access to natural resource
Incentives	Incentives
Policy Regulation/IP Right	Government effectiveness
Proximity to Customers	Size of local Market
	Access to international and regional market
	Growth of Market
Infrastructure	Infrastructure
Ease of doing business	Follow your competitor
	Stable and business friendly environment
	Access to capital market
Presence of Suppliers and Partners	Presence of Suppliers and Partners

Figure 2.1: Weight and relation between different factors

4.2 Step 2: Reshoring Factors

Importance of these factors are taken from the United Nations Conference on Trade and Development (UNTCAD 2009-11) where they showed how different factors played role for selecting location for different industries. For example, skilled labor is more important in electrical equipment manufacturing industries than chemical industries.

4.3 Step 3: Weighting the Factors

These factors are then weighted as below:

Score for USA= $\left(\sum_{j=1}^{j=m}((\sum_{i=1}^{i=n} S_i)/n)\right)_j * W_j\Big)/m$ (2)

Score for China or other Asian countries=$\frac{\left(\sum_{j=1}^{j=m}\left((\sum_{i=1}^{i=n} S_i)/n\right)\right)_j * W_j\Big)}{m} * (1-(L_c + C_L))$ (3)

Where; S_i = Sub-factor from step 1; n= number of sub-factors impacting the location factors.

W = Weight of the location factor for a particular industry from step 2; m= Number of location factors

L_c = Customs, Insurance, Freight cost (%) paid in 2014, for importing -based on NAICS code data from US census.

C_L = Cost of import duties and inventory for long lead-time from China, Considered as 3%.

$L_c = \frac{Import\ value\ including\ CIF\ cost\ (\$) - Actual\ Import\ Value\ (\$)}{Actual\ Import\ Value\ (\$)} * 100$ (4)

4.4 Step 4: Reshorability Index

After applying Equation (2) for logistics cost below formula is applied to develop Reshorability Index

Reshorability Index $= \frac{\text{US Score from Eq(1)} - \text{Asian country Score from Eq(2)}}{\text{Asian Country Score from Eq(2)}} * 100$ (5)

5.0 Result and Analysis

Below is the restorability index of 4-digit NAICS code industries which represent top 50 percent of total US import from China (left). The pie chart (right) represent the 3-digit NAICS code industries, those considered in this research are about 56 percent of total US import from China.

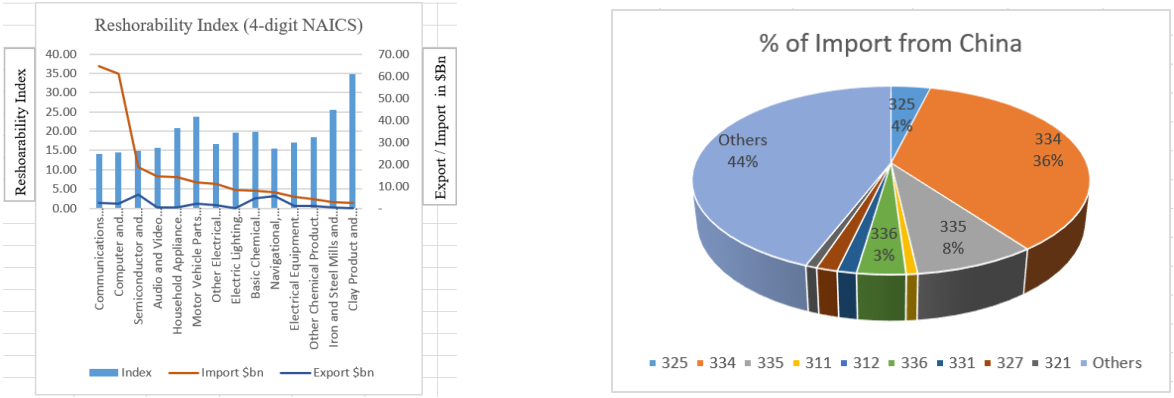


Figure 2.2: Reshorability Index for 4-digit NAICS (left), percent in US import from China for 3-digit NAICS (right)

Export and Import data are also presented in the above graph (in $Bn). Though the export and import value has no direct impact of Reshorability Index, these are important for analysis. The industries which have low Reshorability Index values are likely to have high trade deficit (high import but low export). At the same time, the industries which have high value ($) of import, will have higher impact on economy- if brought back to USA. Communications Equipment Manufacturing (NAICS 3342), alone represent 13.8 percent of total US import from China, creating a deficit of $62 Billion (Import $64 Bn and Export $2 Bn). This has a relatively low Reshorability index (14.2), which justifies the current trend. On the other hand, Motor Vehicle Parts Manufacturing (3363) has relatively high Reshorability Index (23.7) but still has a high trade deficit ($11.75 Bn import and $2.12 Bn Export), same applies for Household Appliance Manufacturing (NAICS 3352). These are the industries which are more feasible for reshoring if other business dynamics support. Primary metal, non-metallic mineral products and wood products have relatively higher Reshorability Index (NAICS 321, 327 and 331).

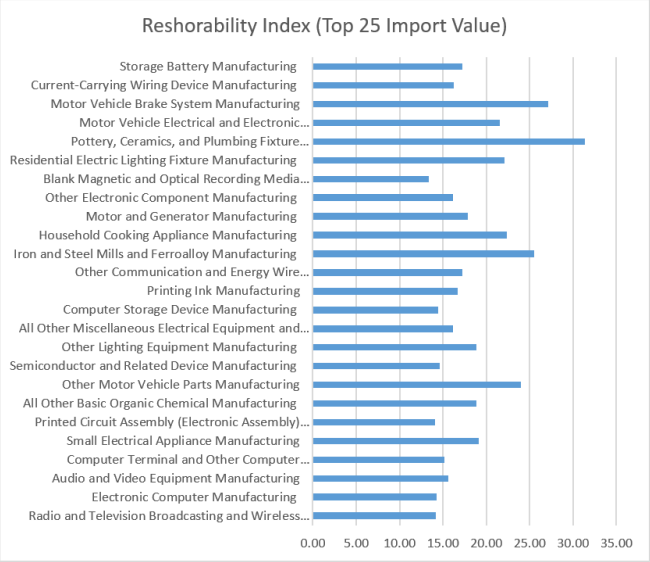


Figure 2.3 on the right represents the reshorability indices of top 25 industries (6-digit NAICS code) based on import value from China in 2014. Motor Vehicle Brake System manufacturing (336340), Iron and Steel Mills and Ferroalloy Manufacturing (331110), Household Cooking Appliance Manufacturing (335221), Pottery Ceramics and Plumbing Fixture Manufacturing (327110) have higher potential for reshoring. These results are congruent with the result of 4-digit NAICS code which indicate that Motor vehicle parts, house hold appliance, clay and refractory products have relatively high Reshorability Index.

Figure 2.3: Reshorability Index for 6-digit NAICS code (US vs China)

6.0 Sensitivity Analysis

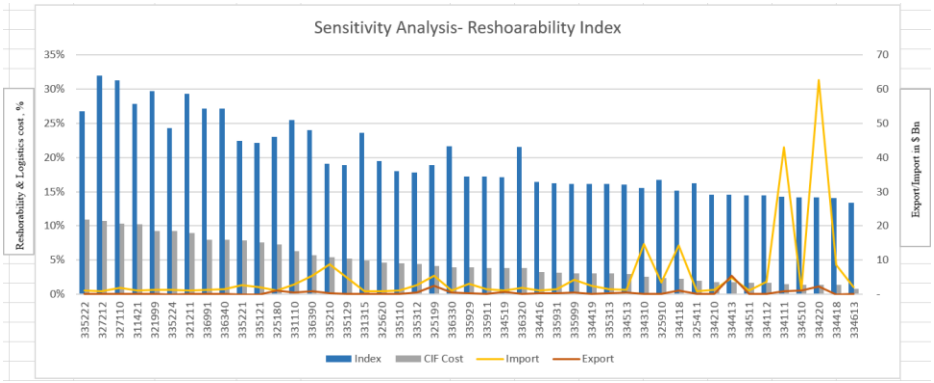


Figure 2.4: Sensitivity Analysis for 6-digit NAICS (US vs China)

CIF (Customs, Insurance and Freight) cost has a big impact on the Reshorability Index. If the logistics cost is high the Reshorability Index is likely to be high also. But there are some exceptions as well, like NAICS 335222 has higher logistics cost than 327212, but still 327121 has higher Roshorability Index due to other socio-economic factors. Another data present in this chart is export/import data of 2014 in $Bn. The industries which has higher Reshorability Index, has less trade deficit than the industries with comparatively low Reshorability Index. Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (NAICS 334220) has relatively low Reshorability Index (14.13) but this category alone has import value of $62 Bn. So, this will have a huge impact on economy if manufacturing brought back to USA. Small Electrical Appliance Manufacturing (NAICS 335210) has a high Reshorability Index (19.09) and also very high trade deficit with China. These industries are very suitable choice for reshoring. Chinses economy has a higher growth rate than US economy. This growth rate of market has higher impact on electronics industries (19.1) than metal and non-metallic industries (13.9) for reshoring. As a result, reshorability of electronics item is comparatively lower. However, due to the very big volume of domestic market at US- reshoring of electronics item will have a profound impact on US economy. The result also indicates that China will continue leading the electronics market, if economic growth continues.

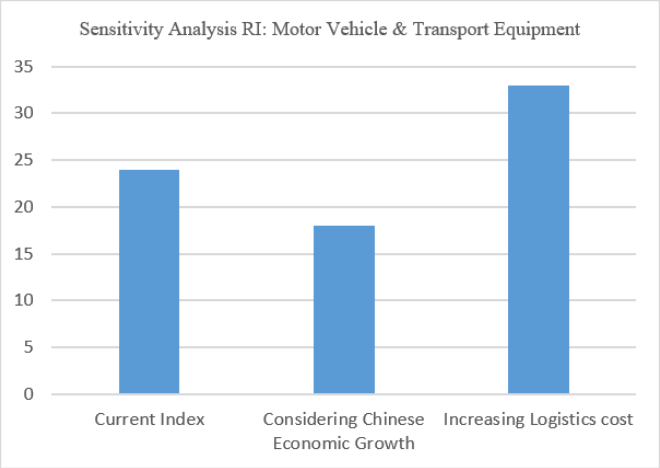


Figure 2.5: Impact of Economic Growth and Logistics Cost on Reshorability Index (US vs China)

Proximity to customers is an important factor for reshoring. Here we defined proximity to customer to by the size and growth of the economy. If a country has a potential local market with good GDP growth, then this country has a strong customer base. In terms of selecting location (excluding logistics cost), the motor vehicle industry is highly dependent on the local market size (17.7 percent) and market growth (12.6 percent) and less dependent of labor cost (6.4 percent). The Chinese economy is growing at a higher rate than the US. It is predicted that China will accede US nominal GDP in next 11 years and will be the world largest economy. [23] There will be more future eligible consumers of cars in China. US economy is not growing that fast. However, there is still a huge consumer market at US. If we consider Chinese GDP and economic growth will be the topmost and US economy will be the same as today, it will reduce the Reshorability Index by 6 points (24 to 18). However, producing in the US will be still beneficial for US manufacturers. Average logistics cost for Motor Vehicle and Transport Equipment (NAICS 336) is 9 percent (of total import cost) from China to US. If this cost increase by 6 percent (up to 15 percent) it will increase Reshorability Index by 9 points (24 to 33).

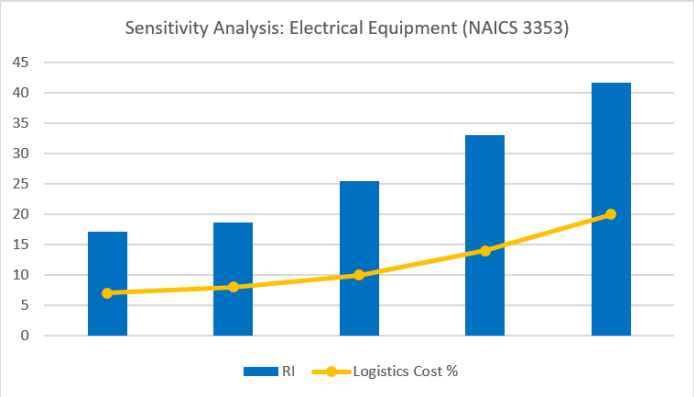
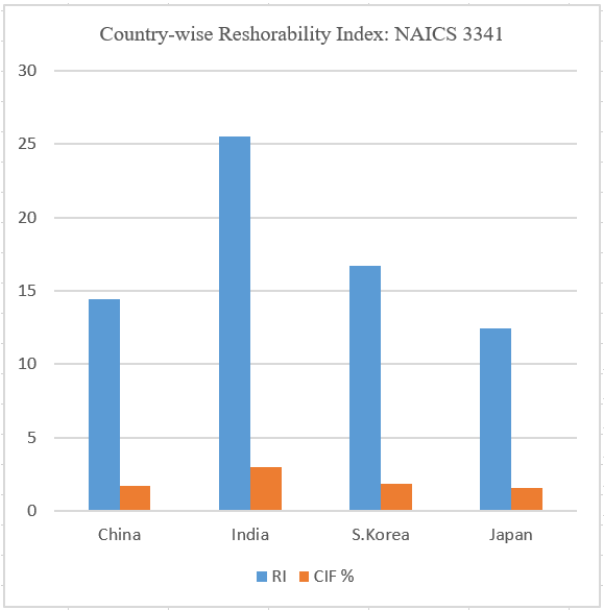


Figure 2.6: Impact of Logistics Cost in Reshorability Index (US vs China)

Reshorability of Electrical Equipment from China to US is 17.15. US imports a huge amount of Electrical Equipment from China. Average logistics cost of sourcing this product to the US from China is currently 6.86 percent (of total import cost). If logistics cost increase up to 20 percent Reshorabilty Index will increase by 34 points.



Country	RI	CIF %	Import $Mn	Export $ Mn
China	14.46	1.67	60,911	1,964
India	25.53	3.01	28	313
S.Korea	16.73	1.87	949	417
Japan	12.43	1.56	1,331	1,224

Figure 2.7: Country-wise RI, CIF (Customs, Freight and Insurance) Cost, Export/Import for Computer & Peripheral Equipment (NAICS 3341)

The Reshorability Index varies from country to country. The country which has high RI is less beneficial for manufacturing. India has higher CIF cost to US which has an impact on higher Reshorability Index for Computer & Peripheral product manufacturing. Imports from India are lower than the other three countries considered here. Reshorability from Japan is comparatively low, which indicates that Japan is still a better place for manufacturing. Trade between the US and Japan for this product is also very balanced. However, Reshorability from China is also not that high which is also reflected by the higher imports from China. These imports may be driven by Chinese low costs, trading facility, and huge local market. But the US also has a big market for this product and will create a good amount of jobs, if these manufacturing activities are brought back to US. Labor cost is an important factor for manufacturing. In this research we have not considered labor in terms of cost only but also other parameters. These parameters include but not limited to labor efficiency, availability, skill, ability to attract and retain talent. Trade deficit

with China for Computer & Peripheral products is huge (58 $Bn). So there is a big potential for US to bring this manufacturing back.

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Chapter 3: Manufacturing Location Quotients

1.0 Study Area

The area under analysis extends north and south between the western Great Lakes Region and the Gulf Coast region along the inland river systems of the Mississippi and Ohio rivers. The study area includes fourteen states total: Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Tennessee, and Wisconsin. In particular, analysis was done at the county level (1,241 counties total).

2.0 Data

Researchers utilized two different data sets to conduct the analysis: one, the U.S. Census Bureau's County Business Patterns (CBP) employment dataset from 2013; and two, Esri's 2013 US Business Locations and Business Summary dataset from ESRI's Business Analyst.

The U.S. Census Bureau's CBP employment dataset is released annually and contains the number of business establishments and the employment level during the week of March 12 aggregated at the county level. Data is organized using the North American Industry Classification System (NAICS). The dataset does not include data for a number of industries: crop and animal production; rail transportation; postal service; insurance and employee benefit funds; trusts, estates, and agency accounts; public schools and colleges; private households; and public administration. However, the analysis was not impacted from the exclusion because the analysis was concerned with manufacturing industries.

Esri's US Business Locations and Business Summary Data is a point based geographic information system dataset based on a comprehensive list of businesses licensed from Dun & Bradstreet®. The dataset's attributes include business name, address location, franchise code, employee count and sales volume estimates, and industry classifications (both a Dun & Bradstreet proprietary eight-digit Standard Industrial Code (SIC) and six-digit NAICS) for over 18 million US businesses as of 2013.

3.0 Methodology

Researchers were interested in identifying both areas of industrial concentration (employment levels) and industrial specialization (location quotients) for 16 manufacturing NAICS codes: 15 industry subsectors and one industry group (Table 3.1).

County employment levels are directly reported by the U.S. Census Bureau provided the disclosing of data does not present confidentiality issues for any indiviual businesses. County employment levels using the Esri dataset were figured by using a 'Spatial Join' to sum the employees for each industries within each county.

Location quotients are used to compare the economic make-up of a smaller geographical area to that of a base geographical area (larger and encompassing). Most of the time, comparisons are made to the US economy as a whole versus a census track, zip code, county, metropolitan statistical area (MSA) boundary, or state. Location quotients greater than one in this study represent a county's economy that is more specialized in a given industry subsector or industry group versus the nation's economy as a whole. For example, a county's location quotient of 1.3 in the transportation manufacturing industry subsector would mean that the county's employment in the industry subsector is 30 percent higher that would be the case if the county's economy mirrored that of the national economy.

Table 3.1: List of industries analyzed and associated NAICS code.

NAICS Code	Description
311	Food Manufacturing
314	Textile Product Mills
315	Apparel Manufacturing
316	Leather and Allied Product Manufacturing
321	Wood Product Manufacturing
322	Paper Manufacturing
326	Plastics and Rubber Manufacturing
327	Nonmetallic Mineral Product Manufacturing
331	Primary Metal Manufacturing
332	Fabricated Metal Manufacturing
333	Machinery Manufacturing
334	Computer and Electronic Product Manufacturing
335	Electrical Equipment, Appliance, and Component Manufacturing
336	Transportation Equipment Manufacturing
337	Furniture and Related Product Manufacturing
3391	Medical Equipment and Supplies Manufacturing

To identify potential hot-spots for industrial reshoring, researchers combined the measures of industrial concentration (employment levels) and specialization (location quotients) for each of the county-industry pairs (a total of 19,856 from 1,241 counties and 16 industry subsectors/groups). The combined measure is the sum of two ratios multiplied by 100: the county-industry pair's employment level divided by the maximum county-industry pair employment level (35,064 for CBP and 186,592 for Esri), and two, the county-industry pair's location quotient divided by the maximum county-industry pair location quotient (872.3327 for CBP and 267.0067 for Esri). This process resulted in a potental maximum value of 200 (if the county-industry pair had the highest employment level and location quotient); however, the actual maximum value was 100.5874 for CBP data and 102.1708 for Esri.

4.0 Flagged Counties

The CBP and Esri datasets both have issues in reporting employment levels that should be noted. As previously mentioned in regards to the CBP dataset, data is either suppressed or estimated when the publishing of it could 'disclose the operations of an individual employer '. In these instances, researchers used the reported counts of establishments in the county along with the midpoint of the reported employment ranges to sum the county's employment in a given industry subsector or group. For example, if the CBP reported a county having six total establishments with three having 10-19 employees (43.5); two having 100-249 (349); and one having 500-999 (749.5); the county was given an estimated employment of 1,142. In total, 39 percent (7,769 of the 19,856 county industry pairs) of the reported county's industry subsector and industry group employment totals were estimated (Table 4.2). Each of these instances was then flagged to indicate that the employment totals reported was estimated. The county employment estimate method had the effect of increasing total employment of the study area by roughly 3.3 percent (Table 3.3).

The Esri dataset presents an issue for analysts in the way it reports employment to business locations designated as a 'Headquarter' which leads to significantly higher employee counts when compared to CBP data. Researchers used a process to flag counties with industry subsector and group employment totals that was impacted by this. First, counties with employment totals or location quotients that were greater than or equal to two standard deviations from the mean were identified. These counties' employment totals were then compared to the CBP establishment data, and analyzed

to see if a 'Headquarter' was present in the individual county. This process resulted in 327 of the 19,856 county industry pairs to be flagged. (Table 3.4).

Table 3.2: The county industry employment estimate ranges, and the number of counties estimated.

County Industry Employment Estimate	Count of Estimated Counties
0 - 19	3,017
20 - 99	2,173
100 - 249	1,199
250 - 499	667
500 - 999	447
1,000 - 2,499	205
2,500 - 4,999	43
5,000 - 9,999	16
10,000 - 24,999	2
25,000 - 49,999	0
50,000 - 99,999	0

Table 3.3: Comparison of industry subsector and group employment: using reported state totals versus estimated county totals.

NAICS	CBP State Employment	CBP w/ County Estimates	Percent Increase
311	553,368	565,910	2.2%
314	25,849	29,872	13.5%
315	15,745	17,783	11.5%
316	6,565	10,672	38.5%
321	143,361	149,640	4.2%
322	161,511	167,278	3.4%
326	331,438	342,155	3.1%
327	123,145	129,059	4.6%
331	220,212	229,356	4.0%
332	603,825	609,994	1.0%
333	493,663	505,296	2.3%
334	161,026	185,570	13.2%
335	140,053	147,968	5.3%
336	679,557	689,367	1.4%
337	137,121	142,533	3.8%
3391	81,323	85,893	5.3%
Total	3,877,762	4,008,341	3.3%

Table 3.4: The number of flagged county-industry pairs within in the Esri data based analysis, and the associated industry subsector or group

Number of Esri Flagged Counties	NAICS Industry
50	332
27	334
25	333
24	327
23	336
22	326, 335, 337
20	311, 315
18	314
15	321
13	322
9	331, 3391
8	316

5.0 Results

County industrial employment levels and location quotients from both data sets show similar distribution patterns with a majority of the counties with little (less than 20 employees and a location quotient less than 1) or zero activity occuring (Figures 3.1 – 3.4).

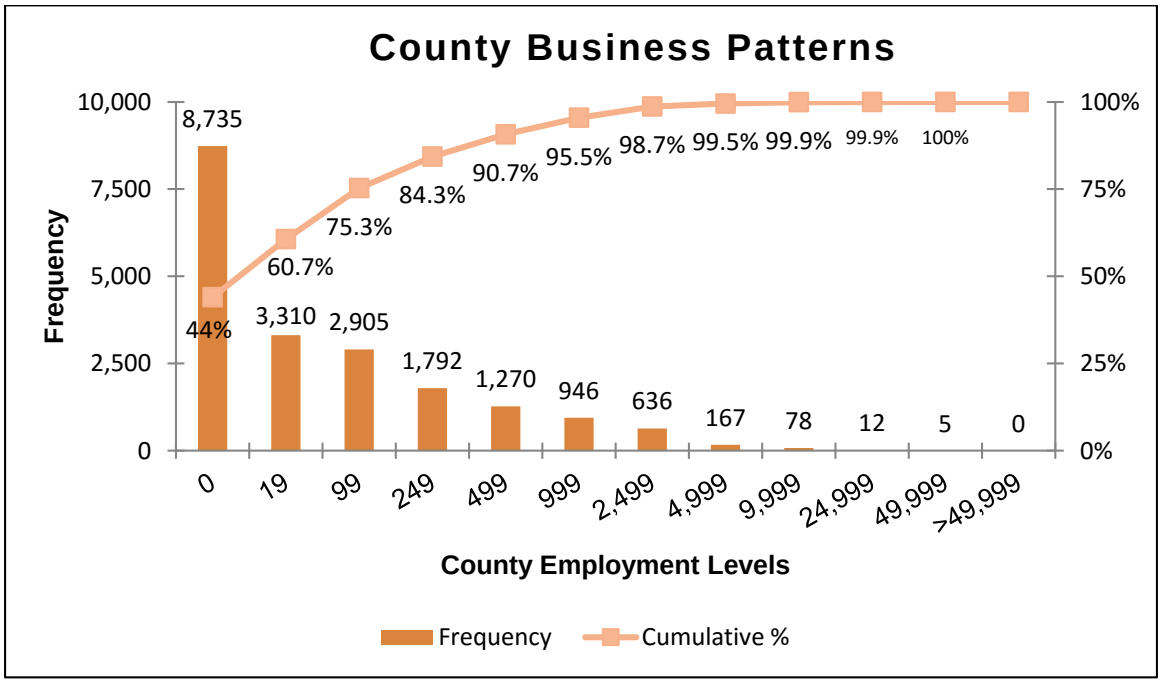

Figure 3.1: The cumulative distribution of CBP county employment levels for the 1,421 counties and 16 industries under analysis (2013).

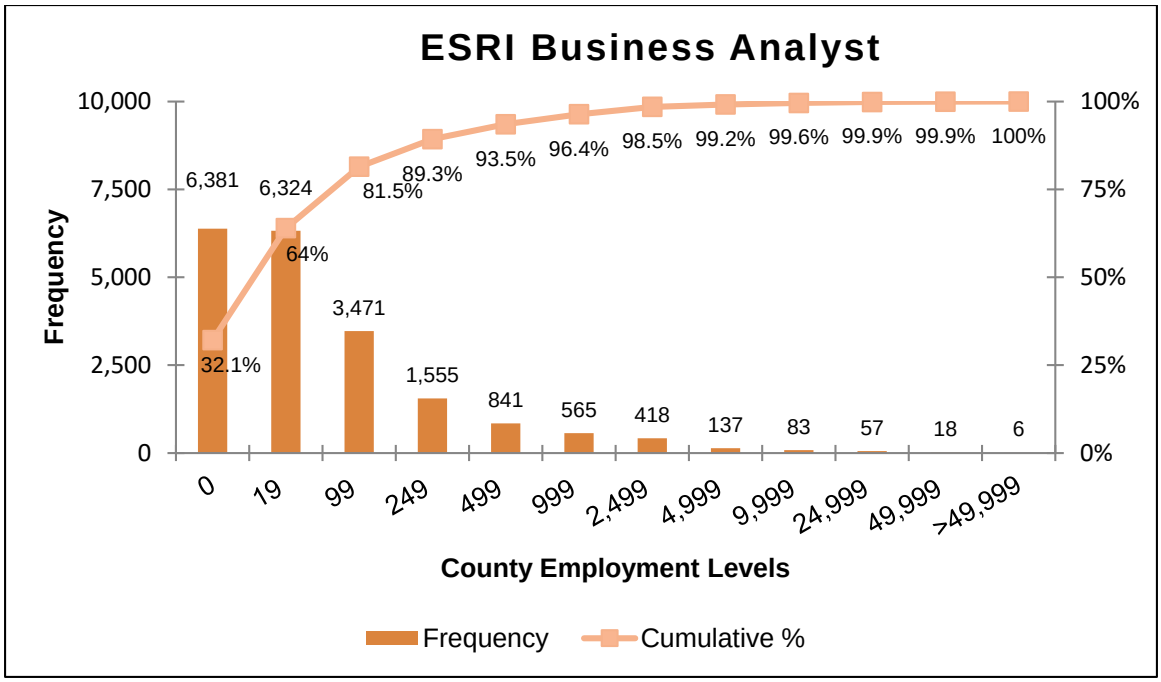

Figure 3.2: The cumulative distribution of Esri county employment levels for the 1,421 counties and 16 industries under analysis (2013).

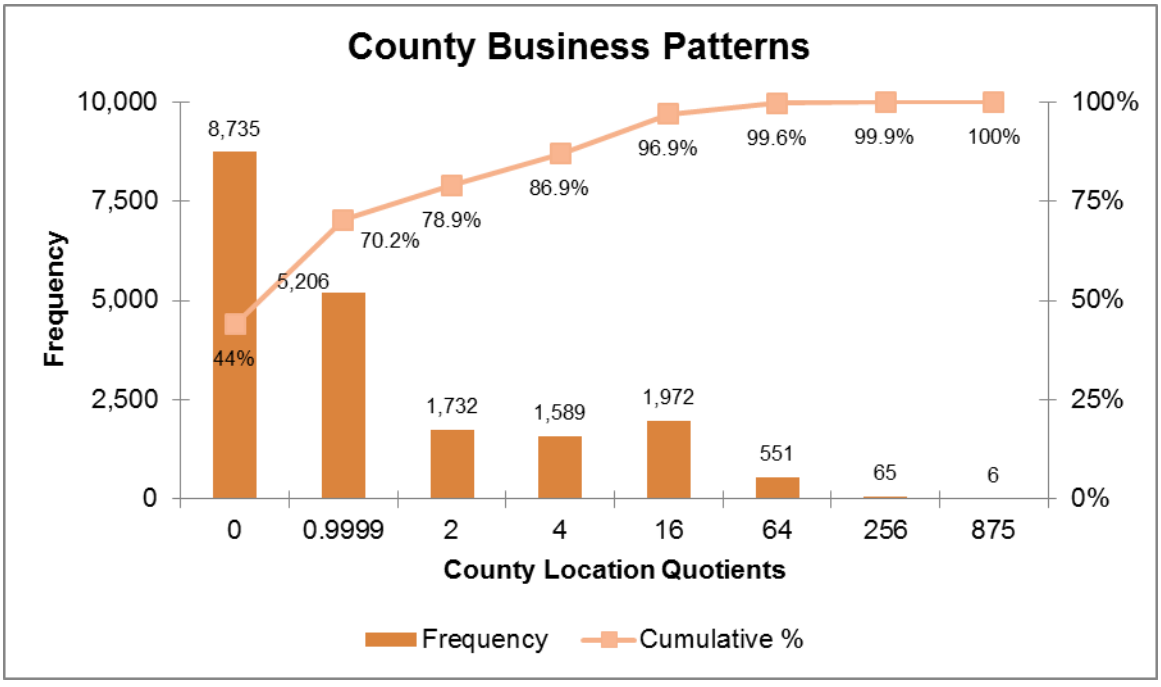

Figure 3.3: The cumulative distribution of CBP location quotients for the 1,421 counties and 16 industries under analysis (2013).

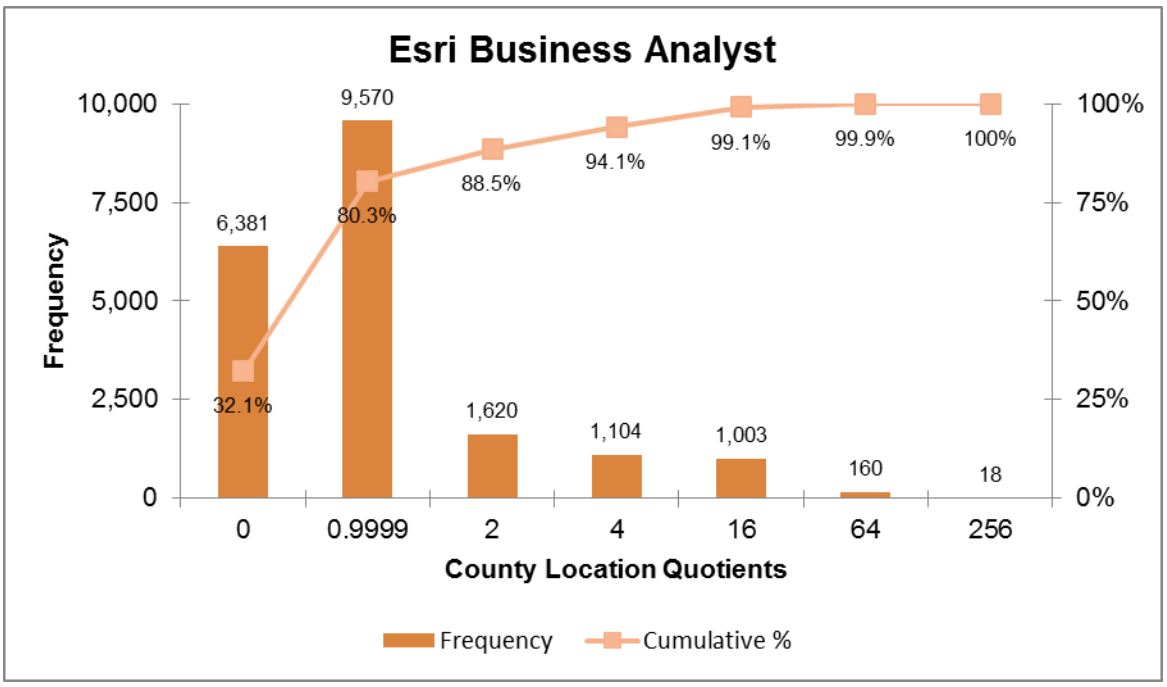

Figure 3.4: The cumulative distribution of Esri location quotients for the 1,421 counties and 16 industries under analysis (2013).

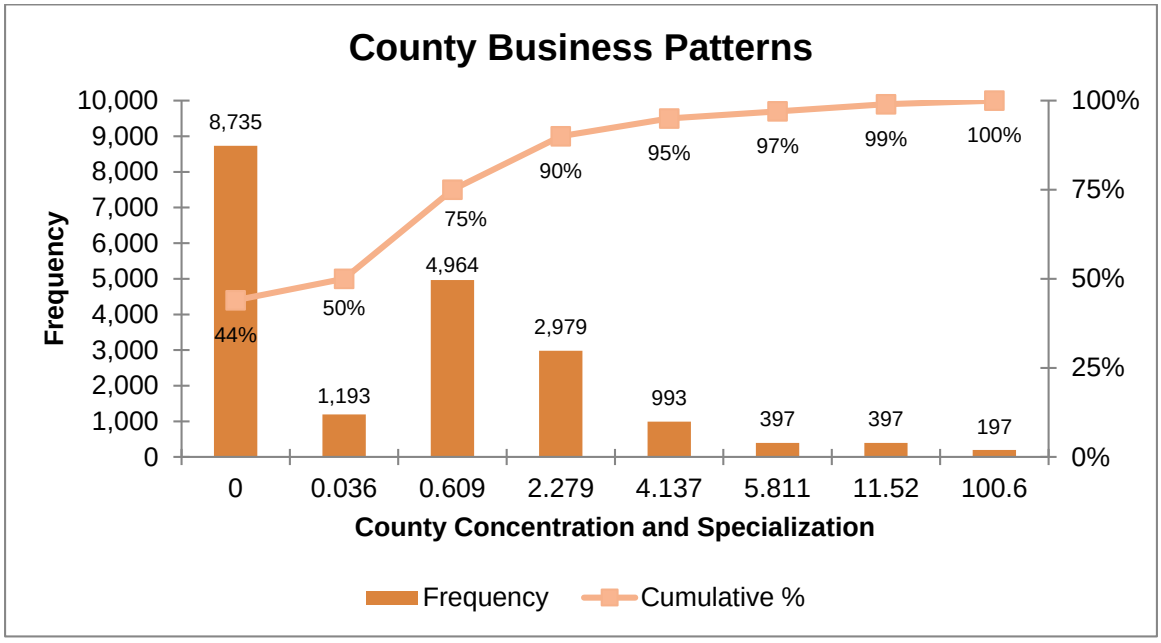

Figure 3.5: The Cumulative distribution of CBP concentration and specialization scores for the 1,421 counties and 16 industries under analysis (2013).

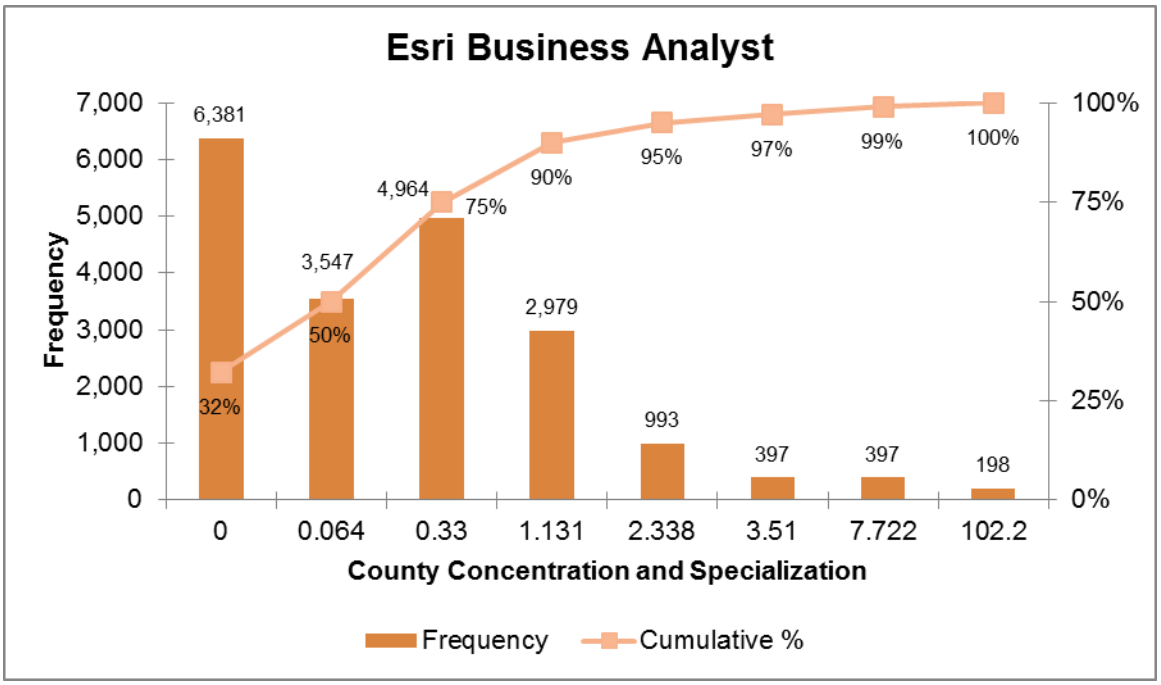

Figure 3.6: The Cumulative distribution of Esri concentration and specialization scores for the 1,421 counties and 16 industries under analysis (2013).

6.0 Analysis by Industry

Data from the Reshoring Initiative was used to identify those industries more likely to reshore manufacturing capacity when compared to others. The 16 industries analyzed are shown in Table 4.5. The seven industry subsectors marked with an asterisk were categorized by the Boston Consulting Group as being 'Tipping Point Industries' which are poised to take advantage of the multiple factors driving the reshoring trend. Analysis for the top ten industries ranked by reshored instances will follow, and due to space will, in general, focus on the areas with the highest combination scores of employment concentration and specialization (those in the top 1 percent). Maps visualizing the results are located in this chapter's appendices (A and B).

6.1 NAICS 331: Primary Metal

The primary metal manufacturing subsector is the sixth ranked industry by employment, but has the third largest average location quotient of 3.0. Employment is generally concentrated in the Midwest portion of the study area, with an almost contiguous blanket of counties with employment from eastern Ohio to the central part of Wisconsin, is particularly concentrated adjacent to bodies of water with commercial navigation, and a bit binary in nature in that 686 of the 1,241 counties register zero employment. The three county area of Lake and Porter in Indiana and Cook in Illinois, within the Chicago metro area, represent the largest concentration of the study area with 24,526 employees. This represents 10.7 percent of the 229,356 primary metal employees in the study area. The 18 county area adjacent to southern Lake Michigan from Manitowoc, WI to Mason, MI is host to 36,869 employees (16 percent). 15,974

employees (7 percent) are from the 10 counties adjacent to Lake Erie. Combined, roughly one out of four employees are located in these two regions. Other counties of note with high employment levels include 6,271 in Jefferson, AL (Birmingham metro area); 5,116 in Madison, IL (East St. Louis); and 4,877 in Stark, OH (Canton metro area).

Table 3.5: Industry Subsectors/Group and number of reshored instances from the Reshoring Initiative's database.

NAICS Industry Subsector or Group	Reshored Instances	Employment	Average LQ	Maximum LQ
NAICS 331: Primary Metal	52	229,356	3	160.3
NAICS 332: Fabricated Metal Product*	45	609,994	1.9	34
NAICS 326: Plastics and Rubber Products*	38	342,155	2.6	74.3
NAICS 336: Transportation Equipment*	36	689,367	2.3	55.9
NAICS 335: Electrical Equipment, Appliance, & Components*	34	147,968	1.9	91.6
NAICS 315: Apparel	32	17,783	2.4	174.2
NAICS 334: Computers and Electronic Products*	31	185,570	0.5	18.7
NAICS 333: Machinery*	25	505,296	2.3	54.1
NAICS 3391: Medical Equipment & Supplies	23	85,893	0.9	116.7
NAICS 337: Furniture & Related Product*	20	142,533	2.7	183.2
NAICS 311: Food	8	565,910	2.6	52.9
NAICS 314: Textile Product Mills	7	29,872	1.8	199.9
NAICS 316: Leather & Allied Products	6	10,672	4.1	872.3
NAICS 327: Nonmetallic Mineral Product	6	129,059	2.3	76.1
NAICS 321: Wood Product	3	149,640	5.8	124.8
NAICS 322: Paper	3	167,278	2.9	143.6

The Owensboro, KY and Evansville, IN metro areas are examples of less employment, but much higher levels of specialization. The Kentucky counties of Hancock and Henderson, and the Indiana counties of Perry, Spencer, and Warrick have location quotients of 160, 29, 23, 45, and 44 respectively, while accounting for 6,612 (or roughly 3 percent) employees. Other counties with high location quotients include Logan (103) and Carroll (84) in Kentucky, and Washington, AL (104).

6.2 NAICS 332: Fabricated Metal Product

The fabricated metal product manufacturing subsector is the second largest subsector by employment, and is generally ubiquitous throughout the study area with 1,096 of the 1,241 counties accounting for at least some employment. As was the case with the primary metal subsector, large concentrations of employment can be found in the counties adjacent to southern Lake Michigan and Lake Erie, and in particular the metro areas of:

- Chicago accounts for 55,441 jobs or roughly nine percent (Cook, DuPage, Lake, Kane, and Will in Illinois and Lake and Porter of Indiana)
- Cleveland-Akron-Canton-Lorain-Elyria accounts for 36,925 jobs or about six percent (Cuyahoga, Lake, Lorain, Stark, and Summit)
- Detroit accounts for 28,956 jobs or about five percent (Macomb, Oakland, and Wayne)
- Milwaukee accounts for 16,910 jobs or about three percent (Milwaukee and Waukesha)

Other metro areas of note include: Beloit, Birmingham, Cincinnati, Dayton, Elkhart-South Bend, Grand Rapids, Indianapolis, Kansas City, Knoxville, Lee's Summit, Louisville, Minneapolis-St. Paul, Muskegon, Rockford, St. Louis, and Wausau. All of the counties making up the metro areas listed above also have location quotients above one except for Hennepin, MN (Minneapolis-St. Paul); Jefferson, KY (Louisville); and St. Louis, MO. The counties with

the highest levels of location quotient specialization include: Van Buren, TN (34); Grant, AR (24); Osage, MO (22); Warren, IN (16); Mercer, IL (15); Jackson, TN (15); Washington, IN (15); and Putnam, IL (15).

6.3 NAICS 326: Plastics & Rubber Products

The Plastics & Rubber products manufacturing subsector is the fifth ranked industry in terms of employment and the sixth ranked industry in terms of average location quotient. The Chicago metro area is again the most concentrated region of the study area, with the three counties of Cook, DuPage, and Kane accounting for 20,037 jobs, or roughly six percent of the subsector's total. Cook County has a location quotient under one, but its employment total of 11,260 is much larger than the second ranked Kent County of Michigan with 8,030 employees (LQ of 4.2), and third ranked Macomb County of Michigan with 4,855 employees (LQ of 2.9). Other counties that scored high include: Jefferson, IL (employment of 3,750 and LQ of 35.6); Elkhart, IN (employment of 4,353 and LQ of 6.5); Summit, OH (employment of 4,385 and LQ of 3.1); Winnebago, WI (employment of 3,737 and LQ of 7.5); and Hancock, OH (employment of 3,339 and LQ of 14). Counties with the highest LQ's include Bracken, Hart, and Lewis of Kentucky (74.3, 51.3, and 45 respectively); Nevada and Miller of Arkansas (64.3 and 30.8); Perry, TN (53.8); and Wyandot, OH (33.4).

6.4 NAICS 336: Transportation Equipment

The transportation equipment manufacturing subsector is the largest by number of employees with 689,367, and has 40 counties that fall within the top one percent of combined employment and LQ's. The heart of the subsector's activity is located in the southern half of Michigan's Lower Peninsula, and most of Indiana and Ohio. The combination of Wayne, MI (35,064employment and 5.1 LQ) Elkhart, IN (30,069 employment and 23.1 LQ) and Macomb, MI (26,126 and 8 LQ) account for 13 percent of the subsector's employment and show high levels of specialization. Other counties of note are located throughout the study region and include: Jefferson (11,060 employees and an LQ of 2.4) and Scott (5,834 and 24.4) in Kentucky; Mobile (7,420 and 4.3), Tuscaloosa (5,480 and 6.5), Montgomery (5,290 and 4.5), and Talladega (3,961 and 14.4) in Alabama; Rutherford (6,828 and 6.1), Hamilton (5,063 and 2.5), and Blount (4,003 and 9.0) in Tennessee; Jackson (6,187 and 12.2) and Madison (5,597 and 10.7) in Mississippi; and Winnebago (6,070 and 6.3) in Wisconsin.

6.5 NAICS 335: Electrical Equipment, Appliance, & Components

The electrical equipment, appliance, and components subsectors' employment is heavily concentrated in a small number of counties: 230 counties contained 100 or more employees, and a total of 738 counties had zero employees. In general, this concentration is in the Great Lake states, and in particular the Chicago metro area up into the southeastern and south central Wisconsin, the Nashville metro area, and the extended Twin Cities metro area in Minnesota. Six counties ranked in the top one percent: Robertson, TN (3,924 employees and a location quotient of 82.3); Cook, IL (6,872 and 1.1); Sandusky, OH (4,176 and 67.1); Jones, MS (4,033 and 58.2); Iowa, IA (2,000 and 91.6); and Waukesha, WI (5,232 and 8.4).

6.6 NAICS 315: Apparel

With 17,783 employees, the apparel subsector was the second smallest for the 16 subsectors and groups under analysis, and by far the smallest employment number of the top ten. 902 of the 1,241 counties within the study area reported no employment, and only 47 counties reported employment estimates greater than 100. However, a number of counties are extremely specialized with the subsector accounting for nine of the 71 counties with LQ's greater than 64. Concentrations of activity are generally in non-urban areas, and is most pronounced within an interrupted corridor beginning in central Kentucky with Larue County and continuing south through Green, Taylor, Metcalfe, and Monroe counties in Kentucky, the eastern portion of Middle Tennessee including Clay, Macon, Dekalb, White, Grundy,

Coffee, Franklin, and also Rhea county in East Tennessee, and down through Dekalb, Cherokee, and Cleburne counties of eastern Alabama.

6.7 NAICS 334: Computers and Electronic Products

The computers and electronic products subsector ranked seventh in terms of employment levels, but ranked last in average LQ (0.5) as well as maximum LQ for county-industry pairs (18.7). 761 counties reported zero employment. A few areas within the study area stand out. Hennepin County in Minnesota accounted for 17,477 employees while also having an LQ of 2.8, but if the larger metro area of the Twin Cities is included, the combination of Hennepin, Anoka, Carver, Dakota, McLeod, and Ramsey account for 29,851 employees (16 percent of the study area's total) and all have LQ's greater than one. Olmstead (4,201 employees and LQ of 7.5) and Winona (1,493 and 9.4) counties, give Minnesota a second concentration of activity. The Chicago metro area including Cook County (9,987 employees and LQ of 0.61), and its adjacent counties of DuPage, Kane, Lake, and Will, account for 22,696 (12 percent) employees with average LQ of 1.2. Three counties along the I-94 corridor in Wisconsin (Milwaukee, Waukesha, and Dane) account for 12,192 employees while having LQ's of 1.7, 2.4, and 1.6 respectively. Madison County in Alabama accounted for 6,735 employees and an LQ of 6.2, while Linn County in Iowa hosted 6,542 employees with an LQ of 7.9. Other metro areas of note were Detroit and Cleveland.

6.8 NAICS 333: Machinery

The machinery subsector's geographical reach is somewhere in between the primary metal and fabricated metal subsectors in that there is almost continuous coverage of counties with employment from Ohio's eastern border to central Wisconsin and up through the Twin Cities metro area, and a total of 282 counties reporting zero employment. The Detroit metro area counties of Oakland (employment of 11,543 and LQ of 2.0), Macomb (11,273 and 4.5), and Wayne (6,485 and 1.2) represent just under six percent of the study area's employment with an average LQ of 2.6. The counties of Cook, DuPage, Kane, Lake, Will, and McHenry account for 31,994 employees with an average LQ of 1.66. Other areas of note include the Milwaukee metro area (Milwaukee County 7,947 and 2.0 and Waukesha County 6,764 and 3.4), the St. Louis metro area (St. Louis County 4,876 and 0.9 and St. Charles County 4,249 and 3.9), Cuyahoga County in Ohio (10,964 and 1.8), Hennepin County in Minnesota (9,322 and 1.2), Kent County in Michigan (8,749 AND 3.0), Black Hawk County in Iowa (6,520 and 10.6), and Auglaize County in Ohio (4,087 and 24.5).

6.9 NAICS 3391: Medical Equipment and Supplies

The medical equipment and supplies is the only industry under analysis that is at the four digit NAICS Industry group level. With 85,893 employees, the group is larger than even the 58,327 employees of the smallest three industry subsectors: Apparel (17,783), Textile Product Mills (29,872), and Leather and Allied Products (10,672). However, employment is concentrated in a relatively few metro areas with 732 counties having zero reported employment. Almost 15 percent of the employees (12,764) are located in the counties of the Twin Cities metro area: Hennepin (8,258 employees and 3.95 LQ), Ramsey (2,474 and 3.5), Carver (839 and 9.4), Anoka (655 and 2.4), and Dakota (538 and 1.3). Other areas of note include Kosciusko County in Indiana with 6,534 employees and an LQ of 78.5, Shelby County of Tennessee (Memphis metro area) with 4,643 employees and an LQ of 4.5, and the Bloomington, IN metro area with 819 employees and an LQ of 116.7 in Owen County and 3,802 employees and an LQ of 31.9 in Monroe County.

6.10 NAICS 337: Furniture and Related Product

The furniture and related product subsector accounted for 142,533 with 91 percent of the employment coming from only 238 counties, and 458 counties reporting zero employment. The largest concentration of industry activity within the study area can be found from central Alabama to northeastern Mississippi. This corridor hosts 22,167 employees, or 15 percent, and is highlighted by Pontotoc (5,443 employees and an LQ of 183.2) and Chickasaw (2,479 and 164.4) counties in Mississippi and Clay (1,009 and 116.9) and Coosa (375 and 130.9) counties in Alabama. The Grand Rapids-Holland-Muskegon metro areas is another hotspot of activity with 11,761 employees (roughly eight percent): Kent County (5,749 and 6.2), Ottawa County (3,959 and 14.3), Allegan (1,242 and 12.6), and Muskegon (811 and

5.6). The following five non-spatially related counties account for roughly 14 percent of the study area's employment: Trempealeau, WI (4,159 and 121.0); Dubois, IN (4,515 and 61.1); Cook, IL (4,695 and 0.7); Fulton, OH (2,276 and 53.3); and Elkhart, IN (3,758 and 11.6).

Chapter 4: Reshoring Project Scenario Development

1.0 Database Preparation

The Freight Analysis Framework (FAF) database is the publicly released freight database developed by BTS and FHWA. The FAF data integrates various database such as Commodity Flow Survey (CFS), International trade data from U.S. Census, USDA agriculture, forest service data, state reports, and Census report, to present a comprehensive freight movement within, out of, and into the U.S. [1] The FAF4, which is the latest version, was released in 2015. The FAF4 consists of 8 international trade regions and 132 domestic zones based on the CFS regions. The FAF4 also includes modes of transportation, commodity types by Standard Classification of Transported Goods (SCTG) code, freight tonnage and value by each origin-destination pair. One of the strength of the FAF data is that the FAF is the only public data which includes commodity-based freight Origin-Destination (O/D) data, international freight flow, and major transportation mode share.

The FAF4 is used in order to estimate new freight distribution after the reshoring. In addition, for this study, researchers have to consider international trade volume and foreign transportation mode. Therefore, the FAF4 is disaggregated as import, export, and domestic flow, and the reshoring freight volume is extracted from the imported freight volume from the East Asia, and the extracted volume is redistributed on the domestic zones.

2.0 Select Commodities

The FAF consists of the freight flows of 43 commodities classified by SCTG code. It is necessary to select commodities which will be reallocated. This study focuses on only manufactured commodities because the definition of reshoring is "the relocation of manufacturing facilities from traditional offshore locations to more attractive offshore locations or even home to the Unisted States" [2]. Thus, the manufactured commodities are selected out of 43 SCTG commodities.

Table 4.1: SCTG Commodities

SCTG	Context	SCTG	Context	SCTG	Context
1	Live animals/fish	16	Crude petroleum	31	Nonmetal min. prods.
2	Cereal grains	17	Gasoline	32	Base metals
3	Other ag prods.	18	Fuel oils	33	Articles-base metal
4	Animal feed	19	Coal-n.e.c.1	34	Machinery
5	Meat/seafood	20	Basic chemicals	35	Electronics
6	Milled grain prods.	21	Pharmaceuticals	36	Motorized vehicles
7	Other foodstuffs	22	Fertilizers	37	Transport equip.
8	Alcoholic beverages	23	Chemical prods.	38	Precision instruments
9	Tobacco prods.	24	Plastics/rubber	39	Furniture
10	Building stone	25	Logs	40	Misc. mfg. prods.
11	Natural sands	26	Wood prods.	41	Waste/scrap
12	Gravel	27	Newsprint/paper	43	Mixed freight
13	Nonmetallic minerals	28	Paper articles	99	Unknown
14	Metallic ores	29	Printed prods.		
15	Coal	30	Textiles/leather		

First of all, we excluded raw materials such as grains, live animals, crude petroleum, and coal. Only manufactured product commodities are targeted for this study. As a result, 27 commodities are remained as shown below table. Secondly, we found top 10 high volume of the imported freight and high value of the imported freight. The shaded cells indicate the top 10 high volume and/or high value of the imported commodities.

Table 4.2: Manufacturing commodities

SCTG*	Context	SCTG*	Context	SCTG*	Context
3	Other ag prods.	23	Chemical prods.	33	Articles-base metal
4	Animal feed	24	Plastics/rubber	34	Machinery
6	Milled grain prods.	26	Wood prods.	35	Electronics
7	Other foodstuffs	27	Newsprint/paper	36	Motorized vehicles
8	Alcoholic beverages	28	Paper articles	37	Transport equip.
9	Tobacco prods.	29	Printed prods.	38	Precision instruments
20	Basic chemicals	30	Textiles/leather	39	Furniture
21	Pharmaceuticals	31	Nonmetal min. prods.	40	Misc. mfg. prods.
22	Fertilizers	32	Base metals	43	Mixed freight

Table 4.3: Top 10 high volume of FAF commodities

SCTG	Commodity	Volume (kilo tons)
35	Electronics	738.3645
30	Textiles/leather	238.4514
34	Machinery	126.9870
40	Misc. mfg. prods	75.1732
38	Precision instrument	65.3190
24	Plastic/rubber	64.5182
36	Motorized vehicles	60.4785
33	Articles-base metal	42.9283
39	Furniture	23.5605
31	Nonmetal min. prods.	19.8424

Table 4.4: Top 10 high value of FAF commodities

SCTG	Commodity	Value (Thousand dollar)
35	Electronics	133,767.7136
38	Precision instrument	9,338.9908
34	Machinery	9,163.7389
40	Misc. mfg. prods	7,415.5474
30	Textiles/leather	6,425.5229
36	Motorized vehicles	3,105.8881
23	Chemical prods.	1,767.8810
20	Basic chemicals	1,548.9620
24	Plastics/rubber	1,421.0461
33	Articles-base metal	1,391.7202

Lastly, we compared the result with the reshored industries reported by Reshoring Initiative. Reshoring Initiative reported top 10 reshored industries as shown below [3];

Table 4.5: Top 10 reshored industries

Industry	Jobs	Cases
Transportation Equipment	19046	30
Electrical Equipment, Appliances, Components	12120	47
Computer/Electronic Products	6783	24
Food	2938	9
Machinery	2795	16
Apparel/Textiles	1954	37
Fabricated Metal Products	1749	25
Wood Products	1028	17
Medical Equipment	628	13
Hobbies	581	22

Through the selection step, we select 17 commodities out of 43 commodities.

3.0 Select Reshoring Regions

The next step is to identify the target regions where the already offshored manufacturing will be relocated. According to the Reshoring Initiative, total 263 companies brought back their off-shored manufacturing to U.S., and it generated new 48,865 jobs at 39 states. For the first option to build the reshoring scenarios, we should consider current reshoring trend based on the statistics, therefore 12 states where jobs were created more than 1,000 are selected as the regions where the reshored manufacturing activities are to be performed [3].

We also assume that the reshored manufacturing are relocated in the Midwest, Southern, or East Coast regions. Therefore, we select the 10 target states which are SC, TX, KY, GA, TN, OH, MI, NY, NC, and KS. Then one FAF zone where number of employment is biggest in each zone is selected. The selected target reshoring regions are shown in the Table 4.6. In addition, the regions highlighted in read represent the geographical position of the reshoring target regions.

Table 4.6: Reshored manufacturing and jobs by state

State	Jobs	Cases	Jobs/Facility	FAF zone
SC	7,780	7	1111	Rest of SC (459)
TX	3,712	12	309	Dallas-Fort Worth (113)
KY	4,612	5	922	Rest of KY (209)
GA	3,005	7	429	Atlanta (131)
TN	2,490	11	226	Rest of TN (479)
OH	3,611	18	201	Cleveland (392)
MI	6,721	13	517	Detroit (261)
NY	1,089	17	64	New York (363)
NC	1,020	14	73	Greensboro-Winston-Salem-High Point (372)
KS	1,000	2	500	Rest of KS (209)

According to the FAF4, in 2012, the imported freight volume from East Asia and major international trade ports are listed in Table 4.7. The ports selected for this study are highlighted. Top 16 ports receive more than 95 percent of the imported volume and we select top 15 ports excluding Chicago because

of lack of Chicago port data such as statistics or the port capacity. The regions highlighted in blue in Figure 4.1 show the geography of FAF zones that present the selected trade ports.

Table 4.7: Imported Volume at the Ports in 2012

Port	Kilo Ton	Value	Cumulative percent
LA	30,961.0863	192,361.0809	0.367
Houston	10,633.4711	25,617.4693	0.494
NY (NJ)	8,083.9842	44,034.8503	0.589
Savannah	5,506.2950	28,016.8391	0.655
San Fran	4,921.4855	23,412.1456	0.713
Seattle	4,282.5861	27,056.8818	0.764
Portland	2,491.8232	9,901.9556	0.794
Norfolk	2,184.6046	10,639.8051	0.819
Baltimore	1,856.3566	8,325.3168	0.842
Chicago	1,770.1859	11,904.8114	0.863
Charleston	1,764.9452	7,656.4365	0.883
Miami	1,422.3752	5,982.1673	0.900
Philadelphia	1,384.4131	4,799.8860	0.915
New Orleans	1,327.1229	2,121.7207	0.932
Mobile	1,172.1642	2,591.4640	0.946
Rest of NC (Wilmington)	751.0942	2,669.6502	0.955
Jacksonville	709.5616	5,013.2464	0.964
Boston	607.2599	3,443.7053	0.971
Honolulu	458.5264	562.1499	0.976
Rest of GA	420.4475	4,390.2163	0.981

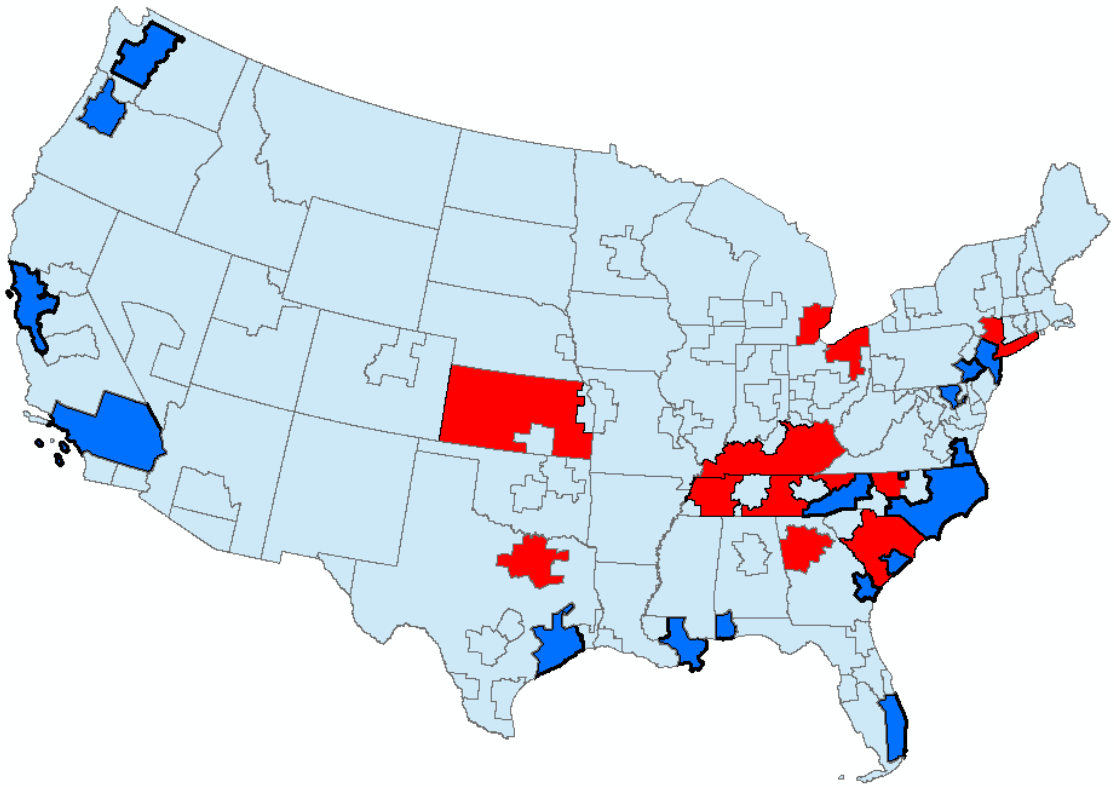

Figure 4.1: Reshoring Target Regions and International Trade Ports

4.0 Sensitivity Analysis

It is not easy to estimate how much manufacturing activities will be brought back to U.S. In this project, we conduct the sensitivity analysis on the assumption of the various reshoring proportions of the 17 reshoring commodities. We assume the proportions from 5 percent up to 20 percent incrementally 5 percent.

- Scenario 1: 5 percent of the imported freight volume will be reallocated to U.S.
- Scenario 2: 10 percent of the imported freight volume will be reallocated to U.S.
- Scenario 3: 15 percent of the imported freight volume will be reallocated to U.S.
- Scenario 4: 20 percent of the imported freight volume will be reallocated to U.S.

5.0 Estimation of the Reshoring Freight OD matrices

For the last step, we decide the estimation methodology for the freight flow matrices. In this project, we use the 'Fratar Trip Distribution Technique' to estimate the expected OD matrix. The advantage of the Fratar method is that the method can reflect current flow trend. The Fratar method is good for estimating expected O/D matrix in conjunction with current freight flow. However, the Fratar has several limitations. The first limitation is that it cannot capture the transportation cost variation. For example, if we extract 20 percent of imported volume evenly from all of states, the imported volume of California also will be decreased. Then, California must import the reduced commodity volume

from reshoring area such as Tennessee or Kentucky. The case may increase total transportation costs. The second limitation is that the calculation is too complex. The estimation method result in gaps of total volume between original data and estimated data, but the Fratar cannot guarantee the premise that is at least all of destination volume of each destination must be same with the original data. Therefore we assume that consumers will select suppliers with lowest transportation costs, and develop a transportation optimization model to estimate the expected O/D matrix.

A transportation optimization model is developed to estimate the minimum total transportation costs. Consider a directed graph, G(N,A) comprised of a set N of nodes and a set of directed arcs connecting a pair of nodes. The set of nodes N consists of four categories of the nodes; 1) the set of international ports i, 2) the set of reshoring target nodes j, 3) the set of final destination nodes k and international trade partner Asia A. The objective function and constraints for the linear optimization procedure are described as below.

(Objective Function)

$$\text{Min} \sum_{Ai} OceanCost_{Ai} x_{Ai} + \sum_{i}\sum_{k} InlandCost_{ik} x_{ik} + \sum_{j}\sum_{k} InlandCost_{jk} y_{jk}$$

The OceanCost denotes shipment costs from Asia to port i, the InlandCost represents truck cost from ith origin to kth destination or from jth origin kth destination. The imported volume via ith port to kth destination is denoted as x_{ik}, the reshored freight volume from jth origin to kth destination is represent as y_{jk}. The both imported and domestic volume include all of 9 commodities volume.

(Constraint 1)

$$\sum_{i} x_{Ai} = Total\ Freight\ Volume\ of\ selected\ commodities\ from\ East\ Asia$$

(Constraint 2)

$$\sum_{i} x_{Ai} - \sum_{j}\sum_{k} x_{ik} = 0$$

(Constraint 3)

$$\sum_{j}\sum_{k} y_{jk} = Total\ Expected\ Reshoring\ Freight\ volume$$

(Constraint 4)

$$\sum_{i} x_{ik} + \sum_{j} y_{jk} = Total\ Freight\ Volue\ of\ Domestic\ Destination\ k$$

(Constraint 5)

$$x_{Ai} \leq Capacity\ of\ port\ i$$

(Constraint 6)

$$\sum_{i} x_{Ai} \leq Capacity\ of\ the\ Panama\ Canal\ (i = East\ \&\ Gulf\ coast\ ports)$$

Constraint 1 specifies the total imported freight volume from East Asia to port i. Constraint 2 ensures that all of the imported volume must be distributed to destination k. Constraint 3 specifies the total reshored commodity volume on the 7 target regions. Constraint 4 ensure the total consumption of the destination k. Constraint 5 guarantee that the imported volume via port i should not exceed its capacity. Constraint 6 specifies that the total imported volume of

East & Gulf Coast ports should not exceed the Panama Canal capacity. The port capacities are referred to MARAD data. The biggest import metric tons are selected from 2000 to 2015 of the MARAD statistics [4], then the metric tons are converted to short tons. The calculated results are used as the port capacities. The Panama Canal capacity is referred to the literature, and the capacity is doubled because of the Panama Canal expansion [5].

7.0 Results

The results of optimization are summarized in the Table 4.8 and 4.9. The scenarios prepared before are analyzed by the developed optimization model. The Table 8 denotes changes of imported volume at port I and the Table 8 represents the target reshoring regions. These analysis focuses 17 target reshoring commodities, and other imported commodities are not considered in this optimization. As shown in Table 8, some of ports will be significantly affected by reshoring. For example, the imported target commodities through the port of Savannah will be decreased almost 70 percent compared to scenario 1, and the imported volume through New Orleans, Baltimore, and New York ports will be decreased more than 30 percent. The drop rate is much higher than reshoring rate. On the other hand, it is estimated that no changes of imported volume through the port of Mobile, San Franscisco, Miami, Wilmington, Portland, and Norfolk will be in 2020 after the reshoring.

The results of the imported freight flow via the ports to domestic destinations are shown at the figure 4.2 to 4.5. The port of Savannah is expected to be the biggest import ports at the East Coast. The port will cover Birmingham, AL and Nashville, TN when 5 percent of imported volume will be reshored and after the Panama Canal will be expended. However, as the reshoring volume will be become larger, the East Coast ports will supply closer area whereas inland reshoring target regions will have bigger market share. The market shares of the reshoring target regions expected is shown at the Figure 4.6.

Table 4.8: Assigned Imported Volume (Thousand Tons) at the Ports after Reshoring

Port	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Mobile	851.776	851.776	851.776	851.776
Los Angeles	22,498.253	21,541.639	21,508.104	21,451.006
San Francisco	6,895.319	6,895.319	6,895.319	6,895.319
Miami	1,545.017	1,545.017	1,545.017	1,545.017
Savannah	5,389.898	4,779.393	1,767.733	1,767.733
New Orleans	1,849.668	1,207.480	1,207.480	1,207.480
Baltimore	1,895.312	1,581.192	1,581.192	1,281.392
New York	8,400.033	8,299.499	8,299.499	5,147.077
Wilmington	988.321	913.690	812.516	812.516
Portland	838.892	838.892	838.892	838.892
Philadelphia	2,729.546	2,729.546	2,729.546	2,729.546
Charleston	2,152.508	1,732.374	1,732.374	1,732.374
Houston	9,416.654	8,985.298	8,400.857	8,135.939
Norfolk	1,233.182	1,233.182	1,233.182	1,233.182
Seattle	5,026.116	4,801.963	4,758.535	4,758.535

Table 4.9: Assigned Reshoring Volume (Thousand Tons)at the Target Regions

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Atlanta (131)	0.000	0.000	3,011.660	3,011.660
Rest of KS (209)	286.849	400.132	443.560	443.560
Rest of KY (209)	964.179	1,150.328	1,150.328	1,150.328
Detroit (261)	1,967.436	2,163.816	2163.816	2,163.816
New York (363)	0.000	0.000	0.000	3,091.154
Greensboro-Winston-Salem-High Point (372)	0.000	455.302	556.475	556.475
Cleveland (392)	353.339	734.921	734.921	1,095.988
Rest of SC (459)	0.000	0.000	0.000	0.000
Rest of TN (479)	202.326	1,331.020	1331.020	1,331.020
Dallas-Fort Worth (113)	0.000	1,312.846	1930.822	2,252.837

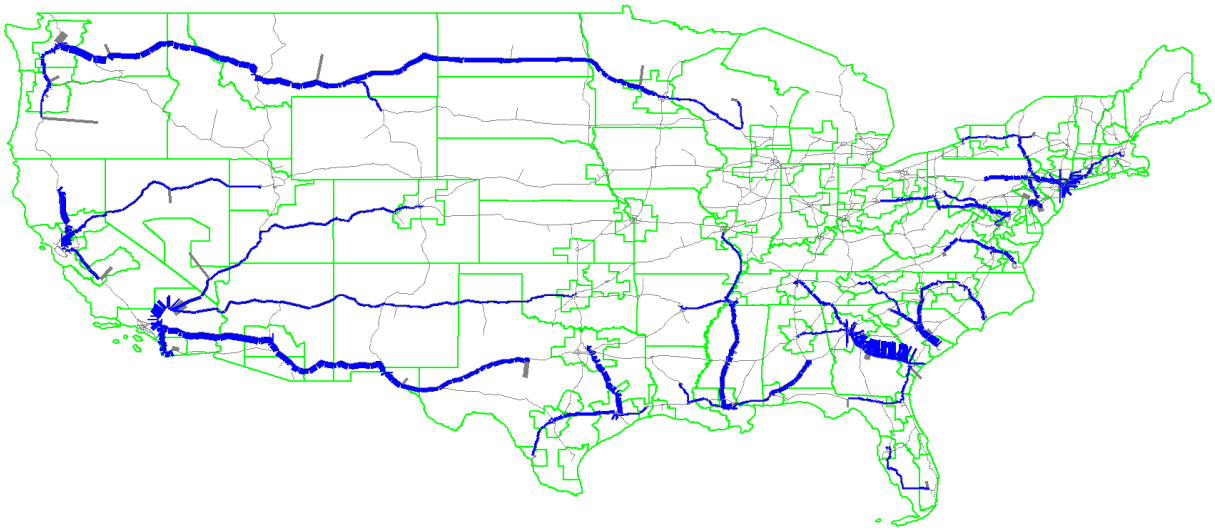

Figure 4.2: Assignment Result of Scenario 1

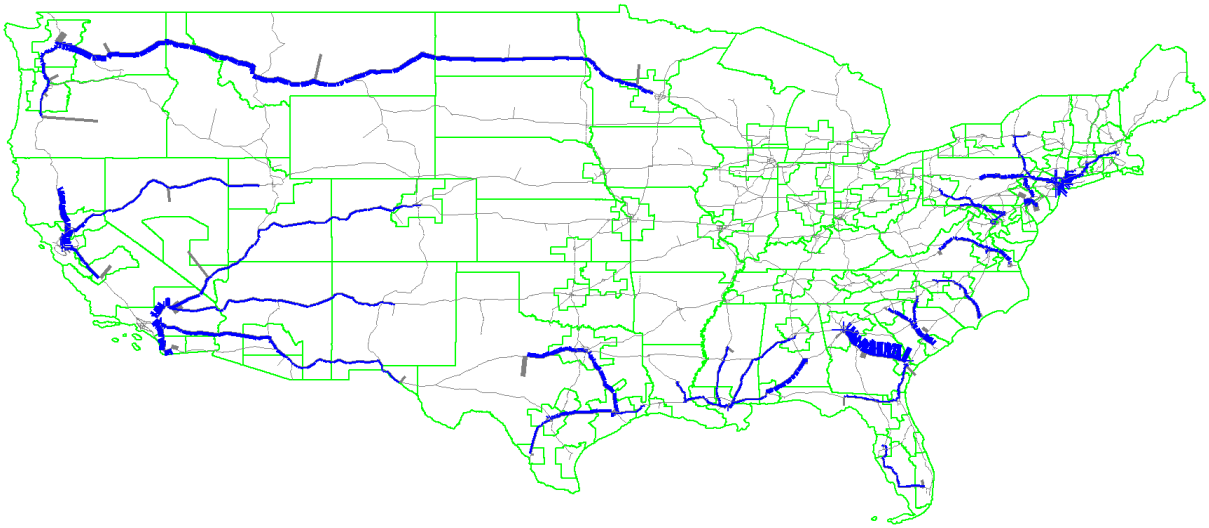

Figure 4.3: Assignment Result of Scenario 2

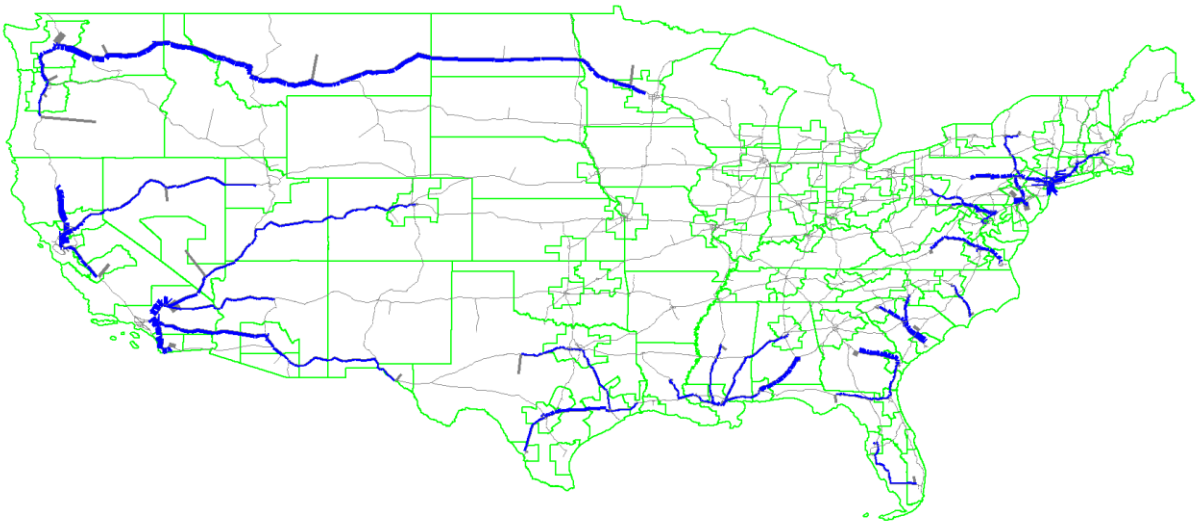

Figure 4.4: Assignment Result of Scenario 3

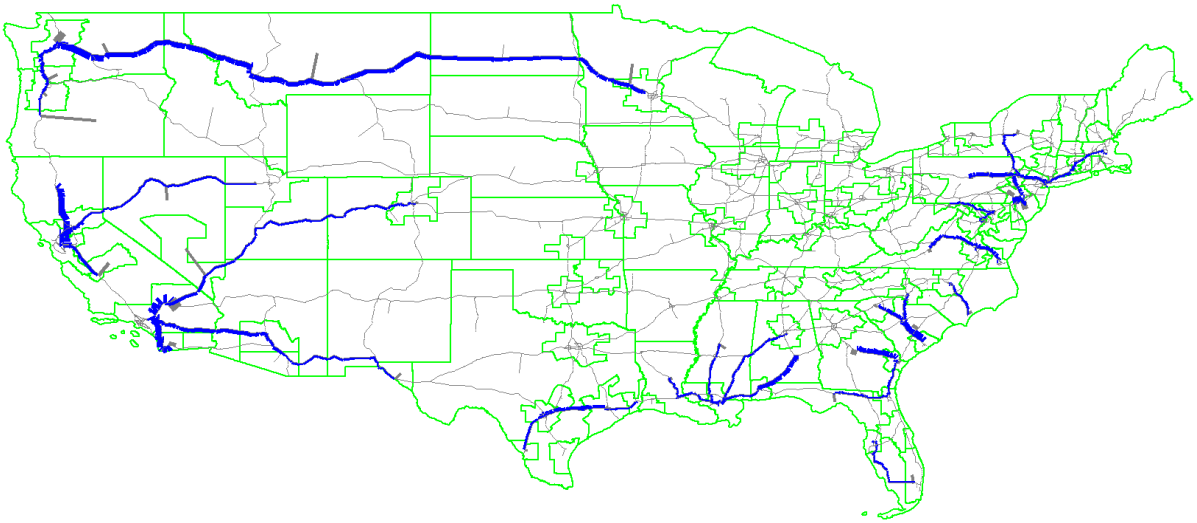

Figure 4.5: Assignment Result of Scenario 4

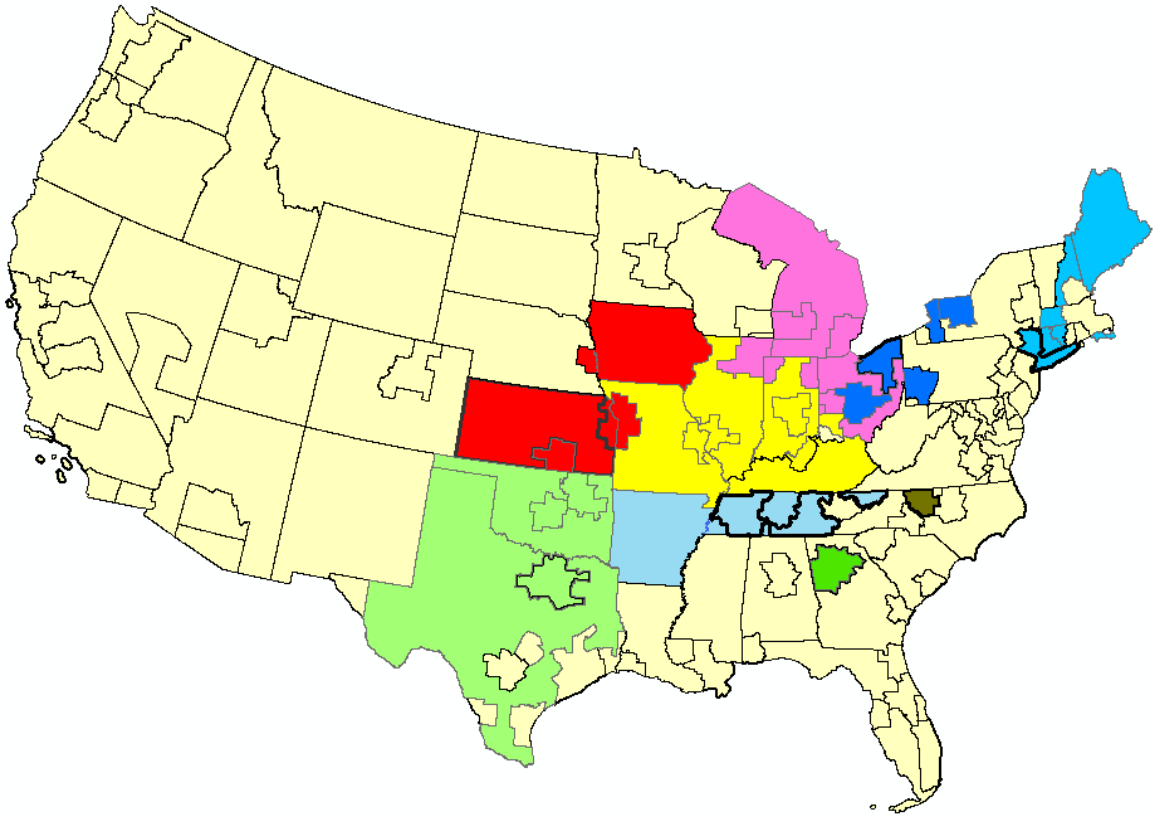

Figure 4.6: The results of the imported freight flow via the ports to domestic destinations

8.0 Conclusion

Four reshoring scenarios are considered in this study in order to estimate freight flow after the reshoring. As reshoring volume is increased, the imported volume through some of ports are decreased. Especially the volume via East Coast and Gulf Coast ports are decreased more than West Coast ports. In this study, LA/LB port, San Francisco port, Portland port, and Seattle-Tacoma port are considered. Only around 5 percent volume at LA/LB and Seattle-Tacoma ports is decreased, the other imported freight volume via San Francisco and Portland is not decreased in scenario 4 compared to scenario 1. On the other hand, East Coast ports have less than 30 percent of imported volume in scenario 4 compared to scenario 1. The total transportation cost is gradually decreased in the each scenario. It means the truck transportation cost from reshoring target regions to closer consumption regions is cheaper than the import transportation cost via East Coast ports. Moreover, the volume of target commodities consumption in the East of Mississippi river regions is higher than the West of Mississippi regions, therefore, it is expected that the reshoring volume will be highly supplied to the Midwest or Southeast regions compared to the West of Mississippi regions.

9.0 References

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Chapter 5: Economic Impact of the Reshoring Supply Chain in the Mid America Region

1.0 Introduction

The phenomena of reshoring, the return of previously off-shored manufacturing to the US, has sparked considerable debate on its potential change to the US economy and transportation system. Some researchers forecast a limited impact, while others view the documented return of some US businesses as a manufacturing renaissance. The paper analyses the economic impact of reshored companies on the Mississippi river basin region of the US. Based on the Reshoring Initiative database of reports of reshoring, a total 13,043 direct manufacturing jobs were added to the regional economy. With the multiplier effect, the aggregate effect on jobs amounts to 64,795 jobs, representing less than 2 percent of the total amount of manufacturing jobs in that region. Most of the regional supply chain demand (75 percent) can be satisfied from within the Mississippi river basin limiting the impact on the transportation networks into the region. This highlights the importance of a regional supplier base for increasing the attractiveness of reshoring for American businesses. Some sectors, including electronic component and electro medical and control instruments manufacturing, will likely increase transportation requirements into the region. Possible ports of entry are identified and more data driven research is recommended.

2.2 Economic impact of reshoring

While no in-depth studies were found on the potential effect of reshoring on creating jobs, a number of studies did estimate that job creation from reshoring could reach 500,000 to 6,000,000 based on different scenarios (Nash-Hoff, 2016). This would be a 4 percent to 40 percent increase of the approximately 14 million manufacturing jobs in the US today. According to the Reshoring Initiative (2016) reshoring and related FDI trends continued strong in 2015, adding 68,000 jobs and bringing the total number of manufacturing jobs brought from offshore to over 249,000 since the manufacturing employment low of 2010. According to the Boston Consulting Group, reshoring combined with higher U.S. exports could add 2.5 million to 5 million jobs by the end of the decade (Sirkin, Zinser, et al. 2011). In perspective, the US outsourced 2.4 million manufacturing jobs to China between 2001 and 2013 (Kimball and Scott 2014).

Several industries have been identified as having the greatest potential for reshoring (Sarder and Nakka 2014). Reshoring is being led by manufacturers of transportation equipment; electrical equipment, appliances and components; and computer and electronic products (Duran 2015). According to A.T. Kearney, electrical equipment, appliance and component manufacturing, transportation equipment manufacturing, and apparel manufacturing are the industries which are reshoring (Van den Bossche and Gupta 2014). Boston Consulting Group identified fabricated metals, fabricated metals, transportation goods, appliances/electrical equipment, computers and electronics, machinery, and furniture as having the most potential for reshoring (Sirkin, Rose, et al. 2012). These industries differ slightly from the list of companies that have reshored compiled by the Reshoring Initiative (See Table 5.1). The reshoring of apparel in particular is an area of difference (Bishop, Bhola, et al. 2011). Each of these industries has its own supply chain so the jobs and transportation impact will vary depending on the industry mix from a “pre-reshored” to a “post-reshored” framework.

Table 5.1: Reshoring Industries by Number of Companies

Industry	Reshoring Initiative Numbers	Boston Consulting Group Identified
331 Primary metal	52	
332 Fabricated metals	45	Yes
326 Plastics and rubber	38	Yes

336 Transportation goods	36	Yes
335 Appliances/electrical equipment	34	Yes
315 Apparel	32	
334 Computers and electronics	31	Yes
333 Machinery	25	Yes
339 Misc. Mfg.	23	
337 Furniture	20	Yes
311 Food Mfg.	8	
314 Textiles	7	
316 Leather	6	
327 Mineral Mfg.	6	
321 Wood	3	
322 Paper	3	
334 Electronics	2	

Source: Reshoring Initiative 2016.

A study performed by Iowa State University found reshoring activities positively impact the incremental job growth of the area. The study estimated the manufacturing jobs in the area would increase by 5,000 new jobs (Basu, 2015). This represents approximately 2 percent of the Iowa's total manufacturing jobs. The author's conclusion is that job growth in Iowa will continue to experience small incremental increases following U.S. manufacturing trends in reshoring and general growth in the sector.

Other studies, particularly those from A.T. Kearney, claim that reshoring is not impacting U.S. manufacturing employment as claimed. There was an overall increase in U.S. manufacturing for five straight years since 2009, but imports of offshored manufactured goods into the U.S. increased at a faster rate than any return of manufacturing operations (Van den Bossche and Gupta 2014). Nager and Atkinson (2015) claim reshoring numbers are modest and the manufacturing sector is still sending jobs overseas, roughly at the same rate as those returning. In a more recent study Van den Bosshe and Gupta, et al. (2015) found that reshoring has stalled and off-shoring is increasing leading them to speculate that the reshoring phenomenon is a one-off aberration. Janssen, Dorr, et al. (2012) confirms that China is indeed losing its competitive position rapidly, but few of the jobs requiring low-skill workforce will ever return to advance economies, most of them preferring to move to other low-cost countries. As Harrington (2011) comments, the reshoring debate continues, but shifting perspectives on supply chain management, coupled with the realities of total landed cost continue to drive change.

2.3 Methodologies used for impact of reshoring research

Since the body of economic impact studies on reshoring is limited, studies of the economic impact of outsourcing were considered for this research. There are a number of studies which measure the impact of offshoring but so far there does not seem to be a consensus on the methodology. Some of the studies focus on labor markets (Feenstra, 2001) and more recent studies focused on the impacts of offshoring on employment, other recent studies have also examined the impacts on productivity. Baldwin (2009) analyzes the impacts of offshoring using an aggregate production function that "expresses gross output as a function of intermediate input and value added" (p. 29). In order to use the research methodology proposed, the formula requires variables such as capital input, labor input, and time, variables commonly used in previous studies about productivity.

Tackling the economic impact of offshoring on skilled workers, Yan (2006) examines the demand for non-production workers relative to production employees in Canadian manufacturing industries. The study is using a regression equation in levels. Foreign outsourcing calculated as the purchase of imported foreign intermediate inputs is one of the variables from the regression, which tries to explain the shift towards the use of skilled workers. The study also

used data from 84 Canadian manufacturing industries over a given period, observing the impact of ICT and foreign outsoucing on the relative demand for skilled workers. The data used in the study are drawn from KLEMS (Capital, Labour, Energy, Material and Services) Productivity dataset; the Annual Survey of Manufacturers (ASM); and the Input-Output tables from Statistics Canada. (Olsen, 2006) approaches the economic impact of offshoring with a similar methodology. The analysis estimates labour productivity through a production function framework. The article also mentions other less frequently used approaches such as estimation of total factor productivity (TFP), TFP growth breakdowns and ANOVA analysis.

A different approach by Phang (2014) to study the economic impact on the Oklahoma Manufacturing Sector considers three factors: Population, Labor Force, and Employment. Using REMI, the model analyses the incremental impact of manufacturing on Gross Regional Product (GRP) Employment, Income, Capital Stock, Taxes, Output, and more. REMI helps general forecasts based on key assumptions and historical data, presenting data using an input-output mode, general equilibrium, econometrics, and economic geography. The study uses the primary national, state, and county data from the Bureaut of Economic Analysis (BEA) and other historical relevant data from U.S. Census Bureau, Bureau of Labor Statistics (BLS), State Employment Security Agencies (ESAs), Energy Information Administration to forecast future economic changes. Running scenarios in REMI, the model can predict "loss of jobs, output, real disposable personal income and other vital economic variables" (Phang, 2014) if certain scenarios happen. In order to run the model, the study used employment data from the REMI baseline as primary data inputs, which is gathered automatically by REMI from the Bureau of Economic Analysis (BEA).

Given a lack of methodology foundation, a standard Input/Out model was used for this study. Economic input-output (I/O) analysis generates estimates of these indirect economic impacts referred to as "multiplier effects" or commonly known as "ripple effects." Multiplier effects measure the impact on output, income, and employment resulting from an increase in final demand. An increase in final demand (e.g., an additional dollar of output or employee compensation or one additional job in the sector) results in a total increase in output or employment in the economy equal to its multiplier. In this regard, multipliers estimate the amount of direct, indirect, and induced effects on income or employment that result from each additional dollar of output, additional job, and additional dollar of employee compensation in a sector.

3.0 Methodology

In an attempt to study the impact of the reshoring companies from various countries to the US, the paper uses the input-output economic modelling tool EMSI, on a preselected region comprised of several states. Reshoring Initiatives database of companies that reshored in US, the location where they locate, and the number of new jobs opened in the area are considered as inputs in the input-output scenario. It should be noted that companies which have moved overseas manufacturing to Mexico and Canada (i.e., nearshoring) are not included in the analysis, but their supply chains would likely create US job growth. Thereafter, the paper analyses the companies' supply chain and the major ports of entry in U.S. where those companies would receive materials needed for production.

According to the Reshoring Initiative research, based on numerous surveys, research, and case studies, in the years 2010-2015, over 300 companies brought back their off-shored manufacturing to U.S., bringing back approximately 248,000 jobs back to the US from offshore (Harry, 2015). However, for the purpose of this study to have a closer observation of the impact scenario in transportation, the study focused on the region comprised of the following 14 states: Alabama (AL), Arkansas (AR), Illinois (IL), Indiana (IN), Iowa (IA), Kentucky (KY), Louisiana (LA), Michigan (MI), Minnesota (MN), Missouri (MO), Mississippi (MS), Ohio (OH), Tennessee (TN), and Wisconsin (WI), which from henceforth on shall be abbreviated to CFIRE region (Center for Freight & Infrastructure Research & Education). The Figure 1 below maps the above mentioned states, providing a visual representations of the studied area.

The initial assumption is that companies who choose to relocate in this area, will choose the closest possible location to their suppliers and, if needed, will import from the nearest port of entries in the North, East, and South-Eastern part,

to minimize the transportation cost of their supply chain. The possible ports of entry for each were identified using the United States International Trade Commission (USITC) database, which can sort by NAICS codes.

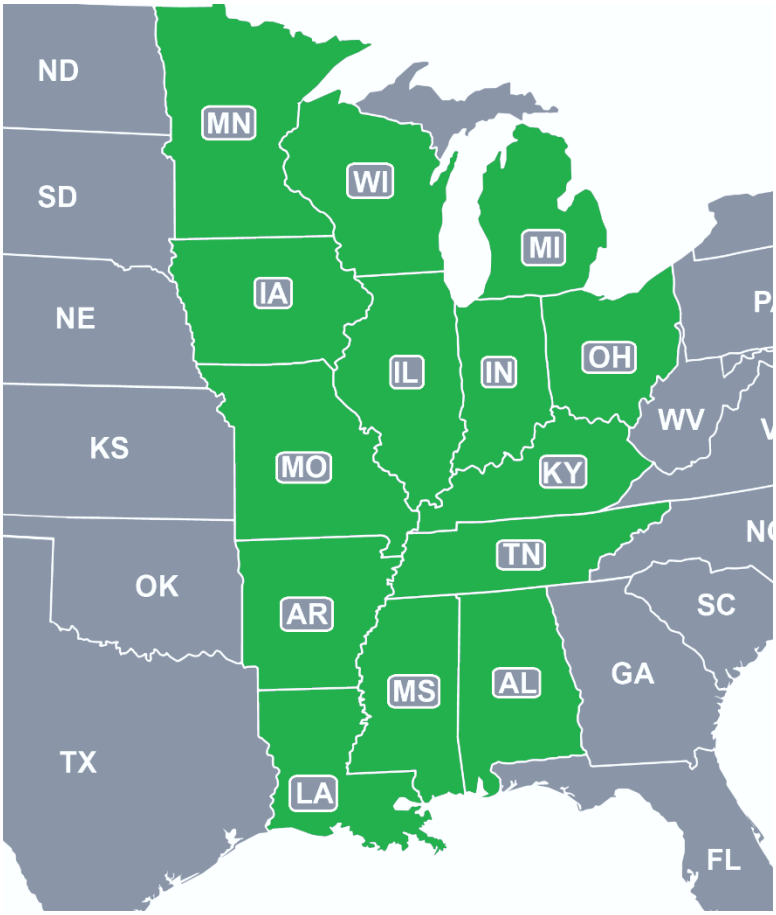

Figure 5.1: States comprised in the reshoring studied region (CFIRE region)

A full list of all the companies that reshored fully or part of their production back to this region, registered as of December 2015, is provided in the Appendix A. The database has been adopted from the Reshoring Initiative list of companies that reshored in US. The total number of companies operate in 30 different industries as listed in the fifth column named "NAICS" in the Appendix A. Using these inputs, the paper conducts an Input-Output Impact scenario using the Economic Modelling tool, EMSI to observe the economic impacts on the earnings, sales, and total number of jobs affected in the region. The next step is observing and interpreting the supply chain analysis, and regional demand of those industries under the Strategic Planning section of the EMSI database. These provided information on the percentages of the total amount satisfied in and out of the region. After the observations on economic impacts, the paper looks at the United States International Trade Commission (USITC) database for the U.S. general imports for the companies under the NAICS codes studied, and IBISWorld to get a better idea on their supply chain. The generated report helped in estimating the impact on the freight and transportation for the area. The data was imported in excel and sorted by the highest value of commodities imported and then mapped to provide an overview of the major port of entry locations.

4.0 Impact study findings

The total number of jobs calculated from 2010 to 2015 amounts to approximately 13,043 new direct jobs generated due to reshoring. This value represents 1.91 percent of the total manufacturing jobs for those industries in the studied region, which is estimated at 680,803 for the year 2015 (EMSI, 2016). The EMSI Input-Output model data shows that the aggregate changes in the initial, direct, indirect, and induced should bring a change of 64,795 jobs, as shown in the Figure 2 below. The initial 13,043 jobs will have a direct impact of 9,580 jobs, according to EMSI I/O scenario of the ripple effect calculation in jobs. The indirect impact will create approximately 7,763 jobs, representing 12 percent of the total impact. The majority of the jobs impacted (53 percent) will be from the induced jobs ripple effect, which is due to the impact of the new earnings, investment, and government created by the initial, direct, and indirect changes. The induced effects are calculated in-house by the economic modelling tool EMSI using data from the Bureau of Economic Analysis (BEA). "It states that induced effects enter the economy as employees spend their paychecks in the region, businesses invest to grow their operations, and government spends more to support the changes" (EMSI 2016, nd).

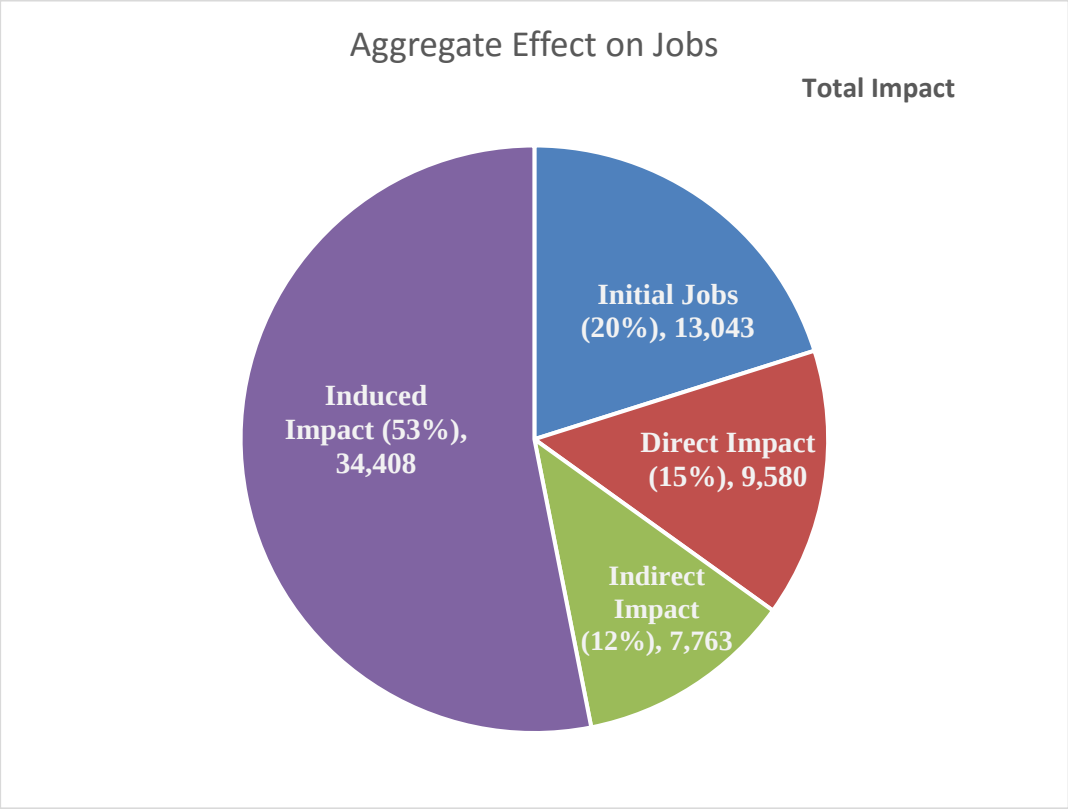

Figure 5.2: Aggregate Effect on the initial new jobs created in the CFIRE region

The manufacturing companies reshoring in the region will affect industry earnings and sales in the region. Table 5.2 below presents the aggregate economic effects on the manufacturing industry in the region. The initial impact on earnings are a little over $1 billion, with a direct effect of $647 million. The impact on sales is significantly greater with an initial impact of $6,5 billion and a direct effect of $2,6 billion. The total economic impact in the region amounts to $3.5 billion in earnings and $14 billion in sales. These changes can have significant impacts on the transportation of commodities in and out of region.

Table 5.2: Aggregate Economic Impact Scenario on the manufacturing industry

	Impact on Earnings	Impact on Sales	Total Jobs
Initial	$1,067,564,738	$6,579,857,755	13,043
Direct	$647,842,995	$2,626,093,809	9,580
Indirect	$431,708,680	$1,499,454,422	7,763
Induced	$1,450,266,184	$3,973,976,147	34,408
Total Impact	**$3,597,382,597**	**$14,679,382,133**	**64,794**

Table 5.2 presents ten of the companies with the most job openings and job announcements, based on the reshored companies list. The predominant industry in the studied region is household appliance manufacturing, motor vehicle parts, and motor vehicle manufacturing. These industries and their supply chain are expected to be most affected by the overall changes. General Electric is on the top of the list with household appliance industries, bringing 3,000 jobs back, followed by motor vehicle manufacturing and motor vehicle parts manufacturing of General Motors and Ford companies. According to IBISWorld, the household appliance manufacturing industry (NAICS 33522) supply industries are electrical equipment manufacturing, hose & belt manufacturing, plastic pipe & parts manufacturing, polystyrene foam manufacturing, laminated plastic manufacturing, and steel rolling and drawing (IBISWorld, 2016). Most of these supply industries can be found within the region or imported from Eastern US ports. Similarly, most the motor vehicle manufacturing supply industries demand can be satisfied within the region.

Table 5.3: Top Reshoring companies ranked by total number of new jobs openings

Company Name	Jobs	Year	State	NAICS	NAICS Description
GE	3,000	2014	KY	3352	Household Appliance Manufacturing
GM - TN	1,800	2014	TN	3363	Motor Vehicle Parts Manufacturing
Ford - MI	1,400	2013	MI	3361	Motor Vehicle Manufacturing
Ford - OH	1,400	2015	OH	3361	Motor Vehicle Manufacturing
Made in America Seating	510	2014	TN	3372	Office Furniture (including Fixtures) Manufacturing
Ford - OH	450	2014	OH	3363	Motor Vehicle Parts Manufacturing
GE	400	2012	KY	3352	Household Appliance Manufacturing
Renfro - AL	257	2011	AL	3151	Apparel Knitting Mills
Suarez Manufacturing	250	2011	OH	3352	Household Appliance Manufacturing
Heinz	249	2013	OH	3114	Fruit and Vegetable Preserving and Specialty Food
…	…	…	…	…	…
TOTAL	9,716				

The supply chain analysis provided by the economic modelling tool EMSI helped with the observation of the impact the reshoring companies have on the regional demand of the studied region. Table 5.3 presents the top 10 industries

sorted by the total amount for the regional demand from 30 reshored industries studied. Moreover, the third and fourth column shows how much of that particular industry is satisfied in region and how much is imported from outside. A list with all the companies is attached in Appendix B. Most of the demand estimated in actual dollars comes from motor vehicle parts, plastics product manufacturing, synthetic rubber and artificial synthetic fibers which are all satisfied within the region, which is also the majority of the jobs. This reinforces the decision the companies made to locate in closer proximity to their suppliers and market. Most of the supply chain for these particular industries of the reshored companies could be satisfied within the region.

Table 5.4: CFIRE Regional demand for industries ranked by total amount

NAICS	Industry	Amount	In-Region	Out of Region
3363	Motor Vehicle Parts Manufacturing	$22,772,853,899	93.6%	6.4%
5511	Management of Companies and Enterprises	$10,776,238,518	70.8%	29.2%
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	$8,000,117,824	71.3%	28.7%
3261	Plastics Product Manufacturing	$6,455,069,916	72.4%	27.6%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	$3,996,234,178	81.9%	18.1%
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	$3,687,854,666	81.5%	18.5%
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing	$3,398,630,316	83.5%	16.5%
4251	Wholesale Electronic Markets and Agents and Brokers	$3,241,757,294	72.5%	27.5%
3315	Foundries	$3,046,691,816	81.9%	18.1%

Regional demand for the studied industries offers information on how much of the amount of demand is satisfied in the region and how much will be imported from outside of the region (See Table 5.4). The out-of-region includes both domestic and international suppliers. The figure 3 below shows the in region and out of region demand percentage for the 30 industries. The data suggests most of the industry demand can be satisfied inside the region (74.5 percent). The remaining 25.5 percent will be imported from outside, presumably the nearest entry ports.

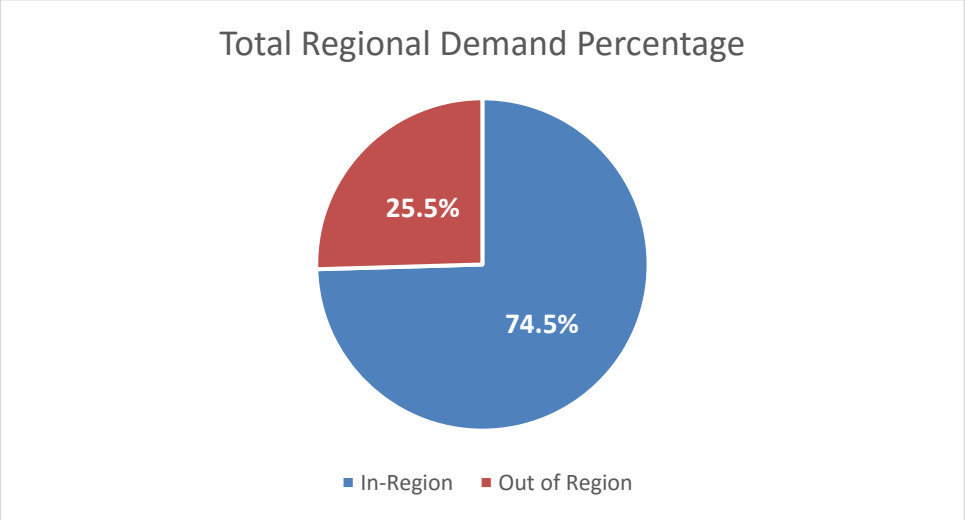

Figure 5.3: Total Regional Demand in and out of region percentage for all the industries.

Moreover, the data suggests that approximately 75.2 percent of semiconductor and other electronic component manufacturing and 52.7 percent of navigational, measuring, electro medical, and control instruments manufacturing industries are satisfied from outside the region potentially creating a ripple effect in the supply chain (See Table 5.5). Out of $1.7 billion total demand for semiconductor and other electronic component, only $438 million is satisfied within the region, the remaining being imported from outside. Therefore, companies that make use of electrical equipment and component manufacturing in their production cycle might find themselves importing from suppliers located outside the studied region.

Table 5.5: CFIRE regional demand for industries ranged by out of region percentages

NAICS	Industry	Amount	In-Region	Out of Region
3344	Semiconductor and Other Electronic Component Manufacturing	$1,766,142,715	24.8%	75.2%
3345	Navigational, Measuring, Electro medical, and Control Instruments Manufacturing	$867,183,416	47.3%	52.7%
3359	Other Electrical Equipment and Component Manufacturing	$646,828,855	51.0%	49.0%
4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers	$1,013,110,967	51.5%	48.5%
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	$2,248,355,613	53.0%	47.0%
3314	Nonferrous Metal (except Aluminum) Production and Processing	$2,029,987,495	57.8%	42.2%

The analysis of the data from USITC for U.S. General Imports by NAICS codes for the reshoring industries in the CFIRE region shows the amount of freight in dollars coming into the US, and by which port of entry. This information is significant in analyzing the impact on the freight and transportation for the reshoring companies. The total studied commodities imported from all ports of entry for the year 2015 amounts to $734 billion. Data gathered from TradeStats Express supports these statistics, showing that for the year 2015 approximately $942 billion of studied commodities were imported from all countries. The main five ports of entry the majority of the studied commodities are imported from, as seen in the chart below, are Los Angeles, CA, importing a little over $100 billion, followed by Laredo, TX, importing approximately $97 billion value of commodities, $77 billion coming in from New York, NY, $65 billion from Detroit, MI, and $41 billion through Savannah, GA.

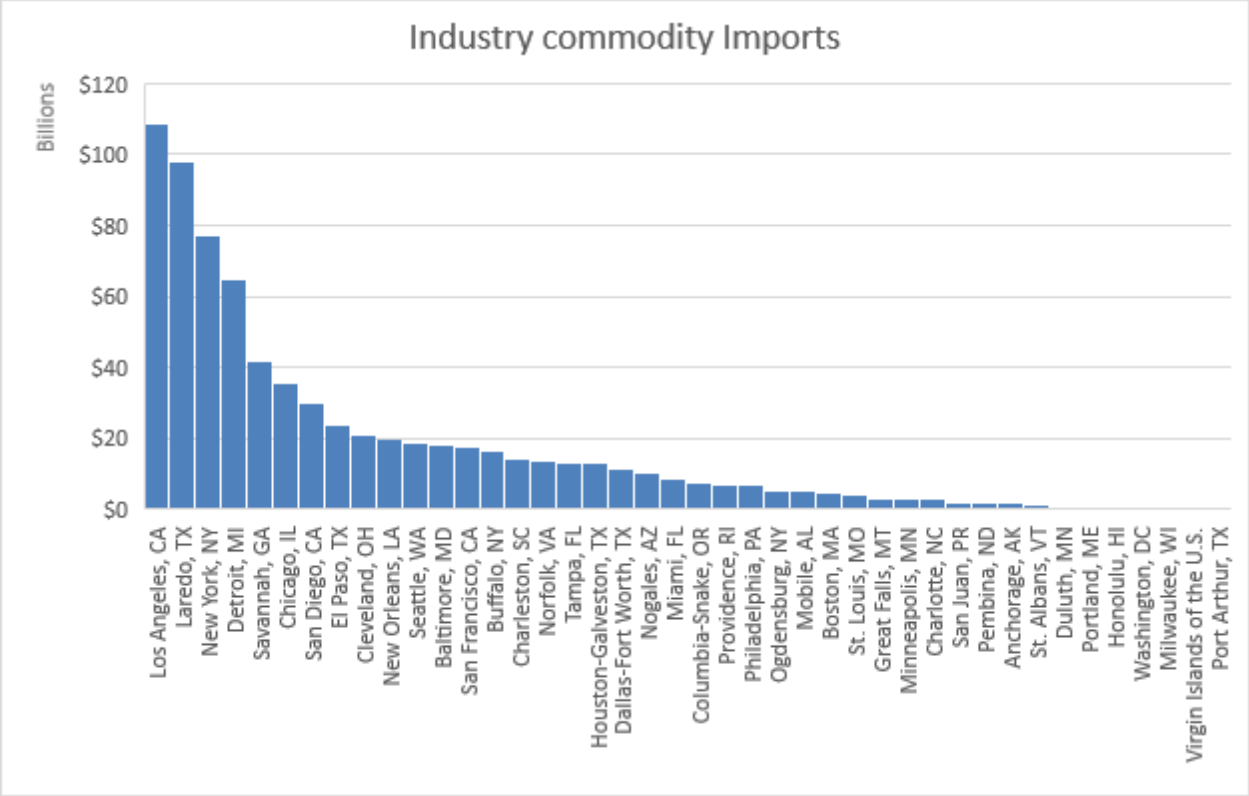

Figure 5.4: Top 20 commodity imports for the studied industries

Based on the literature review observations, companies reshored in the CFIRE region focus on minimizing the transportation cost by choosing the closest proximity to the port of entry of their commodities, their supply chain will be predominant in the East-Northern part of the US. Even though the entry port in Los Angeles, CA holds the largest amount of value, the ports located in the Eastern part of the US will provide a closer supply chain with entry ports such as Laredo, TX, New York, NY, or Detroit, MI. The map presented in Figure 5 below, presents the major ports of entry of the commodities and their respective size depending on the amount imported. The figure shows that most of the large bubbles representing the total amount of value imported inside the US, are coming from outside the region, with the exception of Detroit, MI. Companies finding themselves importing from ports such as Laredo, TX, New York, NY, or even Los Angeles, CA, will affect the supply chain transportation for the region, making use of railways and/or trucking to bring the supplies to the production facility location.

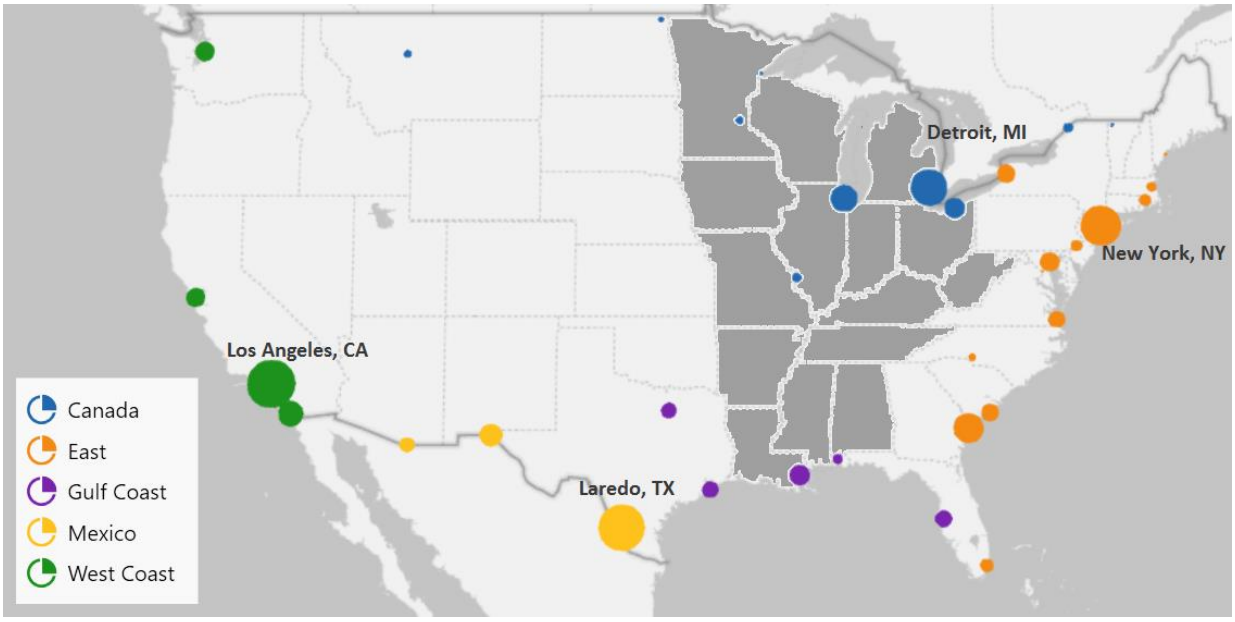

Figure 5.5: Ports of entry for studied commodities. Source: USITC, 2015

The industry with most imports is motor vehicle manufacturing (NAICS 3361), bringing a total of $196 billion in the US in 2015, according to the USITC data. The figure 6 below illustrates and ranks the ports of entry by the total amount imported. Most of the commodities for this industry are coming in through Detroit, MI, $32 billion (approximately 17 percent), Laredo, TX, $30 billion (15.5 percent), and Los Angeles, CA, $20 billion (10 percent), which also holds the highest number of total commodity imports for the studied industries. Motor vehicle parts manufacturing (NAICS 3363) is in close correlation with the motor vehicle manufacturing. The demand for these commodities can be satisfied through Canada or East Coast region.

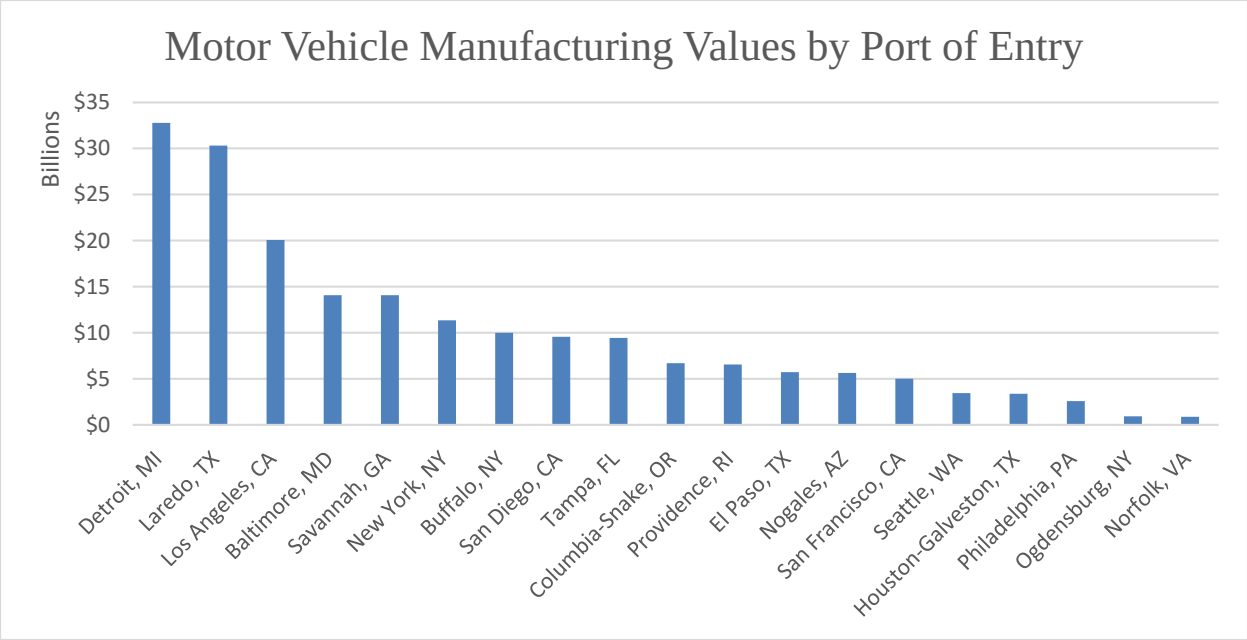

Figure 5.6: Motor Vehicle Manufacturing (NAICS 3361).

The least amount value imported for Motor vehicle manufacturing and Motor vehicle parts manufacturing are from ports of entry such as Seattle, WA, Philadelphia, PA, Ogdensburg, NY, and Norfolk, VA, importing less than $5 billion annually. However, the audio and video equipment manufacturing industry supply chain might look different. As can be observed in the Figure 7 below, the entry points located in California hold the largest amount of import values for this particular industry. There can be a division in the supply chain, with companies deciding to either bringing the components from the West Coast or choosing the shorter route and keeping the supply chain closer to the CFIRE region. If it is the latter, it could spur close competition between the port of Laredo, TX and Detroit, MI, both of them being close in the amount of value imported. The reasoning for the port of choice is influenced by the total landed cost which often is impacted by the distance between the final location of the reshored company and the nearest port of entry.

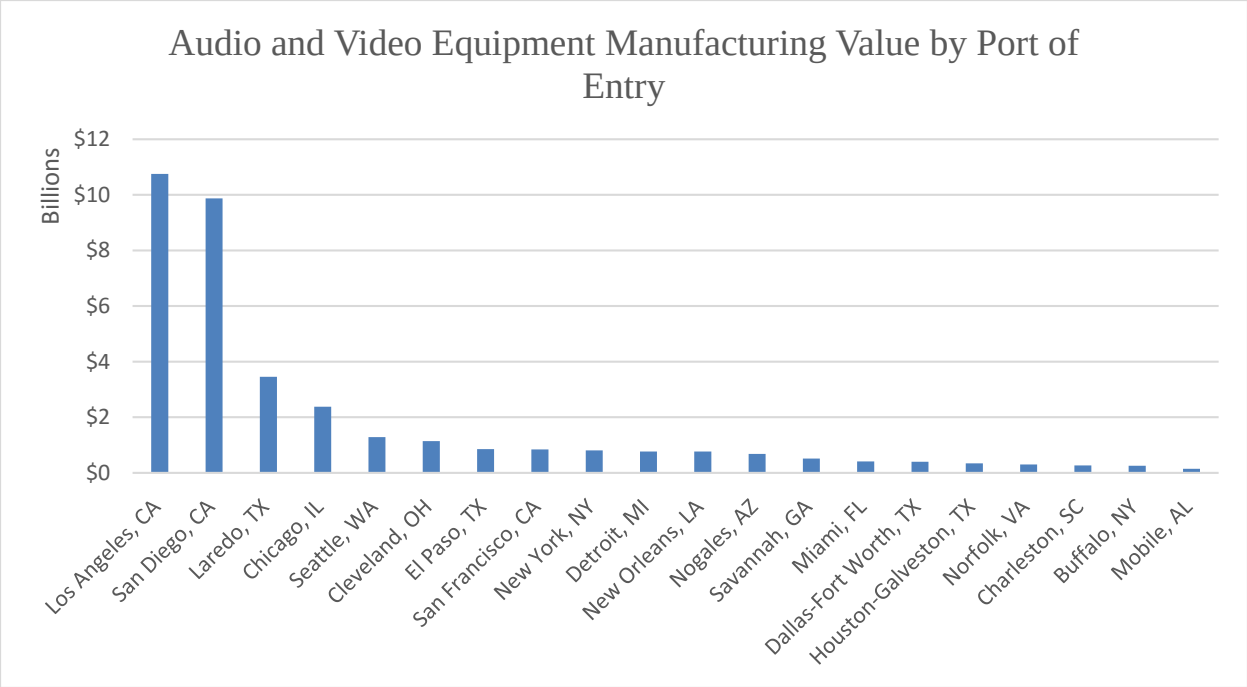

Figure 5.7: Audio and video equipment manufacturing

IBISWorld suggests the industry comprises manufacturers or electronic audio and video equipment for home entertanment systems, vehicles, and public areas. The supply industries are circuit board & electronic component manufacruing, glass product manufacturing, plastic products miscellaneous manufacturing, and semiconductor & circuit manufacturing. As stated above, more than 70 percent these supply industries are satisfied outside the region, directly affecting the transportation supply chain. Nevertheless, in order to miminize transportation costs, it is safe to assume companies will focus on the closer ports such as Laredo, TX, and Chicago, IL. The industry provides in region entry ports such as Chicago, IL, Cleaveland, OH, and others which have significant import values, between $1.1 billion and $2.3 billion. This industry also satisfies the demand for car & automobile manufacturing, SUV & light truck manufacturing, and consumer electronics stores industries, which can be found in the area.

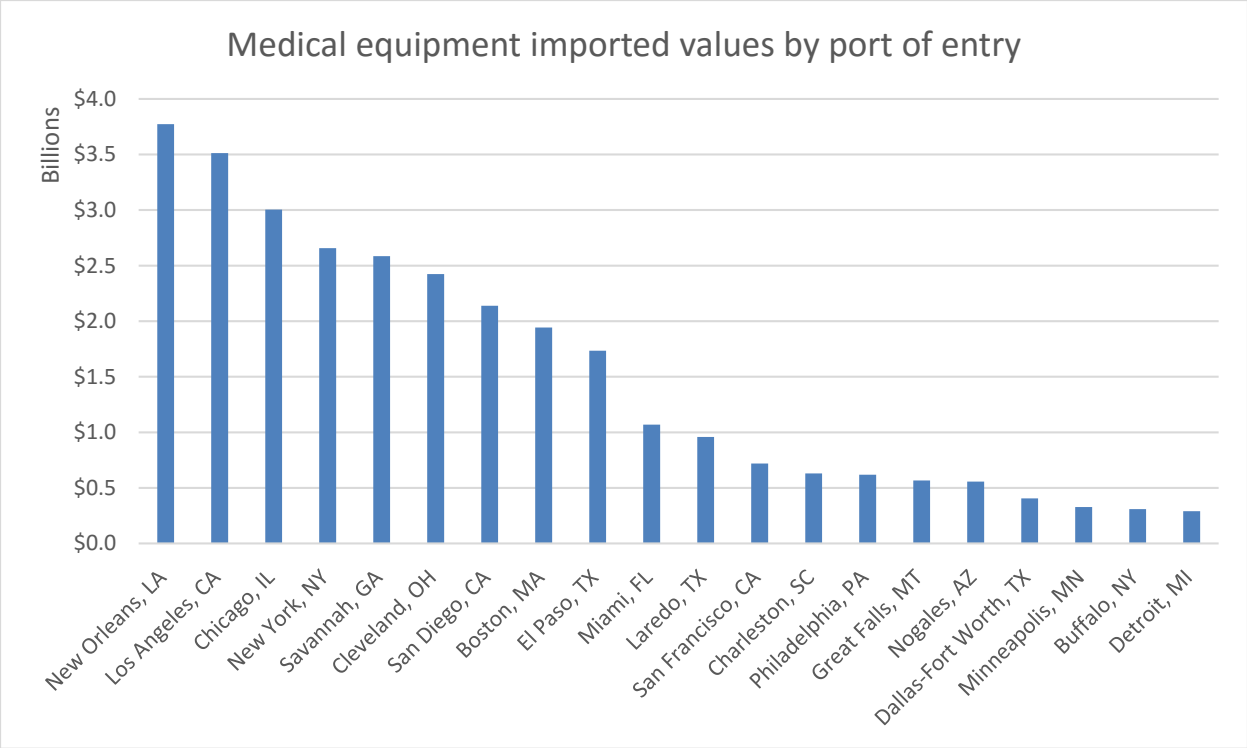

Figure 5.8: Medical Equipment imported values

Another significant industry bringing inside the region their supply is medical instrument & supplies manufacturing (NAICS 3391). The majority of the annual imports valued at $3.7 billion only through the entry port in New Orleans, LA. Approximately $6.63 billion is imported through the West Coast through entry ports such as Los Angeles, CA, San Diego, CA, and San Francisco, CA. However, the majority of the values can be supplied from in-region ports of entry such as Detroit, MI, Chicago, IL or imported from or Southern and Eastern ports, such as Laredo, TX, New York, NY.

5.0 Conclusion

The reshoring phenomenon has generated a lot of interest in recent years. Case studies and the increasing number of reports from companies prove that reshoring is a real trend, and although its magnitude remains in question, its direct and indirect effects can be observed already throughout the United States. In order to gain a complete understanding of its implication on the economic impact on transportation, it is necessary to continue monitoring reshoring activities and conduct a more in depth study. This includes observations on the national level of the reshored companies and their supply chains, monitoring the values of imports and export from the ports of entry and interpret the changes and how it affects the transportation of commodities in the area.

The paper briefly listed the important factors considered by reshored companies, and the most significant one was the transportation costs incurred from their supply chain. Using Reshoring Institutes companies' database, an extensive list with all the companies that are expecting to reshore was generated. For the purpose of observing the economic impact of the manufacturing companies, the analysis took into consideration 39 industries and focused on a region comprised of 14 states, also called the CFIRE region. An impact scenario analysis was conducted and it showed that the reshoring companies will have a total of 13,043 direct jobs. The aggregate effect on jobs amounts to 64,795 new jobs. Even though it seems like a large number, it only represents ~2 percent of the total amount of manufacturing

jobs in that region. The analysis also showed most of their supply chain regional demand (75 percent) can be satisfied within the region, and the rest (25 percent) will be imported through nearby entry ports or states. Using data from USITC, the study showed the most significant ports importing the needed commodity, and considering the companies will focus on lowering the transportation costs, the supply chain analysis will shift towards the North-Eastern, South-Eastern, and Eastern ports, such as Detroit, MI, Chicago, IL, Laredo, TX, and respectively New York, NY. Moreover, data suggested that approximately 75 percent of semiconductor and other electronic component manufacturing, and 53 percent of electro medical and control instruments manufacturing industries are satisfied from outside the region potentially creating a ripple effect in the transportation supply chain. Out of the total regional demand for these industries, only 25 percent is satisfied within the region, the remainder being imported from outside.

Current unavailable national level data from popular economic tools, such as EMSI & IMPLAN, not having national in-region and out-region data, limited the research to critical areas and industries. Using the REMI model complemented with origin/destination (OD) data from a source such as Datamyne would considerable strengthen the study. The reshoring study provided valuable insight to the current and upcoming changes to be expected, and even if the impact is modest, it has potential to have significant aggregate implications on the transportation system. However, for a better understanding of the impacts of reshoring on changing national transportation activities, a more comprehensive study is suggested.

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Appendix A:

Table 1: Companies that have reshored (369), were kept from offshoring (218), or transplanted manufacturing or other processes to the U.S. (236)

Company Name	**Action**
1888 Mills	Reshoring
3D Robotics	Reshoring
3M	Reshoring
800razors.com	Reshoring
9to5 Seating	Reshoring
A-Power Energy Generation Systems	Transplant
A123 Systems	Kept from Offshoring
Acco Brands	Reshoring
AccuRounds	Reshoring
ACE Clearwater Enterprises	Reshoring
Achronix	Kept from Offshoring
Acme Wire	Kept from Offshoring
Advanced Micro Devices	Kept from Offshoring
AGCO	Reshoring
Aichele Inc.	Transplant
Airbus - AL	Transplant
Airbus - OH	Transplant
AirGuide Manufacturing - FL	Reshoring
AirGuide Manufacturing - MS	Reshoring
Airtex Design Group	Reshoring
Alevo	Transplant
Alita USA Holdings	Transplant
All American Clothing Co.	Kept from Offshoring
All-Clad Metalcrafters	Reshoring
Allen Edmonds	Kept from Offshoring
Allison Transmission	Kept from Offshoring
Allison Transmission	Reshoring
Alok Industries	Transplant
Alorica	Kept from Offshoring
Alpina Foods	Transplant

Company Name	Action
Alpine Express	Kept from Offshoring
Altera	Reshoring
Altierre Digital Retail	Reshoring
American Apparel	Reshoring
American Giant	Reshoring
American Home Manufacturing	Reshoring
American Standard Brands	Kept from Offshoring
American Yazaki Corporation	Transplant
American Yuncheng Gravel Cylinder	Transplant
AmFor Electronics	Kept from Offshoring
Annelore	Kept from Offshoring
Anton Alexander	Kept from Offshoring
AO Eyewear	Reshoring
Appalachian Flooring, Inc	Transplant
Apple	Reshoring
Aquateko	Reshoring
ARCA	Reshoring
Architec Housewares	Kept from Offshoring
Arden Companies	Reshoring
Argoz	Reshoring
Armstrong World Industries Inc.	Reshoring
Artaic	Kept from Offshoring
Ashley Furniture	Reshoring
AT&T	Reshoring
August	Kept from Offshoring
Aurora Metals	Reshoring
Austin Manufacturing Systems	Kept from Offshoring
Authentic Comfort	Reshoring
Author Solutions	Reshoring
Autoline Industries	Transplant
Avago Technologies	Kept from Offshoring
Avian Group	Transplant
Aviation Partners Group	Kept from Offshoring
Axenics	Reshoring

Company Name	Action
B. Braun Medical Inc.	Reshoring
Bailey Hydropower	Reshoring
Baker-Hughes Oilfield Operations Inc.	Kept from Offshoring
Balluff, Inc.	Transplant
Barn Light Electric	Kept from Offshoring
BASF	Transplant
Bauer Pottery Company	Kept from Offshoring
Bayer	Kept from Offshoring
Beaudet Aviation	Transplant
Beaulieu International Group	Transplant
Benteler Steel/Tube	Transplant
Berner International	Kept from Offshoring
Bertolini Corporation, Inc.	Kept from Offshoring
Beyond Clothing	Kept from Offshoring
Biotrial S.A.	Transplant
BIOX Corporation	Transplant
Bison Gear & Engineering Corp.	Reshoring
Black Hills IP - MN	Kept from Offshoring
Black Hills IP - SD	Kept from Offshoring
BMW - Mexico	Transplant
BMW - SC	Transplant
BMW - SC	Transplant
BMW - WA	Transplant
Boathouse Sports	Kept from Offshoring
Bob's Design Engineering/BDE Manufacturing Tech	Reshoring
Bodine Aluminum - MO	Kept from Offshoring
Bodine Aluminum - TN	Kept from Offshoring
Boeing - MT	Reshoring
Boeing - SC	Reshoring
Boeing - WA	Reshoring
Bonfiglioli	Transplant
Bosca	Reshoring
Bosch Rexroth	Kept from Offshoring
Bow & Drape	Kept from Offshoring

Company Name	Action
Brace Pharmaceuticals	Transplant
Bradshaw Kirchofer	Kept from Offshoring
Brammo Inc.	Reshoring
Brembo	Transplant
Bridgestone	Transplant
Brillcast Inc.	Reshoring
Britax Child Safety Inc.	Transplant
Brooks Bros. - MA	Reshoring
Brooks Bros. - NC	Reshoring
Brooks Bros. - NY	Reshoring
Buck Co.	Reshoring
Buck Knives	Kept from Offshoring
Bulldog LED Lighting	Kept from Offshoring
BuzziSpace	Transplant
C&B Machinery	Kept from Offshoring
Caesarstone	Transplant
Calibowl	Reshoring
Calibur11	Reshoring
Canada Metal (Pacific) Ltd.	Transplant
Canadian Solar, Inc.	Transplant
Cannon Spring & Racecraft	Reshoring
Capitaine Frank	Transplant
Carbonite	Reshoring
Carbonite	Reshoring
Carlisle Companies	Reshoring
Carol Gregg	Reshoring
Carolina Cotton Works	Kept from Offshoring
Cascades Tissue Group	Transplant
Case I-H	Kept from Offshoring
Caterpillar - GA	Reshoring
Caterpillar - IL	Reshoring
Caterpillar - IN	Reshoring
Caterpillar - TX	Reshoring
Celebriducks	Reshoring

Company Name	Action
Celebriducks	Reshoring
Central Virginia Manufacturing	Kept from Offshoring
Cepheid	Kept from Offshoring
CertoPlast	Transplant
CF Industries	Kept from Offshoring
Chamberlain Group Inc.	Reshoring
CharlieDog and Friends	Reshoring
Chesapeake Bay Candle	Reshoring
Chevrolet - MD	Kept from Offshoring
Chevrolet - Mexico	Reshoring
Chevron	Kept from Offshoring
Chiappa	Transplant
Chobani - ID	Kept from Offshoring
Chobani - NY	Kept from Offshoring
Chrysler - Mexico	Reshoring
Chrysler (Multicraft)	Reshoring
cinda b	Kept from Offshoring
Circle Gear and Machine Co., Inc.	Reshoring
Cirrus Pharmaceuticals	Transplant
Cisco Systems	Reshoring
citim AM	Transplant
Cleveland CycleWerks	Reshoring
Club Monaco	Reshoring
CN Wire Corp.	Transplant
Cnooc	Transplant
Coleman Co.	Reshoring
Collegiate Beads	Reshoring
Colorado Flexible Heaters	Reshoring
Columbia Marking Tools	Reshoring
Commscope	Reshoring
Comprehensive Logistics Co.	Reshoring
Cone Denim	Kept from Offshoring
Continental AG	Transplant
Continental Motors	Transplant

Company Name	Action
Continental Tire	Transplant
Contract Sew & Repair	Kept from Offshoring
Control Devices, LLC	Reshoring
Conveyorized Solutions	Reshoring
Core Products International Inc.	Reshoring
Cotton Babies	Reshoring
Cotton Incorporated	Kept from Offshoring
Coville Inc.	Kept from Offshoring
CP Lab Safety	Reshoring
Crawford Furniture	Reshoring
Creation Technologies	Kept from Offshoring
Creative Things	Reshoring
Crown Battery	Reshoring
Cryoquip Manufacturing	Kept from Offshoring
D'Addario - Kept from Offshoring	Kept from Offshoring
D'Addario - Reshoring	Reshoring
Dalen Products Inc.	Reshoring
Dalton Dynamics Corp.	Transplant
Dassault	Transplant
Datacard	Reshoring
Davis Tool	Kept from Offshoring
Dazor Manufacturing Corp.	Reshoring
Dearborn Overhead Crane	Kept from Offshoring
Defy Mfg. Co.	Kept from Offshoring
Dell	Reshoring
Delta Air Lines inc.	Reshoring
Dendoff Springs	Reshoring
DENSO Air Systems	Transplant
DESA Heating	Reshoring
Detroit Bikes	Kept from Offshoring
Dewalt	Reshoring
Diagnostic Devices Inc.	Reshoring
Dialog Direct	Reshoring
Dicastal North America Inc.	Transplant

Company Name	Action
Dillard's Dept Store	Reshoring
Diving Unlimited International	Reshoring
DK Diagnostics	Transplant
Dobbin	Kept from Offshoring
Dodge	Reshoring
Doran Jones	Reshoring
Dow Chemical	Kept from Offshoring
Downtown Decorations, Inc.	Reshoring
Dr. Fresh	Reshoring
Draexlmaier Automotive of America	Transplant
Dunn and Company	Reshoring
E-Z-Go	Reshoring
Eagle Creek Software Services	Kept from Offshoring
Eagle Tool US	Kept from Offshoring
EaglePicher Technologies	Reshoring
Eberspaecher	Transplant
Ebonite	Reshoring
Echelon Snowboards	Reshoring
ECI Biotech	Kept from Offshoring
Eclipse Automation, Inc.	Transplant
Eimskip	Transplant
Elan-Polo	Reshoring
Electrolux - NC	Transplant
Electrolux - SC	Transplant
Electrolux - TN	Transplant
Electronic Sheetmetal Craftsmen, Inc.	Kept from Offshoring
Element Electronics - MI	Reshoring
Element Electronics - SC	Reshoring
Embraer S.A.	Transplant
Embraer S.A. - R&D	Transplant
Emerson Electric	Reshoring
Empire Level Manufacturing Corporation	Kept from Offshoring
Encana	Transplant
Energid Technologies	Reshoring

Company Name	Action
Ennovea	Reshoring
Enor Corp	Reshoring
Enser Corporation	Kept from Offshoring
Enve Composites	Kept from Offshoring
Environmental StoneWorks	Kept from Offshoring
Epson	Kept from Offshoring
ESAB	Kept from Offshoring
Escatec	Reshoring
Essar Global Ltd.	Transplant
ET Water Systems	Reshoring
Ethan Allen	Kept from Offshoring
Euphrates, Inc.	Transplant
Eva Franco	Kept from Offshoring
Evert-Fresh	Kept from Offshoring
EveryWare Global	Reshoring
ExOne	Kept from Offshoring
Exotic Metals Forming Company	Kept from Offshoring
Expedia.com	Reshoring
Extra	Transplant
Exxel Outdoors	Reshoring
Exxon Mobil Corp.	Kept from Offshoring
Fables by Barrie	Reshoring
Fage USA Dairy Industry, Inc.	Transplant
farm2fashion	Kept from Offshoring
Farouk Systems	Reshoring
Faurecia	Transplant
Felix Schoeller	Transplant
Fellowes Inc.	Reshoring
Firestone Home Products	Reshoring
Firstronic	Reshoring
Fiveloaves twofish	Reshoring
Flambeau	Kept from Offshoring
Flextronic Inc. - CA	Reshoring
Flextronics - CA 2	Reshoring

Company Name	Action
Flextronics (Apple)	Reshoring
Fluortubing USA	Transplant
Foamiture	Kept from Offshoring
Focal Upright	Reshoring
Footwear Industries Tennessee	Transplant
Ford - 2010 - MW	Reshoring
Ford - MI	Reshoring
Ford - NY	Reshoring
Ford - OH	Reshoring
Ford - OH	Reshoring
Forma Apparel Manufacturing	Kept from Offshoring
FormFactor	Reshoring
Formosa Plastics Group	Transplant
Foxconn - CA	Transplant
Foxconn - PA	Transplant
FPI Thermoplastic Technologies	Kept from Offshoring
Fredrich Boysen GmbH	Transplant
FRULACT	Transplant
Full Petential	Reshoring
Fuyao Glass Industry Group Co.	Transplant
GE - 2010 - KY	Reshoring
GE - CA	Kept from Offshoring
GE - IL	Reshoring
GE - IT - MI	Kept from Offshoring
GE - KY	Reshoring
GE - NY	Reshoring
GE - OH	Reshoring
GE Aviation	Reshoring
Generac Power Systems	Reshoring
Genicon	Reshoring
Georgia Chopsticks	Kept from Offshoring
Gestamp South Carolina LLC	Transplant
Giti Tire	Transplant
Glenmark	Transplant

Company Name	Action
Global Industries	Kept from Offshoring
Global Sticks Inc.	Reshoring
GlobalFoundries	Transplant
GM	Reshoring
GM	Kept from Offshoring
GM - IN	Reshoring
GM - TN	Reshoring
Golden Dragon	Transplant
Goodyear	Kept from Offshoring
Google	Reshoring
Gracious Living Corp.	Transplant
Grayling Industries	Reshoring
Gree Electric Appliances	Transplant
Green Circle Bio Energy Inc.	Kept from Offshoring
Green Leaf, Inc.	Reshoring
Green Toys	Kept from Offshoring
GreenTech Automotive	Kept from Offshoring
Ground Water Rescue	Reshoring
Grupo FerroAtlßntica	Transplant
GSH Industries	Reshoring
GT Advanced Technologies	Reshoring
Guidepoint Systems	Reshoring
GW Plastics	Reshoring
Haier Group	Transplant
Haifa Group	Transplant
HALDRUP USA	Transplant
Halla Visteon Climate Controls	Transplant
Hamilton Shirts	Kept from Offshoring
Hampton Products	Reshoring
Handful	Reshoring
Hankook	Transplant
Hanna's Candle Company	Kept from Offshoring
Harbec Inc.	Kept from Offshoring
Haso Ltd.	Transplant

Company Name	Action
Hayward Pool	Kept from Offshoring
Hedstrom Plastics	Reshoring
Heinz	Reshoring
Heirloom Collection	Kept from Offshoring
Hentz Manufacturing LLC	Kept from Offshoring
Hercules Networks	Reshoring
Heritage Glass	Kept from Offshoring
Herman Miller	Reshoring
HessAire	Reshoring
Hiawatha Rubber Co.	Reshoring
Hickey Freeman Tailored Clothing	Reshoring
Home Depot	Reshoring
Home Shopping Network	Reshoring
Honda - 2011	Transplant
Honda - 2014	Transplant
Honda - IN	Transplant
Honda - OH	Transplant
Horton Archery	Reshoring
Horween Leather Company	Kept from Offshoring
Host Analytics	Reshoring
HP	Kept from Offshoring
Hubbardton Forge	Reshoring
Hubei Xingfa Chemicals Group	Transplant
Huf North America Automotive Parts	Transplant
Hurst	Reshoring
Hy-Lite	Reshoring
Hypertherm	Kept from Offshoring
Hytrol	Kept from Offshoring
I-Con Systems	Reshoring
i-lighting	Reshoring
Iberdrola - AZ	Transplant
Iberdrola - CO	Transplant
IBM	Reshoring
IKEA	Transplant

Company Name	Action
Ilapak	Transplant
Ilkare	Kept from Offshoring
Imagineering	Reshoring
Independence LED	Reshoring
innoBots	Transplant
InPro Corp.	Reshoring
Intel - AZ	Kept from Offshoring
Intel - OR	Kept from Offshoring
Interroll	Transplant
Intertech Plastics	Reshoring
Intex Technologies	Kept from Offshoring
Ipsen	Transplant
iRT Wheels	Reshoring
Isofoton	Transplant
J. Crew	Kept from Offshoring
JA Solar	Transplant
Jacobs Engineering Group Inc.	Reshoring
Jarden	Reshoring
Jarden Plastic Solutions	Reshoring
Jatco	Reshoring
JDS Uniphase	Reshoring
Jeanette Specialty Glass	Kept from Offshoring
JN Fibers Inc.	Transplant
Jolie and Elizabeth	Kept from Offshoring
Joseph Abboud	Kept from Offshoring
Jotul	Transplant
JS Karaoke	Reshoring
JTEKT Corporation	Transplant
Jyoti Structures	Transplant
K'nex	Reshoring
K'nex - Lincoln Logs	Reshoring
Karen Kane	Reshoring
Karges Furniture Co.	Kept from Offshoring
Keats Southwest	Reshoring

Company Name	Action
Keen Footware	Reshoring
Keer Group	Transplant
Kenai Sports	Reshoring
Kennedy Valve	Reshoring
Kent Bicycles	Reshoring
Kermit Tile USA	Transplant
KI – 2009	Reshoring
KI – 2010	Reshoring
Kia	Transplant
Knox Machinery	Reshoring
Kohler Co. - SC	Kept from Offshoring
Kohler Co. - TX	Kept from Offshoring
Kohler Co. - WI	Kept from Offshoring
Komo Machine	Reshoring
Kone	Reshoring
Kool Aid	Reshoring
Korhani	Reshoring
Korona Candles	Transplant
KraussMaffei Group	Transplant
Kryton Engineered Metals, Inc.	Reshoring
Kumho Tire USA Inc.	Transplant
LA Aluminum	Reshoring
Lamplight	Reshoring
Leaktite	Kept from Offshoring
LEDS America	Reshoring
Lenovo	Transplant
Lenox	Reshoring
Leviton Network Solutions	Reshoring
Lifeloc	Reshoring
Lighting OEM Inc.	Reshoring
LightSaver Technologies	Reshoring
Lilliputian Systems	Kept from Offshoring
Lincolnton Furniture Company	Reshoring
Linda Bean's Perfect Maine	Kept from Offshoring

Company Name	Action
Lindenburg Industry LLC	Transplant
Linita Design	Transplant
Little Tikes	Reshoring
Live Lobster Co.	Kept from Offshoring
Lodge Cast Iron	Kept from Offshoring
Lollicup USA, Inc.	Reshoring
Long-Stanton Manufacturing Co.	Reshoring
Louis Hornick & Company	Reshoring
Lucky Jeans	Reshoring
Lufthansa Technik	Transplant
Luke's Lobster	Kept from Offshoring
LyondellBasell	Kept from Offshoring
M-Wave International	Reshoring
Macro Sensors	Kept from Offshoring
Mag Industries	Kept from Offshoring
MagLite	Kept from Offshoring
Magna International	Reshoring
Maine Fair Trade Lobster	Kept from Offshoring
Mando America	Transplant
Mannington Commercial	Reshoring
Mansfield Plumbing	Kept from Offshoring
Mantra Information Services	Reshoring
Manufacture New York	Kept from Offshoring
Marlin Steel Wire Products	Reshoring
Marmen Energy	Transplant
Mars Inc.	Reshoring
Martin Greenfield Clothiers	Kept from Offshoring
Martinrea	Transplant
Master Lock	Reshoring
Master Lock	Reshoring
Matrix Packaging	Reshoring
Maxx Sunglasses	Reshoring
Mazzetta Co.	Kept from Offshoring
Mega Brands	Reshoring

Company Name	Action
Menck USA Inc.	Transplant
Mercedes-Benz	Transplant
Merck Animal Health	Reshoring
Metem Corp.	Kept from Offshoring
Meter Bearings Group	Transplant
Methanex	Transplant
Method	Transplant
Miasa Automotive LLC	Transplant
Michelin	Transplant
Michigan Ladder Co.	Reshoring
Miller Manufacturing Co.	Reshoring
Mindtree	Transplant
Mistic	Reshoring
Mitchell Metal Products – 2009	Reshoring
Mitchell Metal Products – 2010	Reshoring
Mitsubishi Caterpillar Forklift America Inc.	Transplant
Mitsubishi Nuclear Energy Systems	Transplant
Mohawk Home	Reshoring
MonoSol LLC	Transplant
Monster.com	Kept from Offshoring
Morey Corporation	Reshoring
Morinaga America Foods, Inc.	Transplant
Morio Denki	Transplant
Motorola Solutions	Reshoring
Motorola/Flextronics	Reshoring
MRPC	Reshoring
Mullican Flooring	Reshoring
Multicraft International	Reshoring
Music Computing	Kept from Offshoring
NatLabs (National Prosthetic Dental Labs)	Reshoring
Navistar International Corp.	Reshoring
NBS	Kept from Offshoring
NCR	Reshoring
Neovision Technology	Reshoring

Company Name	Action
Nester Hosiery	Kept from Offshoring
Networkfleet	Kept from Offshoring
Neutex Advanced Energy Group	Reshoring
New Balance	Kept from Offshoring
New England Footwear	Reshoring
New Grand Ocean International	Transplant
New Lab	Kept from Offshoring
New Ridge LLC	Transplant
Next Level LLC	Kept from Offshoring
Nike	Reshoring
Nippon Sharyo Manufacturing	Transplant
Nissan - MS	Transplant
Nissan - TN	Transplant
No Nonsense -TN	Reshoring
No Nonsense - NC	Reshoring
NOHMs Technologies Inc.	Kept from Offshoring
Nomiku	Reshoring
Nordson Corp	Reshoring
NORRES	Transplant
Northern Woolen Mills	Kept from Offshoring
NovaSom Inc.	Kept from Offshoring
NOVO 1	Reshoring
NPI Medical	Reshoring
Nucor	Kept from Offshoring
O'Neal Manufacturing Services	Reshoring
Octal Petrochemicals	Transplant
Oemeta	Transplant
OFabz Swimwear	Kept from Offshoring
Offsite Networks	Reshoring
OIL India, Indian Oil Corp.	Transplant
Olevia	Reshoring
OMA SUD	Transplant
Oorja Fuel Cells	Reshoring
Oracle	Reshoring

Company Name	Action
Orascom	Transplant
Otis Elevator	Reshoring
OtterBox	Reshoring
Ottobock	Transplant
Outdoor GreatRoom Co.	Reshoring
Owens Corning	Kept from Offshoring
Oxnard Pallet Co.	Kept from Offshoring
OYO Sportstoys	Reshoring
P.A.M.A. Furniture	Reshoring
Paccar	Reshoring
Pace Industries	Kept from Offshoring
Pacific Handy Cutter	Reshoring
Pacific Industries	Transplant
Panasonic	Transplant
Panyl	Kept from Offshoring
Parkdale Mills	Kept from Offshoring
ParkTool	Reshoring
Parsons Co.	Kept from Offshoring
Peerless Industries, Inc.	Reshoring
Pequea Machine Inc.	Reshoring
Philips	Transplant
Philips Lighting	Transplant
Pierrepont Hicks	Kept from Offshoring
Pigtronix	Reshoring
Plaid Enterprises	Reshoring
Plasan Carbon Composites	Transplant
Point6	Reshoring
Polymera, Inc.	Reshoring
PolyTech Fibers LLC	Kept from Offshoring
PolyTech Plastic Molding	Reshoring
Poppy von Frohlich	Kept from Offshoring
Portwest LLC	Transplant
Powin Corp.	Reshoring
Precision Extrusion Inc.	Reshoring

Company Name	Action
Presair	Reshoring
Priceline.com	Reshoring
Pride Manufacturing	Reshoring
Production Castings, Inc	Reshoring
Project Repeat	Kept from Offshoring
PRUF LED	Reshoring
Pulse Plastics	Reshoring
QSI	Kept from Offshoring
Quality Float Works Inc.	Reshoring
Quick Fitting, Inc.	Reshoring
Quirky	Reshoring
Raleigh Denim	Kept from Offshoring
Ralph Lauren - 2013	Reshoring
Ralph Lauren - 2014	Reshoring
Raytheon	Kept from Offshoring
Reading Truck Body	Reshoring
Ready Seafood	Kept from Offshoring
Redman & Associates	Reshoring
Regal Ware Inc.	Reshoring
Rehau, Inc.	Transplant
Reliance Worldwide Corp.	Transplant
Renegade Materials	Kept from Offshoring
Renfro	Kept from Offshoring
Renfro - AL	Reshoring
ResTech Plastic Molding	Reshoring
Rethink Robots	Kept from Offshoring
Reverie	Reshoring
RF Micro Devices	Reshoring
Rhythmlink International LLC	Transplant
RibbedTee	Reshoring
Ridgeline Energy Services Inc.	Transplant
Rocket EMS Inc.	Kept from Offshoring
Roger Corp.	Reshoring
Rolls-Royce - 2007	Transplant

Company Name	Action
Rolls-Royce - 2011	Transplant
Rolls-Royce - 2014	Transplant
Round House Manufacturing	Kept from Offshoring
ROXUL, Inc.	Transplant
Royal Dutch Shell	Transplant
Royal Park USA	Kept from Offshoring
Sallie Mae	Reshoring
Samsung	Transplant
Samsung - ONT	Transplant
Santa Barbara Umbrella	Kept from Offshoring
Santa Cruz Bicycles	Kept from Offshoring
Santa's Own	Reshoring
Sanyo	Transplant
Sasol	Transplant
Sauder	Reshoring
SB Manufacturing	Reshoring
School House	Reshoring
Schott Bros. Inc.	Kept from Offshoring
Scott Electronics	Kept from Offshoring
Scovill Fasteners Inc.	Reshoring
Sea Hag Seafood	Kept from Offshoring
SeaMicro	Kept from Offshoring
Seesmart Inc.	Reshoring
Selected Furniture	Reshoring
SentrySafe	Reshoring
Seung Chang Airtek Inc.	Transplant
SG Mills	Transplant
Shandon Tralin Paper	Transplant
Shandong Swan USA	Transplant
Shantui Construction Machinery Co. Ltd.	Transplant
Shapes by Brenda June	Kept from Offshoring
Shapeways	Kept from Offshoring
Shepherd Thermoforming	Reshoring
Sherex Fastening Solutions	Reshoring

Company Name	Action
Shinola	Kept from Offshoring
Shrivallabh Pittie Group	Transplant
Shuck's Lobster	Kept from Offshoring
SIEL SpA	Transplant
Siemens	Transplant
Siemens USA	Transplant
Silcotech	Transplant
Silevo	Reshoring
Siro Group USA	Transplant
SKF Group	Transplant
SL Corporation	Transplant
Sleek Audio	Reshoring
Slingshot Bikes	Reshoring
Smart Step	Kept from Offshoring
Smith's Products	Reshoring
Snap-on	Kept from Offshoring
Software Assurance, LLC	Reshoring
Solar World	Kept from Offshoring
Solvay	Transplant
Source Bits	Reshoring
Southern Motion Furniture	Kept from Offshoring
Spectrum Plastics Group	Kept from Offshoring
St. Martin Cabinetry of America	Transplant
Stanley Electric U.S. Company Inc.	Kept from Offshoring
Stanley Furniture	Reshoring
Starbucks	Reshoring
Startup Box	Reshoring
Stoke Inc.	Kept from Offshoring
Suarez Manufacturing	Reshoring
Suhr Industries	Reshoring
Sundance Energy	Reshoring
SunPower Corp.	Reshoring
Sunstar America Inc.	Reshoring
Suntron	Reshoring

Company Name	Action
Superior Essex	Reshoring
Sussex IM	Reshoring
SyncFab	Kept from Offshoring
Syntax-Brillian	Reshoring
Tabula	Kept from Offshoring
TAC Manufacturing	Transplant
Tacony Corporation	Reshoring
Taesung Alabama	Transplant
Tailor Made Products	Reshoring
Taiwan Semiconductor Manufacturing Co.	Transplant
Taizhou Fuling Plastics	Transplant
Tang Energy Group - Proposed	Transplant
TanTec	Transplant
Taphandles	Reshoring
Tasus Corp.	Transplant
TDC Cutting Tools	Transplant
Team Technologies	Reshoring
Tecumseh	Kept from Offshoring
Terex	Kept from Offshoring
Terryberry	Reshoring
Tesla Motors	Kept from Offshoring
Tesla Motors	Reshoring
Texas Instruments	Reshoring
The Beadery	Kept from Offshoring
The Richelieu Group - 2011	Transplant
The Richelieu Group - 2014/Walmart	Transplant
The Vollrath Co.	Reshoring
Thomasville Furniture	Reshoring
Thompson Tee	Kept from Offshoring
Thrustmaster	Reshoring
ThyssenKrupp AG	Transplant
ThyssenKrupp Bilsten	Transplant
Tianjin Pipe Group - 2012	Transplant
Tianjin Pipe Group - 2014	Transplant

Company Name	Action
Todd Shelton	Kept from Offshoring
Tognum	Transplant
Toner Plastics	Kept from Offshoring
Top-Eastern Group	Transplant
Torcomp	Transplant
Tornik	Kept from Offshoring
Toshiba Industrial	Transplant
Tote Buddy	Reshoring
Toter	Kept from Offshoring
Toto, Ltd.	Transplant
Toydozer	Reshoring
Toyo Tires	Transplant
Toyota - IN	Transplant
Toyota - KY	Transplant
Toyota - MO	Transplant
Toyota - MS	Transplant
Toyota - TN	Transplant
Toyota - TX	Transplant
Toyota - WV	Transplant
Tradlands	Kept from Offshoring
Tree Armor	Reshoring
Trelleborg Wheel Systems	Transplant
Trellis Earth	Reshoring
Trident Case	Reshoring
TRUMPF Inc.	Transplant
Trupart Manufacturing	Kept from Offshoring
Tullahoma Industries	Kept from Offshoring
Twinlab Consolidated Holdings Inc.	Kept from Offshoring
U.S. Block Windows	Reshoring
U.S. Home Systems	Kept from Offshoring
U.S. Ski Pole Company	Reshoring
U.S. Steel	Reshoring
Ultra Green Packaging	Reshoring
Under Armour	Reshoring

Company Name	Action
Unilife	Reshoring
Unionwear	Kept from Offshoring
Uniscite	Transplant
UniTao Pharmaceuticals LLC	Transplant
United States Dinnerware	Kept from Offshoring
Universal Plastics	Kept from Offshoring
Uzin Utz	Transplant
Vallourec	Transplant
Valmeira Glass	Transplant
Vaniman Manufacturing	Reshoring
Vaughan-Bassett	Kept from Offshoring
VEKA	Transplant
Vermont Castings	Reshoring
Vestas Wind Systems	Transplant
Vestas Wind Systems - 2010	Transplant
Viega	Transplant
Virtusa Corp.	Kept from Offshoring
Vision Technical Molding	Kept from Offshoring
Voestalpine	Transplant
Volkswagen	Transplant
Volkswagen 2014	Transplant
Vollrath	Reshoring
Vossloh AG	Transplant
Wanxiang	Transplant
Warrior Sports	Reshoring
Wearbest Sil-Tex	Kept from Offshoring
Weather-Tech	Reshoring
Welded Tube	Transplant
Wetekam Monofilaments	Transplant
WEXCO Industries	Reshoring
Wham-o	Reshoring
Whirlpool - OH 1	Reshoring
Whirlpool - OH 2	Kept from Offshoring
Whirlpool - TN	Kept from Offshoring

Company Name	Action
Whirlpool – OH	Reshoring
Whitcraft	Kept from Offshoring
White Cloud	Reshoring
Wilco	Reshoring
Wild Things, LLC	Kept from Offshoring
Williams	Kept from Offshoring
WindStream Technologies	Reshoring
Wonder Loom	Reshoring
Woodcraft Industries	Transplant
Wright Engineered Plastics	Reshoring
Wrigley Co. - Altoids	Reshoring
Wrigley Co. - Lifesavers	Reshoring
Xerox Corp.	Reshoring
Xerox Corp.	Kept from Offshoring
xobruno	Kept from Offshoring
Yamaha	Transplant
Yaskawa Electric	Transplant
Yiliy	Kept from Offshoring
Yingli Green Energy	Transplant
Yokohama Tire Corp.	Transplant
Yuhuang Chemical	Transplant
ZeeVee	Reshoring
Zeman Manufacturing Co.	Kept from Offshoring
Zentech Manufacturing	Reshoring
Zentek Clothing	Kept from Offshoring
ZF Friedrichshafen AG	Transplant
Zhejiang Walt Technologies	Transplant
Zipp	Kept from Offshoring

Source: The Reshoring Initiative Blog
<http://reshorenow.blogspot.com/2014/12/master-list-of-companies-reshored-kept.html>

Chapter 2: Appendices

Appendix- A Impact of Logistics Cost on Reshorability Index

US vs China:

For Motor Vehicle and Transport Equipment Industry (NAICS 336)

From weighted average method-

Location Score for US = 5.43

Location Score for China= 4.80

Logistics Cost = 8.76% (Customs Freight and Insurance cost from US census database + 3% Inventory and Other Logistics Cost)

China Score, considering logistics cost to US = 4.80- 4.80*8.76%= 4.38

Reshorability Index $= \frac{5.43-4.38}{4.38} * 100 = 24.08$

Appendix- B Co-relation between Different Factors

		US Score	China Score
Reshoring Factors	**Factors Influencing Location Decision**		
Labor Cost, Availability & Skill	Labor Cost & Productivity	5.03	4.67
	Availability of Skill Labor and Talent	5.72	4.32
Availability of natural resources	Access to Natural resource	5.17	4.27
Incentives	Incentives	3.50	3.10
Policy Regulation/IP Right	Government Effectiveness	4.99	4.27
Proximity to Customers	Size of Local Market	6.20	5.65
	Access to International and regional market	6.60	6.06
	Growth of Market	4.23	5.98
Infrastructure	Infrastructure	5.80	4.70
Ease of doing business	Follow Your Competitor	5.73	4.33
	Stable and Business Friendly environment	6.07	3.09
	Access to Capital Market	5.12	4.30
Presence of Suppliers and Partners	Presence of Suppliers and Partners	5.39	4.39

		Score 1-7		
Location Factors	**Sub-Factors**	US	China	Source
Presence of Suppliers and Partners		5.39	4.39	GCI** by WEF***
	Local supplier Quantity	5.5	5.1	GCI** by WEF***

	Local Supplier Quality	5.6	4.5	GCI** by WEF***
	Prevalence of foreign ownership	5.1	4.5	GCI** by WEF***
	Buyer sophistication	4.5	4.3	GCI** by WEF***
	Regulation of security exchange	5	4.4	GCI** by WEF***
	State of cluster development	5.4	4.6	GCI** by WEF***
	Extend of marketing	6.2	4.5	GCI** by WEF***
	Production process sophistication	6.1	4.1	GCI** by WEF***
	Value chain breadth	5.4	4.3	GCI** by WEF***
Follow Your Competitor		5.73	4.33	
	Effectiveness of anti-monopoly policy	5.1	4.5	GCI** by WEF***
	Nature of competitive advantage	5.6	3.9	GCI** by WEF***
	Intensity of local competition	5.9	5.4	GCI** by WEF***
	Legal Right	6.3	3.5	GCI** by WEF***
Availability of Skill Labor and Talent		5.72	4.32	
	University-industry collaboration in R & D	5.8	4.4	GCI** by WEF***
	Availability of Scientist and Engineers	5.3	4.4	GCI** by WEF***
	Quality of Scientific research institution	6.1	4.3	GCI** by WEF***
	Capacity to retain talent	5.7	4.2	GCI** by WEF***
	Capacity to attract talent	5.8	4.2	GCI** by WEF***
	Availability of research and training survives	5.6	4.4	GCI** by WEF***
Labor Cost & Productivity		5.03	4.67	
	Pay in productivity	4.8	4.8	GCI** by WEF***
	Co-operation in labor employer relation	4.7	4.4	GCI** by WEF***
	Flexibility in wages determination	5.6	4.8	GCI** by WEF***
Size of Local Market		6.2	5.65	
	Degree of Customer Orientation	5.4	4.5	GCI** by WEF***
	Domestic Market Size	7	6.8	GCI** by WEF***

Access to International and Regional Market		6.6	6.06	
	Trading across border*	6.5	5.12	World Bank
	Foreign Market Size	6.7	7	GCI** by WEF***
	International logistics Index*	6.49	5.49	World Bank
Growth of Market	GDP growth rate*	4.23	5.98	World Bank
Access to Natural Resource	Global Energy Competitiveness*	5.17	4.27	KPMG
Access to Capital Market		5.12	4.3	
	Availability of financial services	6.2	4.5	GCI** by WEF***
	Affordability of financial services	5.7	4.4	GCI** by WEF***
	Ease of access to loan	3.9	3.7	GCI** by WEF***
	Soundness of Bank	5.4	5	GCI** by WEF***
	Venture capital availability	4.4	3.9	GCI** by WEF***
Government Effectiveness		4.99	4.27	
	Intellectual property protection	5.4	4	GCI** by WEF***
	Burden of government regulation	3.4	4.1	GCI** by WEF***
	Transparency of Govt policy Making	4.4	4.5	GCI** by WEF***
	Availability of latest technology	6.5	4.3	GCI** by WEF***
	FDI and technology Transfer	4.9	4.5	GCI** by WEF***
	Irregular payment and bribe	5	4	GCI** by WEF***
	Property rights	5.3	4.5	GCI** by WEF***
Incentives	Enabling Trade Index	3.5	3.1	WEF***
Infrastructure		5.8	4.7	GCI** by WEF***
Stable and Business Friendly Environment		6.07	3.09	EIU****

*Normalized, **GCI: Global Competitiveness Index 2015, *** WEF: World Economic Forum, ****EIU: Economist Intelligence Unit

Appendix- C Weight of Different Factors on Different Industries Location

		Weight	
Reshoring Factors	**Factors Influencing Location Decision**	Chemicals	Electronics
Labor Cost, Availability & Skill	Labor Cost & Productivity	6%	8%
	Availability of Skill Labor and Talent	5%	9%
Availability of natural resources	Access to Natural resource	6%	1%
Incentives	Incentives	2%	3%
Policy Regulation/IP Right	Government Effectiveness	4%	3%
Proximity to Customers	Size of Local Market	18%	17%
	Access to International and regional market	12%	11%
	Growth of Market	19%	19%
Infrastructure	Infrastructure	5%	5%
Ease of doing business	Follow Your Competitor	3%	6%
	Stable and Business Friendly environment	10%	6%
	Access to Capital Market	1%	2%
Presence of Suppliers and Partners	Presence of Suppliers and Partners	10%	11%

Appendix- D Reshorability Index from China (3-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS Code	Industries	Index	Import	Export
325	Chemicals and Chemicals Products	19.56	17,775,954	13,799,957
334	Computer & Electronic Products	14.51	167,963,585	16,340,547
335	Electrical Equipment, Appliances and Component	18.83	38,694,989	3,055,279
311	Food and Kindred Products	23.51	3,577,717	4,267,184
312	Beverages & Tobacco Products	25.35	54,416	1,353,192
336	Motor Vehicle and Transport Equipment	24.08	15,394,825	26,469,179
331	Primary Metal	25.35	6,122,602	3,123,273
327	Non-metallic Mineral Products	33.23	6,726,309	2,061,716
321	Wood Products	30.16	3,708,158	1,428,929

Appendix- E Reshorability Index from China (4-Digit NAICS Code)

			In thousand $ (2014)	
NAICS	Description	Index	Import	Export
3111	Animal Food Manufacturing	20.65	242,725	169,541
3112	Grain and Oilseed Milling	24.27	216,043	486,274
3113	Sugar and Confectionery Product Manufacturing	26.14	171,222	56,544
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	27.88	1,301,020	249,276
3115	Dairy Product Manufacturing	28.00	21,200	698,497
3116	Animal Slaughtering and Processing	18.46	328,668	2,352,896
3117	Seafood Product Preparation and Packaging	18.38	594,082	11,336
3118	Bakeries and Tortilla Manufacturing	25.53	112,396	14,324
3119	Other Food Manufacturing	22.20	590,361	228,496
3121	Beverage Manufacturing	25.52	52,864	1,352,021
3122	Tobacco Manufacturing	19.85	1,552	1,171
3211	Sawmills and Wood Preservation	30.78	28,394	1,323,199
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	31.24	1,729,297	70,313
3219	Other Wood Product Manufacturing	29.20	1,950,467	35,417
3251	Basic Chemical Manufacturing	19.83	7,948,289	4,471,471
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	23.58	1,453,483	4,315,397
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	21.52	1,003,797	239,606
3254	Pharmaceutical and Medicine Manufacturing	16.10	1,995,154	2,415,513
3255	Paint, Coating, and Adhesive Manufacturing	21.16	124,466	290,508
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	21.00	1,222,045	887,597
3259	Other Chemical Product and Preparation Manufacturing	18.47	4,028,720	1,179,865
3271	Clay Product and Refractory Manufacturing	34.78	2,495,482	101,452
3272	Glass and Glass Product Manufacturing	33.23	2,387,728	381,132
3273	Cement and Concrete Product Manufacturing	36.63	476,094	2,733
3274	Lime and Gypsum Product Manufacturing	45.49	1,087	2,993
3279	Other Nonmetallic Mineral Product Manufacturing	29.38	1,365,918	219,046
3311	Iron and Steel Mills and Ferroalloy Manufacturing	25.47	2,852,847	480,654
3312	Steel Product Manufacturing from Purchased Steel	34.74	538,590	23,067
3313	Alumina and Aluminum Production and Processing	24.04	1,114,250	335,350
3314	Nonferrous Metal (except Aluminum) Production and Processing	19.90	881,985	2,187,789

3315	Foundries	27.34	734,930	96,413
3341	Computer and Peripheral Equipment Manufacturing	14.46	60,911,065	1,964,416
3342	Communications Equipment Manufacturing	14.15	64,537,065	2,258,477
3343	Audio and Video Equipment Manufacturing	15.59	14,583,812	231,184
3344	Semiconductor and Other Electronic Component Manufacturing	14.90	18,614,687	6,221,052
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	15.42	7,098,901	5,379,432
3346	Manufacturing and Reproducing Magnetic and Optical Media	13.44	2,218,055	321,351
3351	Electric Lighting Equipment Manufacturing	19.54	8,366,419	88,385
3352	Household Appliance Manufacturing	20.76	14,039,808	478,038
3353	Electrical Equipment Manufacturing	17.15	5,319,760	1,161,521
3359	Other Electrical Equipment and Component Manufacturing	16.73	10,969,002	1,327,335
3361	Motor Vehicle Manufacturing	22.93	103,833	10,100,981
3362	Motor Vehicle Body and Trailer Manufacturing	31.21	504,927	156,386
3363	Motor Vehicle Parts Manufacturing	23.66	11,750,682	2,116,381
3364	Aerospace Product and Parts Manufacturing	18.73	863,405	13,969,080
3365	Railroad Rolling Stock Manufacturing	25.89	400,348	85,268
3366	Ship and Boat Building	20.98	83,960	29,462
3369	Other Transportation Equipment Manufacturing	27.77	1,687,670	51,086

Appendix- F Reshorability Index from China (6-Digit NAICS Code)

			In Thousand $ (2014)	
6-Digit	Description	Index	Import	Export
311111	Dog and Cat Food Manufacturing	18.97	120,789	297
311119	Other Animal Food Manufacturing	22.36	121,936	169,244
311211	Flour Milling	31.04	52,877	192,551
311212	Rice Milling	17.95	13,378	7,268
311213	Malt Manufacturing	No Data*	5	-
311221	Wet Corn Milling	24.59	39,269	76,574
311224	Soybean and Other Oilseed Processing	21.65	102,377	180,909
311225	Fats and Oils Refining and Blending	17.96	3,272	17,261
311230	Breakfast Cereal Manufacturing	31.66	4,865	11,711
311313	Beet Sugar Manufacturing	No Data	-	-
311314	Cane Sugar Manufacturing	No Data	-	-
311340	Nonchocolate Confectionery Manufacturing	26.40	154,390	8,834

311351	Chocolate and Confectionery Manufacturing from Cacao Beans	No Data	-	-
311352	Confectionery Manufacturing from Purchased Chocolate	No Data	-	-
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	33.63	121,528	135,734
311412	Frozen Specialty Food Manufacturing	21.94	20,962	87
311421	Fruit and Vegetable Canning	27.83	1,014,540	72,972
311422	Specialty Canning	25.05	398	2,104
311423	Dried and Dehydrated Food Manufacturing	24.56	143,592	38,379
311511	Fluid Milk Manufacturing	No Data	-	15,926
311512	Creamery Butter Manufacturing	No Data	-	7,565
311513	Cheese Manufacturing	No Data	-	55,237
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	28.00	21,200	614,939
311520	Ice Cream and Frozen Dessert Manufacturing	No Data	-	4,830
311611	Animal (except Poultry) Slaughtering	18.11	267,711	1,998,165
311612	Meat Processed from Carcasses	18.42	1,713	-
311613	Rendering and Meat Byproduct Processing	20.06	54,217	39,027
311615	Poultry Processing	20.28	5,027	315,704
311710	Seafood Product Preparation and Packaging	18.38	594,082	11,336
311811	Retail Bakeries	No Data	-	-
311812	Commercial Bakeries	No Data	-	-
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	No Data	-	-
311821	Cookie and Cracker Manufacturing	No Data	-	-
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	26.00	58,331	3,442
311830	Tortilla Manufacturing	No Data	-	-
311911	Roasted Nuts and Peanut Butter Manufacturing	22.32	21,589	8,821
311919	Other Snack Food Manufacturing	21.67	3,328	11,078
311920	Coffee and Tea Manufacturing	20.95	145,393	31,355
311930	Flavoring Syrup and Concentrate Manufacturing	26.75	3,680	9,617
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	29.70	40,764	2,700
311942	Spice and Extract Manufacturing	22.58	212,947	13,600
311991	Perishable Prepared Food Manufacturing	27.06	15,773	-
311999	All Other Miscellaneous Food Manufacturing	20.35	146,887	151,325
312111	Soft Drink Manufacturing	28.77	27,893	7,828
312112	Bottled Water Manufacturing	No Data	18	1,158

312113	Ice Manufacturing	No Data	47	129
312120	Breweries	27.08	10,856	1,255,786
312130	Wineries	28.66	2,216	78,450
312140	Distilleries	16.71	11,834	8,670
312230	Tobacco Manufacturing	19.85	1,552	1,171
321113	Sawmills	30.79	28,218	1,291,248
321114	Wood Preservation	29.48	176	31,951
321211	Hardwood Veneer and Plywood Manufacturing	29.34	1,136,607	20,688
321212	Softwood Veneer and Plywood Manufacturing	30.52	63,028	42,652
321213	Engineered Wood Member (except Truss) Manufacturing	29.95	148,377	3,225
321214	Truss Manufacturing	No Data	-	-
321219	Reconstituted Wood Product Manufacturing	37.96	381,285	3,748
321911	Wood Window and Door Manufacturing	27.46	96,146	1,937
321912	Cut Stock, Resawing Lumber, and Planning	No Data	-	-
321918	Other Millwork (including Flooring)	28.86	477,555	2,674
321920	Wood Container and Pallet Manufacturing	26.65	117,773	2,466
321991	Manufactured Home (Mobile Home) Manufacturing	30.06	116	2,332
321992	Prefabricated Wood Building Manufacturing	29.56	18,702	618
321999	All Other Miscellaneous Wood Product Manufacturing	29.72	1,240,175	25,390
325110	Petrochemical Manufacturing	31.79	109,888	410,815
325120	Industrial Gas Manufacturing	23.58	41,569	34,574
325130	Synthetic Dye and Pigment Manufacturing	20.04	785,718	222,281
325180	Other Basic Inorganic Chemical Manufacturing	23.03	1,179,112	1,124,039
325193	Ethyl Alcohol Manufacturing	No Data	91	8,327
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	20.37	376,477	240,576
325199	All Other Basic Organic Chemical Manufacturing	18.84	5,455,434	2,430,859
325211	Plastics Material and Resin Manufacturing	23.02	693,097	2,925,836
325212	Synthetic Rubber Manufacturing	21.54	246,137	797,691
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	25.35	514,249	591,870
325311	Nitrogenous Fertilizer Manufacturing	23.91	497,089	4,619
325312	Phosphatic Fertilizer Manufacturing	19.58	331,170	133,764
325314	Fertilizer (Mixing Only) Manufacturing	No Data	-	-
325320	Pesticide and Other Agricultural Chemical Manufacturing	18.67	175,538	101,223
325411	Medicinal and Botanical Manufacturing	16.22	910,253	93,034
325412	Pharmaceutical Preparation Manufacturing	15.67	703,741	1,309,765

325413	In-Vitro Diagnostic Substance Manufacturing	16.22	324,775	517,162
325414	Biological Product (except Diagnostic) Manufacturing	18.96	56,385	495,552
325510	Paint and Coating Manufacturing	20.91	50,337	126,153
325520	Adhesive Manufacturing	21.33	74,129	164,355
325611	Soap and Other Detergent Manufacturing	24.75	161,348	59,428
325612	Polish and Other Sanitation Good Manufacturing	21.78	31,624	117,917
325613	Surface Active Agent Manufacturing	26.58	137,959	493,790
325620	Toilet Preparation Manufacturing	19.50	891,114	216,462
325910	Printing Ink Manufacturing	16.72	3,443,858	52,681
325920	Explosives Manufacturing	17.54	7,451	80,176
325991	Custom Compounding of Purchased Resins	No Data	-	-
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	17.04	34,445	599,901
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	31.03	542,966	447,107
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	31.33	1,981,813	72,092
327120	Clay Building Material and Refractories Manufacturing	50.01	513,669	29,360
327211	Flat Glass Manufacturing	33.76	279,233	17,141
327212	Other Pressed and Blown Glass and Glassware Manufacturing	32.01	940,511	199,624
327213	Glass Container Manufacturing	46.82	323,709	2,576
327215	Glass Product Manufacturing Made of Purchased Glass	29.79	844,275	161,791
327310	Cement Manufacturing	No Data	47756	279
327320	Ready-Mix Concrete Manufacturing	No Data	-	287
327331	Concrete Block and Brick Manufacturing	40.52	625	-
327332	Concrete Pipe Manufacturing	No Data	-	-
327390	Other Concrete Product Manufacturing	31.60	427,713	2,167
327410	Lime Manufacturing	45.74	127	24
327420	Gypsum Product Manufacturing	45.46	960	2,969
327910	Abrasive Product Manufacturing	22.30	430,306	85,611
327991	Cut Stone and Stone Product Manufacturing	35.40	611,405	1,484
327992	Ground or Treated Mineral and Earth Manufacturing	28.42	166,963	16,064
327993	Mineral Wool Manufacturing	29.39	82,125	79,229
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	27.62	75,119	36,658
331110	Iron and Steel Mills and Ferroalloy Manufacturing	25.47	2,852,847	480,654
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	25.68	373	-
331221	Rolled Steel Shape Manufacturing	35.37	5,915	14,065

331222	Steel Wire Drawing	34.74	532,302	9,002
331313	Alumina Refining and Primary Aluminum Production	35.57	53,624	70,395
331314	Secondary Smelting and Alloying of Aluminum	24.44	10,148	3,705
331315	Aluminum Sheet, Plate, and Foil Manufacturing	23.57	971,479	204,431
331318	Other Aluminum Rolling, Drawing, and Extruding	22.71	78,999	56,819
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	19.38	418,726	1,607,895
331420	Copper Rolling, Drawing, Extruding, and Alloying	20.86	204,903	182,682
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	19.85	193,830	322,995
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	20.46	64,526	74,217
331511	Iron Foundries	27.62	552,476	79,383
331512	Steel Investment Foundries	No Data	-	-
331513	Steel Foundries (except Investment)	27.42	110,411	129
331523	Nonferrous Metal Die-Casting Foundries	25.09	72,034	16,901
331524	Aluminum Foundries (except Die-Casting)	No Data	-	-
331529	Other Nonferrous Metal Foundries (except Die-Casting)	No Data	9	-
334111	Electronic Computer Manufacturing	14.23	42,950,801	813,508
334112	Computer Storage Device Manufacturing	14.45	3,604,029	126,622
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	15.17	14,356,235	1,024,286
334210	Telephone Apparatus Manufacturing	14.61	1,340,067	22,056
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	14.13	62,719,454	2,200,081
334290	Other Communications Equipment Manufacturing	15.06	477,544	36,340
334310	Audio and Video Equipment Manufacturing	15.59	14,583,812	195,819
334412	Bare Printed Circuit Board Manufacturing	18.25	829,294	147,227
334413	Semiconductor and Related Device Manufacturing	14.58	4,904,501	5,473,003
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	16.45	1,126,650	227,002
334417	Electronic Connector Manufacturing	16.95	586,288	184,517
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	14.07	8,595,281	11,388
334419	Other Electronic Component Manufacturing	16.12	2,572,673	177,915
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	14.14	1,084,231	1,099,398
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	14.50	1,026,412	133,289

334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	14.73	376,808	31,717
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	16.03	1,394,811	596,182
334514	Totalizing Fluid Meter and Counting Device Manufacturing	14.83	424,207	22,817
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	15.39	821,948	1,336,088
334516	Analytical Laboratory Instrument Manufacturing	15.30	586,595	882,520
334517	Irradiation Apparatus Manufacturing	16.25	308,949	501,403
334519	Other Measuring and Controlling Device Manufacturing	17.16	1,074,940	776,018
334613	Blank Magnetic and Optical Recording Media Manufacturing	13.40	2,144,095	102,971
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	14.60	73,960	218,380
335110	Electric Lamp Bulb and Part Manufacturing	17.96	1,191,752	39,086
335121	Residential Electric Lighting Fixture Manufacturing	22.09	2,021,465	3,453
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	19.94	304,198	4,471
335129	Other Lighting Equipment Manufacturing	18.87	4,849,004	41,375
335210	Small Electrical Appliance Manufacturing	19.09	8,688,865	406,902
335221	Household Cooking Appliance Manufacturing	22.38	2,708,553	2,429
335222	Household Refrigerator and Home Freezer Manufacturing	26.78	1,054,932	36,302
335224	Household Laundry Equipment Manufacturing	24.33	1,239,871	6,510
335228	Other Major Household Appliance Manufacturing	20.83	347,587	25,895
335311	Power, Distribution, and Specialty Transformer Manufacturing	18.31	369,412	19,256
335312	Motor and Generator Manufacturing	17.83	2,650,959	445,888
335313	Switchgear and Switchboard Apparatus Manufacturing	16.12	1,432,454	346,580
335314	Relay and Industrial Control Manufacturing	16.32	866,935	349,797
335911	Storage Battery Manufacturing	17.20	1,436,059	126,083
335912	Primary Battery Manufacturing	18.63	298,122	15,874
335921	Fiber Optic Cable Manufacturing	17.60	207,067	34,348
335929	Other Communication and Energy Wire Manufacturing	17.24	3,157,068	232,081
335931	Current-Carrying Wiring Device Manufacturing	16.23	1,451,149	303,207
335932	Noncurrent-Carrying Wiring Device Manufacturing	17.96	84,644	17,844
335991	Carbon and Graphite Product Manufacturing	17.74	85,780	119,471
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	16.16	4,249,113	478,427

336111	Automobile Manufacturing	24.03	84,274	10,031,267
336112	Light Truck and Utility Vehicle Manufacturing	24.25	102	4,868
336120	Heavy Duty Truck Manufacturing	18.37	19,457	64,846
336211	Motor Vehicle Body Manufacturing	29.85	1,549	130,774
336212	Truck Trailer Manufacturing	32.76	204,207	3,827
336213	Motor Home Manufacturing	No Data	-	15,812
336214	Travel Trailer and Camper Manufacturing	30.18	299,171	5,973
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	23.22	782,825	200,456
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	21.51	1,963,566	169,292
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	21.69	1,041,318	528,551
336340	Motor Vehicle Brake System Manufacturing	27.14	1,479,520	66,459
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	22.20	605,845	58,100
336360	Motor Vehicle Seating and Interior Trim Manufacturing	25.61	395,725	64,039
336370	Motor Vehicle Metal Stamping	29.97	27,090	41,131
336390	Other Motor Vehicle Parts Manufacturing	23.98	5,454,793	988,353
336411	Aircraft Manufacturing	18.17	15,482	7
336412	Aircraft Engine and Engine Parts Manufacturing	18.62	359,296	5,077
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	18.82	481,760	275
336414	Guided Missile and Space Vehicle Manufacturing	No Data	-	-
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	21.34	513	-
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	18.95	6,354	-
336510	Railroad Rolling Stock Manufacturing	25.89	400,348	85,268
336611	Ship Building and Repairing	19.48	45,742	21,225
336612	Boat Building	22.83	38,218	8,237
336991	Motorcycle, Bicycle, and Parts Manufacturing	27.19	1,356,007	21,832
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	No Data	33	-
336999	All Other Transportation Equipment Manufacturing	30.23	331,630	29,254
31131X	Sugars	31.15	5,290	7,792
31135X	Chocolate And Confectionery From Cacao Beans Products	20.71	11,542	39,918
31181X	Bread & Bakery Products	25.02	54,065	10,882
33641X	Civilian Aircraft, Engines, Equipment, And Parts	No Data		13,924,256

No Data*: No import or import value is too low (<$100,000) to justify CIF cost (>10%)

Appendix- G Logistics Cost from China (6-Digit NAICS code)

NAICS Code	Description	Reshorability Index	Logistics Cost, % of Import
311111	Dog and Cat Food Manufacturing	18.97	6.76%
311119	Other Animal Food Manufacturing	22.36	9.34%
311211	Flour Milling	31.04	15.35%
311212	Rice Milling	17.95	5.95%
311213	Malt Manufacturing	44.06	23.00%
311221	Wet Corn Milling	24.59	10.96%
311224	Soybean and Other Oilseed Processing	21.65	8.81%
311225	Fats and Oils Refining and Blending	17.96	5.96%
311230	Breakfast Cereal Manufacturing	31.66	15.74%
311313	Beet Sugar Manufacturing	No Data	No Data
311314	Cane Sugar Manufacturing	No Data	No Data
311340	Nonchocolate Confectionery Manufacturing	26.40	12.24%
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	No Data	No Data
311352	Confectionery Manufacturing from Purchased Chocolate	No Data	No Data
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	33.63	16.99%
311412	Frozen Specialty Food Manufacturing	21.94	9.03%
311421	Fruit and Vegetable Canning	27.83	13.22%
311422	Specialty Canning	25.05	11.29%
311423	Dried and Dehydrated Food Manufacturing	24.56	10.94%
311511	Fluid Milk Manufacturing	No Data	No Data
311512	Creamery Butter Manufacturing	No Data	No Data
311513	Cheese Manufacturing	No Data	No Data
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	28.00	13.33%
311520	Ice Cream and Frozen Dessert Manufacturing	No Data	No Data
311611	Animal (except Poultry) Slaughtering	18.11	6.08%

311612	Meat Processed from Carcasses	18.42	6.33%
311613	Rendering and Meat Byproduct Processing	20.06	7.60%
311615	Poultry Processing	20.28	7.77%
311710	Seafood Product Preparation and Packaging	18.38	6.29%
311811	Retail Bakeries	No Data	No Data
311812	Commercial Bakeries	No Data	No Data
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	No Data	No Data
311821	Cookie and Cracker Manufacturing	No Data	No Data
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	26.00	11.96%
311830	Tortilla Manufacturing	No Data	No Data
311911	Roasted Nuts and Peanut Butter Manufacturing	22.32	9.31%
311919	Other Snack Food Manufacturing	21.67	8.83%
311920	Coffee and Tea Manufacturing	20.95	8.28%
311930	Flavoring Syrup and Concentrate Manufacturing	26.75	12.48%
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	29.70	14.48%
311942	Spice and Extract Manufacturing	22.58	9.51%
311991	Perishable Prepared Food Manufacturing	27.06	12.69%
311999	All Other Miscellaneous Food Manufacturing	20.35	7.83%
312111	Soft Drink Manufacturing	28.77	13.86%
312112	Bottled Water Manufacturing	29.15	14.11%
312113	Ice Manufacturing	28.44	13.64%
312120	Breweries	27.08	12.71%
312130	Wineries	28.66	13.79%
312140	Distilleries	16.71	4.95%
312230	Tobacco Manufacturing	19.85	7.45%
321113	Sawmills	30.79	12.97%
321114	Wood Preservation	29.48	12.09%
321211	Hardwood Veneer and Plywood Manufacturing	29.34	12.00%
321212	Softwood Veneer and Plywood Manufacturing	30.52	12.79%
321213	Engineered Wood Member (except Truss) Manufacturing	29.95	12.41%

321214	Truss Manufacturing	No Data	No Data
321219	Reconstituted Wood Product Manufacturing	37.96	17.50%
321911	Wood Window and Door Manufacturing	27.46	10.70%
321912	Cut Stock, Resawing Lumber, and Planning	No Data	No Data
321918	Other Millwork (including Flooring)	28.86	11.67%
321920	Wood Container and Pallet Manufacturing	26.65	10.13%
321991	Manufactured Home (Mobile Home) Manufacturing	30.06	12.48%
321992	Prefabricated Wood Building Manufacturing	29.56	12.15%
321999	All Other Miscellaneous Wood Product Manufacturing	29.72	12.25%
325110	Petrochemical Manufacturing	31.79	16.22%
325120	Industrial Gas Manufacturing	23.58	10.66%
325130	Synthetic Dye and Pigment Manufacturing	20.04	8.03%
325180	Other Basic Inorganic Chemical Manufacturing	23.03	10.26%
325193	Ethyl Alcohol Manufacturing	63.98	32.67%
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	20.37	8.28%
325199	All Other Basic Organic Chemical Manufacturing	18.84	7.10%
325211	Plastics Material and Resin Manufacturing	23.02	10.26%
325212	Synthetic Rubber Manufacturing	21.54	9.16%
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	25.35	11.92%
325311	Nitrogenous Fertilizer Manufacturing	23.91	10.90%
325312	Phosphatic Fertilizer Manufacturing	19.58	7.67%
325314	Fertilizer (Mixing Only) Manufacturing	No Data	No Data
325320	Pesticide and Other Agricultural Chemical Manufacturing	18.67	6.96%
325411	Medicinal and Botanical Manufacturing	16.22	5.01%
325412	Pharmaceutical Preparation Manufacturing	15.67	4.55%
325413	In-Vitro Diagnostic Substance Manufacturing	16.22	5.00%
325414	Biological Product (except Diagnostic) Manufacturing	18.96	7.19%
325510	Paint and Coating Manufacturing	20.91	8.69%
325520	Adhesive Manufacturing	21.33	9.00%
325611	Soap and Other Detergent Manufacturing	24.75	11.50%

325612	Polish and Other Sanitation Good Manufacturing	21.78	9.34%
325613	Surface Active Agent Manufacturing	26.58	12.78%
325620	Toilet Preparation Manufacturing	19.50	7.61%
325910	Printing Ink Manufacturing	16.72	5.41%
325920	Explosives Manufacturing	17.54	6.07%
325991	Custom Compounding of Purchased Resins	No Data	No Data
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	17.04	5.67%
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	31.03	15.74%
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	31.33	13.33%
327120	Clay Building Material and Refractories Manufacturing	50.01	24.12%
327211	Flat Glass Manufacturing	33.76	14.90%
327212	Other Pressed and Blown Glass and Glassware Manufacturing	32.01	13.77%
327213	Glass Container Manufacturing	46.82	22.48%
327215	Glass Product Manufacturing Made of Purchased Glass	29.79	12.30%
327310	Cement Manufacturing	107.73	45.21%
327320	Ready-Mix Concrete Manufacturing	No Data	No Data
327331	Concrete Block and Brick Manufacturing	40.52	19.00%
327332	Concrete Pipe Manufacturing	No Data	No Data
327390	Other Concrete Product Manufacturing	31.60	13.51%
327410	Lime Manufacturing	45.74	21.90%
327420	Gypsum Product Manufacturing	45.46	21.75%
327910	Abrasive Product Manufacturing	22.30	6.93%
327991	Cut Stone and Stone Product Manufacturing	35.40	15.94%
327992	Ground or Treated Mineral and Earth Manufacturing	28.42	11.37%
327993	Mineral Wool Manufacturing	29.39	12.03%
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	27.62	10.81%
331110	Iron and Steel Mills and Ferroalloy Manufacturing	25.47	9.28%

331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	25.68	9.43%
331221	Rolled Steel Shape Manufacturing	35.37	15.92%
331222	Steel Wire Drawing	34.74	15.52%
331313	Alumina Refining and Primary Aluminum Production	35.57	16.04%
331314	Secondary Smelting and Alloying of Aluminum	24.44	8.53%
331315	Aluminum Sheet, Plate, and Foil Manufacturing	23.57	7.89%
331318	Other Aluminum Rolling, Drawing, and Extruding	22.71	7.24%
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	19.38	4.65%
331420	Copper Rolling, Drawing, Extruding, and Alloying	20.86	5.82%
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	19.85	5.03%
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	20.46	5.51%
331511	Iron Foundries	27.62	10.81%
331512	Steel Investment Foundries	No Data	No Data
331513	Steel Foundries (except Investment)	27.42	10.67%
331523	Nonferrous Metal Die-Casting Foundries	25.09	9.00%
331524	Aluminum Foundries (except Die-Casting)	No Data	No Data
331529	Other Nonferrous Metal Foundries (except Die-Casting)	52.22	25.22%
334111	Electronic Computer Manufacturing	14.23	4.48%
334112	Computer Storage Device Manufacturing	14.45	4.66%
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	15.17	5.25%
334210	Telephone Apparatus Manufacturing	14.61	4.79%
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	14.13	4.39%
334290	Other Communications Equipment Manufacturing	15.06	5.17%
334310	Audio and Video Equipment Manufacturing	15.59	5.60%
334412	Bare Printed Circuit Board Manufacturing	18.25	7.72%
334413	Semiconductor and Related Device Manufacturing	14.58	4.77%
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	16.45	6.30%

334417	Electronic Connector Manufacturing	16.95	6.70%
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	14.07	4.34%
334419	Other Electronic Component Manufacturing	16.12	6.03%
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	14.14	4.40%
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	14.50	4.70%
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	14.73	4.89%
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	16.03	5.96%
334514	Totalizing Fluid Meter and Counting Device Manufacturing	14.83	4.97%
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	15.39	5.44%
334516	Analytical Laboratory Instrument Manufacturing	15.30	5.36%
334517	Irradiation Apparatus Manufacturing	16.25	6.14%
334519	Other Measuring and Controlling Device Manufacturing	17.16	6.86%
334613	Blank Magnetic and Optical Recording Media Manufacturing	13.40	3.77%
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	14.60	4.78%
335110	Electric Lamp Bulb and Part Manufacturing	17.96	7.50%
335121	Residential Electric Lighting Fixture Manufacturing	22.09	10.62%
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	19.94	9.02%
335129	Other Lighting Equipment Manufacturing	18.87	8.20%
335210	Small Electrical Appliance Manufacturing	19.09	8.37%
335221	Household Cooking Appliance Manufacturing	22.38	10.84%
335222	Household Refrigerator and Home Freezer Manufacturing	26.78	13.93%
335224	Household Laundry Equipment Manufacturing	24.33	12.23%
335228	Other Major Household Appliance Manufacturing	20.83	9.69%

335311	Power, Distribution, and Specialty Transformer Manufacturing	18.31	7.77%
335312	Motor and Generator Manufacturing	17.83	7.39%
335313	Switchgear and Switchboard Apparatus Manufacturing	16.12	6.03%
335314	Relay and Industrial Control Manufacturing	16.32	6.19%
335911	Storage Battery Manufacturing	17.20	6.89%
335912	Primary Battery Manufacturing	18.63	8.02%
335921	Fiber Optic Cable Manufacturing	17.60	7.21%
335929	Other Communication and Energy Wire Manufacturing	17.24	6.92%
335931	Current-Carrying Wiring Device Manufacturing	16.23	6.12%
335932	Noncurrent-Carrying Wiring Device Manufacturing	17.96	7.49%
335991	Carbon and Graphite Product Manufacturing	17.74	7.33%
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	16.16	6.06%
336111	Automobile Manufacturing	24.03	8.72%
336112	Light Truck and Utility Vehicle Manufacturing	24.25	8.88%
336120	Heavy Duty Truck Manufacturing	18.37	4.36%
336211	Motor Vehicle Body Manufacturing	29.85	12.81%
336212	Truck Trailer Manufacturing	32.76	14.73%
336213	Motor Home Manufacturing	No Data	No Data
336214	Travel Trailer and Camper Manufacturing	30.18	13.04%
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	23.22	8.13%
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	21.51	6.83%
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	21.69	6.97%
336340	Motor Vehicle Brake System Manufacturing	27.14	10.96%
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	22.20	7.36%
336360	Motor Vehicle Seating and Interior Trim Manufacturing	25.61	9.87%
336370	Motor Vehicle Metal Stamping	29.97	12.89%

336390	Other Motor Vehicle Parts Manufacturing	23.98	8.69%
336411	Aircraft Manufacturing	18.17	4.19%
336412	Aircraft Engine and Engine Parts Manufacturing	18.62	4.57%
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	18.82	4.72%
336414	Guided Missile and Space Vehicle Manufacturing	No Data	No Data
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	21.34	6.70%
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	18.95	4.83%
336510	Railroad Rolling Stock Manufacturing	25.89	10.07%
336611	Ship Building and Repairing	19.48	5.25%
336612	Boat Building	22.83	7.83%
336991	Motorcycle, Bicycle, and Parts Manufacturing	27.19	10.99%
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	20.47	6.03%
336999	All Other Transportation Equipment Manufacturing	30.23	13.07%
31131X	Sugars	31.15	15.42%
31135X	Chocolate And Confectionery From Cacao Beans Products	20.71	8.10%
33641X	Civilian Aircraft, Engines, Equipment, And Parts	No Data	No Data
31181X	Bread & Bakery Products	25.02	11.27%

Appendix- H Score on Different Factors (US vs India)

		Score 1-7	
Location Factors	**Sub-Factors**	**US**	**India**
Presence of Suppliers and Partners		5.39	4.14
	Local supplier Quantity	5.5	4.6
	Local Supplier Quality	5.6	4.2
	Prevalence of foreign ownership	5.1	4.2
	Buyer sophistication	4.5	3.8
	Regulation of security exchange	5	4.3
	State of cluster development	5.4	4.5

	Extent of marketing	6.2	4.1
	Production process sophistication	6.1	4
	Value chain breadth	5.4	4.1
Follow your competitor		5.73	4.68
	Effectiveness of anti-monopoly policy	5.1	4.4
	Nature of competitive advantage	5.6	3.9
	Intensity of local competition	5.9	4.8
	Legal Right	6.3	5.6
Availability of Skill labor and talent		5.72	4.03
	University-industry collaboration in R & D	5.8	3.9
	Availability of Scientist and Engineers	5.3	4.4
	Quality of Scientific research institution	6.1	4
	Capacity to retain talent	5.7	3.9
	Capacity to attract talent	5.8	3.8
	Availability of research and training survives	5.6	4.2
Labor Cost and Productivity		5.03	4.17
	Pay in productivity	4.8	4
	Co-operation in labor employer relation	4.7	4.1
	Flexibility in wages determination	5.6	4.4
Size of local Market		6.2	5.2
	Degree of Customer Orientation	5.4	4
	Domestic Market Size	7	6.4
Access to international and regional market		6.6	5.375
	Trading across border	6.5	4.35
	Foreign Market Size	6.7	6.4
	International logistics Index	6.49	4.34
Growth of Market	GDP growth rate	4.23	5.98
Access to natural resource	Global energy competitiveness KPMG	5.17	3

Access to capital market		5.12	3.94
	Availability of financial services	6.2	4.2
	Affordability of financial services	5.7	4.1
	Ease of access to loan	3.9	3.6
	Soundness of Bank	5.4	4.3
	Venture capital availability	4.40	3.50
Government effectiveness		4.99	3.89
	Intellectual property protection	5.4	3.7
	Burden of government regulation	3.4	3.6
	Transparency of Govt policy Making	4.4	4
	Availability of latest technology	6.5	4.1
	FDI and technology Transfer	4.9	4.2
	Irregular payment and bribe	5	3.5
	Property rights	5.3	4.1
Incentives	Enabling Trade	3.5	2.4
Infrastructure		5.8	3.6
Stable and business friendly environment		6.07	2.23

Appendix- I Reshorability Index from India (3-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS Code	Description	Index	Import	Export
311	Food and Kindred Products	30.66	2,200,626	143,124
312	Beverages & Tobacco Products	34.56	20,302	7,450
321	Wood Products	41.55	85,967	23,221
325	Chemicals and Chemicals Products	29.89	8,047,053	3,017,353
327	Non-metallic Mineral Products	51.24	545,525	185,597
331	Primary Metal	40.72	1,454,140	1,594,632
334	Computer & Electronic Products	24.66	878,780	2,074,178
335	Electrical Equipment, Appliances and Component	28.47	753,327	500,109
336	Motor Vehicle and Transport Equipment	34.64	1,198,379	3,326,081

Appendix- J Reshorability Index from India (4-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS	Description	Index	Import	Export
3111	Animal Food Manufacturing	28.55	3,935	13,697
3112	Grain and Oilseed Milling	34.72	321,880	34,670
3113	Sugar and Confectionery Product Manufacturing	29.15	48,902	7,879
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	39.77	93,333	7,010
3115	Dairy Product Manufacturing	26.32	67,879	18,405
3116	Animal Slaughtering and Processing	33.12	8,180	10,223
3117	Seafood Product Preparation and Packaging	26.58	57,964	18
3118	Bakeries and Tortilla Manufacturing	38.61	64,776	490
3119	Other Food Manufacturing	29.41	1,533,777	50,732
3121	Beverage Manufacturing	39.64	5,799	46,907
3122	Tobacco Manufacturing	32.63	14,503	187
3211	Sawmills and Wood Preservation	33.53	4,141	15,076
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	34.71	3,934	3,834
3219	Other Wood Product Manufacturing	42.37	77,892	4,311
3251	Basic Chemical Manufacturing	30.21	1,857,758	1,319,629
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	34.70	303,167	490,868
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	30.11	66,534	500,876
3254	Pharmaceutical and Medicine Manufacturing	29.39	5,424,789	370,351
3255	Paint, Coating, and Adhesive Manufacturing	34.14	3,036	43,326
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	34.56	113,721	117,538
3259	Other Chemical Product and Preparation Manufacturing	30.52	278,048	174,765
3271	Clay Product and Refractory Manufacturing	45.37	59,202	24,946

3272	Glass and Glass Product Manufacturing	43.56	122,200	106,277
3273	Cement and Concrete Product Manufacturing	48.07	6,933	1,260
3274	Lime and Gypsum Product Manufacturing	No Data*	3	734
3279	Other Nonmetallic Mineral Product Manufacturing	55.18	357,187	52,380
3311	Iron and Steel Mills and Ferroalloy Manufacturing	40.97	1,044,320	155,654
3312	Steel Product Manufacturing from Purchased Steel	35.63	83,381	7,961
3313	Alumina and Aluminum Production and Processing	37.97	90,403	21,907
3314	Nonferrous Metal (except Aluminum) Production and Processing	36.34	70,576	1,363,262
3315	Foundries	45.46	165,460	45,848
3341	Computer and Peripheral Equipment Manufacturing	25.53	27,558	312,577
3342	Communications Equipment Manufacturing	23.35	278,187	550,970
3343	Audio and Video Equipment Manufacturing	24.83	4,704	44,490
3344	Semiconductor and Other Electronic Component Manufacturing	25.36	290,767	236,513
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	25.02	252,474	879,773
3346	Manufacturing and Reproducing Magnetic and Optical Media	26.71	25,090	49,855
3351	Electric Lighting Equipment Manufacturing	35.12	134,835	10,932
3352	Household Appliance Manufacturing	28.26	28,348	50,939
3353	Electrical Equipment Manufacturing	27.44	385,729	183,166
3359	Other Electrical Equipment and Component Manufacturing	26.33	204,415	252,572
3361	Motor Vehicle Manufacturing	No Data	140	53,501
3362	Motor Vehicle Body and Trailer Manufacturing	34.80	3,967	21,795
3363	Motor Vehicle Parts Manufacturing	34.69	994,699	156,277
3364	Aerospace Product and Parts Manufacturing	33.49	159,904	3,014,360
3365	Railroad Rolling Stock Manufacturing	36.80	19,167	57,941
3366	Ship and Boat Building	No Data	54	5,295
3369	Other Transportation Equipment Manufacturing	39.48	20,448	16,912

Appendix- K Reshorability Index from India (6-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS	Description	Index	Import	Export
311111	Dog and Cat Food Manufacturing	28.02	3,235	228
311119	Other Animal Food Manufacturing	31.06	700	13,469
311211	Flour Milling	46.94	27,956	1,163
311212	Rice Milling	33.68	177,478	793

311213	Malt Manufacturing	No Data	-	-
311221	Wet Corn Milling	35.42	3,767	9,221
311224	Soybean and Other Oilseed Processing	32.81	97,909	22,310
311225	Fats and Oils Refining and Blending	37.27	8,987	893
311230	Breakfast Cereal Manufacturing	41.75	5,783	290
311313	Beet Sugar Manufacturing	23.53	-	-
311314	Cane Sugar Manufacturing	23.53	-	-
311340	Nonchocolate Confectionery Manufacturing	34.76	3,944	999
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	23.53	-	-
311352	Confectionery Manufacturing from Purchased Chocolate	23.53	-	-
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	39.54	9,325	1,177
311412	Frozen Specialty Food Manufacturing	41.66	306	-
311421	Fruit and Vegetable Canning	40.44	77,535	4,328
311422	Specialty Canning	27.82	92	233
311423	Dried and Dehydrated Food Manufacturing	32.16	6,075	1,272
311511	Fluid Milk Manufacturing	23.53	-	53
311512	Creamery Butter Manufacturing	23.53	1,632	8
311513	Cheese Manufacturing	23.53	717	293
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	26.17	65,449	18,051
311520	Ice Cream and Frozen Dessert Manufacturing	23.53	81	-
311611	Animal (except Poultry) Slaughtering	31.84	3,449	1,119
311612	Meat Processed from Carcasses	23.53	4	-
311613	Rendering and Meat Byproduct Processing	34.08	4,727	8,843
311615	Poultry Processing	No Data	-	261
311710	Seafood Product Preparation and Packaging	26.58	57,964	18
311811	Retail Bakeries	23.53	-	-
311812	Commercial Bakeries	23.53	-	-
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	23.53	-	-
311821	Cookie and Cracker Manufacturing	23.53	-	-
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	36.72	7,082	368
311830	Tortilla Manufacturing	23.53	-	-
311911	Roasted Nuts and Peanut Butter Manufacturing	29.92	13,103	2,771
311919	Other Snack Food Manufacturing	37.22	10,887	1,311

311920	Coffee and Tea Manufacturing	29.50	102,083	1,945
311930	Flavoring Syrup and Concentrate Manufacturing	33.26	1,157	5,602
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	37.99	4,900	1,715
311942	Spice and Extract Manufacturing	30.21	187,966	4,884
311991	Perishable Prepared Food Manufacturing	36.30	1,331	-
311999	All Other Miscellaneous Food Manufacturing	29.16	1,212,350	32,504
312111	Soft Drink Manufacturing	39.86	2,807	1,831
312112	Bottled Water Manufacturing	No Data	8	6
312113	Ice Manufacturing	23.53	5	13
312120	Breweries	42.50	2,408	17
312130	Wineries	32.88	205	1,539
312140	Distilleries	24.58	366	3,857
312230	Tobacco Manufacturing	32.63	14,503	187
321113	Sawmills	33.53	4,141	11,852
321114	Wood Preservation	No Data	-	3,224
321211	Hardwood Veneer and Plywood Manufacturing	34.58	3,724	2,356
321212	Softwood Veneer and Plywood Manufacturing	31.01	9	101
321213	Engineered Wood Member (except Truss) Manufacturing	37.73	169	-
321214	Truss Manufacturing	31.01	-	-
321219	Reconstituted Wood Product Manufacturing	35.37	32	1,377
321911	Wood Window and Door Manufacturing	41.32	579	143
321912	Cut Stock, Resawing Lumber, and Planing	31.01	-	-
321918	Other Millwork (including Flooring)	34.38	82	338
321920	Wood Container and Pallet Manufacturing	42.30	5,847	2,491
321991	Manufactured Home (Mobile Home) Manufacturing	No Data	-	-
321992	Prefabricated Wood Building Manufacturing	38.93	524	442
321999	All Other Miscellaneous Wood Product Manufacturing	42.42	70,860	897
325110	Petrochemical Manufacturing	37.69	41,449	49,362
325120	Industrial Gas Manufacturing	33.85	373	2,558
325130	Synthetic Dye and Pigment Manufacturing	30.13	259,772	74,464
325180	Other Basic Inorganic Chemical Manufacturing	34.51	115,175	337,598
325193	Ethyl Alcohol Manufacturing	No Data	-	79,128
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	30.05	120,404	90,072
325199	All Other Basic Organic Chemical Manufacturing	29.66	1,320,585	686,447

325211	Plastics Material and Resin Manufacturing	34.59	182,766	328,145
325212	Synthetic Rubber Manufacturing	32.52	10,418	128,585
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	35.09	109,983	34,138
325311	Nitrogenous Fertilizer Manufacturing	40.70	1,955	5,891
325312	Phosphatic Fertilizer Manufacturing	31.82	1,559	427,215
325314	Fertilizer (Mixing Only) Manufacturing	25.71	-	-
325320	Pesticide and Other Agricultural Chemical Manufacturing	29.77	63,020	67,770
325411	Medicinal and Botanical Manufacturing	29.02	259,905	25,426
325412	Pharmaceutical Preparation Manufacturing	29.41	5,154,211	188,929
325413	In-Vitro Diagnostic Substance Manufacturing	29.04	6,594	92,165
325414	Biological Product (except Diagnostic) Manufacturing	27.55	4,079	63,831
325510	Paint and Coating Manufacturing	34.56	2,322	22,525
325520	Adhesive Manufacturing	32.81	714	20,801
325611	Soap and Other Detergent Manufacturing	37.95	18,818	5,006
325612	Polish and Other Sanitation Good Manufacturing	32.64	12,188	17,347
325613	Surface Active Agent Manufacturing	31.50	29,610	61,986
325620	Toilet Preparation Manufacturing	35.60	53,105	33,199
325910	Printing Ink Manufacturing	34.29	29,794	4,352
325920	Explosives Manufacturing	26.45	11,203	5,256
325991	Custom Compounding of Purchased Resins	25.71	-	-
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	32.77	349	60,403
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	30.25	236,702	104,754
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	46.77	45,194	6,887
327120	Clay Building Material and Refractories Manufacturing	41.02	14,008	18,059
327211	Flat Glass Manufacturing	43.70	105	1,556
327212	Other Pressed and Blown Glass and Glassware Manufacturing	47.01	46,811	69,581
327213	Glass Container Manufacturing	44.70	24,707	8,245
327215	Glass Product Manufacturing Made of Purchased Glass	39.98	50,577	26,895
327310	Cement Manufacturing	No Data	-	1,075
327320	Ready-Mix Concrete Manufacturing	31.01	-	-
327331	Concrete Block and Brick Manufacturing	No Data	-	3
327332	Concrete Pipe Manufacturing	31.01	-	-

327390	Other Concrete Product Manufacturing	48.07	6,933	182
327410	Lime Manufacturing	31.01	3	18
327420	Gypsum Product Manufacturing	No Data	-	716
327910	Abrasive Product Manufacturing	39.11	25,592	30,263
327991	Cut Stone and Stone Product Manufacturing	57.37	311,544	73
327992	Ground or Treated Mineral and Earth Manufacturing	44.33	614	6,374
327993	Mineral Wool Manufacturing	46.96	10,543	5,953
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	43.17	8,894	9,717
331110	Iron and Steel Mills and Ferroalloy Manufacturing	40.97	1,044,320	155,654
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	36.64	25	-
331221	Rolled Steel Shape Manufacturing	47.50	1,337	5,100
331222	Steel Wire Drawing	35.45	82,019	2,861
331313	Alumina Refining and Primary Aluminum Production	52.28	7,741	8,857
331314	Secondary Smelting and Alloying of Aluminum	43.66	117	58
331315	Aluminum Sheet, Plate, and Foil Manufacturing	35.95	68,862	7,100
331318	Other Aluminum Rolling, Drawing, and Extruding	40.97	13,683	5,892
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	37.03	28,404	1,294,316
331420	Copper Rolling, Drawing, Extruding, and Alloying	39.77	19,655	12,682
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	32.61	22,191	43,945
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	36.17	326	12,319
331511	Iron Foundries	47.58	130,322	43,092
331512	Steel Investment Foundries	31.01	-	-
331513	Steel Foundries (except Investment)	36.89	22,542	225
331523	Nonferrous Metal Die-Casting Foundries	40.22	12,596	2,531
331524	Aluminum Foundries (except Die-Casting)	31.01	-	-
331529	Other Nonferrous Metal Foundries (except Die-Casting)	No Data	-	-
334111	Electronic Computer Manufacturing	23.82	8,298	112,795
334112	Computer Storage Device Manufacturing	23.78	2,615	41,238
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	26.68	16,645	158,544
334210	Telephone Apparatus Manufacturing	23.77	9,508	13,059

334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	23.23	263,203	532,079
334290	Other Communications Equipment Manufacturing	28.78	5,476	5,832
334310	Audio and Video Equipment Manufacturing	24.83	4,704	44,490
334412	Bare Printed Circuit Board Manufacturing	30.41	18,116	5,647
334413	Semiconductor and Related Device Manufacturing	24.50	76,400	137,036
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	27.98	35,592	28,785
334417	Electronic Connector Manufacturing	25.98	25,197	17,414
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	23.32	72,134	2,185
334419	Other Electronic Component Manufacturing	25.72	63,328	45,446
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	24.09	72,714	162,837
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	25.18	6,988	25,761
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	25.96	1,802	3,163
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	26.16	47,285	98,199
334514	Totalizing Fluid Meter and Counting Device Manufacturing	27.07	8,189	3,705
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	24.66	44,620	245,048
334516	Analytical Laboratory Instrument Manufacturing	27.62	5,006	134,266
334517	Irradiation Apparatus Manufacturing	24.15	49,164	79,920
334519	Other Measuring and Controlling Device Manufacturing	27.57	16,706	126,874
334613	Blank Magnetic and Optical Recording Media Manufacturing	26.70	22,904	8,285
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	26.84	2,186	41,570
335110	Electric Lamp Bulb and Part Manufacturing	28.58	23,501	3,547
335121	Residential Electric Lighting Fixture Manufacturing	34.53	36,735	642
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	30.25	2,182	889
335129	Other Lighting Equipment Manufacturing	37.86	72,417	5,854
335210	Small Electrical Appliance Manufacturing	31.60	13,744	40,114
335221	Household Cooking Appliance Manufacturing	25.49	3,186	268

335222	Household Refrigerator and Home Freezer Manufacturing	25.22	4,923	3,761
335224	Household Laundry Equipment Manufacturing	24.30	3,740	1,939
335228	Other Major Household Appliance Manufacturing	26.41	2,755	4,857
335311	Power, Distribution, and Specialty Transformer Manufacturing	32.33	41,405	3,261
335312	Motor and Generator Manufacturing	27.20	190,681	61,772
335313	Switchgear and Switchboard Apparatus Manufacturing	27.29	62,863	55,338
335314	Relay and Industrial Control Manufacturing	25.93	90,780	62,795
335911	Storage Battery Manufacturing	35.59	5,547	43,770
335912	Primary Battery Manufacturing	26.22	255	1,435
335921	Fiber Optic Cable Manufacturing	25.74	4,003	9,351
335929	Other Communication and Energy Wire Manufacturing	30.57	11,126	36,483
335931	Current-Carrying Wiring Device Manufacturing	24.79	89,203	42,351
335932	Noncurrent-Carrying Wiring Device Manufacturing	29.80	13,113	3,168
335991	Carbon and Graphite Product Manufacturing	27.62	28,275	13,982
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	25.73	52,893	102,032
336111	Automobile Manufacturing	No Data	129	47,892
336112	Light Truck and Utility Vehicle Manufacturing	No Data	-	23
336120	Heavy Duty Truck Manufacturing	No Data	11	5,586
336211	Motor Vehicle Body Manufacturing	38.23	74	20,184
336212	Truck Trailer Manufacturing	No Data	33	1,557
336213	Motor Home Manufacturing	28.60	-	-
336214	Travel Trailer and Camper Manufacturing	34.60	3,860	54
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	34.39	178,510	36,929
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	31.90	63,286	27,837
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	33.56	148,936	12,349
336340	Motor Vehicle Brake System Manufacturing	35.07	245,810	15,450
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	33.92	162,914	7,517
336360	Motor Vehicle Seating and Interior Trim Manufacturing	40.46	27,232	3,975
336370	Motor Vehicle Metal Stamping	36.46	626	1,018
336390	Other Motor Vehicle Parts Manufacturing	36.39	167,385	51,202
336411	Aircraft Manufacturing	32.27	334	1,357,297

336412	Aircraft Engine and Engine Parts Manufacturing	30.77	18,971	43,649
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	33.87	140,474	159,121
336414	Guided Missile and Space Vehicle Manufacturing	28.60	-	23,709
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	No Data	5	6,246
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	34.37	120	95
336510	Railroad Rolling Stock Manufacturing	36.80	19,167	57,941
336611	Ship Building and Repairing	45.23	54	4,948
336612	Boat Building	No Data	-	347
336991	Motorcycle, Bicycle, and Parts Manufacturing	39.09	19,791	15,396
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	42.77	187	3
336999	All Other Transportation Equipment Manufacturing	56.38	470	1,513
31131X	Sugars	41.01	9,282	625
31135X	Chocolate And Confectionery From Cacao Beans Products	25.81	35,676	6,255
31181X	Bread & Bakery Products	38.85	57,694	122
33641X	Civilian Aircraft, Engines, Equipment, And Parts	28.60	-	1,424,243

Appendix- L Score on Different Factors (US vs South Korea)

		Score 1-7	
Location Factors	**Sub-Factors**	**US**	**S. Korea**
Presence of Suppliers and Partners		5.39	4.43
	Local supplier Quantity	5.5	5
	Local Supplier Quality	5.6	5
	Prevalence of foreign ownership	5.1	4.2
	Buyer sophistication	4.5	4.1

	Regulation of security exchange	5	3.7
	State of cluster development	5.4	4.3
	Extent of marketing	6.2	4.8
	Production process sophistication	6.1	5.2
	Value chain breadth	5.4	4.7
Follow your competitor		5.73	5.30
	Effectiveness of anti-monopoly policy	5.1	4.4
	Nature of competitive advantage	5.6	5.3
	Intensity of local competition	5.9	5.9
	Legal Right	6.3	5.6
Availability of Skill labor and talent		5.72	4.55
	University-industry collaboration in R & D	5.8	4.6
	Availability of Scientist and Engineers	5.3	4.4
	Quality of Scientific research institution	6.1	5
	Capacity to retain talent	5.7	4.4
	Capacity to attract talent	5.8	4.2
	Availability of research and training services	5.6	4.7
Labor Cost and Productivity		5.03	4.40
	Pay in productivity	4.8	4.4
	Co-operation in labor employer relation	4.7	3.6
	Flexibility in wages determination	5.6	5.2
Size of local Market		6.2	5.45
	Degree of Customer Orientation	5.4	5.5
	Domestic Market Size	7	5.4
Access to international and regional market		6.6	6.37
	Trading across border	6.5	6.54
	Foreign Market Size	6.7	6.2
	International logistics Index	6.49	5.85
Growth of Market	GDP growth rate	4.23	4.54

Access to natural resource	Global energy competitiveness KPMG	5.17	4.63
Access to capital market		5.12	3.24
	Availability of financial services	6.2	4
	Affordability of financial services	5.7	3.9
	Ease of access to loan	3.9	2.2
	Soundness of Bank	5.4	3.9
	Venture capital availability	4.4	2.2
Government effectiveness		4.99	4.13
	Intellectual property protection	5.4	3.7
	Burden of government regulation	3.4	3.2
	Transparency of Govt policy Making	4.4	3.1
	Availability of latest technology	6.5	5.7
	FDI and technology Transfer	4.9	4.6
	Irregular payment and bribe	5	4.4
	Property rights	5.3	4.2
Incentives		3.5	3.1
Infrastructure		5.8	5.7
Stable and business friendly environment		6.07	4.62

Appendix- M Reshorability Index from South Korea (3-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS Code	Industries	Index	Import	Export
311	Food and Kindred Products	24.86	367,814	3,466,074
312	Beverages & Tobacco Products	28.98	148,029	241,279
321	Wood Products	26.88	4,093	82,273
325	Chemicals and Chemicals Products	21.64	2,768,424	6,944,953
327	Non-metallic Mineral Products	36.25	354,714	438,932
331	Primary Metal	26.81	5,495,264	1,507,346
334	Computer & Electronic Products	16.37	16,342,291	6,654,960

335	Electrical Equipment, Appliances and components	20.85	3,520,922	1,566,610
336	Motor vehicle and Transport Equipment	18.90	21,833,146	5,154,445

Appendix- N Reshorability Index from South Korea (4-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS	Description	Index	Import	Export
3111	Animal Food Manufacturing	25.95	521	82,134
3112	Grain and Oilseed Milling	26.75	16,618	275,817
3113	Sugar and Confectionery Product Manufacturing	23.80	4,287	128,112
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	25.49	84,444	310,331
3115	Dairy Product Manufacturing	23.86	17,552	419,532
3116	Animal Slaughtering and Processing	25.97	5,226	1,813,986
3117	Seafood Product Preparation and Packaging	21.01	44,889	7,217
3118	Bakeries and Tortilla Manufacturing	27.68	73,137	57,987
3119	Other Food Manufacturing	24.10	121,140	370,958
3121	Beverage Manufacturing	36.84	84,186	238,500
3122	Tobacco Manufacturing	19.90	63,843	132,377
3211	Sawmill and Wood Preservation	No Data		
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	25.32	1,902	16,719
3219	Other Wood Product Manufacturing	28.27	2,191	36,140
3251	Basic Chemical Manufacturing	20.99	884,629	3,309,586
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	23.48	1,346,289	1,181,487
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	20.08	26,359	202,777
3254	Pharmaceutical and Medicine Manufacturing	16.28	118,672	1,231,246
3255	Paint, Coating, and Adhesive Manufacturing	20.16	41,126	105,302
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	18.05	206,060	629,998

3259	Other Chemical Product and Preparation Manufacturing	19.35	145,289	284,557
3271	Clay Product and Refractory Manufacturing	23.59	31,304	87,837
3272	Glass and Glass Product Manufacturing	23.86	125,238	163,142
3274	Lime and Gypsum Product Manufacturing	No Data	119	2,204
3279	Other Nonmetallic Mineral Product Manufacturing	24.67	105,460	183,109
3311	Iron and Steel Mills and Ferroalloy Manufacturing	28.32	4,247,778	238,764
3312	Steel Product Manufacturing from Purchased Steel	33.05	184,283	26,169
3313	Alumina and Aluminum Production and Processing	21.13	127,748	223,034
3314	Nonferrous Metal (except Aluminum) Production and Processing	20.01	913,952	1,019,772
3315	Foundries	21.28	21,503	20,673
3341	Computer and Peripheral Equipment Manufacturing	16.73	949,246	417,553
3342	Communications Equipment Manufacturing	17.02	8,320,941	410,875
3343	Audio and Video Equipment Manufacturing	17.90	542,355	111,551
3344	Semiconductor and Other Electronic Component Manufacturing	15.18	4,964,787	3,945,125
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	16.44	924,018	1,682,789
3346	Manufacturing and Reproducing Magnetic and Optical Media	15.24	640,944	87,067
3351	Electric Lighting Equipment Manufacturing	18.28	104,428	43,491
3352	Household Appliance Manufacturing	24.58	1,537,174	198,233
3353	Electrical Equipment Manufacturing	18.45	820,069	566,841
3359	Other Electrical Equipment and Component Manufacturing	17.84	1,059,251	638,580
3361	Motor Vehicle Manufacturing	18.84	14,591,061	995,794
3362	Motor Vehicle Body and Trailer Manufacturing	22.05	2,081	103,657
3363	Motor Vehicle Parts Manufacturing	19.27	6,271,730	619,630
3364	Aerospace Product and Parts Manufacturing	17.38	772,011	3,287,121
3365	Railroad Rolling Stock Manufacturing	20.06	59,639	6,513
3366	Ship and Boat Building	16.05	107,061	59,728
3369	Other Transportation Equipment Manufacturing	19.83	29,563	82,002

Appendix- O Reshorability Index from South Korea (6-Digit NAICS Code)

			In Thousand $ (2014)	
6-Digit	Description	Index	Import	Export
311111	Dog and Cat Food Manufacturing	21.63	219	30,301

311119	Other Animal Food Manufacturing	29.28	302	51,833
311211	Flour Milling	30.78	4,912	19,634
311212	Rice Milling	23.22	358	32,624
311213	Malt Manufacturing	25.74	14	713
311221	Wet Corn Milling	23.68	850	30,829
311224	Soybean and Other Oilseed Processing	22.43	2,544	175,956
311225	Fats and Oils Refining and Blending	20.62	120	10,589
311230	Breakfast Cereal Manufacturing	26.36	7,820	5,472
311313	Beet Sugar Manufacturing	No Data	0	0
311314	Cane Sugar Manufacturing	No Data	0	0
311340	Nonchocolate Confectionery Manufacturing	22.59	2,709	36,256
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	No Data	0	0
311352	Confectionery Manufacturing from Purchased Chocolate	No Data	0	0
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	20.53	1,349	171,930
311412	Frozen Specialty Food Manufacturing	24.80	4,856	2,820
311421	Fruit and Vegetable Canning	25.78	75,766	106,924
311422	Specialty Canning	23.15	818	1,787
311423	Dried and Dehydrated Food Manufacturing	19.99	1,655	26,870
311511	Fluid Milk Manufacturing	22.15	1,955	663
311512	Creamery Butter Manufacturing	No Data	0	8651
311513	Cheese Manufacturing	16.48	5	312,068
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	23.60	7,735	94,604
311520	Ice Cream and Frozen Dessert Manufacturing	24.55	7,857	3,546
311611	Animal (except Poultry) Slaughtering	28.47	1,900	1,694,259
311612	Meat Processed from Carcasses	No Data	0	0
311613	Rendering and Meat Byproduct Processing	25.66	2,765	6,331
311615	Poultry Processing	19.56	561	113,396
311710	Seafood Product Preparation and Packaging	21.01	44,889	7,217
311811	Retail Bakeries	No Data	0	0
311812	Commercial Bakeries	No Data	0	0
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	No Data	0	0
311821	Cookie and Cracker Manufacturing	No Data	0	0
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	28.36	27,673	25,188
311830	Tortilla Manufacturing	No Data	0	0

311911	Roasted Nuts and Peanut Butter Manufacturing	24.56	318	21,198
311919	Other Snack Food Manufacturing	36.54	5,642	18,346
311920	Coffee and Tea Manufacturing	21.14	16,197	46,435
311930	Flavoring Syrup and Concentrate Manufacturing	23.11	2,680	5,139
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	25.99	18,235	9,520
311942	Spice and Extract Manufacturing	22.96	7,354	11,906
311991	Perishable Prepared Food Manufacturing	24.77	29,047	-
311999	All Other Miscellaneous Food Manufacturing	22.74	41,667	258,414
312111	Soft Drink Manufacturing	36.81	67,169	9,696
312112	Bottled Water Manufacturing	54.37	483	105
312112	Bottled Water Manufacturing	No Data	483	105
312113	Ice Manufacturing	No Data	17	62
312120	Breweries	49.63	3,290	186,839
312130	Wineries	31.15	3,796	25,047
312140	Distilleries	34.49	9,431	16,751
312230	Tobacco Manufacturing	19.90	63,843	2,779
321113	Sawmills	No Data	0	29383
321114	Wood Preservation	No Data	0	31
321211	Hardwood Veneer and Plywood Manufacturing	18.25	32	411
321212	Softwood Veneer and Plywood Manufacturing	No Data	27	5,102
321213	Engineered Wood Member (except Truss) Manufacturing	No Data	0	1485
321214	Truss Manufacturing	No Data	0	0
321219	Reconstituted Wood Product Manufacturing	25.26	1,843	9,721
321911	Wood Window and Door Manufacturing	37.54	272	2,483
321912	Cut Stock, Resawing Lumber, and Planing	No Data	0	0
321918	Other Millwork (including Flooring)	No Data	0	1531
321920	Wood Container and Pallet Manufacturing	25.37	672	11,135
321991	Manufactured Home (Mobile Home) Manufacturing	No Data	0	1678
321992	Prefabricated Wood Building Manufacturing	No Data	52	336
321999	All Other Miscellaneous Wood Product Manufacturing	27.73	1,195	18,977
325110	Petrochemical Manufacturing	18.32	205,070	236,753
325120	Industrial Gas Manufacturing	18.60	378	77,088
325130	Synthetic Dye and Pigment Manufacturing	19.23	64,971	257,952
325180	Other Basic Inorganic Chemical Manufacturing	26.66	85,613	659,568
325193	Ethyl Alcohol Manufacturing	No Data	0	86480

325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	22.83	38,696	321,717
325199	All Other Basic Organic Chemical Manufacturing	21.28	489,901	1,670,028
325211	Plastics Material and Resin Manufacturing	23.41	750,147	823,714
325212	Synthetic Rubber Manufacturing	21.65	301,978	226,969
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	25.63	294,164	130,804
325311	Nitrogenous Fertilizer Manufacturing	30.57	2,672	22,041
325312	Phosphatic Fertilizer Manufacturing	25.62	658	148,453
325314	Fertilizer (Mixing Only) Manufacturing	No Data	0	0
325320	Pesticide and Other Agricultural Chemical Manufacturing	18.83	23,029	32,283
325411	Medicinal and Botanical Manufacturing	16.67	24,960	58,002
325412	Pharmaceutical Preparation Manufacturing	17.16	30,949	765,233
325413	In-Vitro Diagnostic Substance Manufacturing	17.04	25,118	203,406
325414	Biological Product (except Diagnostic) Manufacturing	14.81	37,645	204,605
325510	Paint and Coating Manufacturing	19.88	21,608	45,850
325520	Adhesive Manufacturing	20.46	19,518	59,452
325611	Soap and Other Detergent Manufacturing	20.28	9,724	86,558
325612	Polish and Other Sanitation Good Manufacturing	21.75	13,836	52,613
325613	Surface Active Agent Manufacturing	21.35	30,328	144,719
325620	Toilet Preparation Manufacturing	16.95	152,172	346,108
325910	Printing Ink Manufacturing	19.02	51,243	10,037
325920	Explosives Manufacturing	No Data	0	13686
325991	Custom Compounding of Purchased Resins	No Data	0	0
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	18.02	20,463	45,454
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	19.95	73,583	215,380
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	23.56	27,430	63,320
327120	Clay Building Material and Refractories Manufacturing	23.79	3,874	24,517
327211	Flat Glass Manufacturing	22.81	13,486	14,526
327212	Other Pressed and Blown Glass and Glassware Manufacturing	22.08	79,074	66,414
327213	Glass Container Manufacturing	40.66	13,480	2,694
327215	Glass Product Manufacturing Made of Purchased Glass	21.70	19,198	79,508
327310	Cement Manufacturing	No Data	62621	627
327320	Ready-Mix Concrete Manufacturing	No Data	0	41

327331	Concrete Block and Brick Manufacturing	18.25	10	968
327332	Concrete Pipe Manufacturing	No Data	0	0
327390	Other Concrete Product Manufacturing	24.60	29,962	1,004
327410	Lime Manufacturing	No Data	0	317
327420	Gypsum Product Manufacturing	43.03	119	1,887
327910	Abrasive Product Manufacturing	22.41	81,220	38,421
327991	Cut Stone and Stone Product Manufacturing	25.46	8,363	2,340
327992	Ground or Treated Mineral and Earth Manufacturing	31.36	310	8,355
327993	Mineral Wool Manufacturing	25.19	6,583	30,828
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	47.73	8,984	103,165
331110	Iron and Steel Mills and Ferroalloy Manufacturing	28.32	4,247,778	217,698
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	No Data	64	16
331221	Rolled Steel Shape Manufacturing	No Data	0	21268
331222	Steel Wire Drawing	33.05	184,219	4,885
331313	Alumina Refining and Primary Aluminum Production	22.75	38,060	12,189
331314	Secondary Smelting and Alloying of Aluminum	25.38	1,541	3,250
331315	Aluminum Sheet, Plate, and Foil Manufacturing	19.47	69,721	167,641
331318	Other Aluminum Rolling, Drawing, and Extruding	23.89	18,426	39,954
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	19.19	585,903	652,488
331420	Copper Rolling, Drawing, Extruding, and Alloying	21.69	286,624	65,713
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	20.40	24,459	250,659
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	19.76	16,966	50,912
331511	Iron Foundries	20.59	13,923	14,134
331512	Steel Investment Foundries	No Data	0	0
331513	Steel Foundries (except Investment)	21.47	6,531	521
331523	Nonferrous Metal Die-Casting Foundries	29.87	1,049	6,018
331524	Aluminum Foundries (except Die-Casting)	No Data	0	0
331529	Other Nonferrous Metal Foundries (except Die-Casting)	No Data	0	0
334111	Electronic Computer Manufacturing	16.51	293,569	158,280
334112	Computer Storage Device Manufacturing	16.43	240,791	54,173
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	17.05	414,886	205,100
334210	Telephone Apparatus Manufacturing	15.83	69,356	7,214

334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	17.03	8,226,803	384,878
334290	Other Communications Equipment Manufacturing	19.05	24,782	18,783
334310	Audio and Video Equipment Manufacturing	17.90	542,355	111,551
334412	Bare Printed Circuit Board Manufacturing	16.86	85,046	31,760
334413	Semiconductor and Related Device Manufacturing	15.17	2,844,615	3,710,675
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	17.72	82,090	78,111
334417	Electronic Connector Manufacturing	16.56	40,264	60,080
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	14.89	1,840,615	4,751
334419	Other Electronic Component Manufacturing	17.77	72,157	59,748
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	16.24	167,265	211,147
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	16.67	109,827	99,422
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	16.47	71,479	12,609
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	16.17	171,832	256,868
334514	Totalizing Fluid Meter and Counting Device Manufacturing	17.26	65,585	6,111
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	16.44	149,152	510,741
334516	Analytical Laboratory Instrument Manufacturing	16.75	60,673	274,607
334517	Irradiation Apparatus Manufacturing	16.10	99,914	66,522
334519	Other Measuring and Controlling Device Manufacturing	16.93	28,291	244,762
334613	Blank Magnetic and Optical Recording Media Manufacturing	15.22	635,569	23,817
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	17.68	5,375	63,250
335110	Electric Lamp Bulb and Part Manufacturing	18.54	27,431	18,004
335121	Residential Electric Lighting Fixture Manufacturing	19.16	2,230	835
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	18.66	12,237	2,951
335129	Other Lighting Equipment Manufacturing	18.06	62,530	21,701
335210	Small Electrical Appliance Manufacturing	17.40	97,580	163,329
335221	Household Cooking Appliance Manufacturing	21.30	92,545	5,471
335222	Household Refrigerator and Home Freezer Manufacturing	26.61	1,025,676	10,335

335224	Household Laundry Equipment Manufacturing	23.72	172,361	5,041
335228	Other Major Household Appliance Manufacturing	19.22	149,012	14,057
335311	Power, Distribution, and Specialty Transformer Manufacturing	21.75	174,584	31,902
335312	Motor and Generator Manufacturing	17.04	322,345	280,706
335313	Switchgear and Switchboard Apparatus Manufacturing	18.48	240,296	149,236
335314	Relay and Industrial Control Manufacturing	17.13	82,844	104,997
335911	Storage Battery Manufacturing	18.02	375,349	58,065
335912	Primary Battery Manufacturing	17.61	16,057	22,249
335921	Fiber Optic Cable Manufacturing	17.71	21,392	10,525
335929	Other Communication and Energy Wire Manufacturing	18.17	112,672	91,005
335931	Current-Carrying Wiring Device Manufacturing	18.01	125,699	121,397
335932	Noncurrent-Carrying Wiring Device Manufacturing	17.11	19,996	11,817
335991	Carbon and Graphite Product Manufacturing	16.10	37,672	45,514
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	17.73	350,414	278,008
336111	Automobile Manufacturing	18.84	14,591,009	962,921
336112	Light Truck and Utility Vehicle Manufacturing	No Data	31	198
336120	Heavy Duty Truck Manufacturing	No Data	21	32,675
336120	Heavy Duty Truck Manufacturing	No Data	21	32675
336211	Motor Vehicle Body Manufacturing	23.64	194	93,041
336212	Truck Trailer Manufacturing	No Data	39	3,406
336213	Motor Home Manufacturing	No Data	0	306
336214	Travel Trailer and Camper Manufacturing	21.73	1,848	6,904
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	17.94	807,079	73,625
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	19.02	536,067	53,030
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	18.74	1,151,174	61,052
336340	Motor Vehicle Brake System Manufacturing	18.20	278,953	55,874
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	18.95	681,900	21,005
336360	Motor Vehicle Seating and Interior Trim Manufacturing	19.13	190,636	16,352
336370	Motor Vehicle Metal Stamping	30.51	44,432	7,096
336390	Other Motor Vehicle Parts Manufacturing	20.03	2,581,489	331,596
336411	Aircraft Manufacturing	25.18	411	314,905
336412	Aircraft Engine and Engine Parts Manufacturing	17.40	178,570	278,988

336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	17.36	592,779	432,700
336414	Guided Missile and Space Vehicle Manufacturing	No Data	0	0
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	15.76	3	137,871
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	19.74	248	121,742
336510	Railroad Rolling Stock Manufacturing	20.06	59,639	6,513
336611	Ship Building and Repairing	16.04	106,955	51,294
336612	Boat Building	24.21	106	8,434
336991	Motorcycle, Bicycle, and Parts Manufacturing	19.20	20,470	15,851
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	21.78	7,896	63,298
336999	All Other Transportation Equipment Manufacturing	17.99	1,197	2,853
31131X	Sugars	25.96	1,328	11,351
31135X	Chocolate And Confectionery From Cacao Beans Products	25.82	250	80,505
31181X	Bread & Bakery Products	27.27	45,464	32,799

Appendix- P Score on Different Factors (US vs Japan)

		Score 1-7	
Location Factors	**Sub-Factors**	**US**	**Japan**
Presence of Suppliers and Partners		5.39	5.64
	Local supplier Quantity	5.5	6.3
	Local Supplier Quality	5.6	6.2
	Prevalence of foreign ownership	5.1	5.3
	Buyer sophistication	4.5	5.3
	Regulation of security exchange	5	5.5
	State of cluster development	5.4	5.3
	Extent of marketing	6.2	5.6
	Production process sophistication	6.1	6.4
	Value chain breadth	5.4	6.1
Follow your competitor		5.73	5.78
	Effectiveness of anti-monopoly policy	5.1	5.4
	Nature of competitive advantage	5.6	6.4
	Intensity of local competition	5.9	6.4

	Legal Right	6.3	4.9
Availability of Skill labor and talent		5.72	4.92
	University-industry collaboration in R & D	5.8	5
	Availability of Scientist and Engineers	5.3	5.4
	Quality of Scientific research institution	6.1	5.8
	Capacity to retain talent	5.7	4.4
	Capacity to attract talent	5.8	3.3
	Availability of research and training services	5.6	5.6
Labor Cost		5.03	5.43
	Pay in productivity	4.8	4.8
	Co-operation in labor employer relation	4.7	5.6
	Flexibility in wages determination	5.6	5.9
Size of local Market		6.2	6.2
	Degree of Customer Orientation	5.4	6.3
	Domestic Market Size	7	6.1
Access to international and regional market		6.6	6.3
	Trading across border	6.5	6.4
	Foreign Market Size	6.7	6.2
	International logistics Index	6.49	6.49
Growth of Market	GDP growth rate	4.23	3.35
Access to natural resource	Global energy competitiveness	5.17	4.55
Access to capital market		5.12	4.64
	Availability of financial services	6.2	5.3
	Affordability of financial services	5.7	5.1
	Ease of access to loan	3.9	3.7
	Soundness of Bank	5.4	5.7
	Venture capital availability	4.4	3.4
Government effectiveness		4.99	5.40

	Intellectual property protection	5.4	6
	Burden of government regulation	3.4	3.5
	Transparency of Govt policy making	4.4	5.3
	Availability of latest technology	6.5	6.2
	FDI and technology Transfer	4.9	4.7
	Irregular payment and bribe	5	6.2
	Property rights	5.3	5.9
Incentives	Enabling Trade	3.5	3.2
Infrastructure		5.8	4.7
Stable and business friendly environment		6.07	4.53

Appendix- Q Reshorability Index from Japan (3-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS Code	Industries	Index	Import	Export
311	Food and Kindred Products	15.99	416,685	6,554,167
312	Beverages & Tobacco Products	17.97	76,204	677,010
321	Wood Products	16.37	10,086	374,678
325	Chemicals and Chemicals Products	14.92	11,251,527	9,984,889
327	Non-metallic Mineral Products	16.37	906,782	489,217
331	Primary Metal	19.94	3,617,901	1,813,124
334	Computer & Electronic Products	12.40	16,508,345	8,586,027
335	Electrical Equipment, Appliances and Components	13.04	5,137,101	1,942,431
336	Motor vehicle and Transport Equipment	13.40	56,150,671	9,514,127

Appendix- R Reshorability Index from Japan (4-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS	Description	Index	Import	Export
3111	Animal Food Manufacturing	12.91	11,515	286641

3112	Grain and Oilseed Milling	15.18	38,334	621637
3113	Sugar and Confectionery Product Manufacturing	17.04	14,638	141759
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	18.12	46,641	801427
3115	Dairy Product Manufacturing	17.58	7,052	409760
3116	Animal Slaughtering and Processing	18.88	35,096	3740827
3117	Seafood Product Preparation and Packaging	14.18	57,800	19464
3118	Bakeries and Tortilla Manufacturing	17.61	48,262	104362
3119	Other Food Manufacturing	15.19	157,347	428290
3121	Beverage Manufacturing	17.97	76,204	416801
3122	Tobacco Manufacturing	No Data	-	260209
3211	Sawmills and Wood Preservation	No Data	128	309145
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	16.93	3,173	22332
3219	Other Wood Product Manufacturing	15.43	6,785	43201
3251	Basic Chemical Manufacturing	14.53	4,108,584	3383677
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	18.66	1,497,063	1162057
3253	Pesticide, Fertilizer, and Other Agricultural Chemical Manufacturing	16.99	61,785	328897
3254	Pharmaceutical and Medicine Manufacturing	13.02	1,383,130	3949723
3255	Paint, Coating, and Adhesive Manufacturing	18.71	122,010	106305
3256	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	16.52	283,640	600515
3259	Other Chemical Product and Preparation Manufacturing	14.35	3,795,315	453715
3271	Clay Product and Refractory Manufacturing	16.45	409,636	89629
3272	Glass and Glass Product Manufacturing	15.56	268,385	269066
3273	Cement and Concrete Product Manufacturing	48.43	877	5433
3274	Lime and Gypsum Product Manufacturing	19.17	195	6641
3279	Other Nonmetallic Mineral Product Manufacturing	17.11	227,689	118448
3311	Iron and Steel Mills and Ferroalloy Manufacturing	22.25	2,510,329	66415
3312	Steel Product Manufacturing from Purchased Steel	25.90	146,224	9225
3313	Alumina and Aluminum Production and Processing	17.53	99,440	224060
3314	Nonferrous Metal (except Aluminum) Production and Processing	12.96	826,730	1502486
3315	Foundries	16.30	35,178	10938

3341	Computer and Peripheral Equipment Manufacturing	12.43	1,331,023	1224998
3342	Communications Equipment Manufacturing	11.55	1,447,719	1175246
3343	Audio and Video Equipment Manufacturing	12.09	1,856,229	419537
3344	Semiconductor and Other Electronic Component Manufacturing	12.60	5,344,007	1624287
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	12.58	5,714,680	3944855
3346	Manufacturing and Reproducing Magnetic and Optical Media	12.04	814,687	197104
3351	Electric Lighting Equipment Manufacturing	12.79	179,072	60852
3352	Household Appliance Manufacturing	12.74	306,777	439302
3353	Electrical Equipment Manufacturing	13.01	2,303,288	475956
3359	Other Electrical Equipment and Component Manufacturing	13.13	2,347,964	966321
3361	Motor Vehicle Manufacturing	13.65	36,005,415	597250
3362	Motor Vehicle Body and Trailer Manufacturing	23.38	104,968	73587
3363	Motor Vehicle Parts Manufacturing	13.75	11,792,628	912548
3364	Aerospace Product and Parts Manufacturing	10.96	6,755,659	7649453
3365	Railroad Rolling Stock Manufacturing	21.11	185,877	15770
3366	Ship and Boat Building	11.78	21,050	56327
3369	Other Transportation Equipment Manufacturing	14.65	1,285,074	209192

Appendix- S Reshorability Index from Japan (6-Digit NAICS Code)

			In Thousand $ (2014)	
NAICS Code	Description	Index	Import	Export
311111	Dog and Cat Food Manufacturing	11.59	553	120,848
311119	Other Animal Food Manufacturing	12.98	10,962	165,793
311211	Flour Milling	18.39	1,123	22,819
311212	Rice Milling	18.80	420	239,998
311213	Malt Manufacturing	No Data	0	9,562
311221	Wet Corn Milling	19.32	1,973	110,024
311224	Soybean and Other Oilseed Processing	14.76	33,546	223,341
311225	Fats and Oils Refining and Blending	13.75	447	12,146
311230	Breakfast Cereal Manufacturing	17.54	825	3,747
311313	Beet Sugar Manufacturing	No Data	0	-
311314	Cane Sugar Manufacturing	No Data	0	-

311340	Nonchocolate Confectionery Manufacturing	15.64	7,871	11,324
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	No Data	0	-
311352	Confectionery Manufacturing from Purchased Chocolate	No Data	0	-
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	16.42	612	410,651
311412	Frozen Specialty Food Manufacturing	22.91	6,556	1,311
311421	Fruit and Vegetable Canning	17.42	36,277	238,636
311422	Specialty Canning	16.85	2,331	8,232
311423	Dried and Dehydrated Food Manufacturing	17.19	865	142,597
311511	Fluid Milk Manufacturing	21.88	98	187
311512	Creamery Butter Manufacturing	No Data	0	4,754
311513	Cheese Manufacturing	10.34	13	249,050
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	17.78	6,415	154,797
311520	Ice Cream and Frozen Dessert Manufacturing	14.61	526	972
311611	Animal (except Poultry) Slaughtering	22.64	12,499	3,659,585
311612	Meat Processed from Carcasses	16.54	22,047	-
311613	Rendering and Meat Byproduct Processing	32.74	550	9,502
311615	Poultry Processing	No Data	0	71,740
311710	Seafood Product Preparation and Packaging	14.18	57,800	19,464
311811	Retail Bakeries	No Data	0	-
311812	Commercial Bakeries	No Data	0	-
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	No Data	0	-
311821	Cookie and Cracker Manufacturing	No Data	0	-
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	19.02	10,282	64,663
311830	Tortilla Manufacturing	No Data	0	-
311911	Roasted Nuts and Peanut Butter Manufacturing	14.64	577	29,149
311919	Other Snack Food Manufacturing	20.63	1,729	41,970
311920	Coffee and Tea Manufacturing	13.65	33,770	60,345
311930	Flavoring Syrup and Concentrate Manufacturing	23.50	300	33,486
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	17.94	44,048	27,063
311942	Spice and Extract Manufacturing	15.02	10,272	15,834
311991	Perishable Prepared Food Manufacturing	19.39	4,832	158
311999	All Other Miscellaneous Food Manufacturing	13.69	61,819	220,285

312111	Soft Drink Manufacturing	25.58	16,549	24,995
312112	Bottled Water Manufacturing	21.75	22	38,757
312113	Ice Manufacturing	29.40	7	26,720
312120	Breweries	23.88	6,775	135,920
312130	Wineries	15.52	42,803	93,076
312140	Distilleries	13.27	10,048	97,333
312230	Tobacco Manufacturing	No Data	0	260,209
321113	Sawmills	16.41	25	308,106
321114	Wood Preservation	No Data	103	1,039
321211	Hardwood Veneer and Plywood Manufacturing	16.74	2,743	2,113
321212	Softwood Veneer and Plywood Manufacturing	No Data	0	4,317
321213	Engineered Wood Member (except Truss) Manufacturing	No Data	51	14,577
321214	Truss Manufacturing	No Data	0	-
321219	Reconstituted Wood Product Manufacturing	17.02	379	1,325
321911	Wood Window and Door Manufacturing	No Data	18	11,929
321912	Cut Stock, Resawing Lumber, and Planning	No Data	0	-
321918	Other Millwork (including Flooring)	No Data	43	2,518
321920	Wood Container and Pallet Manufacturing	24.49	259	19,005
321991	Manufactured Home (Mobile Home) Manufacturing	No Data	0	401
321992	Prefabricated Wood Building Manufacturing	No Data	0	2,037
321999	All Other Miscellaneous Wood Product Manufacturing	14.91	6,465	7,311
325110	Petrochemical Manufacturing	19.29	45,509	15,624
325120	Industrial Gas Manufacturing	15.27	4,605	83,345
325130	Synthetic Dye and Pigment Manufacturing	15.76	153,867	88,020
325180	Other Basic Inorganic Chemical Manufacturing	17.50	517,798	630,249
325193	Ethyl Alcohol Manufacturing	No Data	0	232
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	17.01	280,688	148,325
325199	All Other Basic Organic Chemical Manufacturing	13.70	3,106,117	2,417,882
325211	Plastics Material and Resin Manufacturing	19.28	899,173	761,026
325212	Synthetic Rubber Manufacturing	17.80	454,976	300,492
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	17.52	142,914	100,539
325311	Nitrogenous Fertilizer Manufacturing	24.40	1,685	4,390
325312	Phosphatic Fertilizer Manufacturing	33.01	12,456	286,814
325314	Fertilizer (Mixing Only) Manufacturing	No Data	0	-

325320	Pesticide and Other Agricultural Chemical Manufacturing	13.19	47,644	37,693
325411	Medicinal and Botanical Manufacturing	13.29	82,285	101,571
325412	Pharmaceutical Preparation Manufacturing	12.96	675,900	2,623,558
325413	In-Vitro Diagnostic Substance Manufacturing	14.02	272,502	518,650
325414	Biological Product (except Diagnostic) Manufacturing	12.32	352,443	705,944
325510	Paint and Coating Manufacturing	17.68	96,399	52,437
325520	Adhesive Manufacturing	22.75	25,611	53,868
325611	Soap and Other Detergent Manufacturing	16.69	8,450	87,733
325612	Polish and Other Sanitation Good Manufacturing	17.81	34,316	40,938
325613	Surface Active Agent Manufacturing	18.05	109,908	134,497
325620	Toilet Preparation Manufacturing	14.93	130,966	337,347
325910	Printing Ink Manufacturing	14.05	3,125,204	40,502
325920	Explosives Manufacturing	13.18	16,045	22,552
325991	Custom Compounding of Purchased Resins	No Data	0	-
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	14.99	428,651	72,777
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	17.39	225,415	317,884
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	16.08	355,513	46,568
327120	Clay Building Material and Refractories Manufacturing	18.94	54,123	43,061
327211	Flat Glass Manufacturing	16.61	38,728	22,884
327212	Other Pressed and Blown Glass and Glassware Manufacturing	15.78	124,596	76,998
327213	Glass Container Manufacturing	18.53	8,510	2,520
327215	Glass Product Manufacturing Made of Purchased Glass	14.60	96,551	166,664
327310	Cement Manufacturing	No Data	686	1,574
327320	Ready-Mix Concrete Manufacturing	No Data	0	28
327331	Concrete Block and Brick Manufacturing	No Data	0	443
327332	Concrete Pipe Manufacturing	No Data	0	-
327390	Other Concrete Product Manufacturing	41.37	191	3,388
327410	Lime Manufacturing	19.85	60	-
327420	Gypsum Product Manufacturing	18.87	135	6,641
327910	Abrasive Product Manufacturing	15.70	73,471	58,421
327991	Cut Stone and Stone Product Manufacturing	28.37	300	508
327992	Ground or Treated Mineral and Earth Manufacturing	17.39	24,705	17,198

327993	Mineral Wool Manufacturing	15.40	78,053	30,547
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	21.78	51,160	11,774
331110	Iron and Steel Mills and Ferroalloy Manufacturing	22.25	2,510,329	66,415
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	No Data	0	13
331221	Rolled Steel Shape Manufacturing	17.63	11,075	2,479
331222	Steel Wire Drawing	26.63	135,149	6,733
331313	Alumina Refining and Primary Aluminum Production	20.08	25,617	22,491
331314	Secondary Smelting and Alloying of Aluminum	18.82	1,496	3,100
331315	Aluminum Sheet, Plate, and Foil Manufacturing	17.01	47,494	150,126
331318	Other Aluminum Rolling, Drawing, and Extruding	15.90	24,833	48,343
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	13.66	337,931	1,108,245
331420	Copper Rolling, Drawing, Extruding, and Alloying	14.96	58,044	36,925
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	13.48	100,759	310,448
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	11.77	329,996	46,868
331511	Iron Foundries	16.23	33,225	5,013
331512	Steel Investment Foundries	No Data	0	-
331513	Steel Foundries (except Investment)	17.39	1,654	-
331523	Nonferrous Metal Die-Casting Foundries	19.02	265	5,925
331524	Aluminum Foundries (except Die-Casting)	No Data	0	-
331529	Other Nonferrous Metal Foundries (except Die-Casting)	11.61	34	-
334111	Electronic Computer Manufacturing	11.87	247,571	523,899
334112	Computer Storage Device Manufacturing	12.06	275,755	180,054
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	12.74	807,697	521,045
334210	Telephone Apparatus Manufacturing	13.72	13,152	10,922
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	11.52	1,422,571	1,157,017
334290	Other Communications Equipment Manufacturing	12.99	11,996	7,307
334310	Audio and Video Equipment Manufacturing	12.09	1,856,229	419,537
334412	Bare Printed Circuit Board Manufacturing	12.00	161,807	29,469
334413	Semiconductor and Related Device Manufacturing	12.13	3,228,938	1,103,246
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	14.49	757,062	79,101

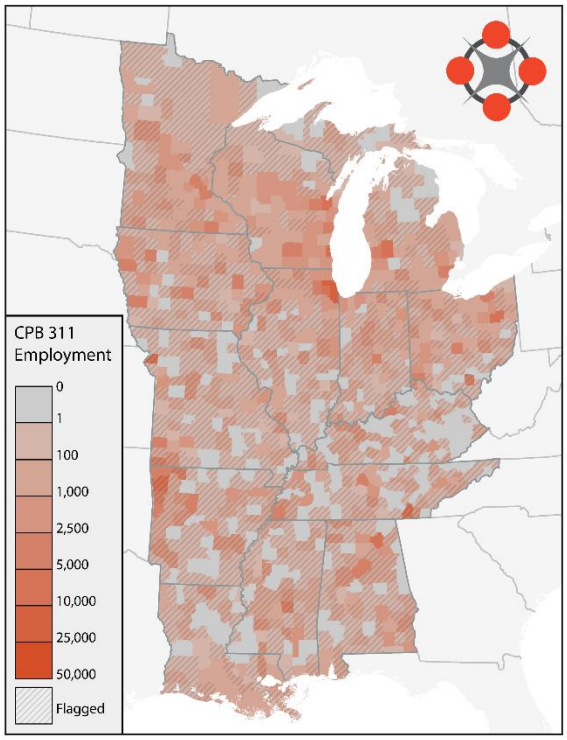
334417	Electronic Connector Manufacturing	14.14	175,628	304,091
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	12.61	152,333	8,673
334419	Other Electronic Component Manufacturing	12.54	868,239	99,707
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	11.62	1,091,065	1,176,916
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	12.83	373,887	667,871
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	13.24	69,358	3,239
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	12.93	810,209	275,289
334514	Totalizing Fluid Meter and Counting Device Manufacturing	13.34	99,427	6,139
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	12.94	647,135	376,191
334516	Analytical Laboratory Instrument Manufacturing	11.98	1,121,308	361,313
334517	Irradiation Apparatus Manufacturing	12.18	396,771	673,537
334519	Other Measuring and Controlling Device Manufacturing	13.65	1,105,520	404,360
334613	Blank Magnetic and Optical Recording Media Manufacturing	12.03	748,468	48,628
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	12.15	66,219	148,476
335110	Electric Lamp Bulb and Part Manufacturing	12.78	156,390	28,752
335121	Residential Electric Lighting Fixture Manufacturing	13.59	712	6,745
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	12.97	1,542	1,240
335129	Other Lighting Equipment Manufacturing	12.86	20,428	24,115
335210	Small Electrical Appliance Manufacturing	12.78	59,766	402,377
335221	Household Cooking Appliance Manufacturing	16.44	8,743	2,742
335222	Household Refrigerator and Home Freezer Manufacturing	12.66	30,295	14,299
335224	Household Laundry Equipment Manufacturing	15.96	8,139	7,882
335228	Other Major Household Appliance Manufacturing	12.45	199,834	12,002
335311	Power, Distribution, and Specialty Transformer Manufacturing	14.40	77,100	18,829
335312	Motor and Generator Manufacturing	13.09	1,053,580	210,627
335313	Switchgear and Switchboard Apparatus Manufacturing	13.05	609,721	86,657
335314	Relay and Industrial Control Manufacturing	12.62	562,887	159,843

335911	Storage Battery Manufacturing	12.04	618,472	51,398
335912	Primary Battery Manufacturing	13.27	67,138	14,310
335921	Fiber Optic Cable Manufacturing	17.13	22,146	10,841
335929	Other Communication and Energy Wire Manufacturing	14.91	110,728	81,781
335931	Current-Carrying Wiring Device Manufacturing	13.10	512,065	212,685
335932	Noncurrent-Carrying Wiring Device Manufacturing	12.68	12,146	6,669
335991	Carbon and Graphite Product Manufacturing	13.24	302,064	141,523
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	13.67	703,205	447,114
336111	Automobile Manufacturing	13.58	35,500,759	565,345
336112	Light Truck and Utility Vehicle Manufacturing	39.46	4,553	1,127
336120	Heavy Duty Truck Manufacturing	17.99	500,103	30,778
336211	Motor Vehicle Body Manufacturing	20.46	101,678	66,845
336212	Truck Trailer Manufacturing	No Data	0	3,253
336213	Motor Home Manufacturing	No Data	2534	908
336214	Travel Trailer and Camper Manufacturing	17.91	756	2,581
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	13.15	2,056,832	315,798
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	13.56	1,804,159	120,145
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	13.22	3,311,203	77,499
336340	Motor Vehicle Brake System Manufacturing	15.17	363,084	38,171
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	13.36	1,854,761	44,209
336360	Motor Vehicle Seating and Interior Trim Manufacturing	15.45	225,046	12,856
336370	Motor Vehicle Metal Stamping	31.47	16,068	5,954
336390	Other Motor Vehicle Parts Manufacturing	15.12	2,161,475	297,916
336411	Aircraft Manufacturing	13.91	1,680	4,267
336412	Aircraft Engine and Engine Parts Manufacturing	10.98	1,877,559	170,939
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	10.95	4,865,899	645,759
336414	Guided Missile and Space Vehicle Manufacturing	18.19	777	33,366
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	10.68	1,733	245,449
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	10.72	8,011	46,454
336510	Railroad Rolling Stock Manufacturing	21.11	185,877	15,770

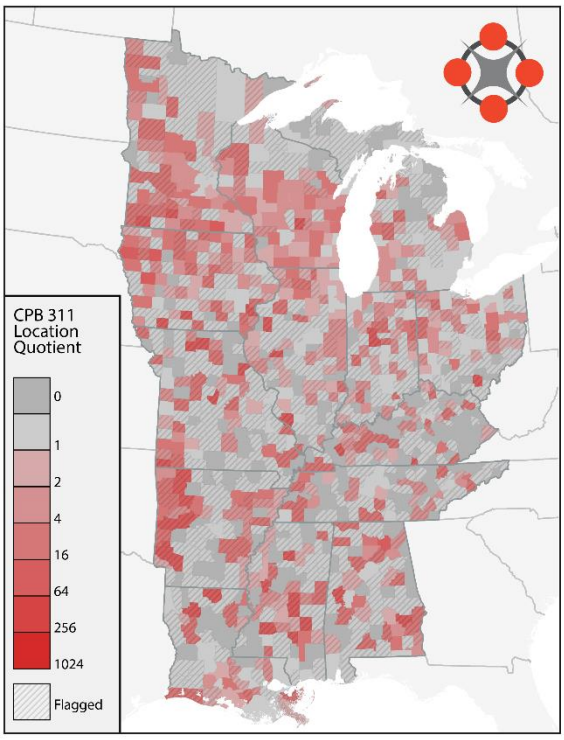
336611	Ship Building and Repairing	11.48	20,318	37,639
336612	Boat Building	20.72	732	18,688
336991	Motorcycle, Bicycle, and Parts Manufacturing	14.79	1,210,324	186,275
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	10.35	5	10,423
336999	All Other Transportation Equipment Manufacturing	12.38	74,745	12,494
31131X	Sugars	19.61	2,368	75,404
31135X	Chocolate And Confectionery From Cacao Beans Products	18.24	4,399	55,031
33641X	Civilian Aircraft, Engines, Equipment, And Parts	No Data	0	6,503,219
31181X	Bread & Bakery Products	17.23	37,980	39,699

Chapter 4 Appendices

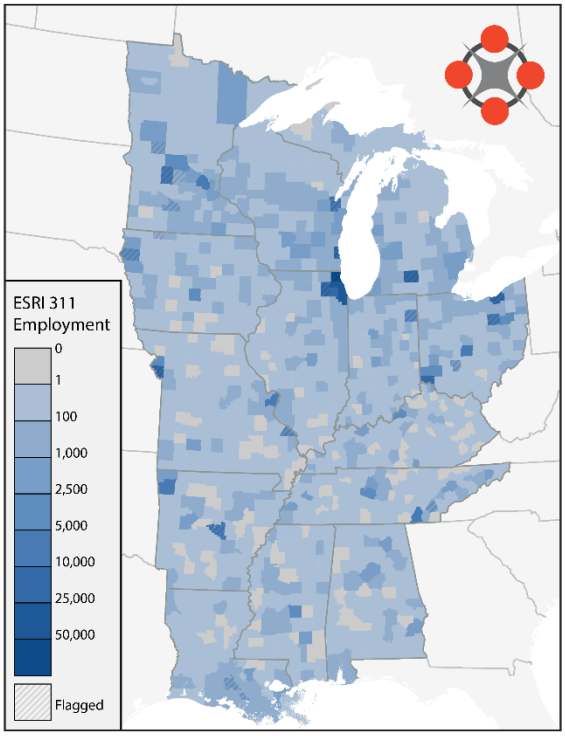
Appendix A: County Employment Levels and Location Quotients



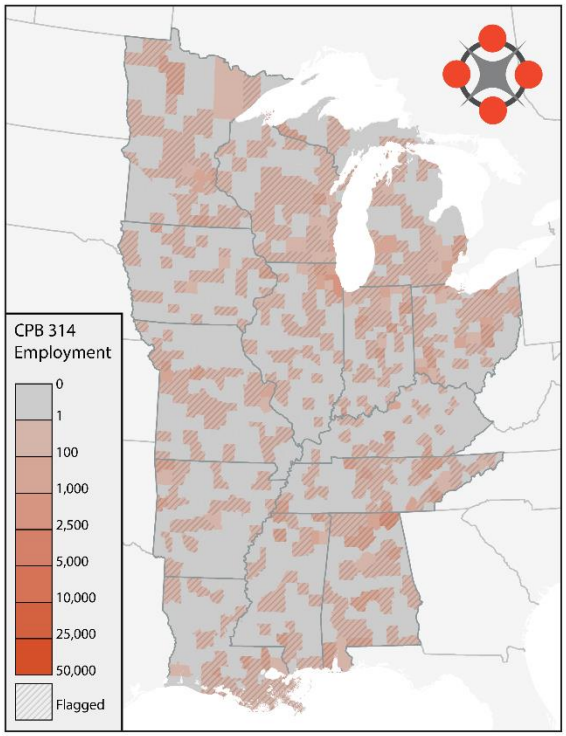
Map A.1 County Employment Levels for the Food Manufacturing Industry Subsector (CBP, 2013).



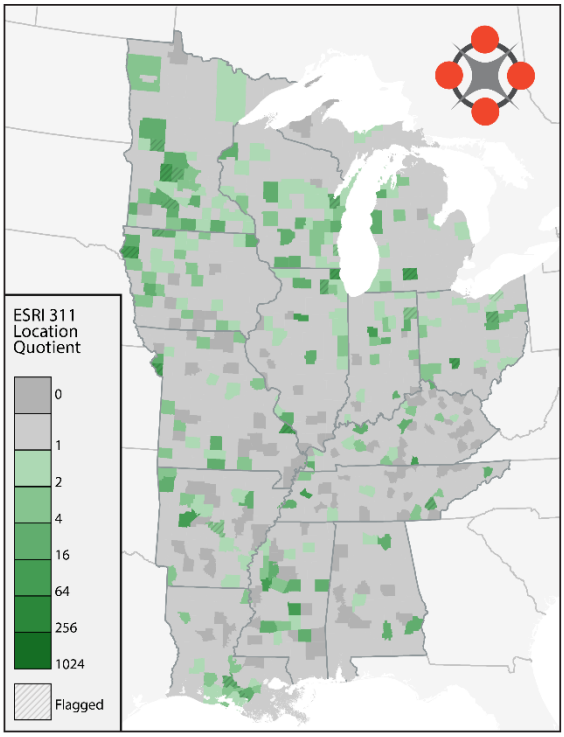
Map A.3 County Location Quotients for the Food Manufacturing Industry Subsector (CBP, 2013).



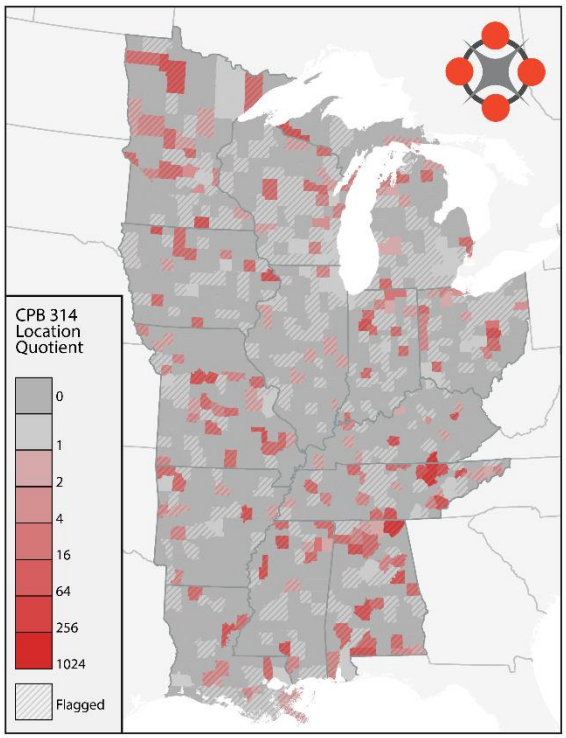
Map A.2 County Employment Levels for the Food Manufacturing Industry Subsector (ESRI, 2013).



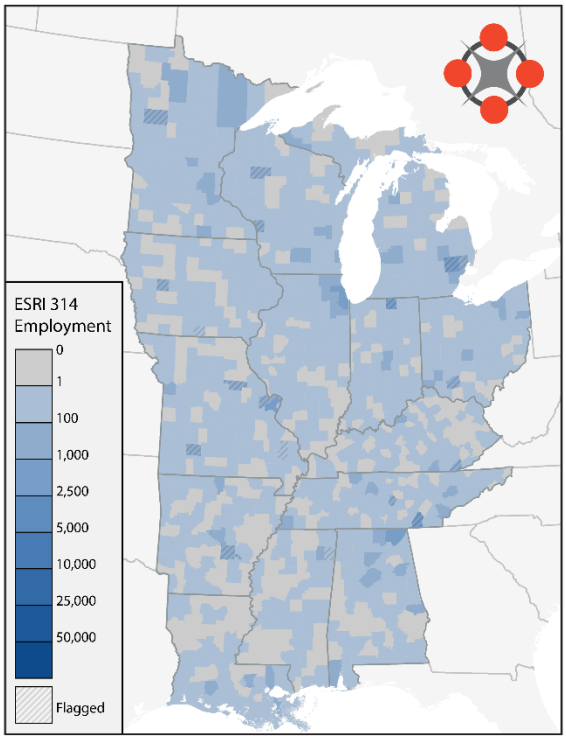
Map A.5 County Employment Levels for the Textile Product Mills Industry Subsector (CBP, 2013).



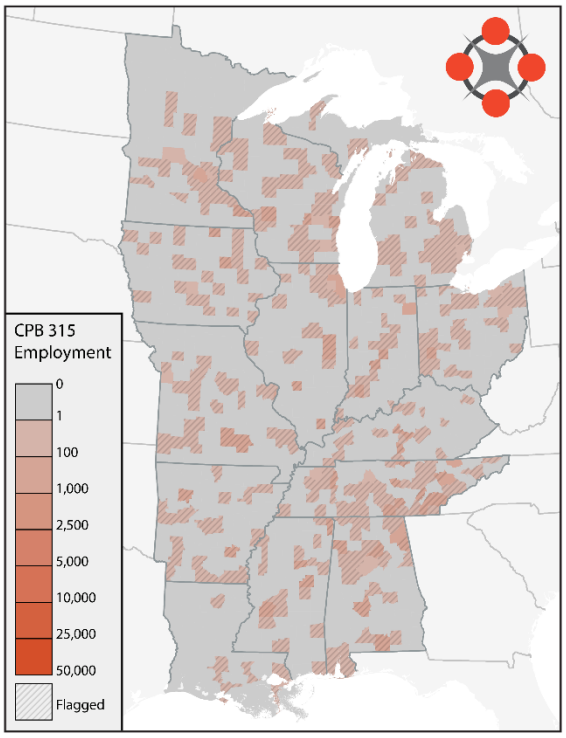
Map A.4 County Location Quotients for the Food Manufacturing Industry Subsector (ESRI, 2013).



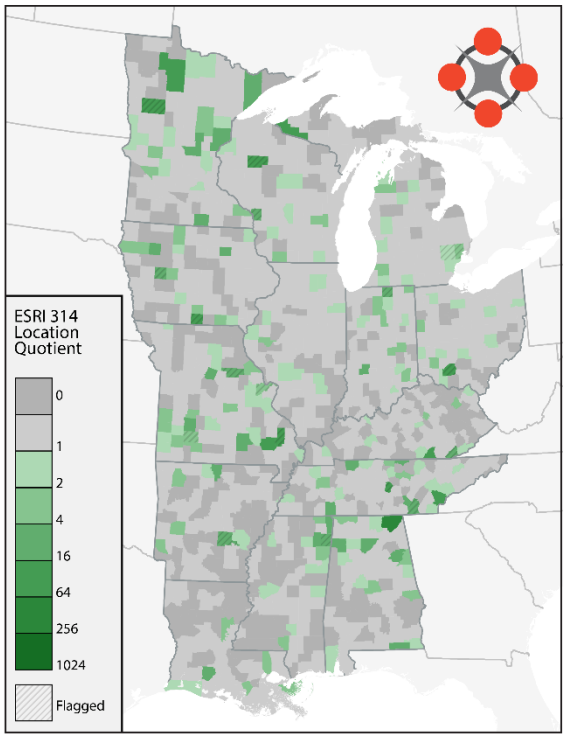
Map A.7 County Location Quotients for the Textile Product Mills Industry Subsector (CBP, 2013).



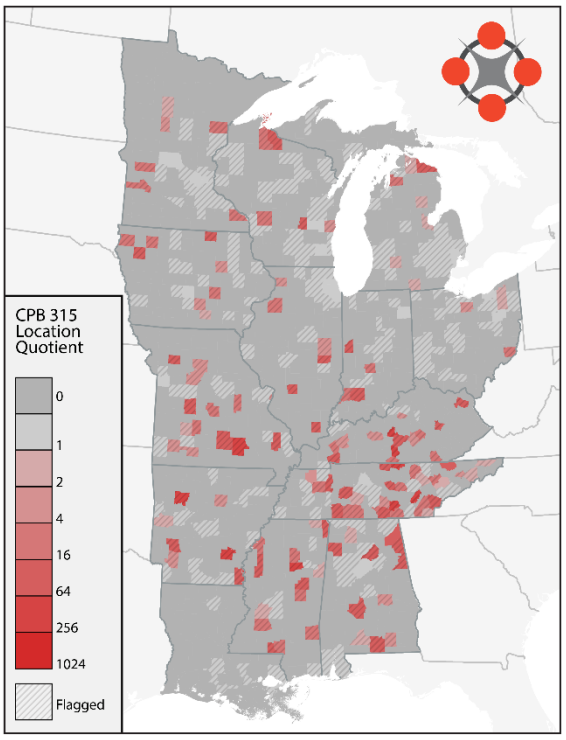
Map A.6 County Employment Levels for the Textile Product Mills Industry Subsector (ESRI, 2013).



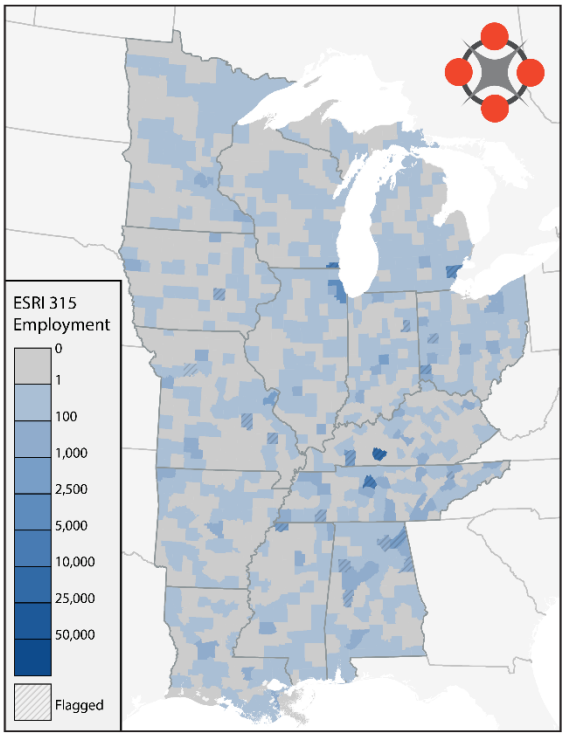
Map A.9 County Employment Levels for the Apparel Manufacturing Industry Subsector (CBP, 2013).



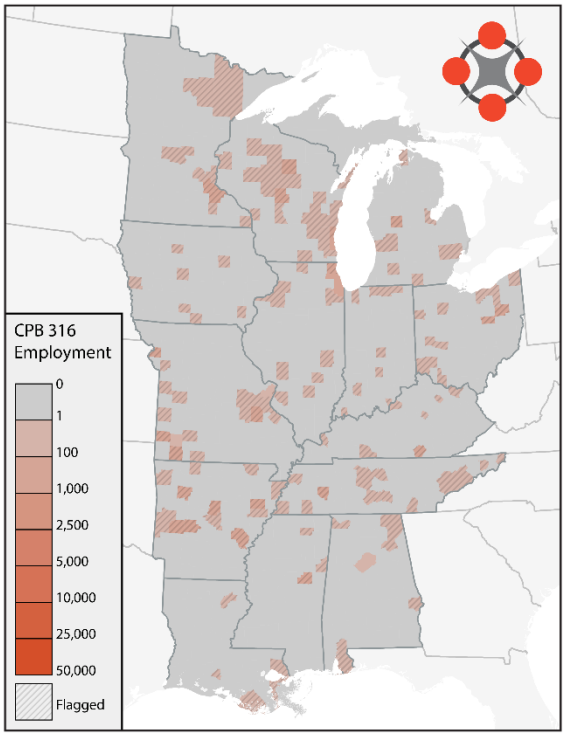
Map A.8 County Location Quotients for the Textile Product Mills Industry Subsector (ESRI, 2013).



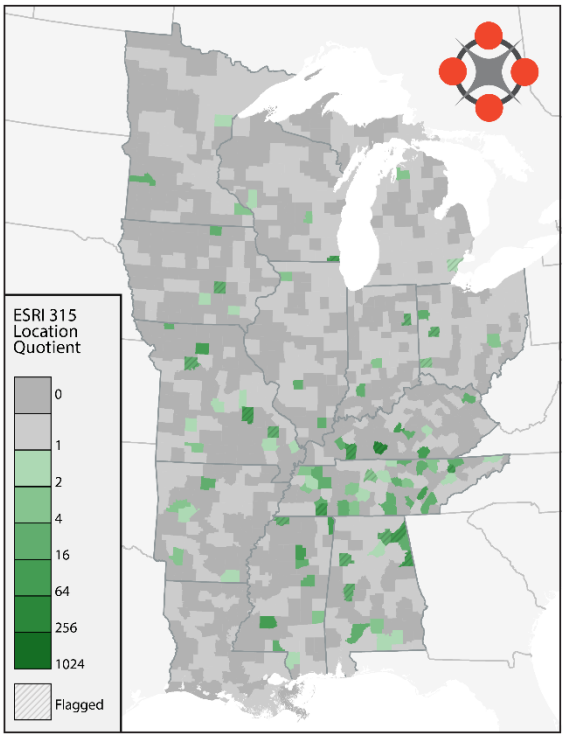
Map A.11 County Location Quotients for the Apparel Manufacturing Industry Subsector (CBP, 2013).



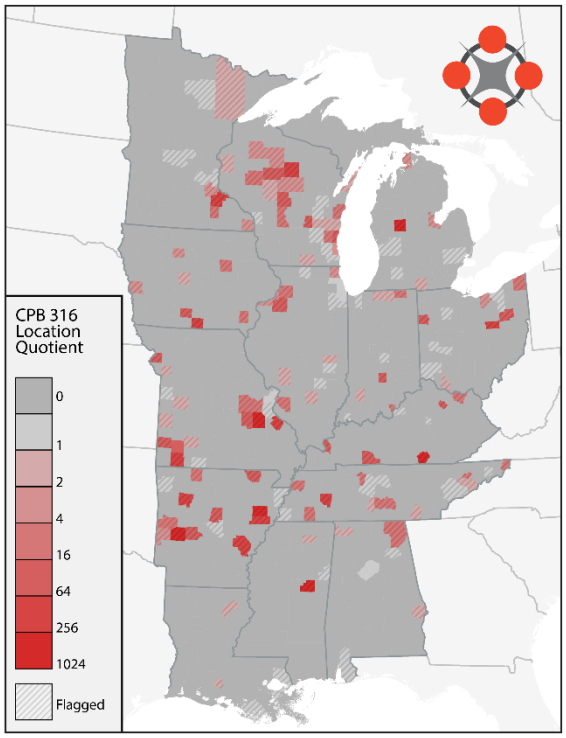
Map A.10 County Employment Levels for the Apparel Manufacturing Industry Subsector (ESRI, 2013).



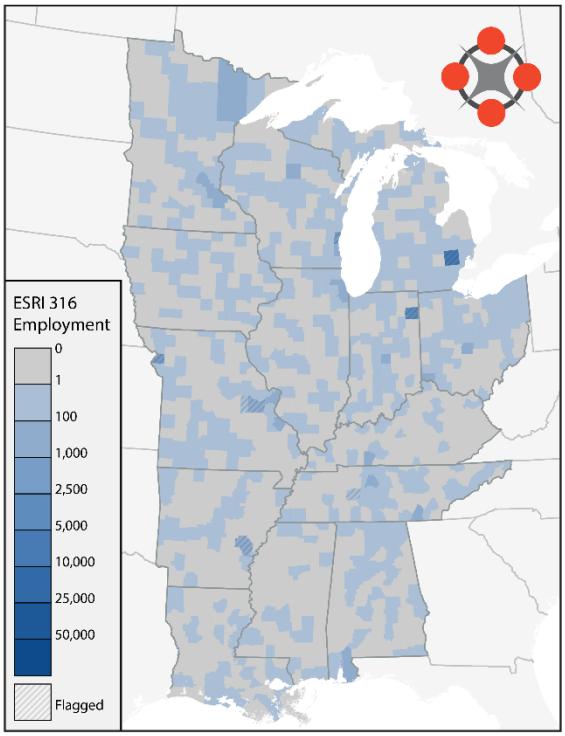
Map A.13 County Employment Levels for the Leather & Allied Product Manufacturing Industry Subsector (CBP, 2013).



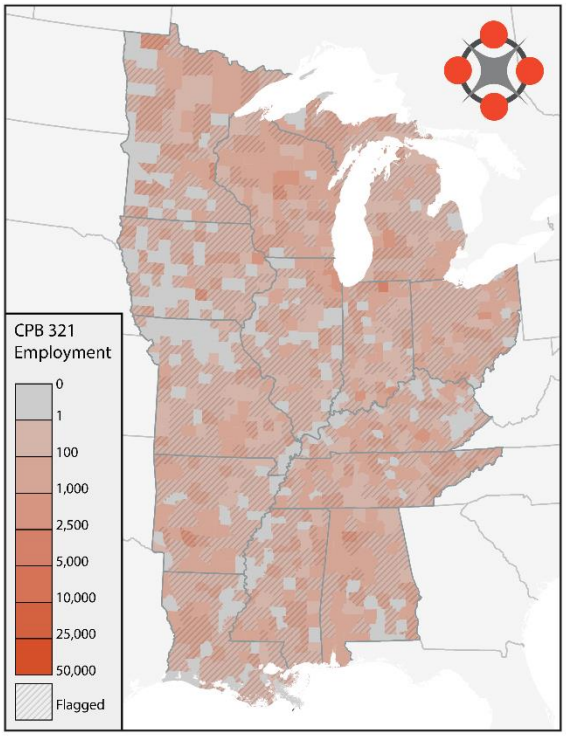
Map A.12 County Location Quotients for the Apparel Manufacturing Industry Subsector (ESRI, 2013).



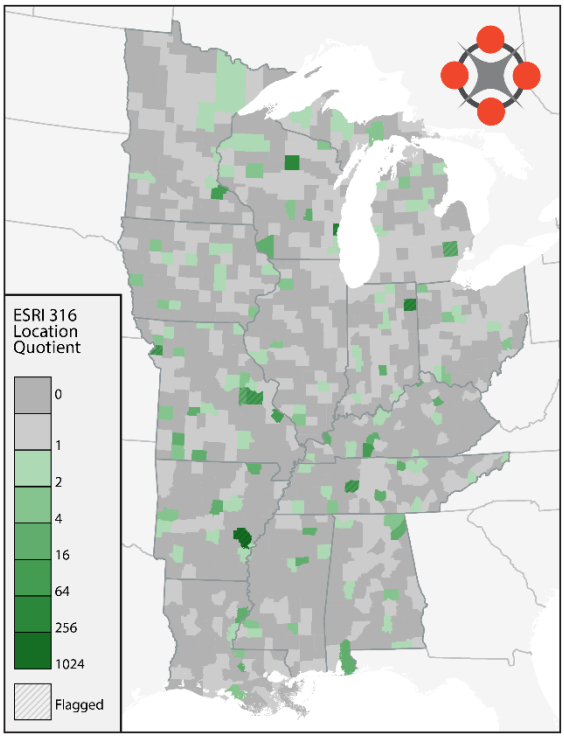
Map A.15 County Location Quotients for the Leather & Allied Product Manufacturing Industry Subsector (CBP, 2013).



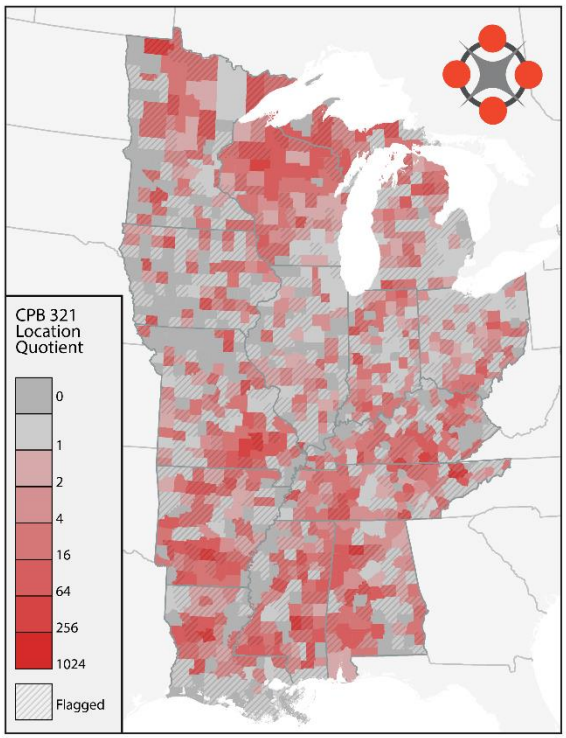
Map A.14 County Employment Levels for the Leather & Allied Product Manufacturing Industry Subsector (ESRI, 2013).



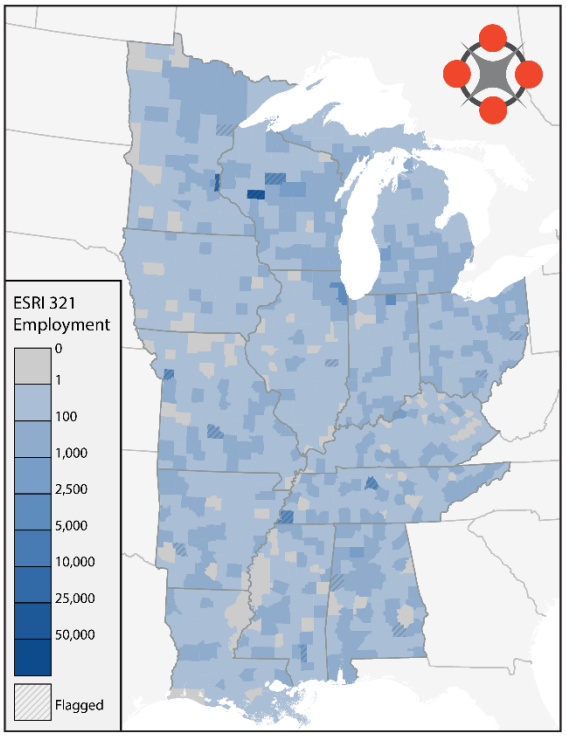
Map A.17 County Employment Levels for the Wood Product Manufacturing Industry Subsector (CBP, 2013).



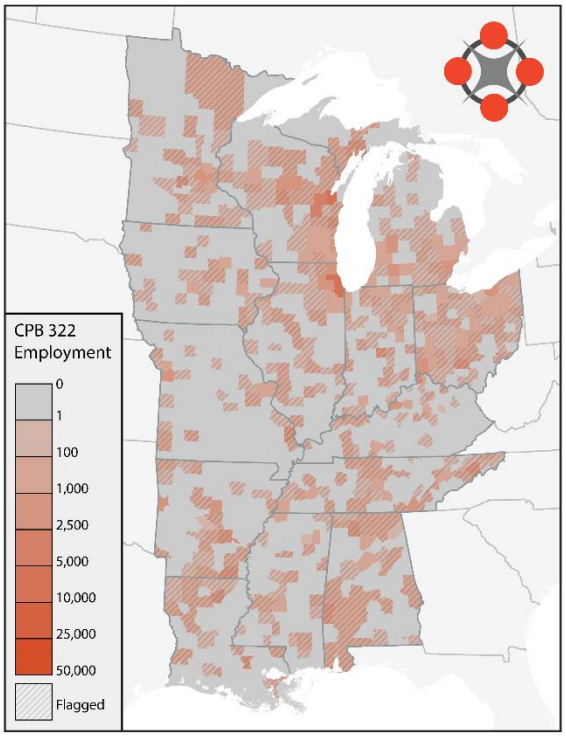
Map A.16 County Location Quotients for the Leather & Allied Product Manufacturing Industry Subsector (ESRI, 2013).



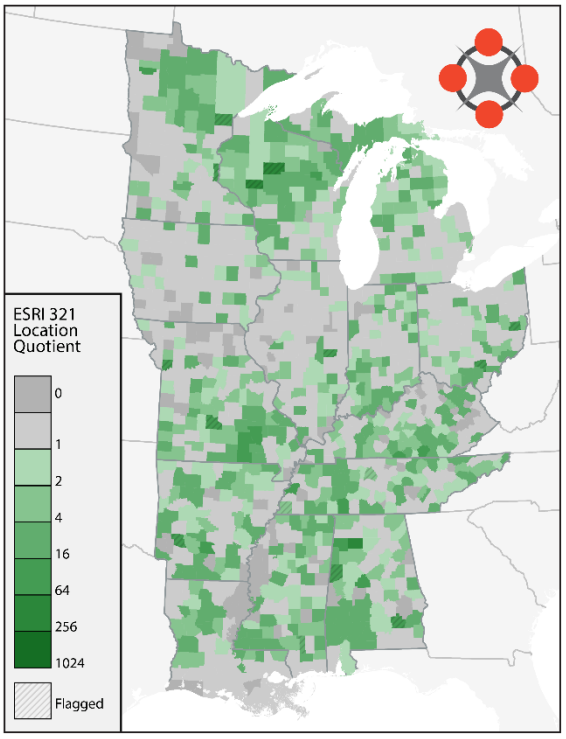
Map A.19 County Location Quotients for the Wood Product Manufacturing Industry Subsector (CBP, 2013).



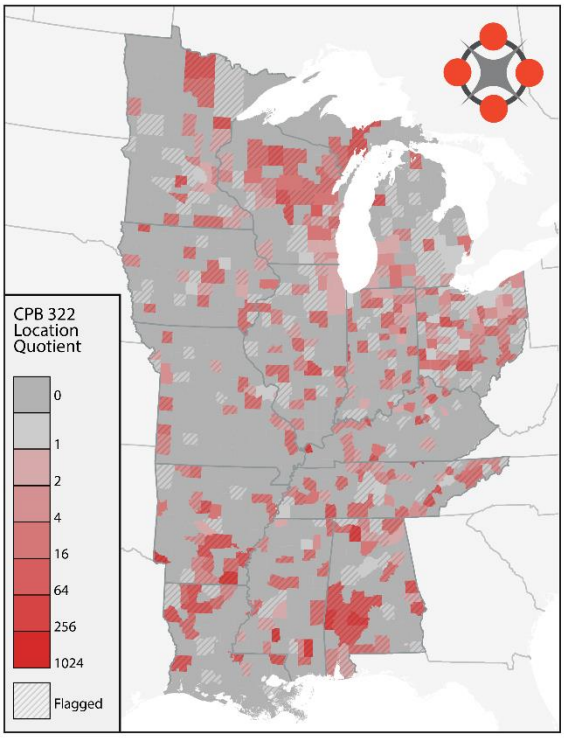
Map A.18 County Employment Levels for the Wood Product Manufacturing Industry Subsector (ESRI, 2013).



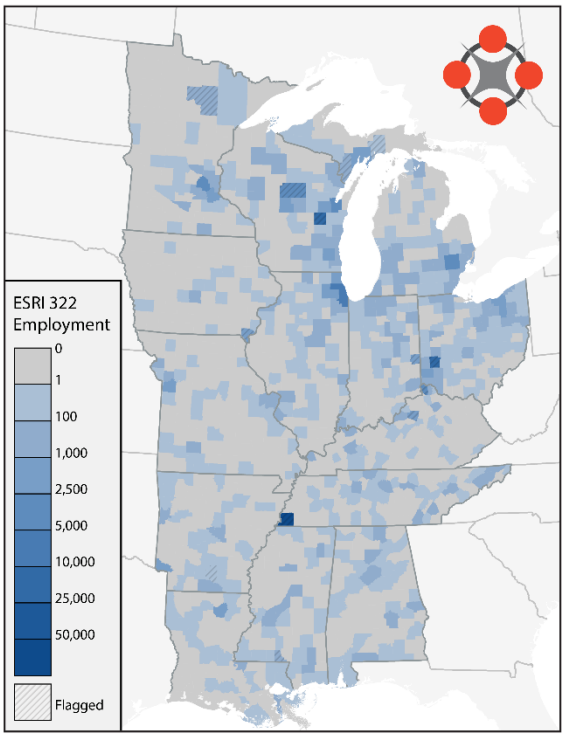
Map A.21 County Employment Levels for the Paper Manufacturing Industry Subsector (CBP, 2013).



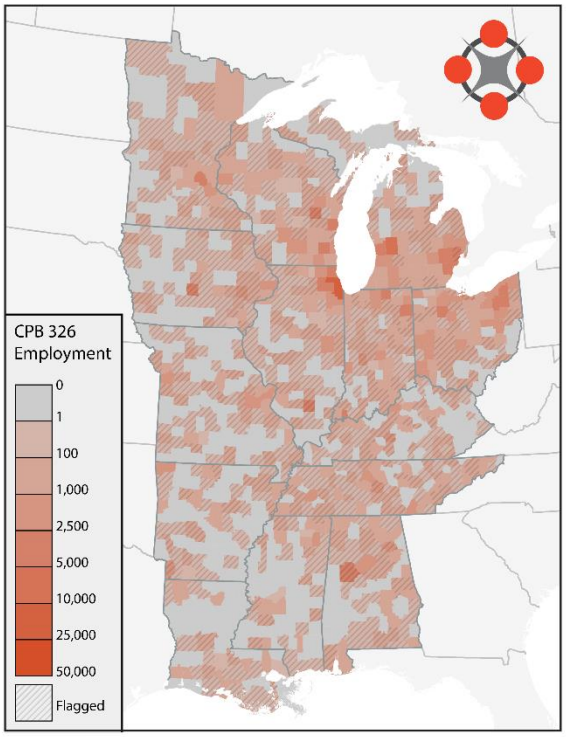
Map A.20 County Location Quotients for the Wood Product Manufacturing Industry Subsector (ESRI, 2013).



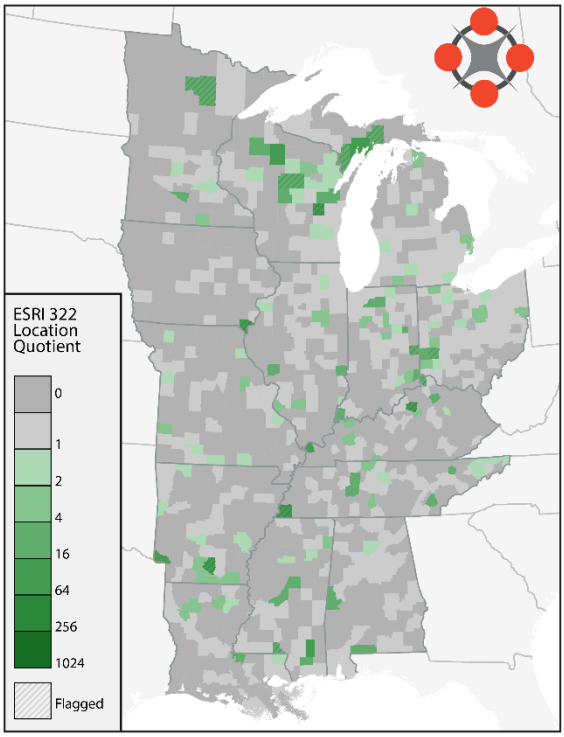
Map A.23 County Location Quotients for the Paper Manufacturing Industry Subsector (CBP, 2013).



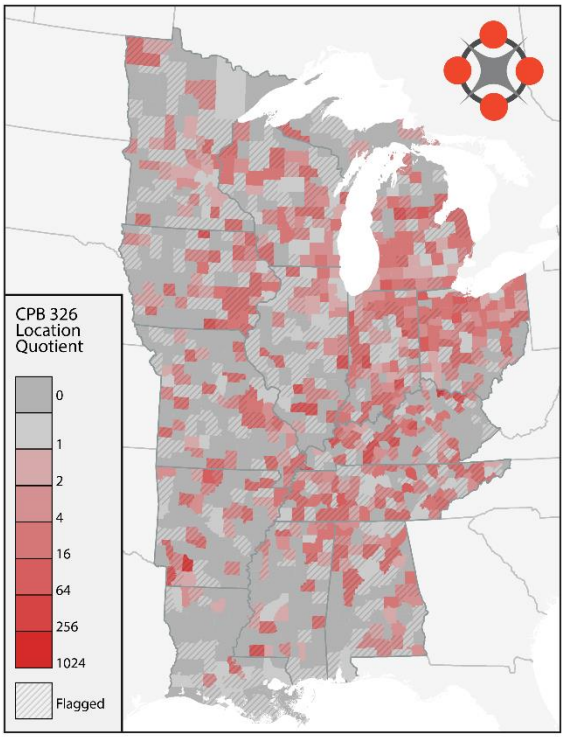
Map A.22 County Employment Levels for the Paper Manufacturing Industry Subsector (ESRI, 2013).



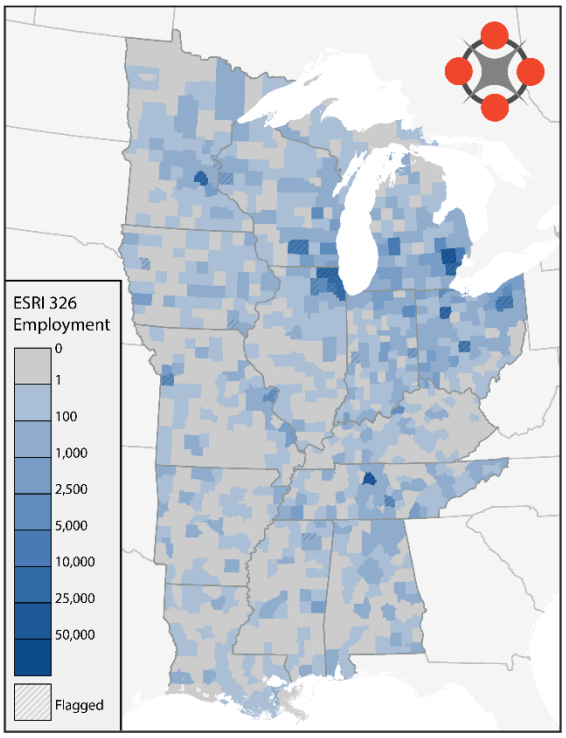
Map A.25 County Employment Levels for the Plastics & Rubber Manufacturing Industry Subsector (CBP, 2013).



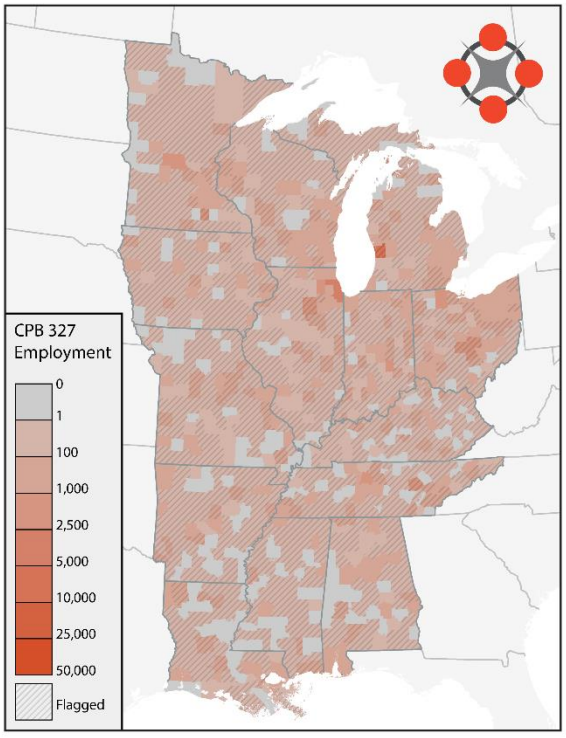
Map A.24 County Location Quotients for the Paper Manufacturing Industry Subsector (ESRI, 2013).



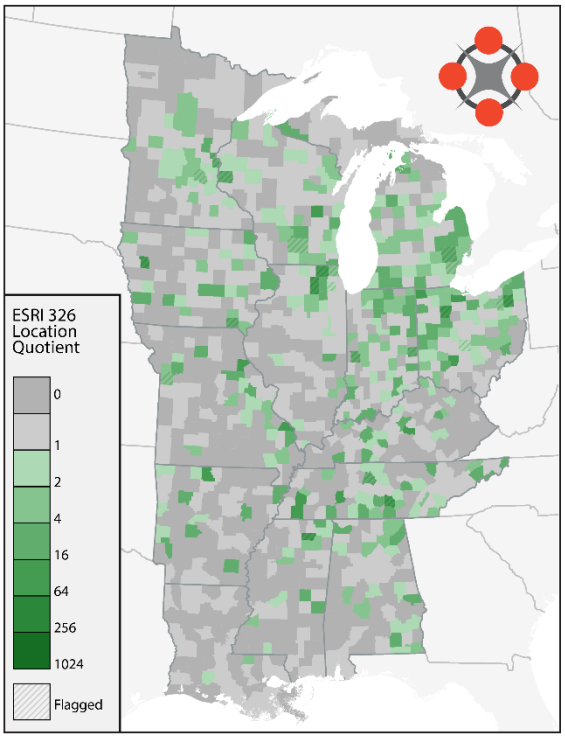
Map A.27 County Location Quotients for the Plastics & Rubber Manufacturing Industry Subsector (CBP, 2013).



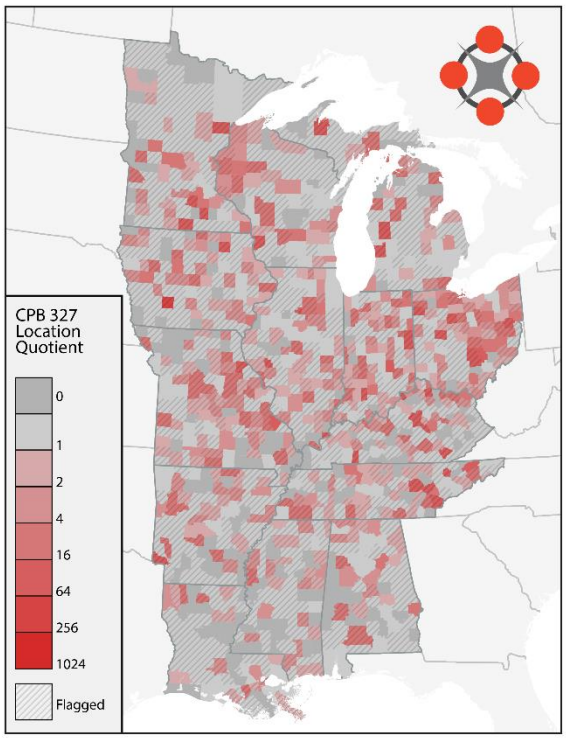
Map A.26 County Employment Levels for the Plastics & Rubber Manufacturing Industry Subsector (ESRI, 2013).



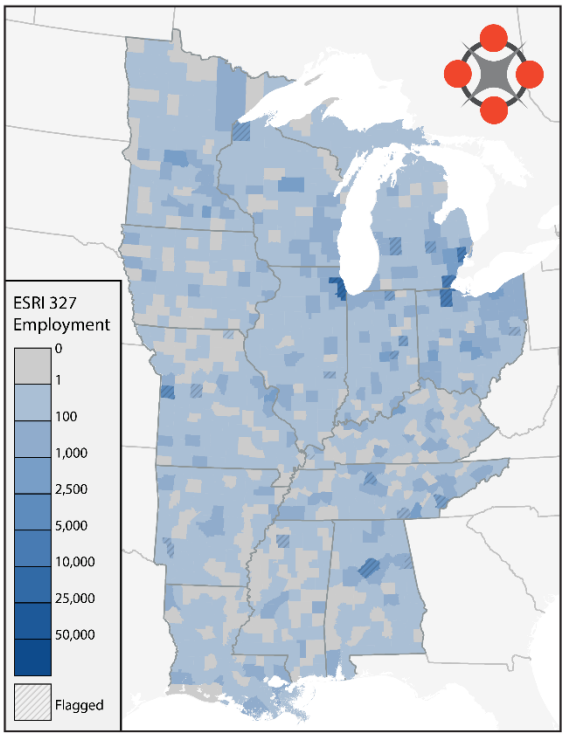
Map A.29 County Employment Levels for the Nonmetallic Mineral Product Manufacturing Industry Subsector (CBP, 2013).



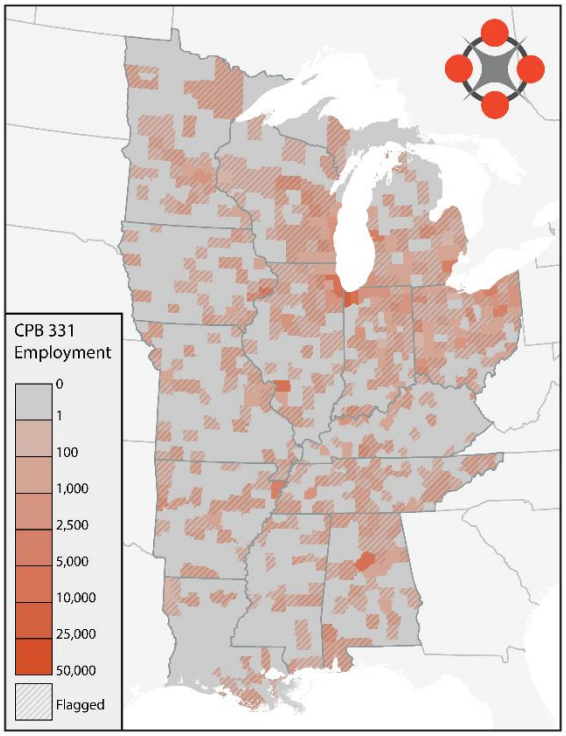
Map A.28 County Location Quotients for the Plastics & Rubber Manufacturing Industry Subsector (ESRI, 2013).



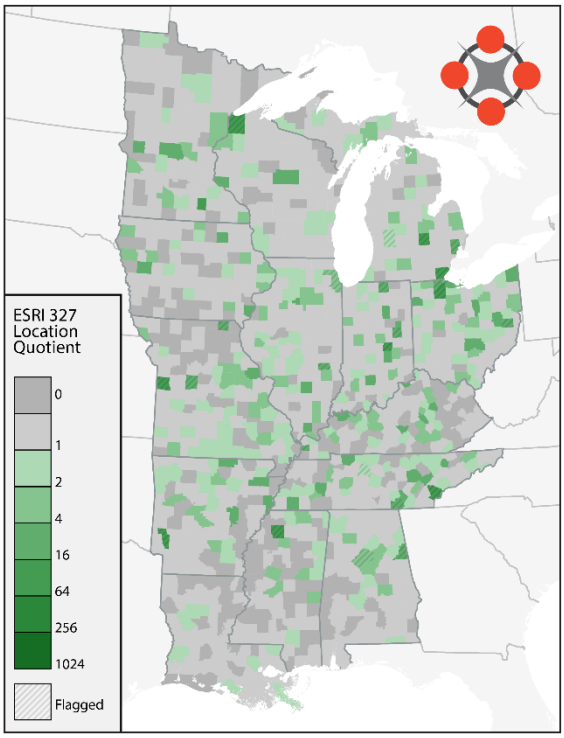
Map A.31 County Location Quotients for the Nonmetallic Mineral Product Manufacturing Industry Subsector (CBP, 2013).



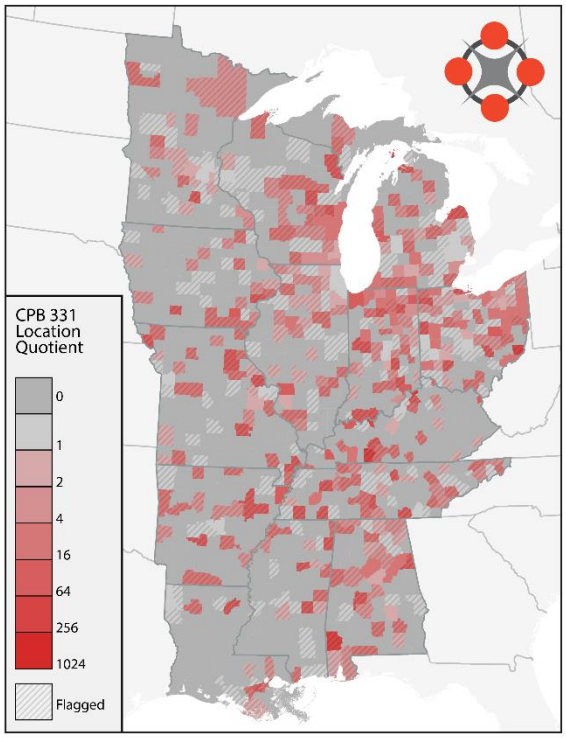
Map A.30 County Employment Levels for the Nonmetallic Mineral Product Manufacturing Industry Subsector (ESRI, 2013).



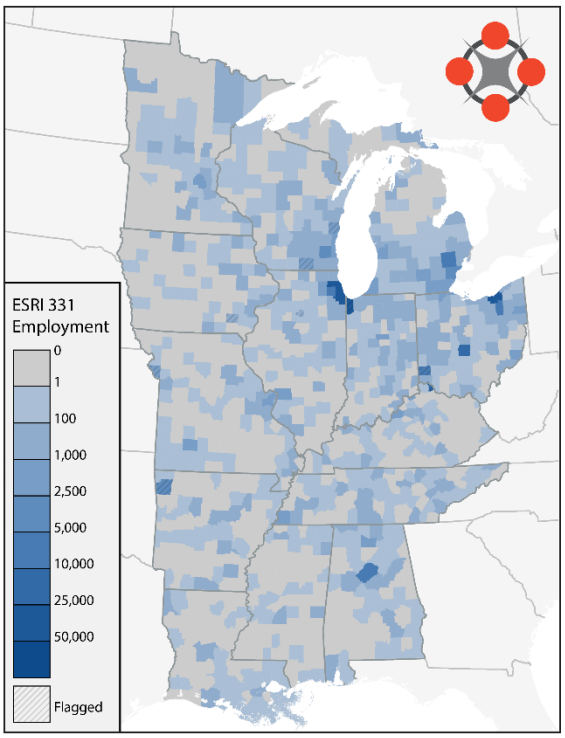
Map A.33 County Employment Levels for the Primary Metal Product Manufacturing Industry Subsector (CBP, 2013).



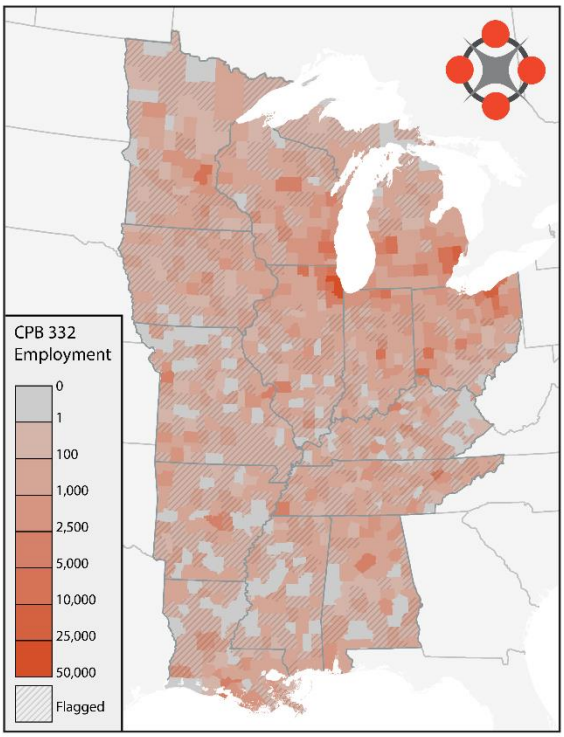
Map A.32 County Location Quotients for the Nonmetallic Mineral Product Manufacturing Industry Subsector (ESRI, 2013).



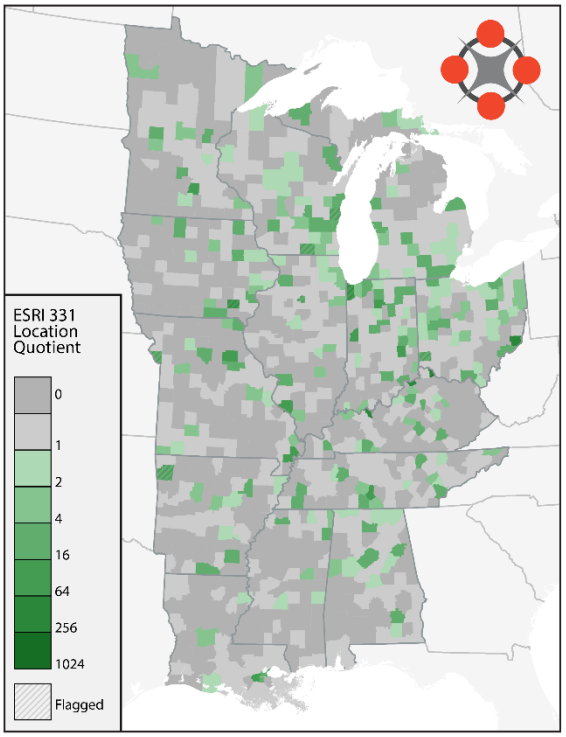
Map A.35 County Location Quotients for the Primary Metal Product Manufacturing Industry Subsector (CBP, 2013).



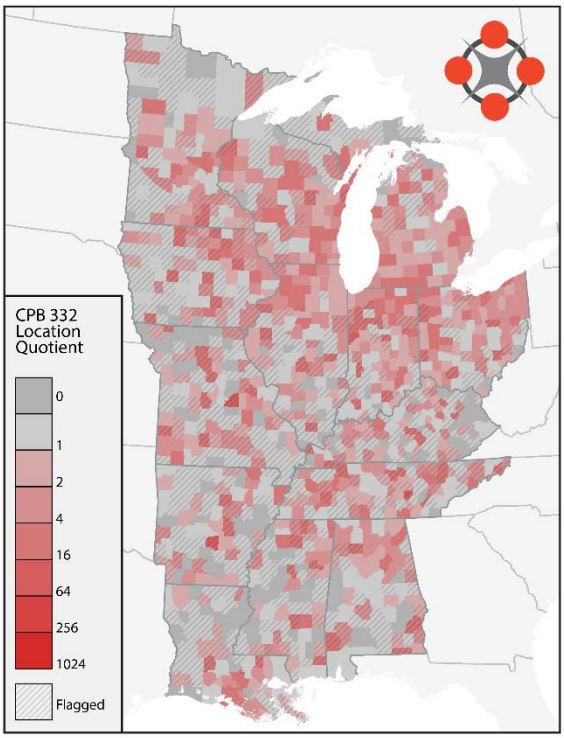
Map A.34 County Employment Levels for the Primary Metal Product Manufacturing Industry Subsector (ESRI, 2013).



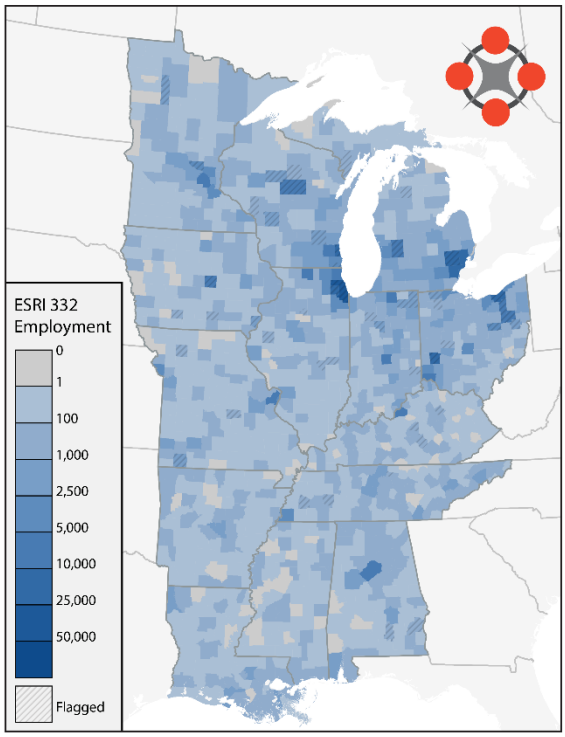
Map A.37 County Employment Levels for the Fabricated Metal Product Manufacturing Industry Subsector (CBP, 2013).



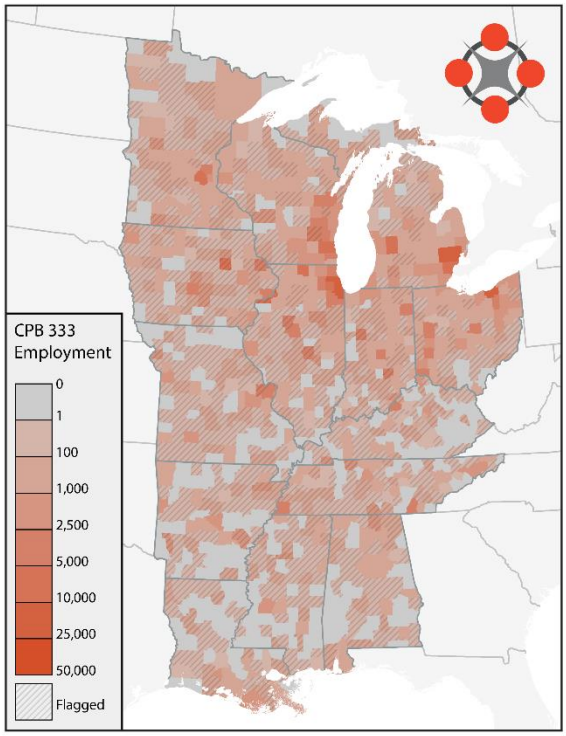
Map A.36 County Location Quotients for the Primary Metal Product Manufacturing Industry Subsector (ESRI, 2013).



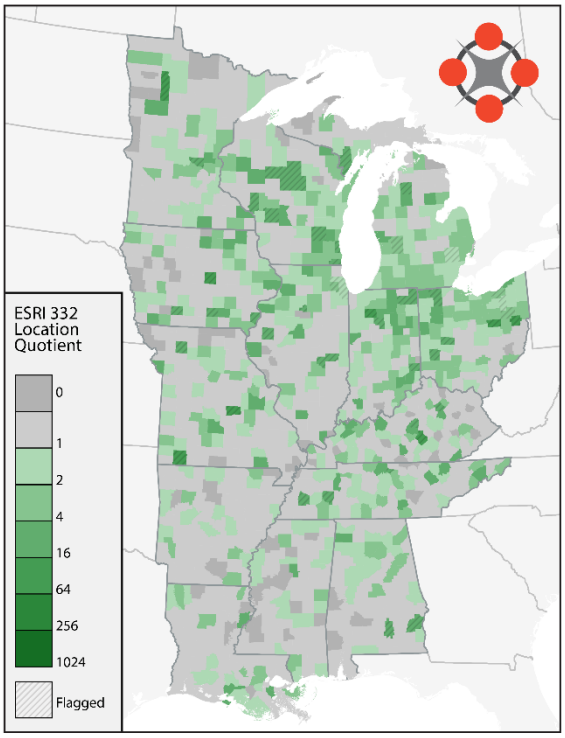
Map A.39 County Location Quotients for the Fabricated Metal Product Manufacturing Industry Subsector (CBP, 2013).



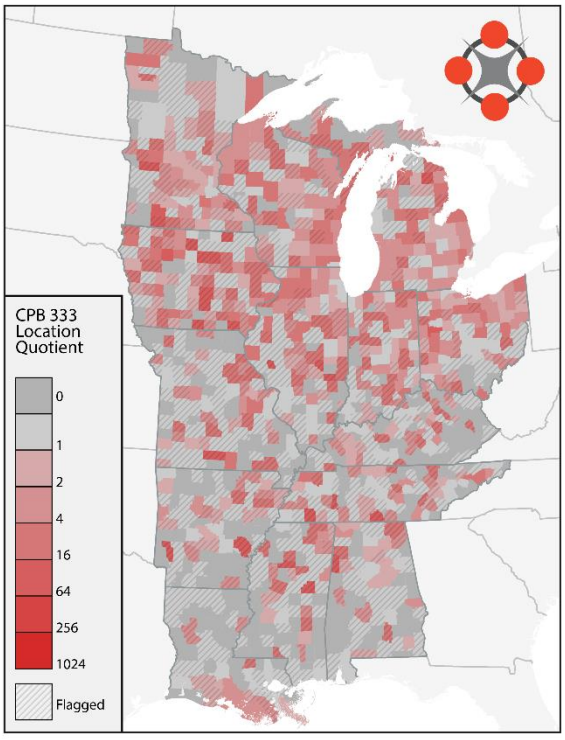
Map A.38 County Employment Levels for the Fabricated Metal Product Manufacturing Industry Subsector (ESRI, 2013).



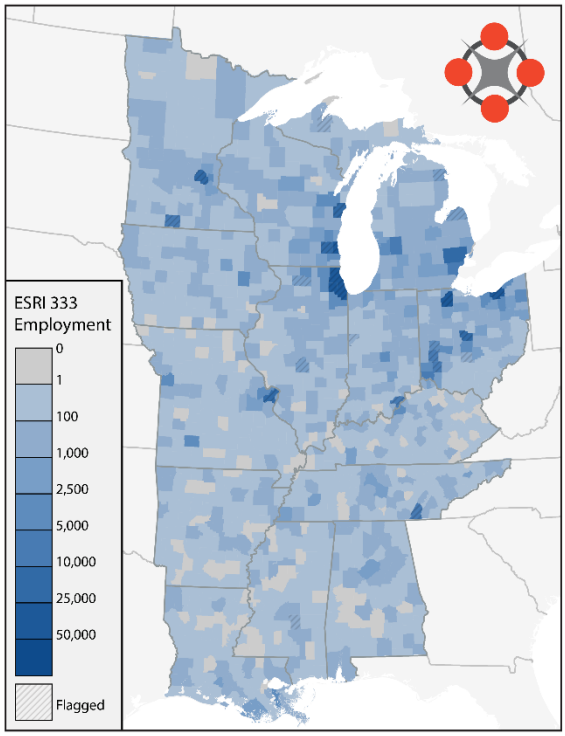
Map A.41 County Employment Levels for the Machinery Manufacturing Industry Subsector (CBP, 2013).



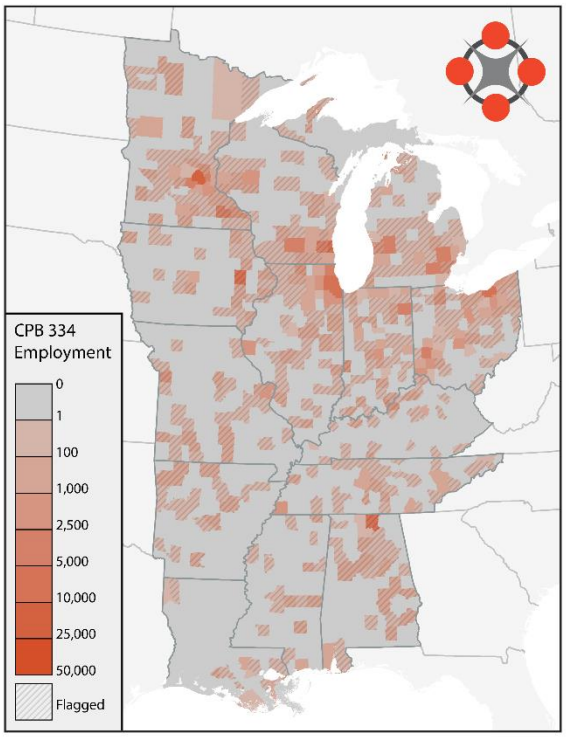
Map A.40 County Location Quotients for the Fabricated Metal Product Manufacturing Industry Subsector (ESRI, 2013).



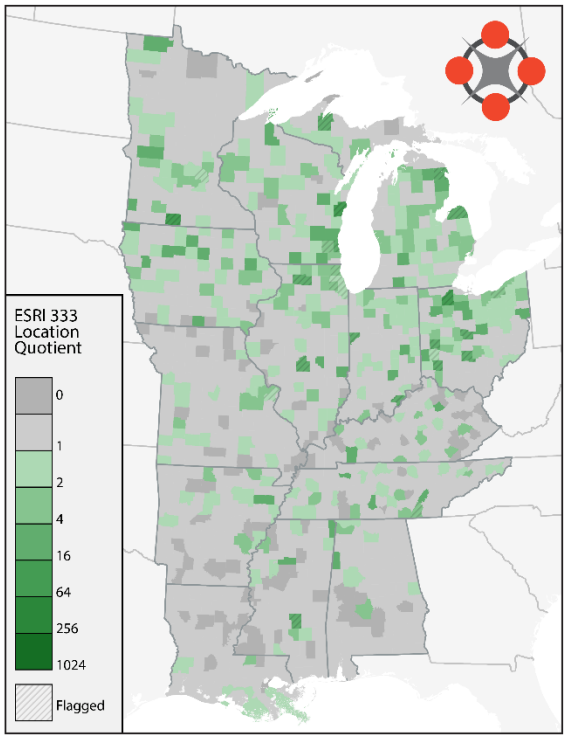
Map A.43 County Location Quotients for the Machinery Manufacturing Industry Subsector (CBP, 2013).



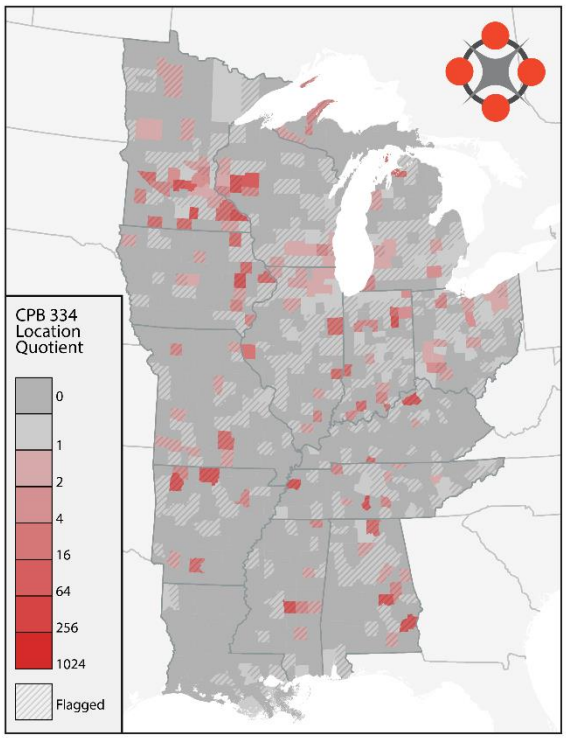
Map A.42 County Employment Levels for the Machinery Manufacturing Industry Subsector (ESRI, 2013).



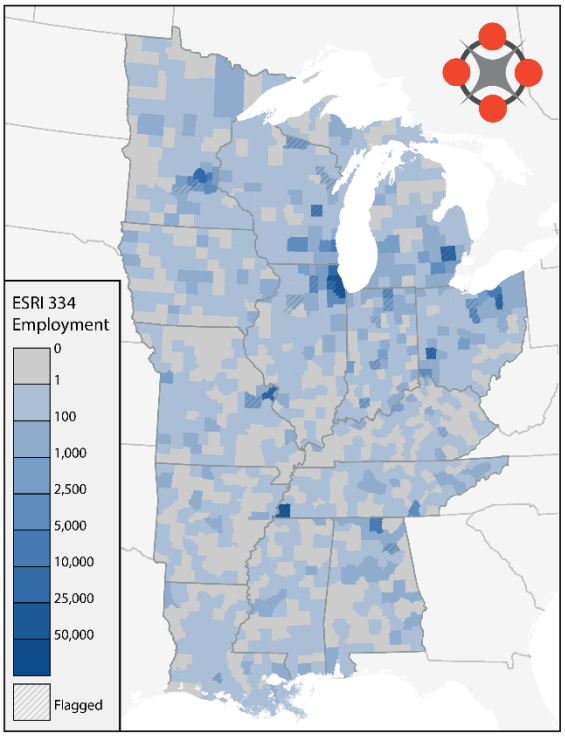
Map A.45 County Employment Levels for the Computer & Electronic Product mfg Industry Subsector (CBP, 2013).



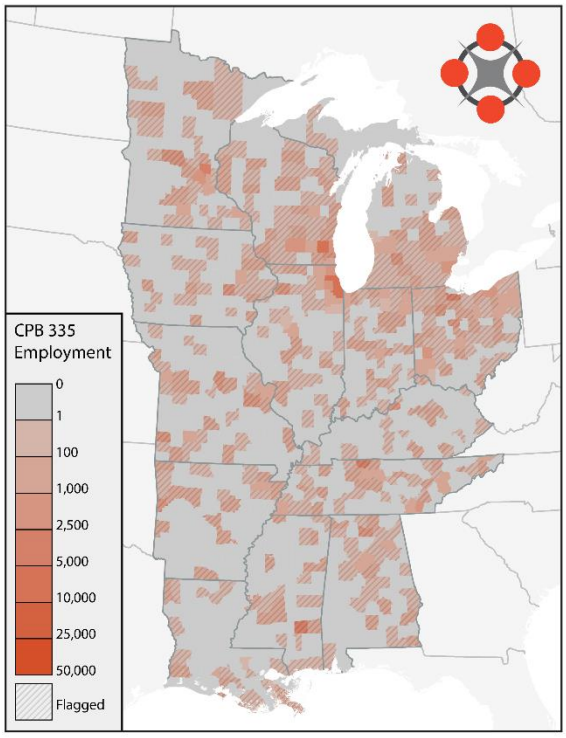
Map A.44 County Location Quotients for the Machinery Manufacturing Industry Subsector (ESRI, 2013).



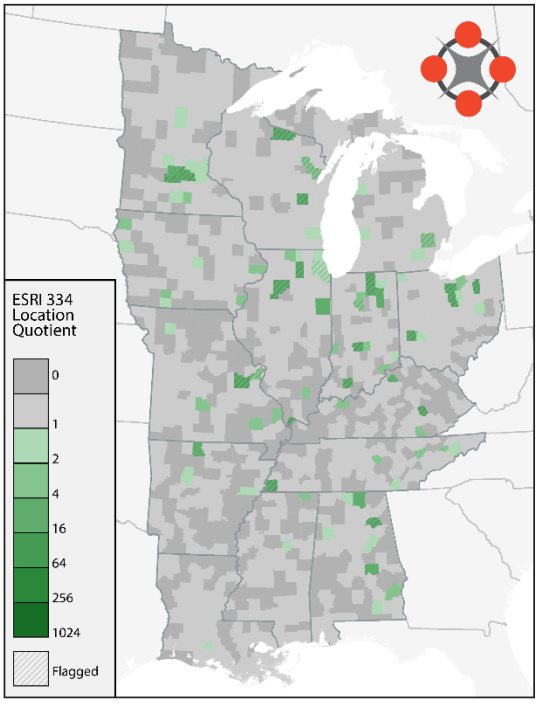
Map A.47 County Location Quotients for the Computer & Electronic Product mfg Industry Subsector (CBP, 2013).



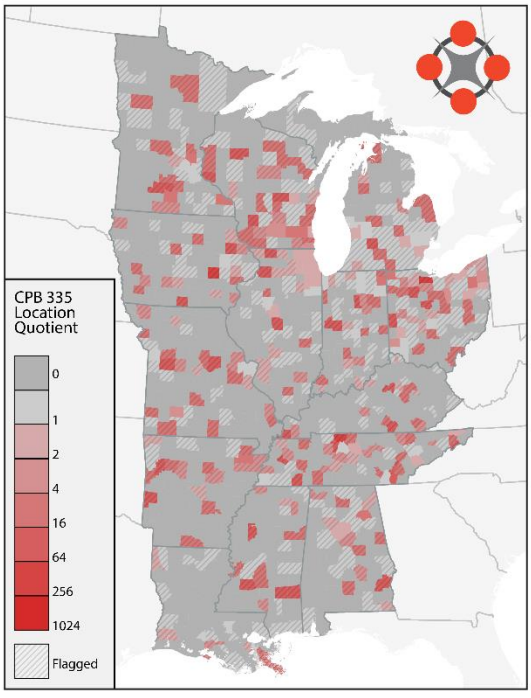
Map A.46 County Employment Levels for the Computer & Electronic Product Manufacturing Industry Subsector (ESRI, 2013).



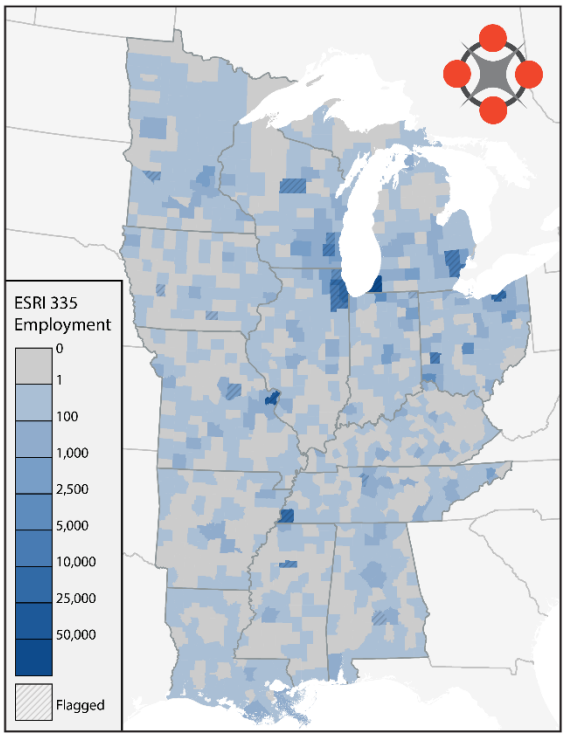
Map A.49 County Employment Levels for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector (CBP,2013).



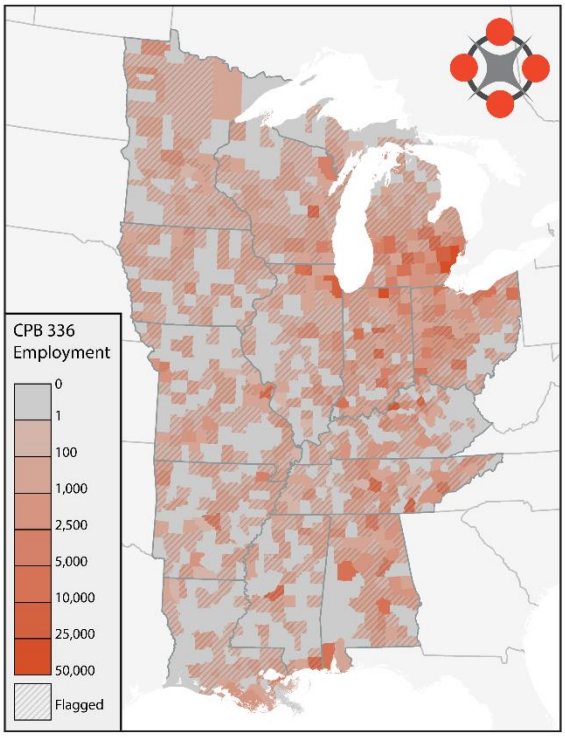
Map A.48 County Location Quotients for the Computer & Electronic Product Manufacturing Industry Subsector (ESRI, 2013).



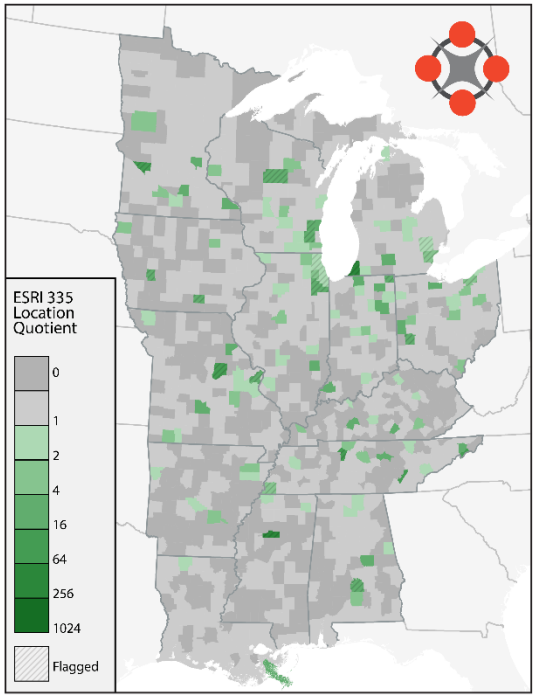
Map A.51 County Location Quotients for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector (CBP,2013).



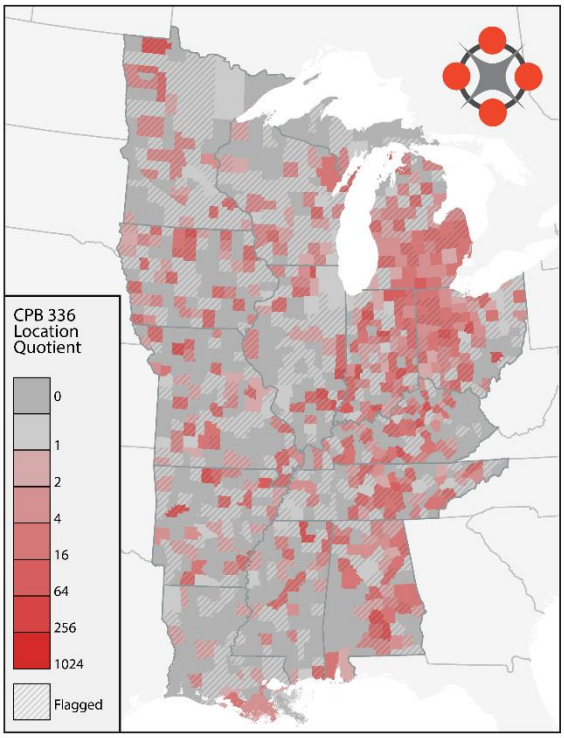
Map A.50 County Employment Levels for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector(ESRI,2013).



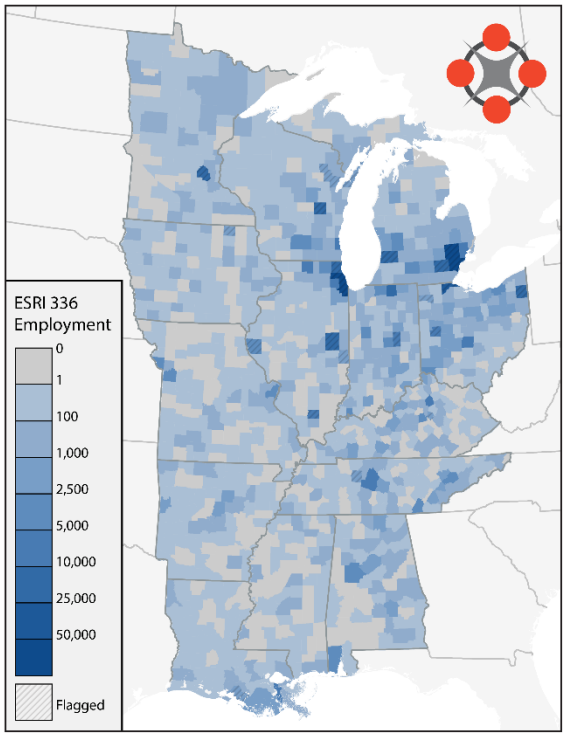
Map A.53 County Employment Levels for the Transportation Equipment Manufacturing Industry Subsector (CBP, 2013).



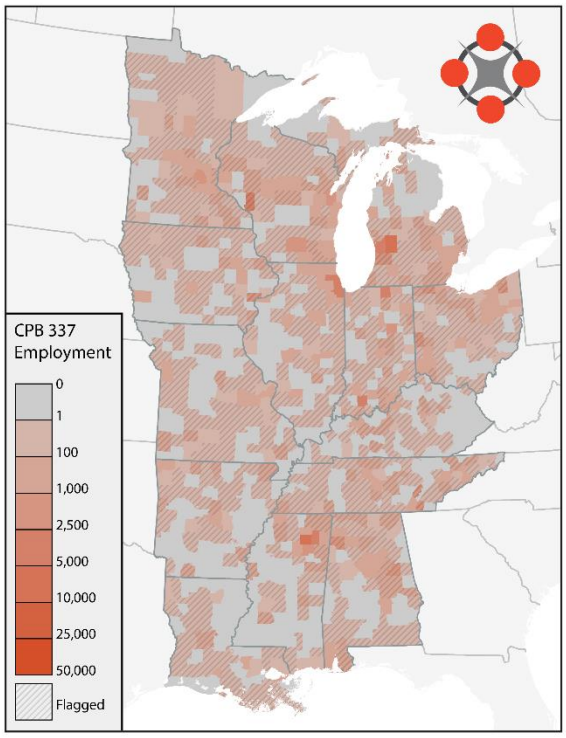
Map A.52 County Location Quotients for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector(ESRI,2013).



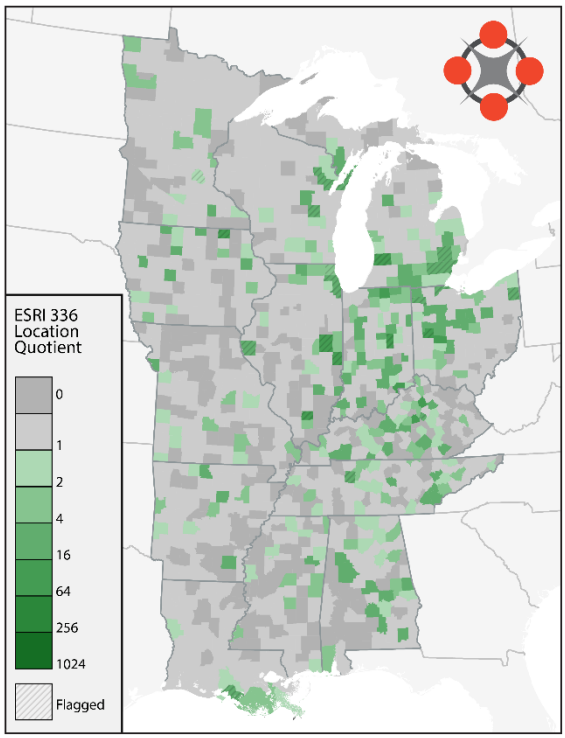
Map A.55 County Location Quotients for the Transportation Equipment Manufacturing Industry Subsector (CBP, 2013).



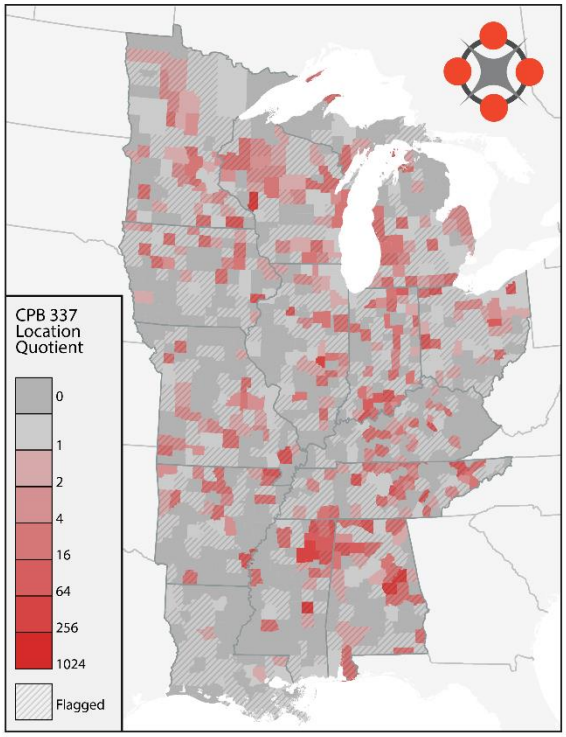
Map A.54 County Employment Levels for the Transportation Equipment Manufacturing Industry Subsector (ESRI, 2013).



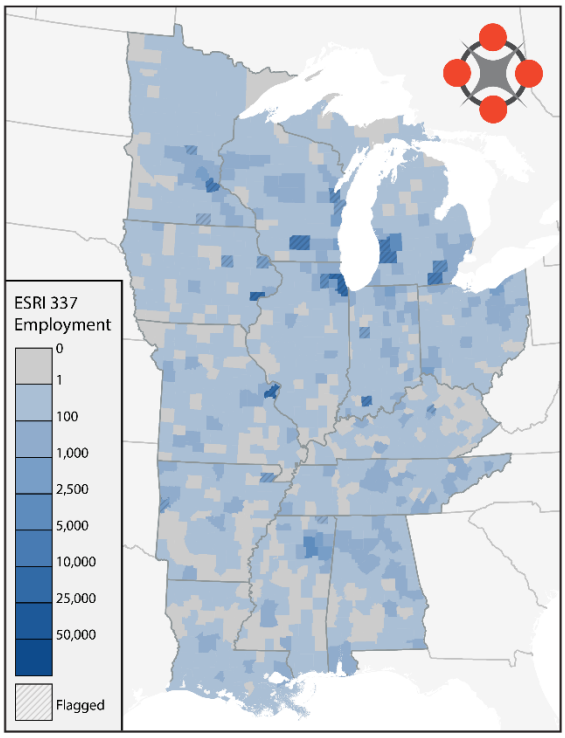
Map A.57 County Employment Levels for the Furniture & Related Product Manufacturing Industry Subsector (CBP, 2013).



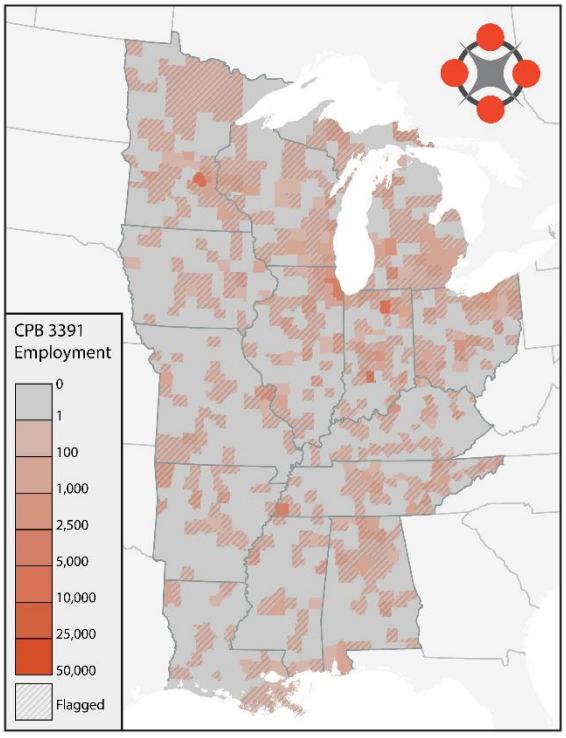
Map A.56 County Location Quotients for the Transportation Equipment Manufacturing Industry Subsector (ESRI, 2013).



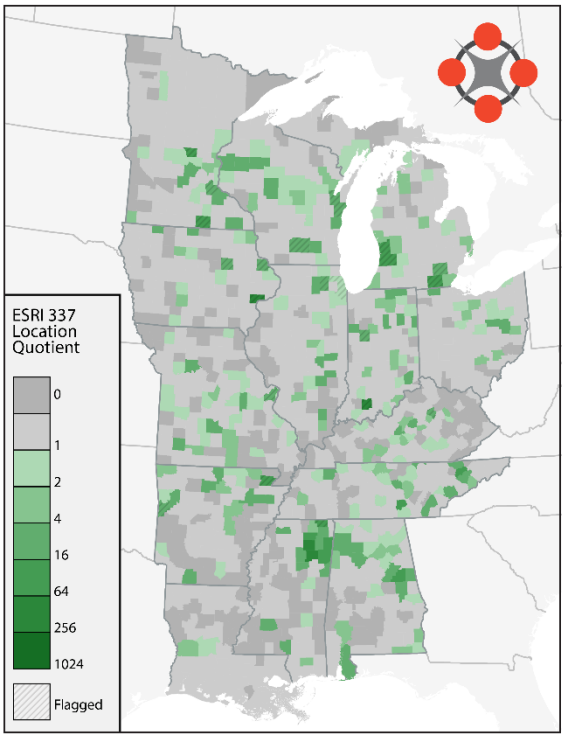
Map A.59 County Location Quotients for the Furniture & Related Product Manufacturing Industry Subsector (CBP, 2013).



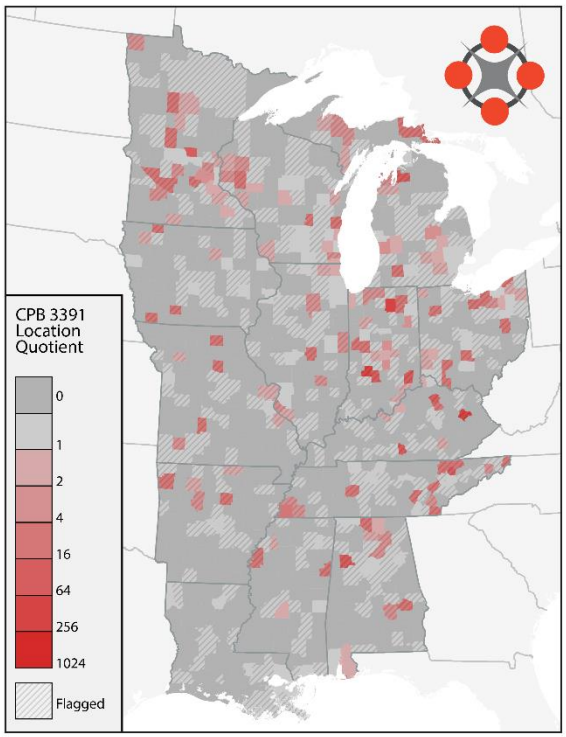
Map A.58 County Employment Levels for the Furniture & Related Product Manufacturing Industry Subsector (ESRI, 2013).



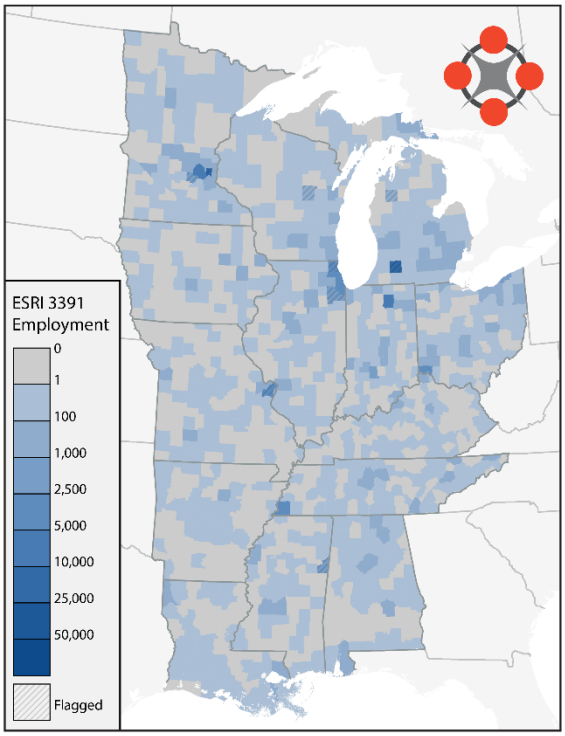
Map A.61 County Employment Levels for the Medical Equipment & Supplies Manufacturing Industry Group (CBP, 2013).



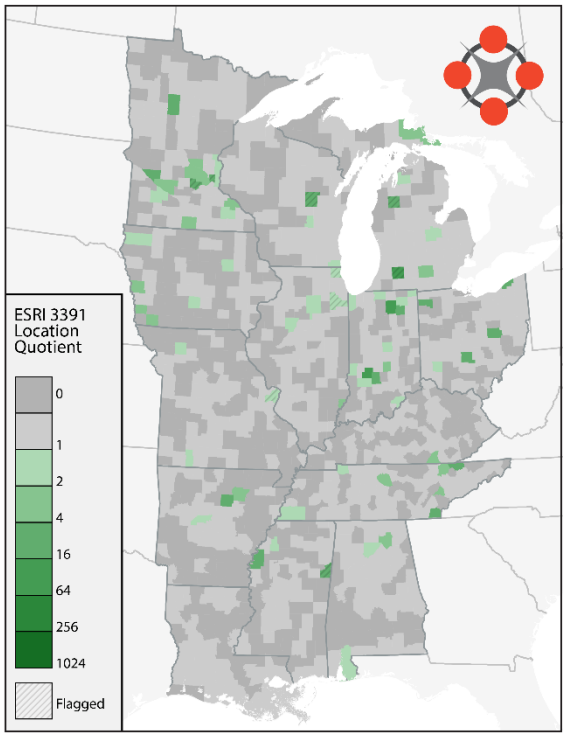
Map A.60 County Location Quotients for the Furniture & Related Product Manufacturing Industry Subsector (ESRI, 2013).



Map A.63 County Location Quotients for the Medical Equipment & Supplies Manufacturing Industry Group (CBP, 2013).

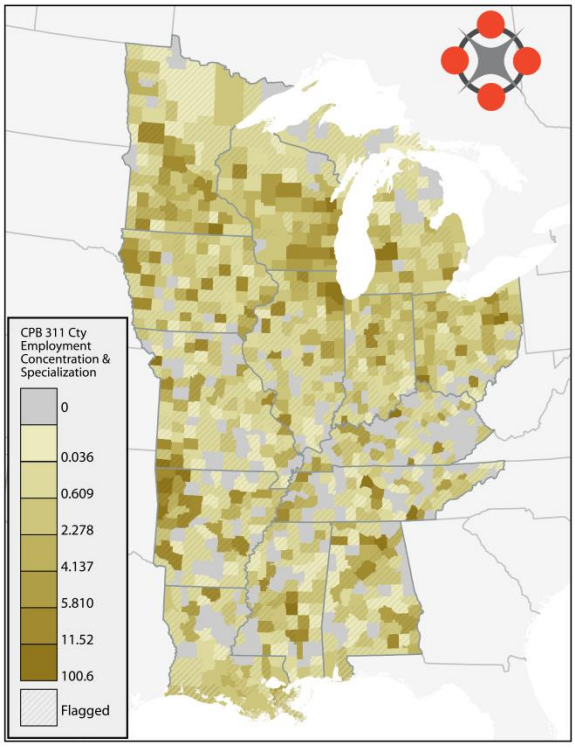


Map A.62 County Employment Levels for the Medical Equipment & Supplies Manufacturing Industry Group (ESRI, 2013).

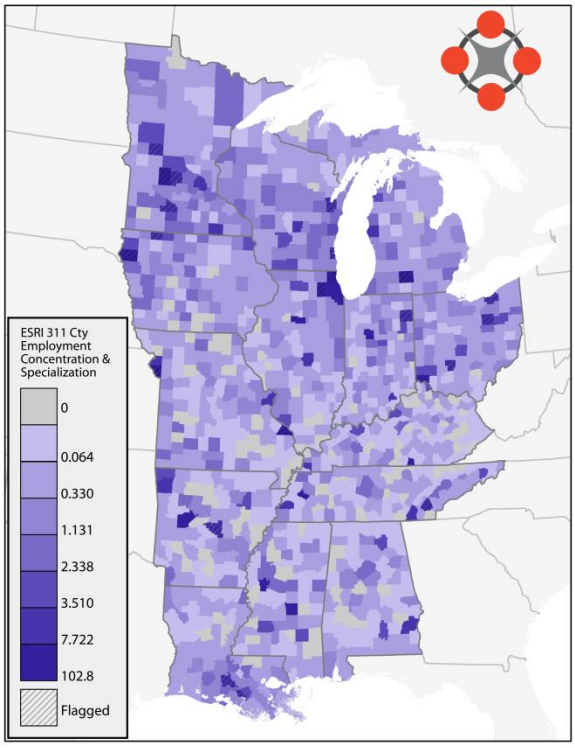


Map A.64 County Location Quotients for the Medical Equipment & Supplies Manufacturing Industry Group (ESRI, 2013).

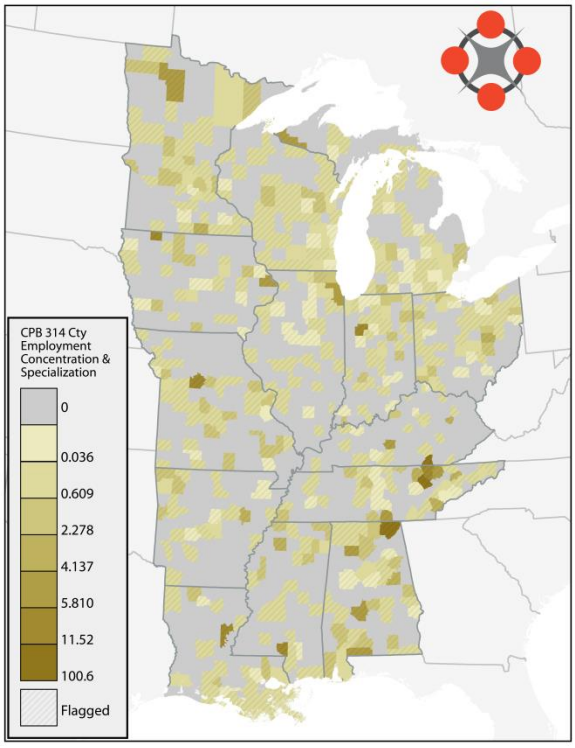
Appendix B: County Hot Spots (Combined Employment Levels and Location Quotients)



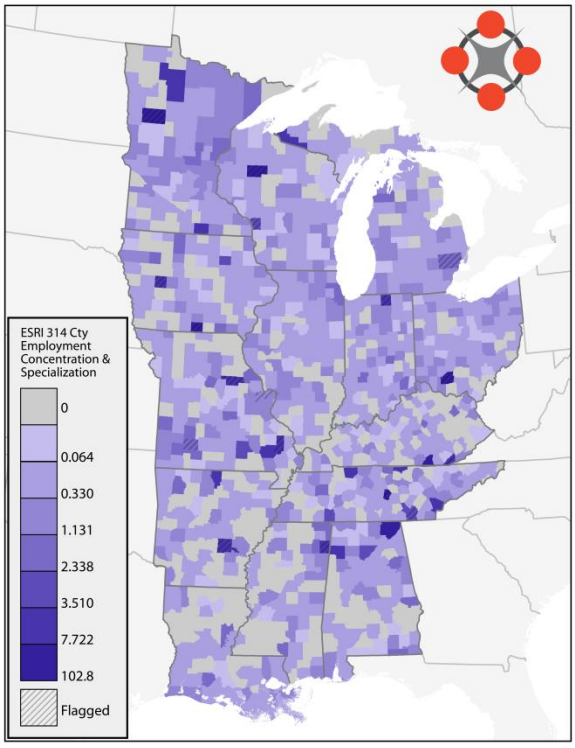
Map B.1 County Hot Spots for the Food Manufacturing Industry Subsector (CBP, 2013).



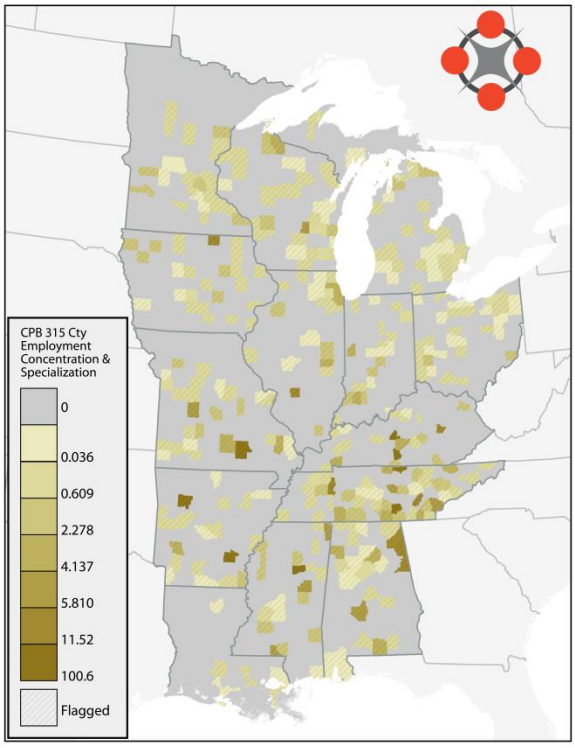
Map B.2 County Hot Spots for the Food Manufacturing Industry Subsector (ESRI, 2013).



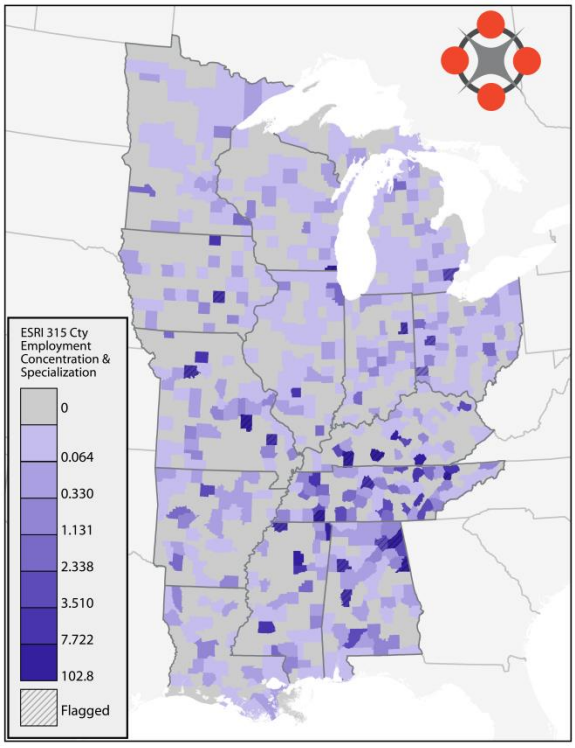
Map B.3 County Hot Spots for the Textile Product Mills Industry Subsector (CBP, 2013).



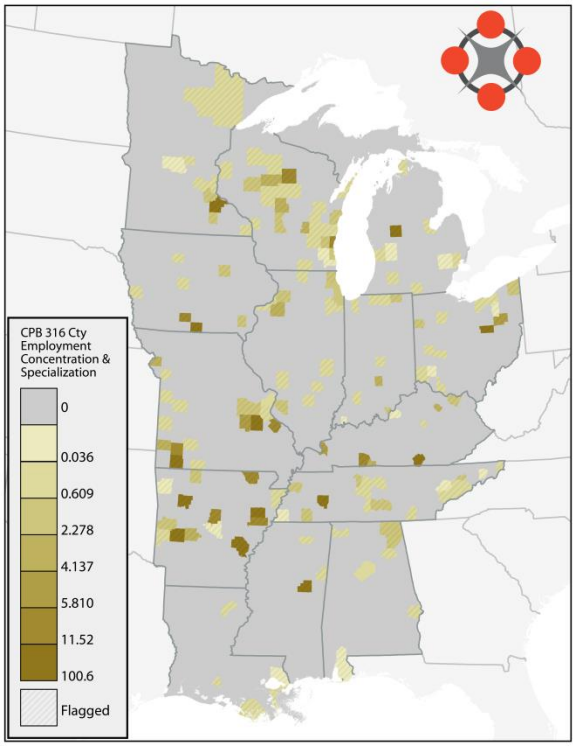
Map B.4 County Hot Spots for the Textile Product Mills Industry Subsector (ESRI, 2013).



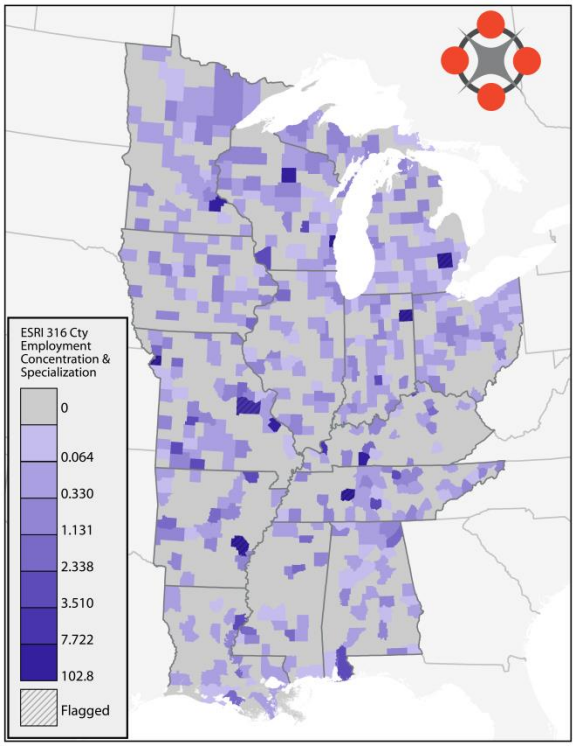
Map B.5 County Hot Spots for the Apparel Manufacturing Industry Subsector (CBP, 2013).



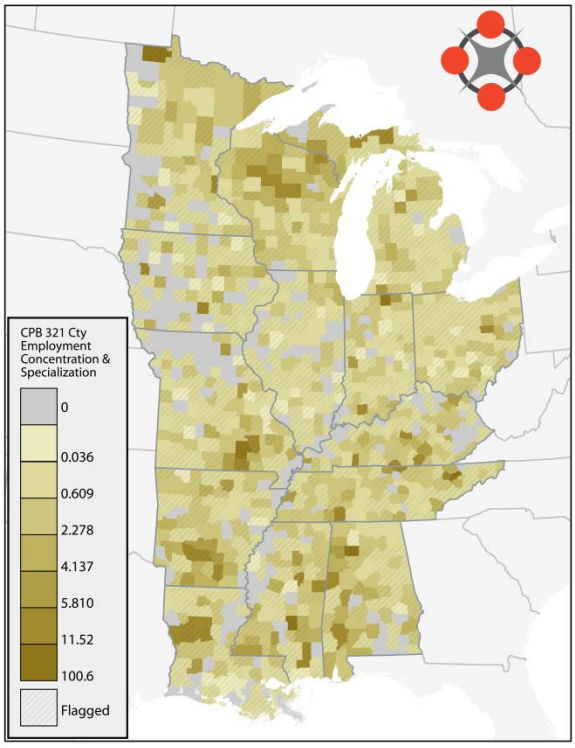
Map B.6 County Hot Spots for the Apparel Manufacturing Industry Subsector (ESRI, 2013).



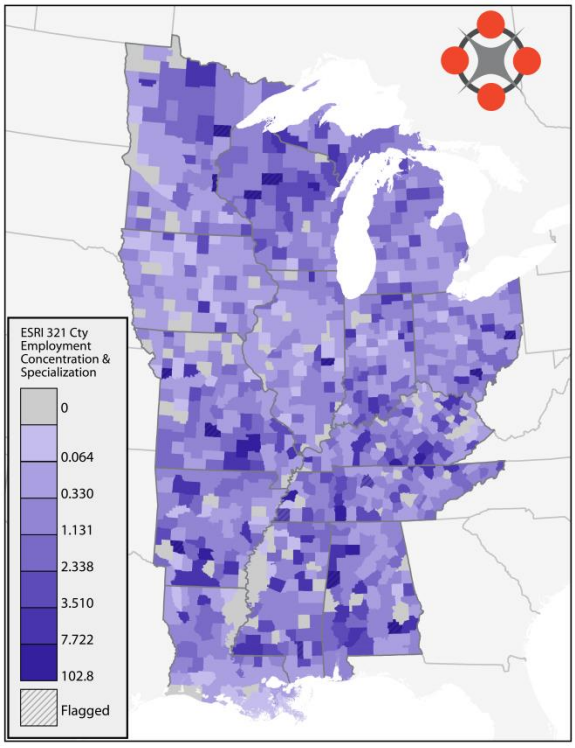
Map B.7 County Hot Spots for the Leather & Allied Product Manufacturing Industry Subsector (CBP, 2013).



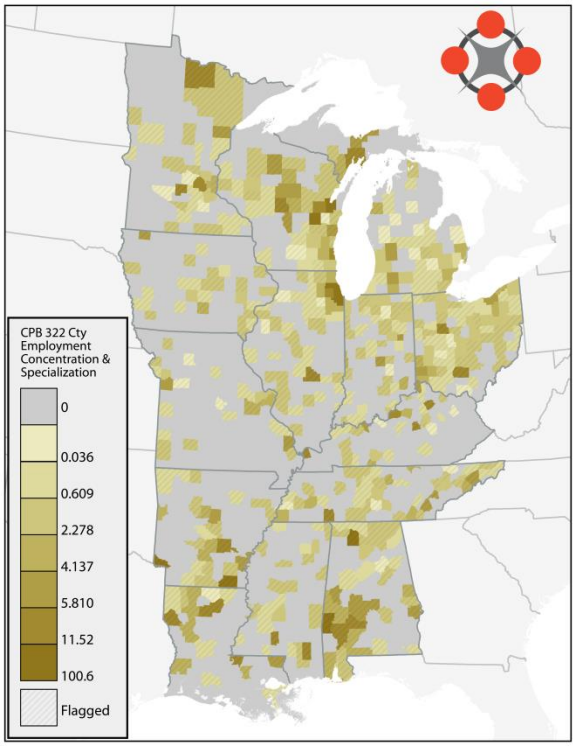
Map B.8 County Hot Spots for the Leather & Allied Product Manufacturing Industry Subsector (ESRI, 2013).



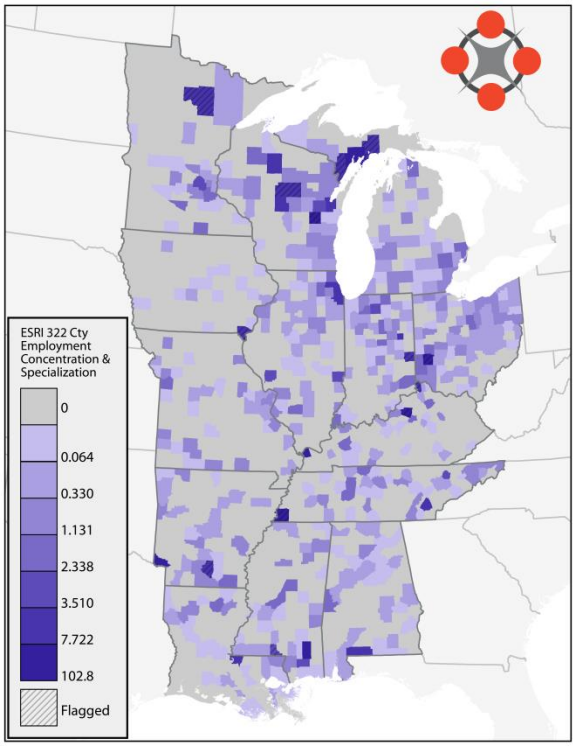
Map B.9 County Hot Spots for the Wood Product Manufacturing Industry Subsector (CBP, 2013).



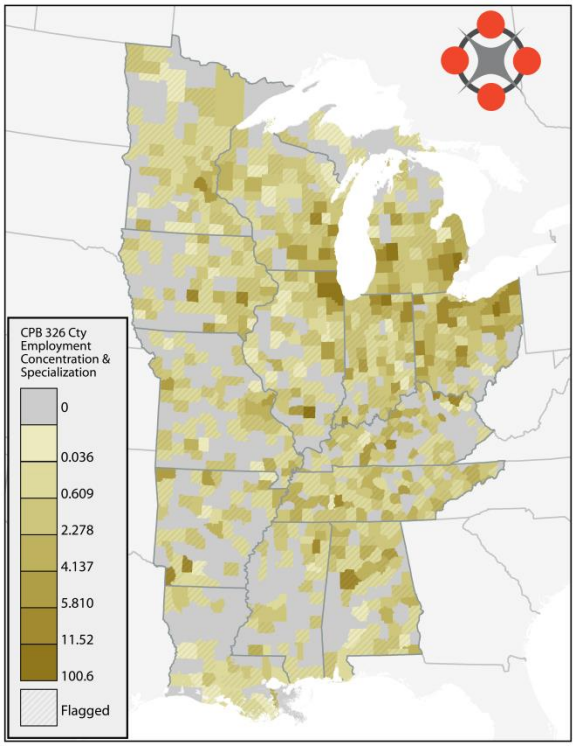
Map B.10 County Hot Spots for the Wood Product Manufacturing Industry Subsector (ESRI, 2013).



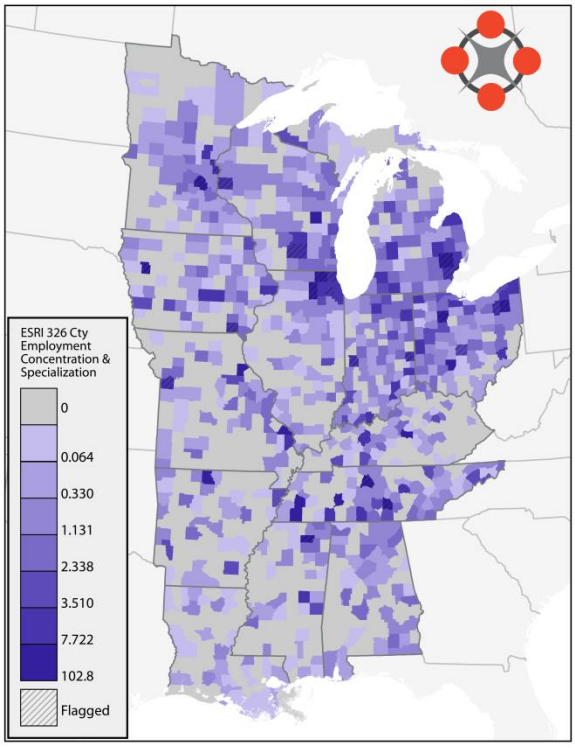
Map B.11 County Hot Spots for the Paper Manufacturing Industry Subsector (CBP, 2013).



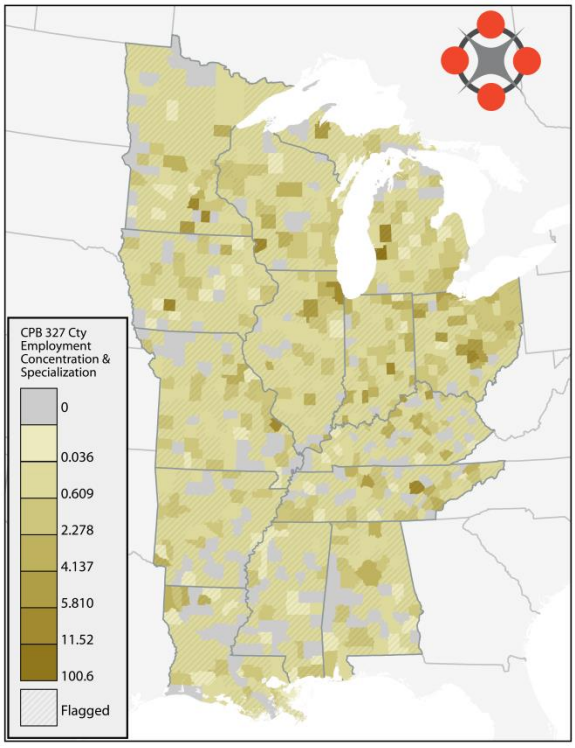
Map B.12 County Hot Spots for the Paper Manufacturing Industry Subsector (ESRI, 2013).



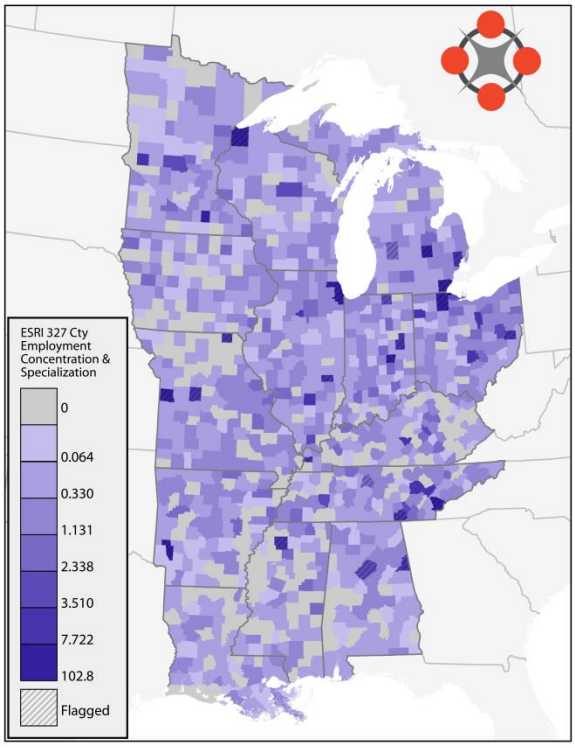
Map B.13 County Hot Spots for the Plastics & Rubber Manufacturing Industry Subsector (CBP, 2013).



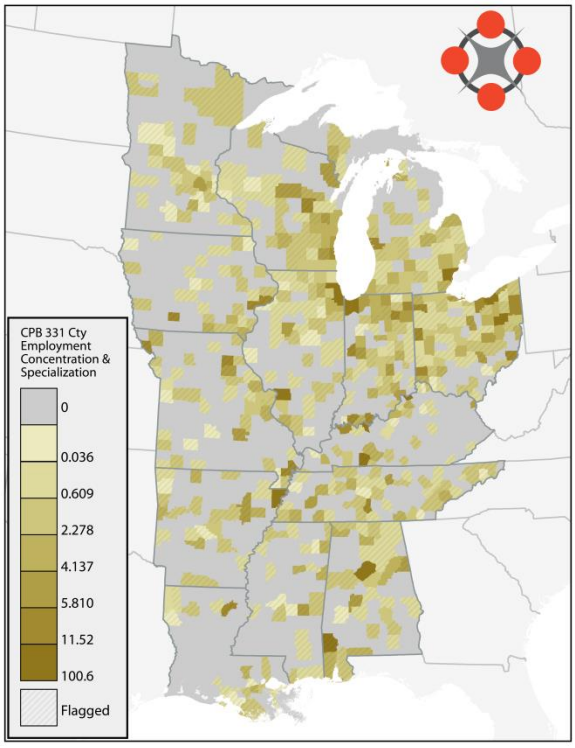
Map B.14 County Hot Spots for the Plastics & Rubber Manufacturing Industry Subsector (ESRI, 2013).



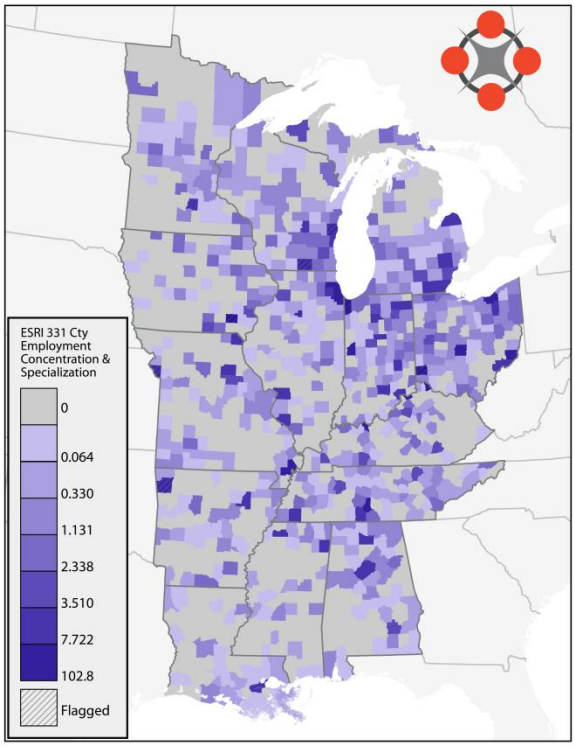
Map B.15 County Hot Spots for the Nonmetallic Mineral Product Manufacturing Industry Subsector (CBP, 2013).



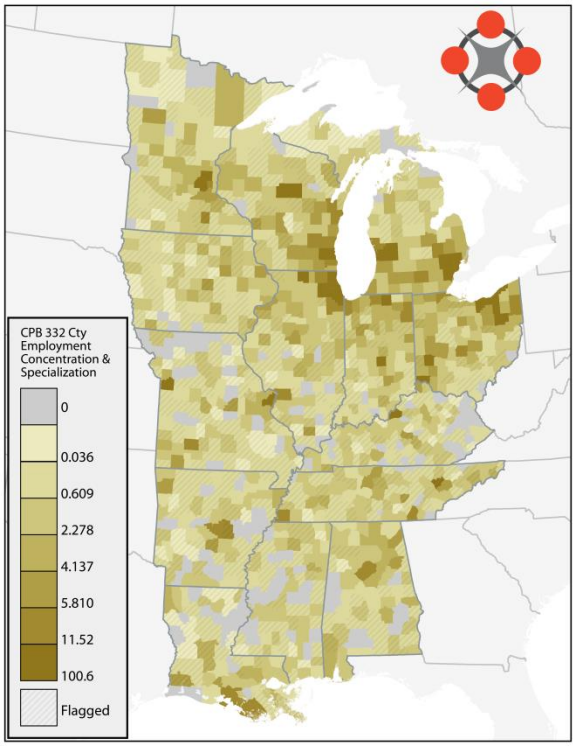
Map B.16 County Hot Spots for the Nonmetallic Mineral Product Manufacturing Industry Subsector (ESRI, 2013).



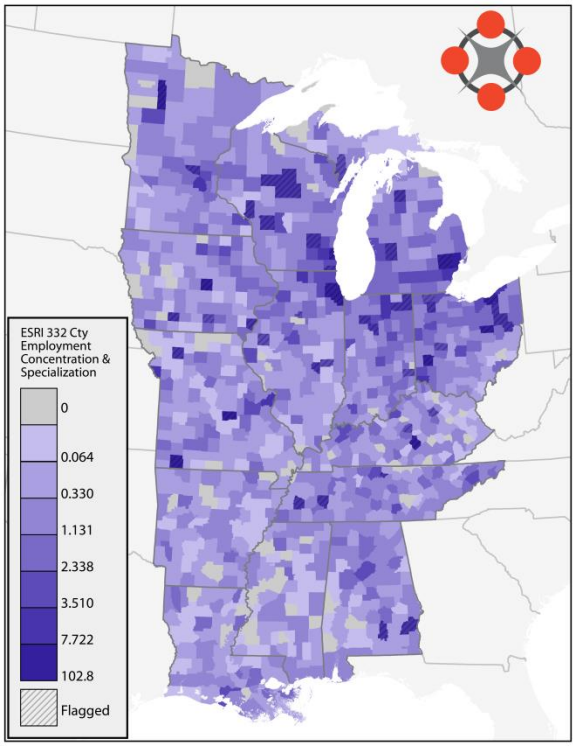
Map B.17 County Hot Spots for the Primary Metal Product Manufacturing Industry Subsector (CBP, 2013).



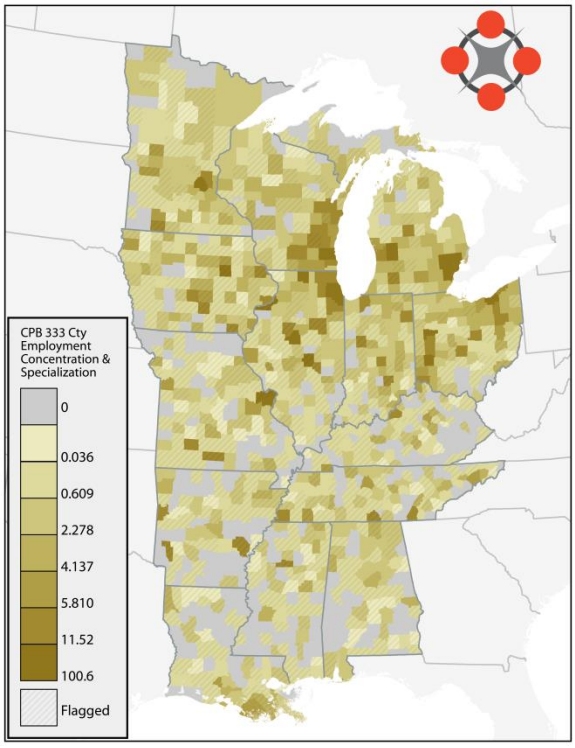
Map B.18 County Hot Spots for the Primary Metal Product Manufacturing Industry Subsector (ESRI, 2013).



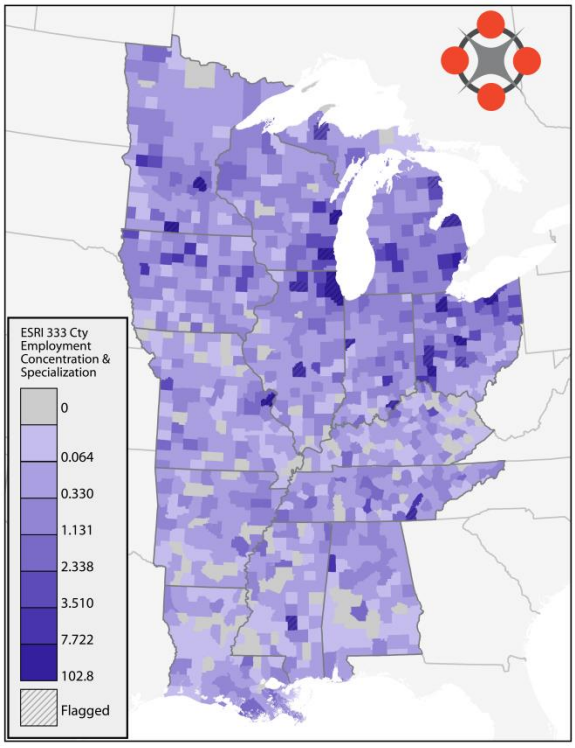
Map B.19 County Hot Spots for the Fabricated Metal Product Manufacturing Industry Subsector (CBP, 2013).



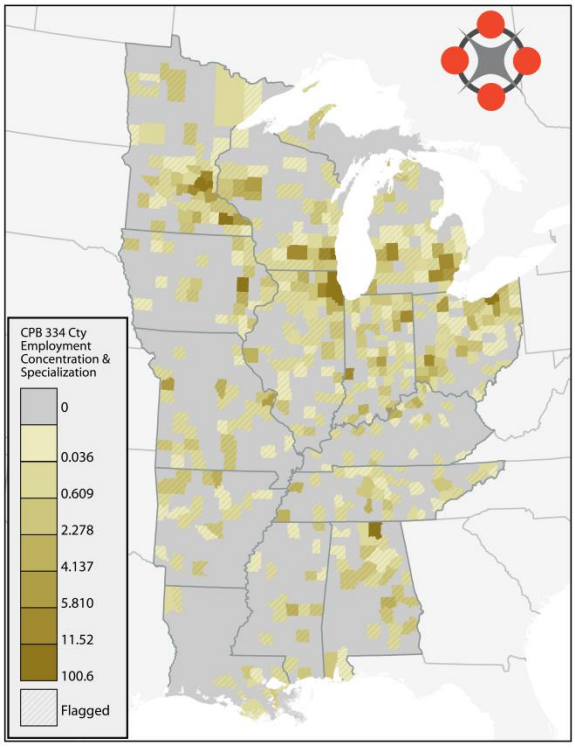
Map B.20 County Hot Spots for the Fabricated Metal Product Manufacturing Industry Subsector (ESRI, 2013).



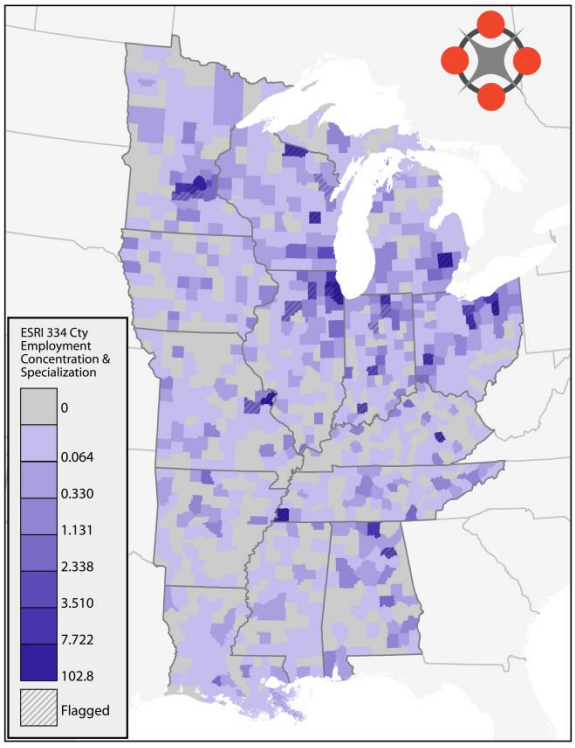
Map B.21 County Hot Spots for the Machinery Manufacturing Industry Subsector (CBP, 2013).



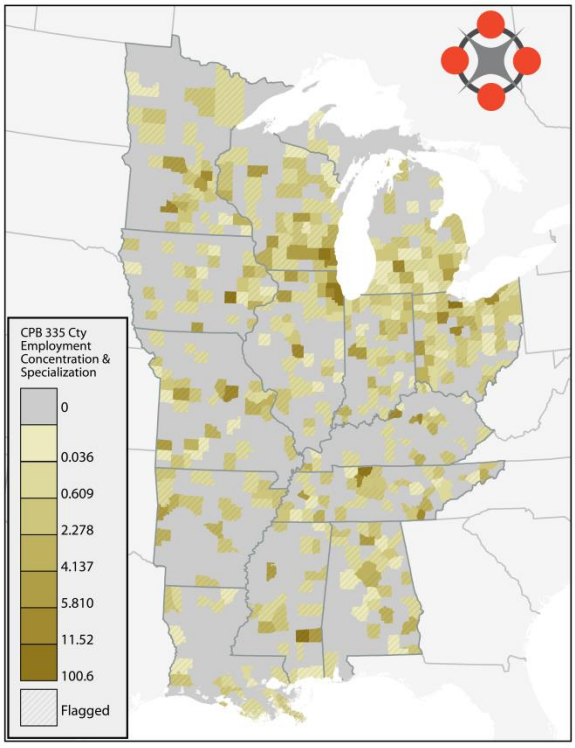
Map B.22 County Hot Spots for the Machinery Manufacturing Industry Subsector (ESRI, 2013).



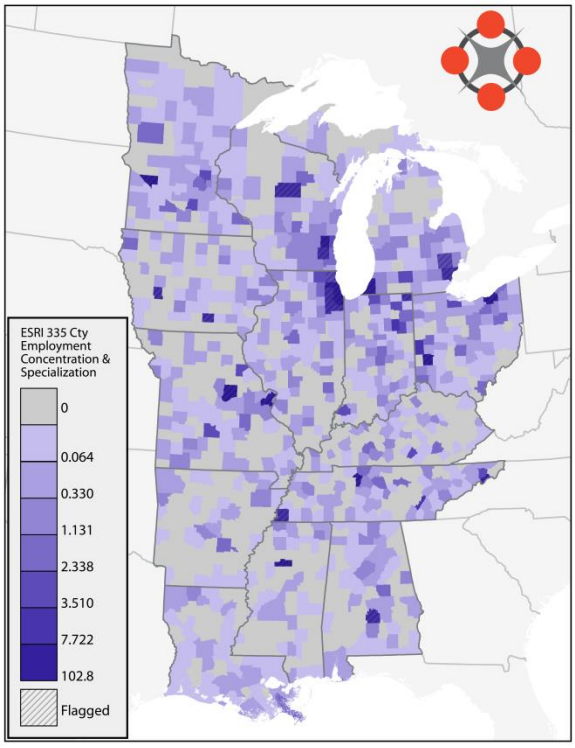
Map B.23 County Hot Spots for the Computer & Electronic Product Manufacturing Industry Subsector (CBP, 2013).



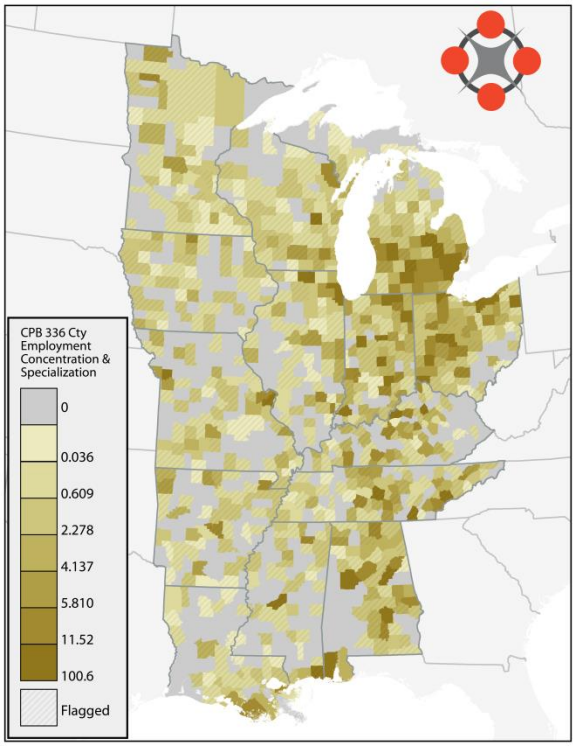
Map B.24 County Hot Spots for the Computer & Electronic Product Manufacturing Industry Subsector (ESRI, 2013).



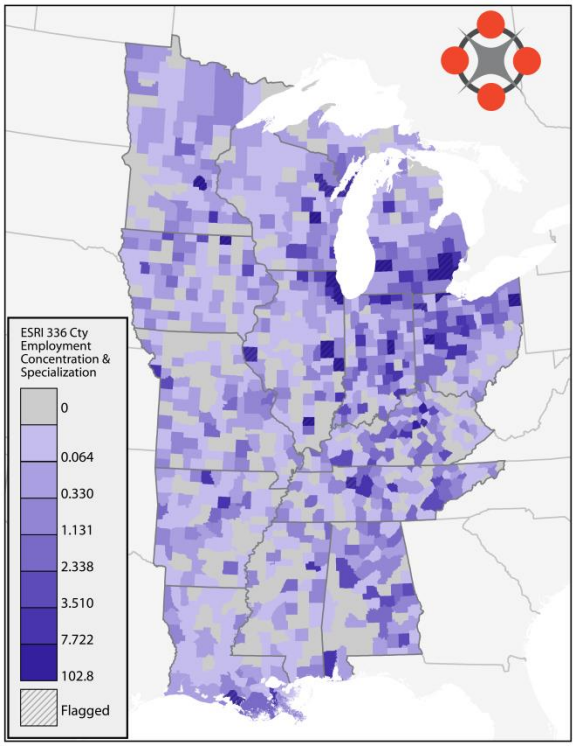
Map B.25 County Hot Spots for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector (CBP, 2013).



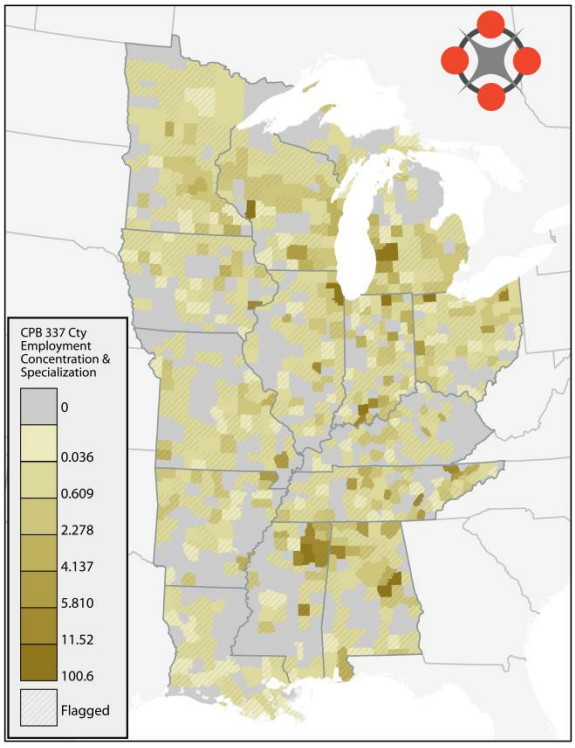
Map B.26 County Hot Spots for the Electrical Equipment, Appliance & Component Manufacturing Industry Subsector (ESRI, 2013).



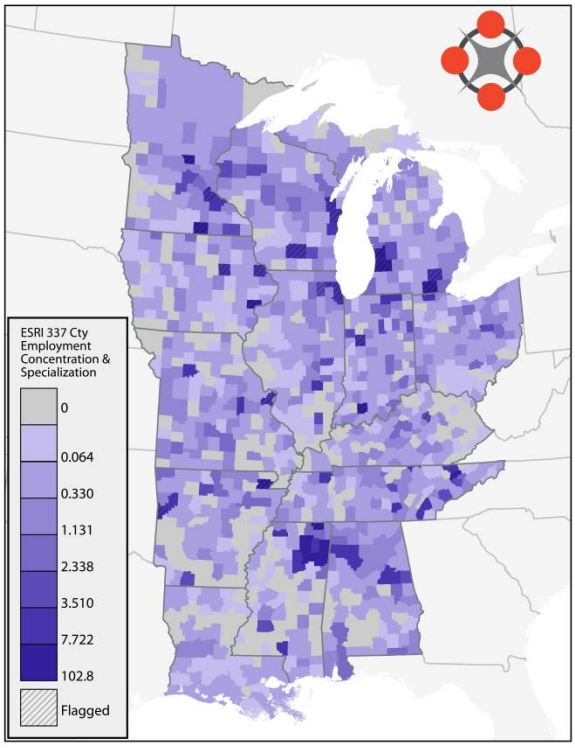
Map B.27 County Hot Spots for the Transportation Equipment Manufacturing Industry Subsector (CBP, 2013).



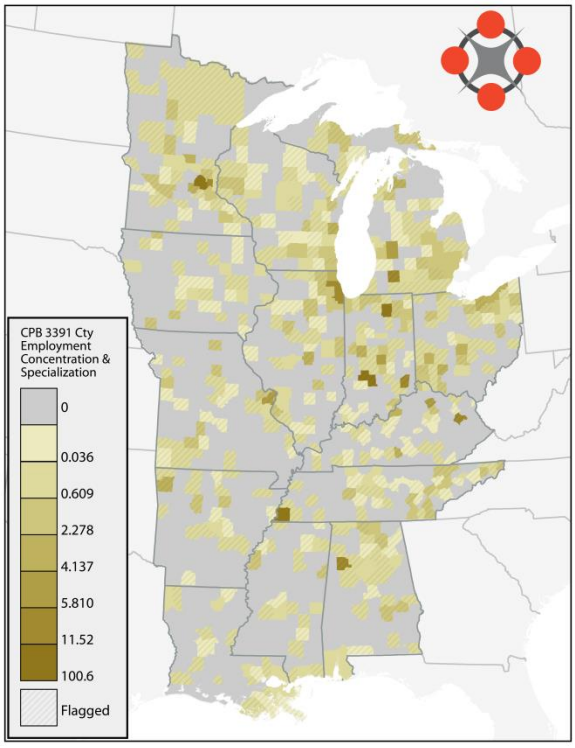
Map B.28 County Hot Spots for the Transportation Equipment Manufacturing Industry Subsector (ESRI, 2013).



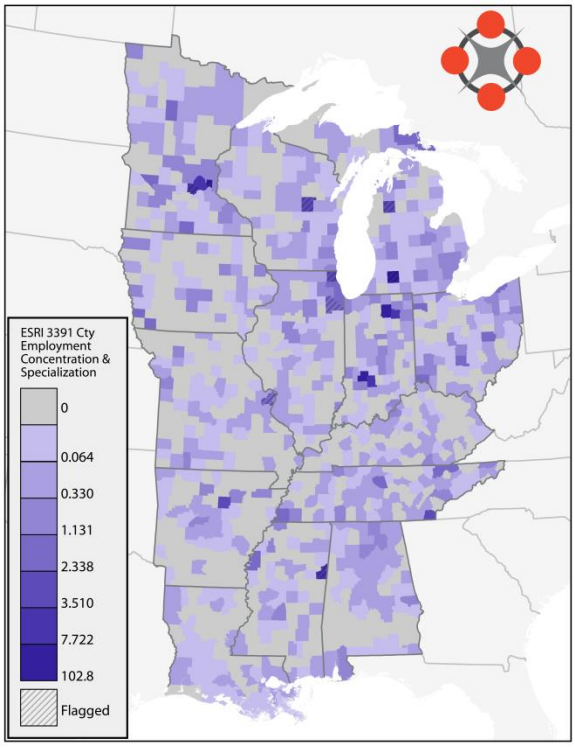
Map B.29 County Hot Spots for the Furniture & Related Product Manufacturing Industry Subsector (CBP, 2013).



Map B.30 County Hot Spots for the Furniture & Related Product Manufacturing Industry Subsector (ESRI, 2013).



Map B.31 County Hot Spots for the Medical Equipment & Supplies Manufacturing Industry Group (CBP, 2013).



Map B.32 County Hot Spots for the Medical Equipment & Supplies Manufacturing Industry Group (ESRI, 2013).

Appendix A

Appendix A List of all registered reshored companies

Company Name	Jobs	Year	State	NAICS	NAICS Description
GE	3,000	2014	KY	3352	Household Appliance Manufacturing
GM - TN	1,800	2014	TN	3363	Motor Vehicle Parts Manufacturing
Ford - MI	1,400	2013	MI	3361	Motor Vehicle Manufacturing
Ford - OH	1,400	2015	OH	3361	Motor Vehicle Manufacturing
Made in America Seating	510	2014	TN	3372	Office Furniture (including Fixtures) Manufacturing
Ford - OH	450	2014	OH	3363	Motor Vehicle Parts Manufacturing
GE	400	2012	KY	3352	Household Appliance Manufacturing
Renfro - AL	257	2011	AL	3151	Apparel Knitting Mills
Suarez Manufacturing	250	2011	OH	3352	Household Appliance Manufacturing
Heinz	249	2013	OH	3114	Fruit and Vegetable Preserving and Specialty Food
Team Technologies	220	2013	TN	3391	Medical Equipment and Supplies Manufacturing
Lighting OEM Inc.	200	2014	MS	3351	Electric Lighting Equipment Manufacturing
Comprehensive Logistics Co.	200	2014	TN	3361	Motor Vehicle Manufacturing
Firstronic	185	2014	MI	3351	Electric Lighting Equipment Manufacturing
Hampton Products	150	2013	WI	3325	Hardware Manufacturing
GE	150	2013	OH	3351	Electric Lighting Equipment Manufacturing
Tacony Corporation	150	2013	MO	3352	Household Appliance Manufacturing
EaglePicher Technologies	130	2014	MO	3359	Other Electrical Equipment and Component Manufacturing

Handful	120	2015	AR	3151	Apparel Knitting Mills
HanesBrands – AR	120	2015	AR	3151	Apparel Knitting Mills
Morey Corporation	110	2013	IL	3342	Communications Equipment Manufacturing
Creative Things	104	2013	AR	3261	Plastics Product Manufacturing
WindStream Technologies	100	2012	IN	3272	Glass and Glass Product Manufacturing
Master Lock	100	2010	WI	3325	Hardware Manufacturing
HessAire	100	2013	AL	3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
Element Electronics	100	2012	MI	3343	Audio and Video Equipment Manufacturing
Roger Corp.	90	2013	AR	3352	Household Appliance Manufacturing
Whirlpool	90	2014	OH	3352	Household Appliance Manufacturing
Peerless Industries, Inc.	85	2010	IL	3321	Forging and Stamping
Generac Power Systems	80	2014	WI	3353	Electrical Equipment Manufacturing
Selected Furniture	80	2012	IN	3371	Household and Institutional Furniture and Kitchen Cabinet Manufacturing
Wrigley Co. - Lifesavers	50	2010	TN	3113	Sugar and Confectionary Product Manufacturing
Little Tikes	50	2013	OH	3399	Other Miscellaneous Manufacturing
PolyTech Plastic Molding	46	2012	AR	3261	Plastics Product Manufacturing
GM - IN	45	2014	IN	3363	Motor Vehicle Parts Manufacturing
AirGuide Manufacturing	40	2013	MS	3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing
Enihcam Manufacturing	40	2014	MI	3335	Metalworking Machinery Manufacturing
Airtex Design Group	35	2014	MN	3141	Textile Furnishing Mills
Genesis Molding	35	2014	IN	3261	Plastics Product Manufacturing
Genesis Molding	35	2014	IN	3261	Plastics Product Manufacturing
Acco Brands	34	2015	MS	3399	Other Miscellaneous Manufacturing

ParkTool	26	2011	MN	3369	Other Transportation Equipment Manufacturing
Whirlpool	25	2012	OH	3352	Household Appliance Manufacturing
Exxel Outdoors	20	2010	AL	3149	Other Textile Product Mills
O'Neal Manufacturing Services	20	2014	AL	3363	Motor Vehicle Parts Manufacturing
Cleveland CycleWerks	20	2012	OH	3369	Other Transportation Equipment Manufacturing
Edsal Manufacturing Co.	20	2010	IL	3372	Office Furniture (including Fixtures) Manufacturing
Horton Archery	20	2012	OH	3399	Other Miscellaneous Manufacturing
Sherex Fastening Solutions	15	2015	OH	3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing
Tailor Made Products	12	2013	WI	3261	Plastics Product Manufacturing
American Mug and Stein Co.	12	2012	OH	3271	Clay Product and Refractory Manufacturing
Ebonite	12	2011	KY	3399	Other Miscellaneous Manufacturing
Bison Gear & Engineering Corp.	10	2012	IL	3353	Electrical Equipment Manufacturing
Acme Alliance	7	2010	IL	3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing
Terryberry	6	2011	MI	3399	Other Miscellaneous Manufacturing
U.S. Ski Pole Company	6	2012	MI	3399	Other Miscellaneous Manufacturing
Brillcast Inc.	5	2012	MI	3315	Foundries
MRPC	5	2014	WI	3391	Medical Equipment and Supplies Manufacturing
Long-Stanton Manufacturing Co.	4	2012	OH	3321	Forging and Stamping
Hiawatha Rubber Co.	3	2012	MN	3262	Rubber Product Manufacturing
Bosca	2	2014	OH	3169	Other Leather and Allied Product Manufacturing
GSH Industries	2	2014	OH	3261	Plastics Product Manufacturing
Mitchell Metal Products	1	2010	WI	3321	Forging and Stamping

TOTAL	**13,043**

Appendix B

Appendix B Regional demand for industries with $500,000 or more

NAICS	Industry	Amount	In-Region	Out of Region
3344	Semiconductor and Other Electronic Component Manufacturing	$1,766,142,715	24.8%	75.2%
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	$867,183,416	47.3%	52.7%
3359	Other Electrical Equipment and Component Manufacturing	$646,828,855	51.0%	49.0%
4236	Household Appliances and Electrical and Electronic Goods Merchant Wholesalers	$1,013,110,967	51.5%	48.5%
4234	Professional and Commercial Equipment and Supplies Merchant Wholesalers	$2,248,355,613	53.0%	47.0%
3314	Nonferrous Metal (except Aluminum) Production and Processing	$2,029,987,495	57.8%	42.2%
5331	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	$904,370,000	58.4%	41.6%
3251	Basic Chemical Manufacturing	$1,962,321,740	58.7%	41.3%
4242	Drugs and Druggists' Sundries Merchant Wholesalers	$782,924,134	59.0%	41.0%
3364	Aerospace Product and Parts Manufacturing	$2,239,350,141	61.7%	38.3%
3212	Veneer, Plywood, and Engineered Wood Product Manufacturing	$744,835,395	67.7%	32.3%
4821	Rail Transportation	$731,586,356	68.2%	31.8%
3399	Other Miscellaneous Manufacturing	$637,320,410	68.4%	31.6%
3241	Petroleum and Coal Products Manufacturing	$1,233,944,265	68.5%	31.5%
4239	Miscellaneous Durable Goods Merchant Wholesalers	$802,000,071	68.5%	31.5%
4244	Grocery and Related Product Merchant Wholesalers	$1,518,450,990	68.7%	31.3%
5511	Management of Companies and Enterprises	$10,776,238,518	70.8%	29.2%
5419	Other Professional, Scientific, and Technical Services	$878,144,207	71.0%	29.0%
3252	Resin, Synthetic Rubber, and Artificial Synthetic Fibers and Filaments Manufacturing	$8,000,117,824	71.3%	28.7%
3339	Other General Purpose Machinery Manufacturing	$1,227,358,703	71.6%	28.4%
5415	Computer Systems Design and Related Services	$663,860,086	72.1%	27.9%

3261	Plastics Product Manufacturing	$6,455,069,916	72.4%	27.6%
5411	Legal Services	$579,090,184	72.4%	27.6%
4251	Wholesale Electronic Markets and Agents and Brokers	$3,241,757,294	72.5%	27.5%
3222	Converted Paper Product Manufacturing	$2,265,041,353	73.0%	27.0%
4249	Miscellaneous Nondurable Goods Merchant Wholesalers	$732,855,083	73.3%	26.7%
3353	Electrical Equipment Manufacturing	$991,356,719	74.9%	25.1%
3262	Rubber Product Manufacturing	$1,536,368,839	75.3%	24.7%
3312	Steel Product Manufacturing from Purchased Steel	$895,442,976	75.8%	24.2%
3313	Alumina and Aluminum Production and Processing	$1,367,345,172	76.9%	23.1%
3323	Architectural and Structural Metals Manufacturing	$2,229,395,864	77.7%	22.3%
3255	Paint, Coating, and Adhesive Manufacturing	$1,057,024,444	78.6%	21.4%
4231	Motor Vehicle and Motor Vehicle Parts and Supplies Merchant Wholesalers	$672,113,349	79.3%	20.7%
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	$1,824,349,406	79.5%	20.5%
5413	Architectural, Engineering, and Related Services	$582,382,650	80.0%	20.0%
4237	Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers	$559,269,833	80.9%	19.1%
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	$3,687,854,666	81.5%	18.5%
4842	Specialized Freight Trucking	$723,183,784	81.6%	18.4%
3311	Iron and Steel Mills and Ferroalloy Manufacturing	$3,996,234,178	81.9%	18.1%
3315	Foundries	$3,046,691,816	81.9%	18.1%
3272	Glass and Glass Product Manufacturing	$1,145,369,950	82.5%	17.5%
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing	$3,398,630,316	83.5%	16.5%
3329	Other Fabricated Metal Product Manufacturing	$1,237,760,654	83.7%	16.3%
3321	Forging and Stamping	$2,202,423,832	84.5%	15.5%
3328	Coating, Engraving, Heat Treating, and Allied Activities	$851,054,562	84.6%	15.4%
3219	Other Wood Product Manufacturing	$510,624,720	85.2%	14.8%

4238	Machinery, Equipment, and Supplies Merchant Wholesalers	$1,706,624,422	85.7%	14.3%
5617	Services to Buildings and Dwellings	$621,206,763	88.2%	11.8%
7225	Restaurants and Other Eating Places	$508,559,508	88.3%	11.7%
4841	General Freight Trucking	$2,059,405,154	90.0%	10.0%
3335	Metalworking Machinery Manufacturing	$796,618,843	90.1%	9.9%
2211	Electric Power Generation, Transmission and Distribution	$816,235,227	91.1%	8.9%
5221	Depository Credit Intermediation	$761,183,954	92.3%	7.7%
3362	Motor Vehicle Body and Trailer Manufacturing	$572,547,424	92.6%	7.4%
3363	Motor Vehicle Parts Manufacturing	$22,772,853,899	93.6%	6.4%
	Total	**$118,587,404,271**		

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