

**The Public Perception of Manufacturing Careers in New  
England**

**A Thesis**

**Submitted By**

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**In partial fulfillment of the requirements  
For the degree of  
Master of Arts in Urban and Environmental Policy and Planning**

**TUFTS UNIVERSITY**

**February 2016**

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## **ABSTRACT**

This thesis study examines public perceptions of manufacturing careers in New England. The rebirth of the American manufacturing sector is a commonly discussed topic in the public discourse. However, there is little primary research studying the public perception of those jobs and whether people consider them viable career options, particularly in New England, which was the first region in the nation to experience both industrialization and subsequent de-industrialization. This study traces the industrial history of New England over time, as well as the historical policies aimed at boosting manufacturing in the region. The study also examines how states are currently working to attract people to manufacturing careers today and how the survey results could inform policy action going forward.

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The Public Perception of Manufacturing Careers  
in New England

## **Chapter 1. Introduction**

Lately, much attention has been paid to the rebirth of the manufacturing sector in America. Though as a whole, the country remains grounded primarily in a service and knowledge-based economy, states and regions all over the U.S. are seeking to grow and diversify their economic bases to include more manufacturing, and New England is no exception. In the case of New England, which historically had one of the earliest and most prosperous manufacturing economies, boosting present-day manufacturing is seen as a way to help reclaim some of the region's historical preeminence before widespread deindustrialization took hold in the region. Today, many formerly industrial cities and towns in New England still face considerable challenges related to the industrial decline that began many decades ago; cities like Springfield, Massachusetts, New Haven, Connecticut and Bristol, Rhode Island have all had experienced significant disinvestment in the post-industrial era and foregone the many positive externalities produced by a robust manufacturing sector and diversified economy. These are just a few examples of the many neighborhoods, towns and cities negatively affected by deindustrialization; there are countless others that have struggled to regain economic vitality.

In 2011, The Manufacturing Institute, an industry advocacy group, commissioned a study to learn more about the public perception of manufacturing

jobs nationwide. They hired Deloitte, a consulting firm, to conduct a nationwide survey of public opinions on manufacturing. In the survey, only 35% of parents indicated that they would “encourage their children to pursue a career in the manufacturing industry” yet two-thirds of Americans *do believe* that the United States is strongly-positioned to compete globally in manufacturing and that manufacturing is a key component of national prosperity (Giffi and DeRocco 2012). These statistics hint at a broad disconnect between the jobs we envision our children having, the jobs that are available, and the jobs that they are actually seeking.

Building off of the Manufacturing Institute study, this thesis aims to reveal public opinions in New England and help elucidate the challenges and opportunities related to attracting people to manufacturing careers. Doing so may help inform both policy makers and manufacturers on ways to increase sector employment. Many parties have a vested interest in this issue. For policy makers, the desired outcome is ensuring that their states have a diversified economic base that employs residents with well-paying, stable jobs. For employers, the goal is making sure there is a pipeline of skilled and willing workers to apply for manufacturing jobs. Without such workers, there is little justification to locate a manufacturing plant in a given area.

### *Significance of the Topic*

In his 2014 State of the Union speech, President Barack Obama devoted considerable airtime to the renaissance of manufacturing. Just prior to that, he

announced the Advanced Manufacturing Partnership (AMP), a new federal initiative to develop manufacturing research facilities all over the United States, modeled off a successful, similar program that exists in Germany. In his announcement speech, he stated:

For generations of Americans, manufacturing was the ticket to a good middle-class life. We made stuff. And the stuff we made -- like steel and cars and planes -- made us the economic leader of the world. And the work was hard, but the jobs were good. And if you got on an assembly plant in Detroit or in a steel plant in Youngstown, you could buy a home. You could raise kids. You could send them to college. You could retire with some security. And those jobs didn't just tell us how much we were worth, they told us how we were contributing to the society and how we were helping to build America, and gave people a sense of dignity and purpose. They saw a Boeing plane or one of the Big Three cars rolling off the assembly line, and they said, you know what, I made that. And they were iconic. And people understood that's what it meant for something to be made in America.

You'll hear some people say, well, why are manufacturing jobs so special, and this is a service economy. Nobody believes that we're going to duplicate all the manufacturing jobs that existed back in the '40s and the '50s just because the economy has changed. You go into an auto plant now, it's different then it was. Fewer people can make more cars.

But keep in mind that when we have manufacturing in this country, what ends up happening is that, first of all, there are a whole lot of suppliers to those manufacturers, so that one plant may be deceptive. It doesn't tell you all the companies all across the country that are working on behalf of those manufacturers. The services that are provided to those manufacturers, the advertising that's connected to it, and the architects and the designers and the software engineers -- all those things may not be counted as manufacturing, but by us having those hubs of manufacturing, it has a ripple effect throughout the economy.

The President's statement captures much of the prevailing sentiment related to the importance of manufacturing. Later in this speech he also emphasizes the importance of partnerships with universities to leverage their existing research and development infrastructure in order to facilitate innovations in manufacturing.

This idea is apropos in New England, where there is a well-known concentration of colleges and universities.

The Federal Advanced Manufacturing Partnership is just one example of myriad initiatives developed in recent years with the intention of stabilizing and bolstering the manufacturing sector. State and local governments across New England have also taken on a role in developing policies aimed at increasing manufacturing jobs (these existing policies are outlined in Chapter 2). Relatedly, education policies aimed at preparing the workforce to enter these jobs have been at the forefront of education policy in recent years, with growing emphasis on science, technology, engineering and math (STEM) education, technical skills and public-private collaborations that prepare students for jobs directly after high school. While many of these policies address critical issues around workforce development and employment, I am hoping to explore whether they sufficiently address the perceptions people have of manufacturing jobs.

### *Research Questions*

The purpose of this research study is to elucidate public perceptions of manufacturing jobs in New England and whether those opinions are reflected or addressed in policies, programs and initiatives intended to bolster training and education for manufacturing careers. The research summarized in the 2012 Manufacturing Institute study indicated that people generally have negative perceptions of manufacturing careers, but this thesis aims to reveal in further detail what perceptions are in the New England region and how they break down

along demographic lines of age, gender, and level of education. Furthermore, the study aims to evaluate whether current workforce development policies in New England address the perceptions of manufacturing jobs. If so, how do they accomplish this and is it effective? If not, how might they better align their goals and objectives to reflect the perceptions of manufacturing careers?

Thus, the central research queries in this study are:

*What are the perceptions of manufacturing careers in New England?*

*What education and workforce development policies and programs related to manufacturing currently exist in New England?*

*How do those policies and programs match with perceptions of manufacturing careers?*

Geographically, this inquiry will focus on New England because the region once had robust manufacturing in various industries and is making a strong effort to reclaim that distinction. Additionally, Massachusetts and Rhode Island recently had new Governors take office, making this an opportune time to examine the past, present and future of manufacturing policy. New political leadership in office may help spur action or re-chart a course required to promote change in the future.

*Statement of Personal Interest*

When I read about the 2012 Manufacturing Institute study, it fascinated me and prompted me to further consider how public perceptions of an industry might affect employment in that sector. I was inspired to continue similar research and subsequently decided to develop this topic into my Master's thesis. I have tailored it specifically to New England since I live and work in the area and feel personally invested in understanding economic and workforce development policies in this region. This thesis provides an opportunity for concentrated research and analysis into a timely challenge facing the state's legislators and decision-makers.

### *Outline and Organization*

Chapter 2 consists of the Literature Review, which dives deeply into the history of industrialization and subsequent waves of deindustrialization in New England as large-scale economic shifts occurred and legacy manufacturing firms migrated to other parts of the country. The literature review also considers the impact of historic policy responses to those shifts and summarizes present-day policies intended to bolster manufacturing employment. Chapter 3 details the methodology for the study, including how the survey was developed and administered online. Chapter 4 will present the survey results. Chapter 5 will consist of synthesis and analysis of the research, including implications the research has for policy-makers and manufacturers. In Chapter 6, I draw conclusions from the study. Appendices include charts of raw survey data and results.

## **Chapter 2. Literature Review**

This literature review broadly covers the history of early industrialization in New England (encompassing Massachusetts, Rhode Island, Connecticut, New Hampshire, Vermont and Maine) as well as the region's initial policy responses to declining manufacturing sectors, which began as early as 1920. This background research provides historical context that helps inform the current state of manufacturing and manufacturing-related public policies in New England. The literature review also traces the relevant history of economic development policies at the federal, state and local levels. Finally, the literature review also summarizes existing research on the public perception of manufacturing careers and major recent policies and programs intended to promote manufacturing careers.

### **What patterns of industrialization and deindustrialization have occurred in New England?**

New England holds a prominent position in American industrial history. The country's very first successful modern factory, a cotton mill, was established in Pawtucket, Rhode Island in 1793 (Koistinen 2013). Twenty years later, Boston manufacturers developed automated weaving that could take place at the same site where the cotton spinning occurred. Following that industrial achievement, many efficient, high-capacity mills were established in the region, concentrated along the Merrimack River in Massachusetts (Koistinen 2013, 11). Over the next

century, the region excelled at pioneering industrial methods, leading to a robust manufacturing economy. In addition to cotton textiles, which became one of the nation's biggest industries and was based almost exclusively in New England, numerous other sectors flourished as well. The metalworking industry developed in locales such as Worcester, Massachusetts, Springfield, Massachusetts, Providence, Rhode Island and Hartford, Connecticut. Boots and shoes were also a significant cluster sector as well, with New England factories responsible for producing 60% of the value of the output of the entire U.S. footwear industry, with half of the production in Massachusetts alone (Koistinen 2013, 11). During this prosperous period, which lasted throughout the 1800s, New England was a hotbed of industrial innovation. The region boasted more patents per capita than anywhere else in the country (Koistinen 2013, 11). In his 1952 study of New England's economy, Harvard economist Seymour Harris wrote, "with an area of 12,000 square miles, Southern New England alone produces \$7 billion of manufactured goods and is one of the great manufacturing "nations" of the world" (Harris 1952, 7).

However, the region's strengths and capabilities in manufacturing and production would eventually be tested. As the first area of the country to industrialize on a broad scale, New England was also one of the first regions to experience industrial decline. This is notable because many parts of the United States did not begin to grapple with serious deindustrialization until the 1970s. New England experienced its first wave of serious industrial decline shortly after World War I.

Once deindustrialization began in New England, the decline of the textile industry was particularly drastic. From 1919-1947 New England lost 158,000 textile jobs ( $\frac{1}{3}$  of total 1919 employment). Meanwhile, the rest of the country gained 237,000 jobs. However, decline was not experienced evenly in all industrial sectors across New England. Connecticut fared significantly better than Massachusetts, with manufacturing employment actually increasing 21% in those years (compared to Massachusetts where it declined 11%). This could be attributed to the fact that Connecticut's manufacturing sectors were more diversified and less dominated by textiles and shoes. 62% of manufacturing activity in Connecticut produced higher-value durable goods (compared to 40% in Massachusetts and 24% in Rhode Island). Additionally, the state's geographic proximity to large markets in the middle-Atlantic (including New York City) protected it from early deindustrialization (Harris 1952, 17). However, in time even Connecticut's resiliency was thwarted; the state's manufacturing economy eventually fell victim to industrial decline as well.

### **What caused New England's deindustrialization?**

New England's early wave of deindustrialization could be attributed to various causes. Cotton textile production was particularly susceptible to relocation because it utilized very simple technology, needed relatively unskilled labor and required little capital investment overall to set up a production facility. As a result, a cotton factory could easily be established in a less developed, less expensive region of the United States like the South (Koistinen 2013, 14). The

Southern economy was the greatest beneficiary of New England's early industrial decline and held numerous competitive advantages over New England. Labor arbitrage was a driving factor in the redistribution of mills and factories from New England to the South. The lower cost of labor was the most significant factor differentiating the two regions. As agriculture declined in the South, many Southern workers found themselves unemployed and were subsequently willing to work for much lower pay than workers in the north. Furthermore, unions in the region were also very weak, so the workforce commanded wages typically one-third to one-half of what New England workers were paid (Koistinen 2013; Harris 1952). Additional factors such as lower distribution costs due to the proximity to Southern cotton fields, lower taxes, lower construction costs to build factories and lower energy prices all made the region very appealing for industrialists (Koistinen 2013; Harris 1952). These economic cost-of-production determinants were all substantial factors that drove industrial investment into the South (Harris 1952).

*In A Common Thread: Labor, Politics and Capital Mobility in the Massachusetts Textile Industry 1880-1934*, author Beth Anne English provides a detailed look into the forces that motivated New England mill owners to relocate to the South as well as the actual relocation process. Many owners employed a gradual relocation strategy, where they first opened southern branch subsidiaries in addition to their primary plants in New England. Over time, as the southern plants became more productive and profitable, the benefits to full relocation became clearer and the New England plants were shuttered. The Dwight

Manufacturing Company followed this process in a gradual move from Chicopee, Massachusetts to Alabama City, Alabama between 1894 and 1927 (English 2003, 15). English studied historical records and corporate documents from the Dwight Manufacturing Company in order to fully understand what provoked the company to move from New England to the South. Her case study revealed there were additional intangible factors motivating plant owners to move in addition to the more tangible and quantifiable cost-of-production factors such as wages, taxes and construction costs. For example, Southern politicians actively recruited New England cotton mills to their municipalities, employing various regional promotion strategies and fostering a perception among mill owners that the South was “friendly” to industrial investment while the North, with its labor regulations and taxes was “hostile” to it. This “southern industrial booster rhetoric” emerged as a predominant view among plant operators in this time period and also helped facilitate the relocation of New England factories to the South (English 2003, 12).

### **What was the effect on workers, unions and towns?**

As industrial employment steeply declined across New England, many cities and towns were left ravaged by the economic loss. Deindustrialization had broad negative impacts on cities and towns. The loss of jobs and factories left barren manufacturing facilities across the physical landscape, diminished municipal finances, and impacted the mental and physical health of workers in these locales. Towns that experienced significant deindustrialization had higher crime and higher incidences of mental illness and suicide (Koistinen 2013, 20).

The psychological ramifications and financial impact on workers who were not able to transition their skills to other sectors could linger for decades.

Additionally, real estate values plummeted in cities where industry declined, shrinking the tax base and decreasing the property tax revenues for the municipality. Increased foreclosures and deteriorated vacant properties also prevailed in these cities and towns, along with a general sense of malaise among inhabitants (Koistinen 2013, 20).

When a factory closes, the loss of jobs often extends far beyond just the shuttered plant. In *The Deindustrialization of America*, Barry Bluestone and Bennett Harrison describe the closing of a cutlery manufacturing plant in New Jersey in 1978. An economic impact assessment conducted after the closing indicated that the closure resulted in a direct loss of 760 manufacturing jobs and an additional 468 jobs in the service sector (such as banks, restaurants, pubs and other businesses that would normally serve employed workers) (Bluestone 1982, 68). This study helps illustrate the multiplicative effect that industrial jobs have on the larger economy and how broadly the loss of those jobs may be felt across other sectors. Due to these ripple effects, a single plant closure could transform a once-bustling city into a desolate and bleak environment.

This situation was even captured in a contemporary work of Pulitzer Prize winning fiction published in 2001. *Empire Falls* is set in a fictional town of the same name, situated along a river in central Maine. Decades ago, it was a quintessential New England factory town that prospered due to a large textile and clothing factory owned by the Whiting Family. In time, the mill and factories

were “sold to multinational corporations so they could be pillaged and then closed” (Russo 2001, 23). Today, the town is now a relic of industrial New England. The closing of the factory precipitated a decline in the entire town that prevails today, where job opportunities are limited and the town’s inhabitants are perpetually dispirited.

### **How did early industrial decline influence public perceptions of manufacturing in New England?**

Much of the historical primary research on perceptions of manufacturing from this time come in the form of journalistic investigations conducted for newspapers and magazines. The condition of New England’s economy actually received national attention as early as the 1920s (Koistinen 2005). In 1931, Louis Adamic wrote an expose in Harper’s Magazine describing conditions in declining mill towns throughout New England. He found dejected workers who were anxious about their future work prospects from Rhode Island to New Hampshire and numerous places in between. There was considerable disdain for plant owners in mill towns, who were viewed as selfish and exploitative. In Haverhill, Massachusetts, a town that had once prospered by specializing in the production of shoes, residents viewed the shoe industry as “an evil we can not get along without,” reflecting both a critical need and a degree of hostility toward factory work (Adamic 1931, 758).

While there is no historical survey conducted on public opinions of manufacturing careers in New England, one can surmise that the drastic upending

of industries in the region had a marked impact on inhabitants' perceptions of manufacturing work. The instability foisted upon them by factory relocations and the prospect of being without work and income for months on end would certainly weigh heavily on those who were surrounded by it for years without reprieve. Furthermore, in a region so densely concentrated with and heavily dependent on manufacturing firms, there was a dearth of alternative employment options. Other sectors were not heavily developed at the time nor were they accessible to the many workers who lacked a secondary education. The quote above from a Haverhill resident embodies this sense of resigned acceptance that manufacturing work was viewed as their only viable option. Watching employment opportunities in this sector dry up could wreak havoc on the workers' collective psyche.

While the New England workers' perceptions of manufacturing were not widely studied at the time, the manufacturers' views of New England were. The Federal Reserve Bank of Boston issued a survey to executives and business owners nationwide after World War II to learn about perceptions of New England's economy. The results of the survey were alarming to the region's boosters and others who were committed to improving the industrial climate. Many business owners perceived of New England as being "in decline, that its business managers were wedded to out-of-date practices, that its workers were intractable and overpaid and that many public officials in the region harbored anti-business attitudes" (Koistinen 2005, 8). These notions largely reflected the views propagated through media reports about the region. While many cities and towns were indeed experiencing drastic economic decline, many regional backers

believed the media reports were overblown. They were concerned that the media reports would reinforce negative perceptions and make it even harder to attract out-of-state investment the region so desperately needed (Koistinen 2005).

### **How did New England leaders address deindustrialization?**

After decades of industrial prosperity in New England, the poor condition of deindustrialized cities and towns was alarming. The region's economic woes and the negative perceptions surrounding it served as impetus for policymakers, business leaders and workers to begin devising ways to bolster the region's industrial economy. These early policy experimentations are important to study, as many present day industrial retention policies still bear a fundamental resemblance to them. There were three principal policy responses to deindustrialization put forth in this time period: retrenchment, federal assistance and economic development (Koistinen 2013). Each possessed its own advantages and disadvantages and had varying levels of success in stemming early industrial decline in New England.

Retrenchment was the practice of "cutting social legislation and taxes" and was heavily favored by manufacturers who viewed these regulations as a central obstacle inhibiting their profitability and growth (Koistinen 2013, 30). The Massachusetts state legislature had been particularly active in enacting labor regulations as the region's industrial sectors developed. State laws regulating working hours, child labor and safety conditions were all enacted in this time; by the start of the 20th Century, Massachusetts had the "most rigorous and detailed

system of industrial legislation and enforcement of any state in the nation” (English 2003, 43). Rhode Island and Connecticut also enacted comprehensive legislation during this era, though Rhode Island was somewhat slower to action and less inclined to establish regulation than Massachusetts and Connecticut. In Rhode Island, the employment of children in textile mills was particularly widespread and accepted throughout the nineteenth century; in 1830, it was estimated that 40% of the manufacturing workforce in Rhode Island was between the ages of six and seventeen (Towles 1908, 11). The state did not pass a law banning the employment of children under fourteen until 1903, long after Massachusetts and Connecticut had done so (Towles 1908, 50).

In time, all three states enacted comprehensive labor regulations that many manufacturers viewed as burdensome compared to the unregulated Southern labor market (Harris 1952). Retrenchment was sought in an effort to curb regulation and ameliorate the financial onus on manufacturers that resulted from labor regulation and state taxation. Many manufacturers believed that New England policy-makers would feel threatened by the rise of the industrial South and therefore more likely to make pro-business concessions. However, in reality, retrenchment efforts were generally unsuccessful, particularly those aimed at reducing social regulations on labor (Koistinen 2013, 4). Hard-fought labor protections were actually increased in the 1920s and 1930s, despite widespread plant closures at the time. This reflects the staunchly pro-labor political climate in New England. Additionally, research showed that industrialists’ campaigns to reduce limitations placed on workers’ hours in Massachusetts (such as the ten

hour workday maximum) may have been misguided anyway. “Close analysis of factory operating rates shows that in the depressed market conditions of the time the regulation had little impact on the state’s cotton makers” (Koistinen 2013, 27). Retrenchment efforts to reduce taxes on industrial businesses were somewhat more successful after World War I. “The political context made retrenchment on business taxes much easier to achieve than cutbacks in social legislation” (Koistinen 2013, 54). At the city level, many municipalities drastically reduced their property tax assessments on textile plants in the late 1920s. Additionally, at the state level in Massachusetts, the state set forth a law exempting manufacturing machinery from property taxes (Koistinen 2013, 54). Later in the 1950s, state requirements on unemployment insurance were greatly reduced to appease business owners. However, these reforms “had no real lasting impact on the competitiveness of Massachusetts industry” (Koistinen 2013, 191-192).

Another tactic aimed at shoring up the regional industrial economy in the early 1900s was a call for federal assistance. One example of federal assistance was the proposal of national policies that would regulate labor standards across all states, thus equalizing the cost of labor between the North and the South. These policies were generally supported by unions and their liberal allies but were staunchly opposed by business and conservative voices. Like retrenchment efforts, calls for federal assistance to address regional cost disparities were not very successful (Koistinen 2013). Gaining political support for such an endeavor solely to provide economic assistance to one distressed region of the country proved challenging at the time. However, as the entire country experienced

widespread economic decline during the Great Depression, which began in 1929, these measures gained additional support under the leadership of President Franklin Delano Roosevelt and other “reform-minded Democratic legislators” on the national stage (Koistinen 2013, 57). Many New Deal policies did in fact help establish greater parity between the labor climate in the North and South. The New Deal agenda sought to modernize the southern economy, develop its infrastructure and exert “upward pressure on wages” under the premise that low wages “perpetuated poverty, undermined living standards and health, and discouraged development” (Wright 2010, 70).

Requests for different types of federal assistance continued to evolve in subsequent decades; in the 1970s there was a renewed call for federal trade protections that would make it more difficult for low-cost overseas producers to export manufactured goods to the United States. New England Governors acted in a coordinated effort through the Conference of New England Governors. They pushed for quotas on textile imports from Japan as well as a commitment not to cut tariffs on cloth. While they were successful in meeting these objectives, in practice they did little overall to help stabilize the downtrodden New England textile industry, which had been declining for almost fifty years at this point. The failure of both retrenchment efforts and federal assistance to impact the regional economy “served to demonstrate how little officials could do for these locations given existing policy tools” (Koistinen 2013, 194). Studying this slate of ineffective policy responses to industrial decline makes it evident that a more inventive and vigorous approach was needed to improve the region’s economy.

Fortunately, that would come in the form of comprehensive economic development and workforce development initiatives.

The most successful counter effort to the decline of New England's industrial sectors was a series of economic development initiatives. Economic development is broadly defined as a positive "change in employment and/or per capita income that is self-sustained" (Mathur 1999, 204). These policies sought to regenerate New England's industrial economy by strengthening remaining sectors and fostering new ones in order to compensate for the declining industries (Koistinen 2013, 3). New England companies in the service sector, such as banks, utilities and railroads all widely supported economic development since "the prospects of these companies depended on the overall level of economic activity in New England" (Koistinen 2013, 115). Economic development initiatives would strategically focus on promoting the region's strengths and capabilities that a "developed region does possess, such as experienced management, skilled labor, numerous research facilities, and abundant financial resources" (Koistinen 2013, 5). These promotion efforts were carried out by not only state and local governments, but also private groups of business leaders (such as the New England Council, an influential business association which still exists today). In fact the public sector's capacity to lead economic development functions was fairly limited until after World War II and the New Deal era, allowing the private sector to play an outsized role in developing early practices to help curb regional deindustrialization (Koistinen 2013, 5). This was in accordance with the overall political climate; private associations and large businesses preponderated at the

time and were entrusted over the public sector to improve the regional economy (Koistinen 2013, 218-219).

Numerous economic development initiatives were spearheaded in this period with considerable success, helping to offset some of the losses sustained by the decline of textiles, shoes and other less advanced industries in New England. Improving access to capital for new firms in the region was one of the most successful initiatives pioneered in this time. The New England Council set up a venture capital organization that would encourage banks to lend to emerging industrial businesses on favorable terms. This practice helped promote a fledgling electronics sector starting in 1940 in Massachusetts (concentrated in the suburbs of Boston). Many of these companies grew rapidly and led to the Boston-area becoming “the best known locus of technologically advanced industry in the world” prior to the development of Silicon Valley in California (Koistinen 2013, 160-161). This is an exceptional example of how economic development efforts effectively achieved regional industrial growth by supporting and developing a newer, cutting-edge manufacturing sector. That said, the electronics sector near Boston also eventually declined starting in the 1980s as a result of competition from abroad and rapid technological shifts that the early electronics companies were ill-prepared to keep pace with (Saxenian 1996, 88; Koistinen 2013, 206).

Though private industry took the lead on early economic development initiatives, the states’ roles evolved and advanced over time. In Massachusetts, the state founded an Industrial Commission in 1929. It studied the state’s economy, industrial development efforts in other states and mounted a publicity effort to

counter the notion that Massachusetts industries were failing and tout the state's competitive advantages. "To attract outside investment, the Commission distributed promotional material, maintained information on the industrial possibilities in each municipality, and on at least one occasion direct-mailed manufacturers in other states about the advantages of transplanting to Massachusetts" (Koistinen 2013, 134). After World War II there was an "intensification of growth-promotion efforts led by state government" which entailed setting up a State Department of Commerce, which was more robust and had greater capacities than the Massachusetts Industrial Commission that was founded earlier (Koistinen, 199-200). As the twentieth century progressed, state-led economic development efforts became even more focused, innovative and effective beginning in 1970s. "While the commonwealth's public efforts in this domain had begun decades earlier, state leaders brought noteworthy energy and imagination to the growth-promoting task beginning in the mid-1970s. So diverse and significant were its efforts in the field that one set of scholars termed Massachusetts "a national leader in creating new roles for state to play" in economic development policy" (Koistinen 2013, 211-212). Some of the practices put forth in this time included expanded lending and financing vehicles for upstart firms, greater efforts to attract foreign direct investment in Massachusetts, and a major effort to fund and facilitate research partnerships between businesses and universities to develop new advanced products and technologies that could be manufactured in Massachusetts (Koistinen 2013, 212-213).

### **Did these policies successfully curb deindustrialization?**

Despite formidable efforts to stabilize New England's manufacturing sectors via economic development, industrial decline continued in cycles throughout the twentieth century. Though there were notable periods of growth in New England that could be attributed to large defense contracts local firms received at the start of the Cold War and the rapid growth of the aforementioned electronics industry in the 1950s, manufacturing employment overall continued to sink in the latter half of the twentieth century. (Koistinen 2013; Bluestone 1982). Furthermore, at this stage, industrial decline was no longer isolated to New England; it gripped the United States more broadly due to widespread international trade liberalization and heightened competition from overseas (Bluestone 1982). Nationwide employment in manufacturing dropped 14% from 1977-1986 (Koistinen 2013, 222). Once deindustrialization became a more widespread phenomenon, it garnered further attention from political leaders on the national stage. Many of the policy responses first formulated in New England earlier in the century were expanded and applied nationally, including calls for retrenchment, federal assistance and economic development (Koistinen 2013). Economic development policies further matured starting in the late 1980s onward and moved toward a contemporary paradigm that merges sector-based demand-side economic development efforts (i.e. attempts to attract industrial employers) with simultaneous supply-side efforts to develop the workforce (Harper-Anderson 2008). Studying this evolution more closely aids in understanding present-day efforts to improve the perception of manufacturing careers.

**When did sector-based, demand-side economic development policies begin to connect more fluidly to workforce development?**

New England's early policy responses and initiatives designed to combat deindustrialization highlight some of the strategies that the region employed in order to make itself more appealing to manufacturers. This is useful in that it helps frame the context through which states work on business attraction strategies, which was often geared toward self-promotion and touting competitive advantages over other states, regions or countries where those firms might otherwise locate. However, this thesis study and survey is centrally focused on New England workers' perspectives of manufacturing careers, not manufacturers' or policy-makers' perspectives of the New England industrial climate. They are critically related, because business location decisions create employment opportunities for residents, and any sound business attraction strategy must assure prospective employers that the region has a labor supply that is both *skilled and willing* to fill those jobs. Recognition of this fact among policy-makers has served to strengthen the link between economic development and workforce development in recent decades.

Over time, economic development policies have become more aligned with workforce development policies, which focus on developing the workforce to take industrial jobs. "The call for greater connection between workforce development and economic development includes both economic and social justifications. Most fundamental from an economic standpoint is the equilibrium

logic of a market economy where efficiency is achieved when the labor supply produced by workforce development meets the labor demand created via economic development. From a macroeconomic standpoint, recent globalization trends have heightened the importance of a high-quality workforce with needed skills in creating regional economic competitiveness, implying that those engaged in economic development now have a greater incentive to pay attention to the development of their region's workforce" (Harper-Anderson 2008, 121; Clark and Gaile 1998).

Though the Massachusetts example exhibited the strong role the private sector once played in economic development efforts, the federal and state governments are now the primary agent of economic and workforce reinvention. Beginning in the 1970s, state and local governments took on a bigger role in workforce development programs (due to the 1973 Comprehensive Employment and Training Act, 1982 Job Training Partnership Act and 1998 Workforce Investment Act). These federal programs were all established to provide funds to states for training and education programs for youth, adults and dislocated workers (Schrock 2013, 164). Today, programs funded through the Workforce Investment Act "are now required to focus training dollars on occupations that are in demand in each local area, creating a direct link between the jobs being created and the skills workforce for which agencies are training clients" (Harper-Anderson 2008, 121). This quote further explicates the increasing connection between economic development and workforce development.

In recent years, industrial workforce development has become transfixed by the notion of a pervasive skills gap in manufacturing. The “skills gap” is the disparity between the skills employers need and the skills held by the workforce in a particular area. This mismatch is purported to be a major inhibitor of manufacturing employment (The Manufacturing Institute 2015). However, the issue of a skills gap is somewhat polemical. Numerous academics and economists contend that the skills gap is inflated (Giloith 1998). Still, industry and governmental research studies of manufacturers’ needs have acknowledged a perceived misalignment in skills manufacturing employees need to fill open positions compared to the skills possessed by the typical job-seeker. In 2005, one workforce development organization in Chicago, the Chicago Workforce Board (CWB), convened summits in various sectors including manufacturing and a common theme emerged: a “persistent shortages of semiskilled workers led local officials to look for new ways to augment and align existing workforce training resources with employer demand” (Schrock 2013, 167). More recently, The Manufacturing Institute’s 2015 survey of manufacturers indicated that 84% of executives believe there is a skills shortage in the United States (The Manufacturing Institute 2015). Recent trends in workforce development in New England (and nationwide) have supported this theme by studying the skills gap and devising strategies to overcome it. This often comes in the form of efforts directed at modifying educational systems and supporting curricula in both secondary schools and higher education that provide students with the opportunity to learn vocational skills that would be highly-suited to manufacturing careers

(Giloth 1998). For older workers outside of the educational system, the system focuses on re-training options to support the development of skills needed in the advanced industrial sectors that now dominate New England's manufacturing activities. A full listing of current programs and initiatives in New England is included at the end of the chapter.

### **How has the perception of manufacturing careers emerged as a policy issue recently?**

The journalistic explorations of declining New England factory towns in the early twentieth century shed light on both workers' negative perceptions of factory work as well as business owners' negative perception of the New England business climate. These pieces are relevant but generally only provided anecdotal evidence as to how people felt about manufacturing at the time. The absence of large-scale surveys or in-depth interviews with residents in those New England towns leaves many unanswered questions about historical perceptions of manufacturing. Having this data would serve as a useful benchmark in order to look back and see how those perceptions have or have not shifted over time. Fortunately, in a more current context, the public perception of manufacturing jobs has become far more widely researched and discussed. Several recent studies of the manufacturing sector have elucidated disinterest and negative public perceptions related to manufacturing careers.

As noted earlier, the Manufacturing Institute, a non-profit industry association advocating for American manufacturers, conducted a large-scale

national survey in 2011 in order to gauge public perceptions of manufacturing. It found that 86% of respondents believe that manufacturing is very important to our national prosperity. However, only 59% of respondents agreed with the statement, “Manufacturing jobs are interesting and rewarding.” Furthermore, only 33% agreed that they would encourage their children to pursue manufacturing careers (Giffi and DeRocco 2012). The disparity in these responses suggests a potential disconnect between the value Americans place on manufacturing careers and the interest they actually have in pursuing them or encouraging their children to pursue them.

Additional contemporary research on the public opinions of manufacturing aligns with The Manufacturing Institute’s 2012 study. A report on a survey of Connecticut Manufacturing Workforce Needs conducted in 2014 cited both the perception issue and the skills gap, noting, “relatively few young people are interested in pursuing careers in manufacturing, and those who do frequently fall short in either (or both) the technical and basic skills necessary to succeed” (Survey of Connecticut... 2014). That same study of manufacturers further stated that “many employers acknowledged that companies like theirs fail to adequately explain and market manufacturing career opportunities to young people and their parents. Several of them also contended that launching an aggressive marketing/branding effort is the most valuable role the state can play” (Survey of Connecticut... 2014). This study of Connecticut manufacturers typifies the desire of manufacturers to receive assistance from state partners when it comes to promoting manufacturing careers. Furthermore, a 2012 study of the

Massachusetts manufacturing economy also surveyed manufacturers and found that “we need to do more to promote manufacturing in the Commonwealth, and we need to get more young people interested in entering the industry” (Bluestone et al 2012, 110). New England states have generally answered this call with a full slate of inventive new programs designed to improve perceptions and spur interest in manufacturing. These programs and initiatives are summarized in a chart at the end of the chapter.

### **What is the economic importance of having an active manufacturing sector?**

Researching the history of policies intended to promote manufacturing in New England is only useful if it is clear *why* the region sought to protect and grow its manufacturing sector. There are in fact multitudes of compelling reasons to support manufacturing. “Any region would want an economy of firms that are very good at producing the highest-value goods and services. These firms pay high wages and contribute to a rising standard of living for residents of their regions” (Giloith 1998, 90). In Massachusetts, the average annual salary in manufacturing in 2010 was over \$75,000, reflecting high levels of education, skills and productivity (Bluestone et al 2012). Additionally, manufacturing jobs have a large additive effect on the economy; a recent study from The Manufacturing Institute showed that manufacturing has a stronger multiplier effect than any other sector. The multiplier effect measures “backward linkages,” or the extended growth sustained in other industries through backward connections in the supply chain to other firms that support manufacturing (for

example, the labor and goods required to make a component that goes into a manufactured product). The larger an industry's multiplier effect, the broader impact its success (or failure) has on the larger economy; this principle was mentioned prior in Bluestone and Harrison's study of the impact that a factory closure had on service-sector jobs outside the factory as well as President Barack Obama's 2014 State of the Union address (as referenced in Chapter 1). As of April 2014, Manufacturing's multiplier was \$1.33 for every one dollar of output of manufactured goods, compared to \$1.11 for the next highest sector (agriculture, forestry, fishing and hunting) (The Manufacturing Institute; U.S. Bureau of Economic Analysis 2014).

The benefits of manufacturing noted above make a strong argument for regions to promote manufacturing jobs. Furthermore, states wishing to draw in manufacturing often attempt to attract not just one company or plant but an assortment of related firms in a particular sector. This is known as a cluster, defined as a "geographically-bounded concentration of similar, relate and complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets, and services, and are faced with similar opportunities and threats" (Giloth 1998, 96). The tendency to cluster is a "critical source of economic advantage. Dense concentrations can reduce the costs of transactions, stimulate supportive services on an economical basis, and enhance the market visibility of all firms in the region" (Giloth 1998, 96; Porter 1990). The textile firms concentrated geographically around the Merrimack River in New England one hundred years

ago exemplified this phenomenon; today firms still derive benefits from co-locating in a common region.

### **What is the current manufacturing climate in New England?**

While understanding the history of manufacturing in New England is certainly important, this thesis is ultimately focused on perceptions of manufacturing today, making it important to also describe the current state of manufacturing in the region. It is also useful to remember that New England is not one monolithic entity. Though the six states share common elements of history, culture and politics, each state, and even cities and areas within the states, differ from each other in various ways. An exhaustive survey of present-day manufacturing in each singular area is not possible in this study; however, this section aims to provide an overview of manufacturing employment statistics in each state. The charts below outline current figures and trends in manufacturing across the region. These figures are discussed in more detail in Chapter 6 under data synthesis and analysis.

***Table 1: Manufacturing Employment by State (as of April 2015)***

	Total employed in manufacturing (in thousands)*	Total employees on nonfarm payrolls (in thousands)	% employed in manufacturing
Connecticut	160.9	1685.4	9.5%
Maine	49.6	608.4	8.2%
Massachusetts	249.3	3470.4	7.2%
New Hampshire	66.9	652.3	10.3%
Rhode Island	41.6	481.3	8.6%
Vermont	31.3	315.0	9.9%

Source: Bureau of Labor Statistics, D-1 Monthly Tables. April 2015.  
N.B. Employment totals are seasonally adjusted.<sup>1</sup>

The table above shows that manufacturing employment in New England states ranges from 7.2% in Massachusetts to 10.3% in New Hampshire. In the United States as a whole, manufacturing represents 8.2% of nonfarm employment (as of April 2015) (Bureau of Labor Statistics 2015). The average manufacturing employment across all six New England states is 8.95%. This is only slightly higher than the national share of manufacturing employment, indicating that today, manufacturing is a relatively average economic output in the region compared to other parts of the country. The Midwest and South now possess far larger shares of national manufacturing employment (Scott 2015). New England no longer holds the same dominance it historically had in manufacturing in the early twentieth century.

**What are current education and workforce development policies related to manufacturing in New England? How do these policies address perceptions?**

A wide variety of programs, policies and initiatives currently exist across New England that are intended to support the manufacturing industry. These run the gamut from state-issued industrial revenue bonds to finance physical

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<sup>1</sup>Additionally, it should be noted that the total employed in manufacturing does not only include those who work in production of manufactured goods but also support staff and others in administrative roles (i.e. sales and marketing staff for a manufacturing firm).

manufacturing plants to targeted educational programs aimed at boosting public perceptions of manufacturing careers. For the purpose of this study, the latter types of programs are most relevant and have been researched and summarized here. Various entities have led the development and implementation of these policies, including state governments, non-profit advocacy organizations and universities, or combined partnerships of those groups that have joined together to share resources and efforts.

When the 2011 Manufacturing Institute study was published it elucidated low public opinions of manufacturing nationwide; this also effectively catalyzed support and spurred the development of several initiatives aimed at improving the image of manufacturing careers. The Manufacturing Institute has taken on a primary role in developing policies and programs to this end. Their two hallmark activities in this area are called “Dream It. Do It” and “Manufacturing Day,” each of which is summarized below.

*Figure 1: Sample messaging developed by The Manufacturing Institute for the Dream It. Do It. program*



Source: <http://www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Dream-It-Do-It.aspx>

*Dream It. Do It. (DIDI)*

Dream It. Do It. was founded by the Manufacturing Institute in 2005 as an advocacy and recruitment program to help spur interest in manufacturing among young people by reforming negative perceptions of manufacturing careers. The program shares resources, best practices and strategies for recruitment among a network of individual state organizations that carry out the work on a more localized level. DIDI provides those members with access to industry expert guidance via training and webinars, professionally designed marketing materials, technical assistance for program development and marketing support to help promote their DIDI activities (“Dream It. Do It”). The target audience of these

efforts is not just youth but also parents and educators, reflecting the important role parents and teachers may have in career decisions.

Four states in New England have Dream It. Do It. network member organizations (Connecticut, Rhode Island, Maine and Vermont). The Connecticut chapter, which is run by the Connecticut Center for Advanced Technology, Inc. (a non-profit economic development organization), was recently recognized for developing an innovative program called the Young Manufacturers Academy (YMA) under its DIDI banner. The YMA was developed after the state noticed a sharp decrease in students applying to technical high schools, where students acquire the skills needed for manufacturing careers. The YMA program was designed to appeal to middle school students, and exposes them to hands-on manufacturing projects and on-site visits to manufacturing firms. It is intended to spur interest in manufacturing careers and boost enrollment in technical high schools. After launching, the Connecticut program successfully achieved a 26% increase in enrollment in manufacturing programs at state high schools and has been granted funding to help expand the model nationally to other Dream It. Do It. organizations (“Young Manufacturers Academy”).

### *Manufacturing Day*

While the Dream It. Do It. program was developed over ten years ago, another initiative called “Manufacturing Day” was born more directly from the results of the 2011 survey. Manufacturing Day, held on the first Friday of each October, is an “occasion during which manufacturers open their doors to

showcase the potential of modern manufacturing and foster interest in manufacturing careers” (“Manufacturing Day”). Manufacturing Day is organized by the Manufacturing Institute along with several co-sponsors who help program and promote events surrounding the day. The Manufacturing Institute provides extensive guidance to firms on planning and marketing a successful Manufacturing Day event. It also includes a comprehensive directory of events on the website MFGDAY.com. In 2014, over 1,600 Manufacturing Day events took place nationwide (including all six New England states), and attracting over 100,000 visitors nationally (“Manufacturing Day”)

#### *Additional Programs*

Aside from Manufacturing Day and Dream It. Do It, other organizations and events throughout New England work toward promoting manufacturing careers as well. One notable example of such work is “AMP It Up!, an initiative created in Massachusetts by Mass Development, the state economic development agency. “AMP It Up!” is an umbrella title for a diverse series of activities designed to help publicize manufacturing in Massachusetts, including promoting the entire month of October as “Manufacturing Month” as well as providing grants to local organizations that provide technical skills and training (“AMP It Up!”).

In summary, there are existing programs in all six states that were designed to promote manufacturing, but questions remain regarding whether or not they are effective. In order to track their achievements, these programs cite

benchmarks largely related to how many events they are holding and how many people are attending them, which may serve as a proxy to understanding whether they are actually shifting public perceptions on manufacturing. However, a regular survey of public opinions of manufacturing would certainly provide a more reliable way of benchmarking and tracking success.

***Table 2: Sample Listing of Manufacturing Programs and Initiatives in New England***

State	Program	Leading Organization
Connecticut	Dream It. Do It.	Connecticut Center for Advanced Technology, Inc.
Maine	Dream It. Do It.	Maine Manufacturing
Massachusetts	AMP It Up!	Mass Development
New Hampshire	Manufacturing Week	New Hampshire Manufacturing Extension Partnership
Rhode Island	Dream It. Do It.	Rhode Island Manufacturers Association
Vermont	Dream It. Do It.	Associated Industries of Vermont

Note: This is merely a sample of some notable programs. It is not exhaustive or comprehensive.

## **Chapter 3. Methodology**

It became clear early in the development of this research study that a survey would allow me to collect valuable primary data on New Englanders' opinions of manufacturing. Since my research in the literature review confirmed that there were no existing studies on contemporary perceptions of manufacturing specific to New England, a survey fills this gap by supplying primary data. This chapter outlines in detail the methodology behind the development of the survey and the process through which it was administered.

### *Survey Design*

Since I endeavored to survey people all across New England, I realized early on that conducting a paper or in-person survey would not be feasible in such a large geographic area; this led me to developing an online survey tool, allowing me to capitalize on the power of the internet for this research. Before launching the survey, I spent considerable time researching survey methodology, formulating the questions, piloting and refining the tool. An overview of that process is provided below.

From the start, I developed the survey with the intention of maximizing the participation rate as much as possible, bearing in mind that even the best-designed survey is ineffective if people are not willing to answer it. Research has shown that the expected length of an online survey correlates negatively to the

participation rate (Galesic and Bosnjak 2009). Furthermore, questions placed toward the end of a long survey receive less attention than those at the beginning. Thus, when developing the survey instrument I focused on keeping it short and succinct and made sure every question would add value to the data yielded. My goal was for the survey take no more than three minutes for the average respondent. I tested the length of time it took respondents to answer the survey in a pilot phase and then advertised to potential participants that the survey took only one to three minutes to complete in order to boost participation rates.

The survey intentionally repeats several questions from the 2011 survey of national opinions on manufacturing careers. Doing so provides the opportunity to directly compare responses and data in order to see how the opinions of survey respondents in New England compare to those from the national survey. If the survey is repeated again at a future time, mirroring previously used questions allows the researcher to see whether opinions have shifted over time. For this reason, the practice of repeating existing questions in survey research is a well-supported practice (Sudman and Bradburn 1982). In addition to questions repeated in from The Manufacturing Institute's 2011 survey, other questions were modified or newly developed in order to expand the scope of the results.

Incentives are an important tool for increasing survey response rates. This survey was administered online through a site that made it easy to provide a small monetary payment to each respondent. The platform also requires unique user IDs and payment information for each completed task, eliminating the risk of one person filling out the survey multiple times for financial gain.

### *Distribution Strategy*

The survey was distributed via an online platform called Amazon Mechanical Turk (MTurk). MTurk is a two-sided network where requesters post short web-based tasks (known as HITs, an acronym for “Human Intelligence Tasks”) and workers (known as Turkers) complete the HITs for a fee. People all across the world have registered as Turkers and regularly complete these simple tasks. MTurk is widely used for public opinion surveys and academic research; in fact over 50% of tasks posted on the platform are surveys, polls or questionnaires (Ross et al 2010). The advantage of posting this survey on MTurk is that the survey could be distributed to a large, heterogenous population in a very short period of time. Had I recruited respondents through personal networks, the data collection could take months to gather and respondents would almost certainly skew toward a specific demographic. The MTurk platform also provides an advantage in that I was able to impose a simple pre-qualification step where the system checked whether the Turker resided in the New England study area (based on the address they originally registered with Mechanical Turk). The HIT would only appear in the queue of Turkers who resided in the study area. Additionally, using MTurk made it very easy to entice participants to take the survey using a small token payment. Amazon handles all the administrative work related to collecting tax information for subjects. The system makes it simple for requesters to place funds in their account and MTurk will automatically disburse payments to participants’ accounts upon completion of the task.

Though recruiting survey participants from an anonymous online platform for academic research might sound unorthodox, the Turker population has been studied in detail and is representative of the general population (Buhrmester et al 2011; Paolacci et al 2010). These studies have validated the use of Mturk as a reliable method to conduct public opinion research. Given the lower cost and shorter timeframe MTurk offers compared to other forms of traditional surveying such as phone polling or in-person survey administration, it is a powerful tool for collecting public opinion data.

### *Survey Tool*

I built out the actual survey using Qualtrics, an online survey design platform. Qualtrics is a user-friendly survey development tool that allows custom question formatting to suit the researcher's needs. It integrates seamlessly with Mechanical Turk and provides detailed analysis of results in an easily comprehensible format, helping to facilitate insights at the conclusion of the study.

Below is a copy of the survey along with comments on the rationale for the inclusion of each question.

**Survey Title: What is your opinion of manufacturing careers?**

**What is this survey?**

**Thank you for participating in this brief study. This survey is part of an academic research project on the public perception of manufacturing careers. All data collected in this study are for research purposes only. You will be asked about your opinion of manufacturing careers as well as basic demographic characteristics (age, gender, ZIP code, and level of education). Your participation is voluntary and you may discontinue participation at any time by closing the browser window or the program to withdraw from the study. Partial data will not be analyzed.**

**Instructions:**

**The entire survey should take only 1-3 minutes. Upon completion, make sure you hit 'submit' in order to generate a unique completion code. You must enter this code into MTurk in order to verify completion and receive compensation.**

**Compensation:**

**For successfully completing the survey, you will receive \$.15 compensation in your MTurk account.**

**Privacy and Confidentiality:**

**No identifiable personal information will be collected. Survey responses will remain completely anonymous. MTurk worker IDs will only be collected for the purpose of distributing compensation and will NOT be linked to survey responses and will NOT be shared with anyone.**

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Part 1: Demographics

*Please identify your age range:*

18-24

25-34

35-44

45-54

55-64

65+

*Please identify your gender.*

M or F

*What is your highest level of education completed?*

Some high school  
High School graduate or equivalent  
Some college  
Associate Degree  
Bachelor's Degree  
Graduate or Professional Degree

The demographic categories above all mirror the demographic categories in the Manufacturing Institute survey from 2011.

*What is your ZIP code? (five digits)*

The purpose of this question is to allow analysis of results based on geographic location of respondents. It also ensures that participants originate from the New England study area.

Part 2: Career Questions

*Question 1: Do you currently work in the manufacturing field?*

Note: Manufacturing is defined as any position which involves the process of actively converting raw materials, parts or components into finished goods.

Answer: Yes / No

Subquestion: IF NO: Have you ever worked in the manufacturing field?

The purpose of these questions is to gather baseline metrics as to how many respondents actually have direct experience working in manufacturing (based on this particular dictionary definition of manufacturing, which is quite broad).

*Question 2: Do you have any close friends or family members who currently or formerly worked in the manufacturing field?*

The purpose of this question is to enable comparisons that show how respondents feel about manufacturing careers vis a vis having personal connection to someone who currently or formerly worked in manufacturing.

*Question 3: Rank the order in which you would prefer to work in the following industries if you were beginning your career today:*

Retail Industry  
Financial Services Industry  
Manufacturing Industry  
Energy Industry  
Healthcare Industry  
Communications Industry  
Technology Industry

1 - Most Prefer

7 - Least Prefer

This question provides a mechanism to understand respondents' preference to work in various industries. It helps to show the relative strength of the respondent's interest or disinterest in manufacturing compared to other sectors. This is also a question from the 2011 Manufacturing Institute survey. It repeats the same categories of industries used in the Manufacturing Institute survey in order to allow comparisons between the two surveys.

*Questions 4-9: Please state whether you agree or disagree with the following statements:*  
Likert Scale: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree

*Q4: Manufacturing careers are both interesting and rewarding.*

*Q5: I would encourage my child to pursue a career in manufacturing.*

These two questions establish how respondents feel about manufacturing careers. They are both repeated from the 2011 Manufacturing Institute survey.

*Q6: If I were starting my career now, I would be interested in entering a manufacturing skills vocational program if given the opportunity.*

The purpose of this question is to understand whether respondents have an interest in entering skills-based programs aimed at improving the education and readiness of the workforce to enter manufacturing careers. Because the second and third research questions in this study relate to actual initiatives and programs aimed at increasing manufacturing employment, it is very important to inquire about sentiment related to one of these programs.

*Q7: Manufacturing jobs are available and accessible within thirty miles of where I live.*

The purpose of this question is to understand whether respondents' perceptions of job availability matches with reality. This is similar to a question on the 2011 Manufacturing Institute survey, which stated, "Manufacturing jobs are available and accessible."

*Q8: Manufacturing jobs are clean and safe.*

The purpose of this question is to establish how respondents feel about manufacturing careers. This is a question from the 2011 Manufacturing Institute survey.

*Q9: Jobs in manufacturing are stable and secure relative to jobs in other industries.*

The purpose of this question is to establish how respondents feel about the stability of manufacturing careers. This is a question from the 2011 Manufacturing Institute survey.

*Q10: The manufacturing industry is very important to my region's economic prosperity.*

The purpose of this question is to establish how respondents feel about the manufacturing sector more broadly as well as its economic value. This is similar to a question from the 2011 Manufacturing Institute survey.

### *Survey Sample*

The survey was first piloted among 10 colleagues, friends and family members, who took it and provided feedback on the clarity, length and design of the survey tool. After incorporating that feedback, the survey was first launched on Mechanical Turk on April 2, 2015. I posted the survey using a call to action that stated, “3 minute survey needs your opinion!” This tagline was used to emphasize the brief nature of the survey and draw in more participants.

**Figure 2: Copy of the HIT for the Survey**



Once a Turker clicked on the link, they would see further details about the survey and how to complete it. They were instructed to follow a hyperlink to Qualtrics to take the actual survey and return to Mechanical Turk after completing it in order to paste their unique completion code and receive payment. Posting the survey on the separate Qualtrics platform helps ensure anonymity of participants and is common practice among academic surveys that recruit participants on Mechanical Turk.

**Figure 3: Further Details about the HIT visible to Turkers**

HIT Preview

**Instructions**

We are conducting an academic survey about the public perception of manufacturing careers. Select the link below to complete the survey. At the end of the survey, you will receive a code to paste into the box below to receive credit for taking our survey. Estimated completion time is 1-3 minutes.

**Make sure to leave this window open as you complete the survey.** When you are finished, you will return to this page to paste the code into the box.

*Template note for Requesters - To verify that Workers actually complete your survey, require each Worker to enter a unique survey completion code to your HIT. Consult with your survey service provider on how to generate this code at the end of your survey.*

**Survey link:** [https://tufts.qualtrics.com/SE/?SID=SV\\_eyvuK0cVxZh8PTT](https://tufts.qualtrics.com/SE/?SID=SV_eyvuK0cVxZh8PTT)

**Provide the survey code here:**

**Submit**

The original goal was to attract 600 responses in order to attain statistical significance at a 95% confidence level. I calculated this based on the overall population of New England using 2014 census data. However, it became clear upon launching the survey that garnering that many responses on the platform would be extremely difficult. Responses trickled in very, very slowly (approximately 1 per day). In an attempt to bolster the response rate, I tested payment increases (from .15 originally to .20 to .25) and found only a small boost in the response quantity. As days passed, the response rate dwindled even further (as the survey was undoubtedly pushed farther and farther down as new tasks were launched on the platform by other requestors). At this stage, I considered alternative recruitment methods, such as personally reaching out to industry groups and other targeted organizations in order to ask them to distribute the survey. However, doing so would likely skew the survey responses towards those

who already work in manufacturing or are invested in its growth and could introduce bias. Ultimately, I expanded the survey on MTurk to residents of all six England states (including Vermont, New Hampshire and Maine beyond the original study area of Massachusetts, Connecticut and Rhode Island) in order to attract a broader sample of qualified workers. Still, the survey closed on April 16, 2015 with just 56 responses. While the final survey response is far short of achieving statistical significance, the results still help to illustrate public sentiment around manufacturing careers in the New England region.

#### *Institutional Review Board*

Because this research study involved collecting data through interaction with human subjects, Tufts University imposed a set of guidelines and a process for proving that the study did not pose any threats to participants and maintained their anonymity. The University's Institutional Review Board (IRB) reviewed the study protocol and granted an exemption from full IRB review on December 12, 2014. The exemption certificate is posted in Appendix A.

## **Chapter 4. Results**

As noted in Chapter 3, the survey yielded far fewer results than I had initially endeavored to collect. However, the fifty-six responses generated provide an interesting, albeit small, glimpse into how New Englanders feel about manufacturing. Since the study sample was not large enough to conduct any statistically significant analyses, I chose to analyze the results using relatively simple cross-tabulations and distributions in Microsoft Excel to show comparative relationships in the data. While a larger sample would have certainly resulted in a much richer analysis, I believe that given the small sample I had, it was best to proceed with a simple comparative analysis. More sophisticated statistical tests would simply not be valid given a sample size. In this chapter, I have started by providing a snapshot of the basic characteristics of the respondents using the aggregated demographic information provided, followed by tables and graphs highlighting some of the more interesting survey results. Explanations and selected summary statistics are provided below each chart or graph; further detailed analysis and discussion is provided in Chapter 5.

## Descriptive Characteristics

**Table 3: Descriptive Characteristics of Survey Respondents**

Question	Responses (n=56)
What is your gender?	31 (55%) = Male 25 (45%) = Female
What is your state of residence?	14 (25%) = Connecticut 27 (48%) = Massachusetts 7 (13%) = Maine 4 (7%) = New Hampshire 1 (2%) = Rhode Island 3 (5%) = Vermont
What is your age range?	11 (20%) = 18-24 28 (50%) = 25-34 9 (16%) = 35-44 6 (11%) = 45-54 2 (4%) = 55-64 0 = 65+
What is your highest level of education completed?	0 = Less than High School 4 (7%) = High School 20 (36%) = Some College 5 (9%) = Associate's Degree 22 (39%) = Bachelor's Degree 5 (9%) = Graduate/Professional Degree
Do you currently work in manufacturing?	7 (13%) = Yes 49 (87%) = No
If not, have you ever worked in manufacturing?	10 (18%) = Yes 39 (70%) = No
Total respondents who currently work OR previously worked in manufacturing	17 (30%)
Do you have close friends or family members who currently work OR previously worked in manufacturing?	29 (52%) = Yes 27 (48%) = No

These descriptive characteristics indicate that the survey sample was comprised of a fairly diverse pool of people. Though the respondents were more likely to be

male, under thirty-five, and college educated compared to the general population, I believe the response pool is varied enough to provide useful insights into general perceptions of manufacturing. Looking at residency of respondents, it is evident that some states were more represented than others in the sample. However, the table below includes the distribution of New England’s population between the six states and provides important context.

***Table 4: Survey Responses by State of Residence***

State	Number of Respondents	Percent of Total Survey Respondents	State’s Percent Total New England Population*
Connecticut	14	25.00%	24.50%
Massachusetts	27	48.21%	45.95%
Maine	7	12.50%	9.06%
New Hampshire	4	7.14%	9.04%
Rhode Island	1	1.79%	7.19%
Vermont	3	5.36%	4.27%

Notes: n=56

\*Population based on 2014 ACS 5-year Estimates

From this reference data, one can see that the distribution of survey responses roughly aligns with the population distribution across those six states. Rhode Island is the one example where residents are extremely underrepresented in the data. Additionally, the low number of total responses from both Vermont and New Hampshire makes it inadvisable to run any cross tabulations on those three states.

*Summary Survey Results: Perceptions of Manufacturing*

**Table 5: Rankings of Industry Preferences**

Industry	Average Ranking *
Technology Industry	2.23
Healthcare Industry	3.43
Energy Industry	3.86
Communications Industry	3.93
Financial Services Industry	4.32
Manufacturing Industry	4.64
Retail Industry	5.59

\*Lower average responses represent higher preference to work in that particular industry. Industries are listed from average highest preference to lowest preference from top to bottom.

The table above shows the responses to the question, “Rank the order in which you would prefer to work in the following industries if you were beginning your career today.” A lower score, such as a first place ranking, indicated the respondents had a *higher* preference to work in that industry and higher scores, such as a seventh place ranking, indicated the respondents possessed a *lower* preference to work in that industry. All fifty-six responses were averaged to show overall sentiment and placed in the table above.

The results above indicate that the technology industry, with the lowest average score, was a highly popular choice among respondents. The retail industry, by contrast, has the highest average score, indicating that it was generally less preferred among respondents. Manufacturing has the second highest average score, indicating a low level of preference compared to the other industries. However, it is worth noting that there was a great deal of variation

within individual responses. Every industry received at least one top ranking and at least one bottom ranking from respondents.

The justification for including these seven specific industries was simply that they were used in the 2011 Manufacturing Institute survey, and I wanted to have to the ability to compare the responses from the two surveys. However, one could certainly question how respondents perceived each of the industry classifications in their own minds. “Technology Industry,” for example, is extremely broad. You could work in “technology” in any number of industries, including manufacturing. I searched through the Manufacturing Institute’s survey methodology in order to see if they included a justification of why these specific industries were included and was unable to determine their rationale.

***Table 6: Rankings of Industry Preferences by Gender***

Industry	Male Average Response n=31	Female Average Response n=25
Technology Industry	2.10	2.40
Healthcare Industry	3.84	2.92
Energy Industry	3.68	4.08
Communications Industry	4.16	3.64
Financial Services Industry	4.35	4.28
Manufacturing Industry	4.55	4.76
Retail Industry	5.32	5.92

Above, the average responses were calculated separately according to whether the respondents identified as male or female. Again, a lower score indicated the

respondents had a higher preference for an industry and a higher score indicated a lower preference. Compared to males, females gave higher average scores to Retail, Manufacturing, Energy and Technology industries, indicating lower preference to work in these industries than the male respondents (though the difference is very small in some cases).

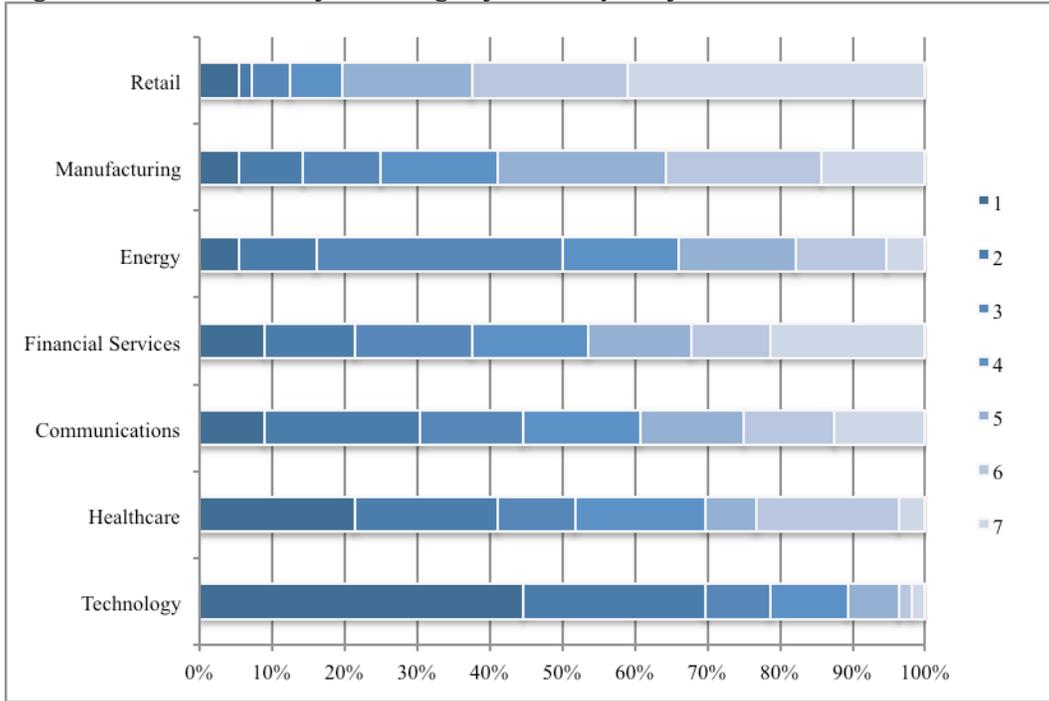
***Table 7: Rankings of Industry Preferences by Occupational History***

Industry	Never worked in manufacturing Average Response n=39	Currently works or formerly worked in manufacturing Average Response n=17
Technology Industry	2.05	2.65
Healthcare Industry	3.31	3.71
Energy Industry	3.92	3.71
Communications Industry	4.13	3.47
Financial Services Industry	4.26	4.47
Manufacturing Industry	4.92	4.00
Retail Industry	5.41	6.00

The table above once again shows average responses to the numerical rankings, but these have been separated out according to whether respondents have ever worked in manufacturing or not. The most relevant piece of information here is how these populations ranked the Manufacturing Industry. The group that had never worked in manufacturing assigned higher scores to manufacturing compared to the group that had worked in manufacturing (respondents currently employed or previously employed in manufacturing were grouped together). This

suggests that people with direct work experience in manufacturing have a more positive opinion of the industry compared to those who have never worked in it.

**Figure 4: Distribution of Rankings of Industry Preferences**



n=56

The table above shows the distribution of rankings for each industry. For example, over 40% of respondents listed "Technology" as their highest preferred industry (assigning it "1"). Over 40% of respondents ranked "Retail" as their least preferred industry (assigning it "7"). Almost 60% of respondents ranked manufacturing in their bottom three slots. In the case of retail, that percentage was 80% of respondents placing it in their bottom three.

**Table 8: Respondents' Perspectives on Manufacturing**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A	Mean
Manufacturing jobs are both interesting and rewarding.	3	9	15	23	6	0	3.36
I would encourage my child to pursue a career in manufacturing.	6	11	21	14	3	1	3
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	11	15	11	15	4	0	2.75
Manufacturing jobs are available and accessible within thirty miles of where I live.	2	4	9	32	9	0	3.75
Manufacturing jobs are clean and safe.	3	16	25	11	1	0	2.84
Jobs in manufacturing are stable and secure relative to jobs in other industries.	5	13	16	20	2	0	3.02
The manufacturing industry is very important to my region's economic prosperity.	3	7	15	25	6	0	3.43

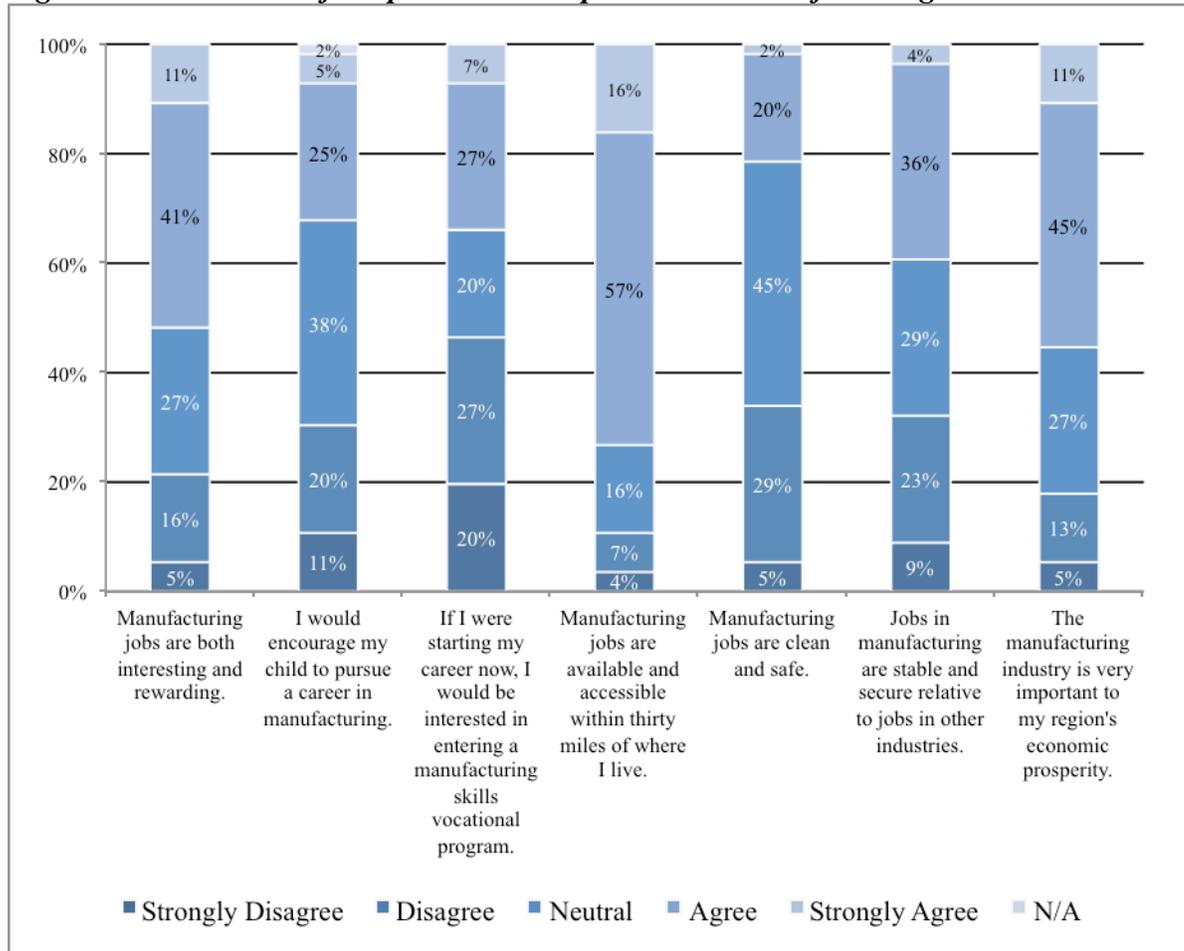
n=56

The table above provides raw data responses to survey questions 4-9, which sought to gauge the respondents' perceptions of manufacturing in further detail.

The response scale was coded numerically from one to five, with Strongly Disagree represented as "1" and Strongly Agree represented as "5". Therefore a

higher mean can be interpreted as a stronger level of agreement with each given statement.

**Figure 5: Distribution of Respondents' Perspectives on Manufacturing**



The chart above shows distributions of responses to each statement. For example, 74% of respondents either agree or strongly agree that manufacturing jobs are available and accessible within thirty miles of where they live. This statement also received the lowest percentage of "Neutral" responses, potentially indicating a respondents had a greater level of confidence in their answers to this statement compared to the other statements.

It is notable here that 52% of respondents agree that manufacturing jobs are both interesting and rewarding and 56% believe manufacturing is important to their region's economic prosperity. Yet only 30% of respondents would encourage their children to pursue a manufacturing career and 34% would be interested in entering a manufacturing skills vocational program. It is also interesting that almost three-fourths of respondents believe that manufacturing jobs are available and accessible near them. This indicates there may be a disconnect between the perceived supply of manufacturing jobs versus the demand or interest in filling those jobs. This will be discussed further in Chapter 5.

**Table 9: Respondents' Perspectives on Manufacturing by Gender**

	Male		Female	
	n=31		n=25	
	% Strongly Disagree or Disagree	% Strongly Agree or Agree	% Strongly Disagree or Disagree	% Strongly Agree or Agree
Manufacturing jobs are both interesting and rewarding.	16%	61%	28%	40%
I would encourage my child to pursue a career in manufacturing.	29%	32%	32%	28%
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	39%	42%	56%	24%
Manufacturing jobs are available and accessible within thirty miles of where I live.	6%	77%	16%	68%
Manufacturing jobs are clean and safe.	32%	23%	36%	20%
Jobs in manufacturing are stable and secure relative to jobs in other industries.	26%	48%	40%	28%
The manufacturing industry is very important to my region's economic prosperity.	10%	61%	28%	48%

The table above shows responses to Questions 4-9 separated by the respondents' reported gender. Several notable disparities are evident in this data. 61% of males agree or strongly agree that manufacturing jobs are both interesting and rewarding, while only 40% of females agree or strongly agree with this statement. 42% of males agree or strongly agree that would be interested in entering a manufacturing skills vocational program; however, only 24% of females agree or strongly agree with this statement. 48% of males agree or strongly agree that jobs in manufacturing are stable and secure relative to other industries; however, only 28% of females agree or strongly agree with this statement. The data suggests a sizable gap in how males and females perceive manufacturing careers. The implications of these results will be discussed and analyzed further in Chapter 5.

**Table 10: Respondents' Perspectives on Manufacturing by Occupational History**

	Never worked in manufacturing n=39		Currently works OR previously worked in manufacturing n=17	
	% Strongly Disagree or Disagree	% Strongly Agree or Agree	% Strongly Disagree or Disagree	% Strongly Agree or Agree
Manufacturing jobs are both interesting and rewarding.	26%	51%	12%	53%
I would encourage my child to pursue a career in manufacturing.	31%	28%	29%	35%
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	54%	26%	29%	53%
Manufacturing jobs are available and accessible within thirty miles of where I live.	10%	72%	12%	76%
Manufacturing jobs are clean and safe.	31%	23%	41%	18%
Jobs in manufacturing are stable and secure relative to jobs in other industries.	26%	41%	47%	35%
The manufacturing industry is very important to my region's economic prosperity.	23%	54%	6%	59%

The table above shows a summary of responses to Questions 4-9 separated by whether or not the respondent had ever worked in the manufacturing industry. There is overall less deviation in the subgroups' opinions categorized in this manner compared to the responses categorized by gender. However, there are several notable statistics. For example, 41% of respondents who have experience working in manufacturing disagree or strongly disagree that manufacturing jobs are clean and safe; among people who have never worked in manufacturing, only 31% of respondents disagree or strongly disagree that manufacturing jobs are clean and safe. This might suggest that those without experience working in manufacturing perceive those jobs to be cleaner and safer than they actually are. Among these subgroups, it is also interesting to calculate the percentage of neutral responses to the given statements. One might hypothesize that the population with experience working in manufacturing would tend to have fewer neutral answers to the statements. The table below summarizes this information and shows that on 4 out of 6 statements, the group with manufacturing experience did select fewer neutral responses.

**Table 11: Respondents' Percentage of Neutral Responses by Occupational History**

	Never worked in manufacturing n=39	Currently works OR previously worked in manufacturing n=17
Manufacturing jobs are both interesting and rewarding.	23%	35%
I would encourage my child to pursue a career in manufacturing.	41%	29%
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	21%	18%
Manufacturing jobs are available and accessible within thirty miles of where I live.	18%	12%
Manufacturing jobs are clean and safe.	46%	41%
Jobs in manufacturing are stable and secure relative to jobs in other industries.	33%	18%
The manufacturing industry is very important to my region's economic prosperity.	23%	35%

**Table 12: Respondents' Perspectives on Manufacturing by Educational Attainment**

	Highest Level of Education Completed: Less Than High School, High School, Some College, Associate's Degree n=29		Highest Level of Education Completed: Bachelor's Degree, Graduate or Professional Degree n=27	
	% Strongly Disagree or Disagree	% Strongly Agree or Agree	% Strongly Disagree or Disagree	% Strongly Agree or Agree
Manufacturing jobs are both interesting and rewarding.	24%	48%	19%	56%
I would encourage my child to pursue a career in manufacturing.	17%	28%	44%	33%
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	31%	45%	63%	22%
Manufacturing jobs are available and accessible within thirty miles of where I live.	7%	79%	15%	67%
Manufacturing jobs are clean and safe.	41%	14%	26%	30%
Jobs in manufacturing are stable and secure relative to jobs in other industries.	24%	45%	41%	33%
The manufacturing industry is very important to my region's economic prosperity.	17%	48%	19%	63%

In the table above, responses to Questions 4-9 are grouped according to level of education. Only 22% of respondents with a Bachelor's degree or higher would be interested in entering a manufacturing skills vocational program if they were starting their careers today, while 45% of those with less than a Bachelor's degree would be interested in entering such a program. Interestingly, only 14% of the less educated group agrees that manufacturing jobs are clean and safe, while more than double that amount (30%) agrees with that statement in the more educated group. This seems to suggest that a low level of perceived cleanliness and safety may not be an impediment to generating interest in manufacturing careers.

The tables and charts in this chapter were intended to provide a summary snapshot of some of the data yielded in the survey. Chapter 5 will delve more deeply into the analysis of this data, and also explores how these results compare to the 2011 National Manufacturing survey, from which many of the survey questions were derived. Chapter 5 also connects this data back to the research conducted on present-day education and workforce development policies in New England and synthesizes this information in an attempt to answer the third research question initially presented in Chapter 1: how do education and workforce development programs in New England match with perceptions of manufacturing careers?

## Chapter 5. Analysis

Though some preliminary analysis was presented in the prior chapter, here I intend to dive deeper into the survey results in order to interpret the results and explore what they may suggest about New Englanders' opinions of manufacturing careers and how that connects to manufacturing programs and policies. In this Chapter, I will also assess how this data compared to the results of the 2011 national study on manufacturing opinions conducted by The Manufacturing Institute.

In general, the survey data revealed some encouraging and positive perceptions of manufacturing careers. For example, only 21% of respondents *disagree* that manufacturing jobs are both interesting and rewarding. Only 18% of respondents believe that manufacturing is *not* important to their region's economic prosperity. A mere 11% of respondents believe that manufacturing jobs are *not* available and accessible within thirty miles of them. These facts suggest a positive overall view of manufacturing work, as well as its economic value and general availability in New England.

However, a divide becomes evident when you look at the percentage of respondents who would actually be interested in entering manufacturing skills programs or encouraging their children to do so. Only 30% of respondents would encourage their children to pursue a career in manufacturing and 34% of respondents themselves would be interested in entering a manufacturing skills program. Though people seem to have decent opinions of the industry overall,

they are personally not interested in pursuing these careers. This is consistent with the ranking of preferred industries, where manufacturing placed very low relative to other industries (only retail was ranked lower). This data seems to embody a sentiment that "manufacturing jobs are great for others, but not for my kids or me." This theme, and its implications will be further discussed in Chapter 6.

In the survey, I intentionally collected information about location (using ZIP codes), gender, education, age and occupational history in order to create a set of demographic variables I could use to filter the survey responses and compare results. In some cases, the small survey sample prevented a full analysis. For example, it would have been ideal to have the ability to look at how responses differed among residents of the six states, but there were not enough responses from New Hampshire, Rhode Island or Maine to do so. A larger survey sample could have provided even more granular data than state-level; I could have segmented ZIP codes to look at individual regions or cities in New England. This locational data would be valuable to know in relation to the statement "manufacturing jobs are available and accessible within thirty miles of where I live." It would be interesting to analyze how particular areas or regions perceive the availability of manufacturing jobs differently and then overlay data showing the actual availability of jobs to reveal whether those perceptions are actually accurate. Furthermore, using ZIP code information, I could then take census data to explore area median household income and other demographic data tied to ZIP codes in order to analyze even more variables. If this study were repeated and re-

designed to achieve a larger sample, this would be an interesting avenue to explore.

### *Gender*

In other cases the demographic variables provided very interesting information for the analysis. Gender was one of the most compelling subsets shown in the data. Table 9 shows that the female respondents generally felt less agreement with all of the statements compared to men. In some cases the disparity was striking. For example, 61% of the men believe manufacturing careers are interesting and rewarding while only 40% of the women respondents agreed with that statement and only 24% of female respondents would consider entering a manufacturing skills vocational program (compared to 42% of men). This data suggests there may be significant work to do in improving the perception of manufacturing careers among women.

It is also necessary to consider *why* it might be worthwhile to improve women's perceptions of manufacturing. Though manufacturing appears to skew toward men (only 27% of the workforce is female), surely other industries skew toward higher sector participation rates among women (2015 Women in Manufacturing Study). What might the rationale be for closing this gap in the manufacturing industry? As stated in Chapter 2, average annual salary for manufacturing jobs in Massachusetts was \$75,000 as of 2010, considerably higher than the median. Attracting women to these higher-wage careers could help erode the wage gap between men and women. Furthermore, for the manufacturers who

are looking to fill jobs, females represent half the human capital and talent in the workforce overall. That untapped labor pool is an immense resource for employers. Finally, a national study of women who currently work in manufacturing commissioned by The Manufacturing Institute in 2015 found that 70% of women who currently work in manufacturing state that they would choose to work in the field again if they were starting their careers today, suggesting that women who actually work in manufacturing feel positively about the field (2015 Women in Manufacturing Study).

This information could be used to inform policy in New England in a variety of ways. While the six states already have a variety of programs in place such as Manufacturing Day and Dream It. Do It., a coordinated outreach campaign embedded *within those programs* might reach more females and increase participation. There is significant precedent for this type of action. During WWII, when factories desperately needed workers to fill roles as millions of men were dispatched overseas for military service, manufacturers recruited women using posters with an image of a female factory worker with an encouraging "We can do it!" slogan plastered across the top. The featured worker would become widely known as "Rosie the Riveter." Over time, the ubiquitous image evolved into a cultural icon and symbol of female economic empowerment.

*Figure 6: Westinghouse poster of "Rosie the Riveter"*



Artist: J. Howard Miller

Source: [https://commons.wikimedia.org/wiki/File%3AWe\\_Can\\_Do\\_It!.jpg](https://commons.wikimedia.org/wiki/File%3AWe_Can_Do_It!.jpg)

### *Level of Education*

Respondents' level of education also provided an interesting variable in the response data. Only 14% of respondents with less than a college degree believe manufacturing is clean and safe, while 30% of those with at least a Bachelor's degree agree with that statement. Only 18% of those who actually have direct experience working in manufacturing agree that those jobs are clean and safe. If one assumes that the group with direct working experience has more realistic perceptions, what might be leading the more educated group to believe manufacturing jobs are cleaner and safer than they actually are? It is possible that the higher educated group is less-informed about manufacturing because they have never considered it as a suitable career for themselves, as their degrees and education tracks have steered them toward career opportunities in other sectors. It is also possible that this response sheds light on the segmentation of type of jobs within the manufacturing field. The higher-educated respondents may be more

familiar with the types of manufacturing jobs commonly known as "advanced manufacturing." Advanced manufacturing represents the type of manufacturing enabled by technology. Jobs in this field are often require advanced degrees in engineering, and are more likely to find work in front of a computer or a fabrication lab than an assembly line (which might be associated with the type of classic industrial work perceived as less clean and safe).

This is one instance where the survey revealed perceptions of manufacturing that are already generally positive. All of the programs and policies summarized in Chapter 2 are seeking to raise awareness of manufacturing careers by exposing participants to them, but what if participating in those programs actually diminished a participant's perception of manufacturing? This raises an interesting point; just how important are one's perceptions and expectations of cleanliness and safety when choosing a career? If those perceptions turn out to be wrong, how much does it matter? A detailed study of the people actually participating in initiatives like Dream It. Do It. would allow us to gauge just how much those programs change perceptions and impact people's career choices.

### *Statistical Correlations*

In order to evaluate whether the relationships in the variables were due to actual differences between demographic groups rather than sample error, I created a linear correlation matrix in Excel. I ran the test across the demographic variables described previously (level of education, age, gender and occupational history) in

relation to the statements in Questions 4-9 in order to test the statistical significance of the relationships and the strength between them. The output of this test is a Pearson's coefficient, which indicates the strength of either a positive or negative correlation for each set of variables. Full results from the test are included in Appendix B.

Using a standard 95% confidence level, several of the relationships in the data are statistically significant. Level of education, for one, is negatively correlated to the statement, "If I were starting my career now, I would be interested in entering a manufacturing skills vocational program." For each higher level of education the respondent reported having attained, they are less likely to agree with that given statement. However, the strength of the relationship is relatively weak, as shown by the R value of  $-.189$ . Age also has a statistically significant relationship to the statement "Manufacturing jobs are available and accessible within 30 miles of where I live." The older a respondent, the less likely they are to agree with that statement. The R value of  $-.51$  indicates a moderate, negative correlation in these variables. Thirdly, respondents who did not report having any close friends or family members who have worked in manufacturing were less likely to agree with the prior statement as well. The R value of  $-.32$  indicates a weak to moderate relationship between these variables. Aside from these three relationships, the full matrix in Appendix B shows that none of the other demographic traits had statistically significant correlations to the answers to Questions 4-9.

The fact that most of the relationships between variables were not statistically significant does not negate the analysis in this study. While the small sample size is not ideal for statistical analysis and made it difficult to draw strong conclusions from this data, I proceeded in a cautious manner to explore what the results *might* suggest and what the subsequent policy implications might be.

#### *Comparison to National Public Perceptions of Manufacturing*

The intentional repetition of questions on this survey from the national Manufacturing Institute survey on public perceptions of manufacturing gives us the ability to see how the responses from the small New England sample compare the national results from three years prior. The table below illustrates several key statistics from the surveys.

**Table 13: National and Local Perspectives on Manufacturing**

	% Agreement from National Survey*	% Agreement from New England Survey
I believe the U.S. manufacturing industry provides careers that are both interesting and rewarding	61%	52%
I believe jobs in the U.S. manufacturing industry are both clean and safe	56%	22%
I believe manufacturing jobs in the U.S. are increasingly available and accessible	32%	n/a
Manufacturing jobs are available and accessible within thirty miles of where I live	n/a	56%
U.S. manufacturing jobs are stable and provide job security relative to other industries	43%	40%
Manufacturing is important to our economic prosperity	90%	n/a
Manufacturing is important to my region's economic prosperity	n/a	56%
I would encourage my child to pursue a career in manufacturing	35%	30%

All figures represent percentage of respondents who "agree" or "strongly agree" with the given statement

\*Source: The 2012 Manufacturing Institute Report on Public Perceptions of Manufacturing

The table above shows both notable differences and similarities in the responses. While the majority of respondents believe manufacturing careers are both interesting and rewarding in the surveys, significantly fewer respondents would encourage their children to pursue careers in manufacturing. The Manufacturing Institute concluded in its report that "Americans want manufacturing jobs...for someone else," as a key takeaway. This is consistent with the themes expressed in the survey of New Englanders. From a policy standpoint,

it may indicate that improving the public perception of manufacturing careers needs to be more targeted on parents.

There was a large disparity in the percentage of respondents who agree that manufacturing jobs are both clean and safe. In the national survey, 56% agree with this statement; in New England, only 22% agree. It is hard to pinpoint what might be leading to this variation in responses. Furthermore, at 56%, the perception of accessibility and availability of manufacturing jobs in New England is significantly higher than the national survey, where only 32% of respondents agreed with that statement (though the wording and inclusion of the word "increasingly" in the national survey statement might be responsible for the difference). In reality, New England's manufacturing employment is only slightly higher than the national average (as discussed earlier in Chapter 4). It is possible that the New England respondents are overestimating the supply of regional manufacturing jobs, or that the national respondents were underestimating the supply of manufacturing jobs, or perhaps a combination of both scenarios.

Timing could also be a factor in the two studies. The Manufacturing Institute's survey was conducted in 2011 and they issued their report the following year in 2012. It is possible that national opinions of manufacturing have shifted in the four years since that survey was conducted. A more current national survey would enable more valid direct comparisons to the survey of New Englanders.

### *Why Don't People Want to Pursue Manufacturing Careers?*

One of the most substantial takeaways from the survey was that in New England, people generally do not want to pursue manufacturing compared to careers to other industries as evidenced by the ranking responses in Question 3 (see Table 5). Though this study alone cannot explain exactly why that may be the case, it allows us to draw on other contemporary research to analyze a potential connection to theories around the desire for “meaningful work” that have emerged recently. The Work Foundation conducts research on this topic and has posited that in affluent societies, people have become more likely to view work as a “source of personal fulfillment” over time, thus desiring more “meaningful work” (Overell 2008). While the designation of “meaningful work” is certainly subjective, it is possible that manufacturing careers have weaker associations on a larger scale with “meaningful work” than other industries, such as education, healthcare, non-profit careers and public service, just to name a few. If this is true, it suggests that the manufacturing industry could do a better job of explaining how manufacturing is meaningful to both individuals and society. For example, manufacturing careers that involve producing new types of pharmaceuticals or advanced medical devices could in fact provide the type of “meaningful work” many job seekers are interested in pursuing.

### *Limitations of the Study*

As noted in Chapter 4, it was exceedingly difficult to attain a large survey sample. This prevented a much richer statistical analysis. The low number of responses seems to suggest that MTurk is best used for surveys that are not narrowly targeted to a specific population (such as national or global public opinion surveys). It is also possible that the large number of workers Amazon claims it has signed up on the MTurk platform is inflated or that the number of Turkers actively completing tasks each day versus the overall population of enrolled users is much, much lower.

As with any survey, semantics can play a large part in how survey participants respond to questions. The distinction between a “career” and a “job” is one linguistic area that warrants discussion here. In order to be consistent, I used the term “manufacturing careers” throughout this study (which was also used in the 2011 national survey); however, it is quite possible the results would have changed significantly had I used the term “manufacturing jobs.” To some, “manufacturing careers” might imply a more professional, long-term, better-paid type of opportunity compared to a “manufacturing job.”

In summary, there is a great deal of information that is hard to capture in a brief survey. The survey was intentionally designed to be very short in order to attract more respondents. However, there are many more salient questions that could have been posed had the survey been longer. Additionally, surveys in general do not lend themselves to the type of nuanced opinions you might glean

from an interview or focus group. Taking these limitations into account, Chapter 6 includes a discussion of areas of opportunity for further study on this topic.

## **Chapter 6. Conclusion**

### *Summary of Research Findings*

Overall, the results of the thesis survey indicated that most New Englanders are not interested in pursuing manufacturing careers themselves. Compared to other industries, it ranks quite low in terms of preferences (see Table 5). However, they feel positively about the general economic value of manufacturing and believe those jobs are an important part of the region's prosperity overall. Additionally, perceptions of manufacturing vary significantly among different demographic groups. These results suggest that policies and programs aimed at improving perceptions of manufacturing might be more effective if they were micro-targeted on specific populations, such as girls and women or parents.

What might such a program look like? Any program would have to be developed with the input of people from those demographic groups, who are in the best position to tell policy-makers what would or would not impact their perceptions of manufacturing careers. Many of the current programs focused on this question seem geared toward exposure to modern manufacturing jobs. Programs like Manufacturing Day enable people to visit manufacturing firms, speak with employees and see the work they are actually doing. The efficacy of these programs is untested as of yet; however, the Manufacturing Institute just

announced an effort to conduct a study of those who participated in 2015 Manufacturing Day events in order to see whether participation impacted their opinions of manufacturing and whether they would consider it a viable career option (“New Study to Determine Impact of Manufacturing Day”). More studies like this focused directly on evaluating impact and outcomes could yield valuable data and help determine which programs are most effective.

### *Recommendations for Policy Changes and Development*

The results of this study and the early research in the literature review can be synthesized to help inform the development of policies and programs intended to boost interest in manufacturing careers. First, as noted above, the established programs such as Dream It. Do It. and Manufacturing Day are due to have their efficacy tested and analyzed by evaluating people’s opinions of manufacturing both before and after participating in those programs. If they are working successfully, they should be more widely promoted across New England. If not, the Manufacturing Institute, legislators, and other vested parties should work to alter them so that they achieve better outcomes.

Secondly, notable disparities appeared in the survey data among various demographic groups’ opinions of manufacturing. While the statistical significance of the survey results were limited, if the survey was expanded and these disparities held up among a larger sample, it would be compelling evidence that a more nuanced approach is required to reach different populations. For example, a gender-specific campaign targeted toward middle-school age girls

might pair them with female mentors in the manufacturing industry in order to expose them to the work and dispel any misconceptions they may have about the industry.

Any additional policy development would need to reflect the many stakeholders involved in educating, influencing, and developing the workforce to pursue manufacturing careers. This might include prospective employees, current manufacturing employees, employers, advocacy organizations such as the Manufacturing Institute, and federal, state, or local workforce development agencies. Input from diverse affiliated populations such as these may lead to better policies with broader support on all sides of the issue.

In summary, the three substantial recommendations here are:

1. Test the outcomes and analyze the efficacy of existing programs and policies aimed at improving the public perception of manufacturing. Based on that information, either expand the existing programs or alter them until they produce better outcomes.
2. Develop new approaches tailored to specific demographic groups where public perception of manufacturing is particularly low.
3. Involve *all* stakeholders in the development of new policies and programs in order to ensure multiple perspectives are being taken into account and objectives are being met.

### *Areas of Opportunity for Further Study*

There are many ways this survey could be improved and expanded in further iterations. Over time, public perceptions of manufacturing may change. As such, in order to study this topic in further detail, it would be valuable to repeat the survey over time in order to gauge whether opinions are shifting. A larger survey sample would also provide better opportunities to assess opinions against different variables (such as age of respondents or urban versus rural dwellers) and conduct statistically significant analyses on the results.

As noted earlier, surveys have inherent limitations in that they present a specific set of answers from which respondents can choose. A mixed-methods study, which also includes interviews or focus groups might reveal more detailed opinions and provide more guidance as to why people answered the survey the way that they did.

This survey focused on a very broad definition of manufacturing (defined as any position which involves the process of actively converting raw materials, parts or components into finished goods). In reality, there are many different types of manufacturing jobs and careers, such as those known as “advanced manufacturing” which was the primary focus of the President’s 2012 State of the Union excerpt provided in Chapter 1. It would be very interesting to better understand just how people perceive advanced manufacturing versus other types of manufacturing. Additionally, it might allow the opportunity to explore how people respond to the idea of a manufacturing “career” versus a “job” as discussed in Chapter 5. A future survey could better define what manufacturing

careers actually look like (using pictures or perhaps even videos) in order to see how participant responses change when presented with a visual accompaniment.

In the broader scheme, this study serves as an exploratory guide to analyze how public perceptions factor in to someone's career choice in *any* given sector. This type of inquiry is not limited to manufacturing; it could be repeated and expanded to any number of industries, such as finance or education or medicine. This study is merely a starting point to gaining a better understanding of how public perceptions impact one's career choices and how those play into to larger conversations around workforce development policy and economic development frameworks.

# Appendix A



OFFICE OF THE VICE PROVOST FOR RESEARCH

Social, Behavioral, and Educational Research  
Institutional Review Board  
FWA00002063

Title: The Public Perception of Manufacturing Careers

December 12, 2014 | Notice of Action

IRB Study # 1412002 | Status: EXEMPT

PI: Annie Burtoff  
Faculty Advisor: Justin Hollander  
Review Date: 12/12/2014

The above referenced study has been granted the status of Exempt Category 2 as defined in 45 CFR 46.101 (b). For details please visit the Office for Human Research Protections (OHRP) website at: [http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html#46.101\(b\)](http://www.hhs.gov/ohrp/humansubjects/guidance/45cfr46.html#46.101(b))

- The Exempt Status does not relieve the investigator of any responsibilities relating to the research participants. Research should be conducted in accordance with the ethical principles, (i) Respect for Persons, (ii) Beneficence, and (iii) Justice, as outlined in the Belmont Report.
- Any changes to the protocol or study materials that might affect the Exempt Status must be referred to the Office of the IRB for guidance. Depending on the changes, you may be required to apply for either expedited or full review.

IRB Administrative Representative Initials:

Handwritten initials 'JWS' in black ink, written over a horizontal line.

# Appendix B

Correlation Coefficients Matrix

Missing values removal

Pairwise deletion

		GENDER	AGE RANGE	LEVEL OF EDUCATION	DO YOU CURRENTLY WORK IN MANUFACTURING?	HAVE YOU EVER WORKED IN MANUFACTURING?	Do you have any close friends or family members who / currently or formerly worked in the manufacta...
<b>GENDER</b>	R	1.					
	R Standard Error						
	t						
	p-value						
	HO (5%)						
<b>AGE RANGE</b>	R	0.2787	1.				
	R Standard Error	0.01708					
	t	2.13255					
	p-value	0.03753					
	HO (5%)	rejected					
<b>LEVEL OF EDUCATION</b>	R	0.21998	0.16252	1.			
	R Standard Error	0.01762	0.01803				
	t	1.65712	1.21035				
	p-value	0.10329	0.23142				
	HO (5%)	accepted	accepted				
<b>Do you currently work in manufacturing?</b>	R	0.12219	0.	-0.06875	1.		
	R Standard Error	0.01824	0.01852	0.01843			
	t	0.9047	0.	-0.50642			
	p-value	0.36964	1.	0.01462			
	HO (5%)	accepted	accepted	accepted			
<b>Have you ever worked in manufacturing?</b>	R	-0.13252	-0.1516	0.27977	#N/A	1.	
	R Standard Error	0.0209	0.02079	0.01961	#N/A		
	t	-0.91663	-1.05146	1.99776	#N/A		
	p-value	0.36341	0.29773	0.05079	#N/A		
	HO (5%)	accepted	accepted	accepted			
<b>Do you have any close friends or family members who / currently or formerly worked in the manufacta...</b>	R	0.13992	0.01608	0.21452	0.14858	0.21293	1.
	R Standard Error	0.01816	0.01852	0.01767	0.01811	0.02031	
	t	1.03845	0.0741	1.61398	1.1041	1.49401	
	p-value	0.30369	0.94121	0.11236	0.27445	0.14099	
	HO (5%)	accepted	accepted	accepted	accepted	accepted	
<b>Manufacturing jobs are both interesting and rewarding.</b>	R	-0.13537	-0.04591	0.00831	-0.23308	0.12617	-0.15916
	R Standard Error	0.01818	0.01848	0.01852	0.01751	0.02094	0.01805
	t	-1.004	-0.33775	0.06106	-1.76129	0.87197	-1.18471
	p-value	0.31986	0.73688	0.95154	0.08365	0.38709	0.24132
	HO (5%)	accepted	accepted	accepted	accepted	accepted	accepted
<b>I would encourage my child to pursue a career in manufacturing.</b>	R	0.06426	-0.20504	-0.18981	-0.19318	0.00829	-0.12786
	R Standard Error	0.01844	0.01774	0.01785	0.01783	0.02128	0.01822
	t	0.47317	-1.53941	-1.42067	-1.44882	0.05684	-0.94733
	p-value	0.638	0.12954	0.16116	0.15373	0.95489	0.34789
	HO (5%)	accepted	accepted	accepted	accepted	accepted	accepted
<b>If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.</b>	R	-0.16619	-0.18445	-0.29272	-0.24981	-0.11544	-0.17972
	R Standard Error	0.01801	0.01789	0.01893	0.01736	0.02099	0.01792
	t	-1.22846	-1.37906	-2.24958	-1.89881	-0.79673	-1.34249
	p-value	0.2209	0.17356	0.02857	0.06334	0.4291	0.18505
	HO (5%)	accepted	accepted	rejected	accepted	accepted	accepted
<b>Manufacturing jobs are available and accessible within thirty miles of where I live.</b>	R	-0.06755	-0.5116	-0.06915	-0.10153	0.06251	-0.31681
	R Standard Error	0.01843	0.01367	0.01844	0.01833	0.02119	0.01666
	t	-0.49751	-4.37541	-0.4798	-0.75	0.42937	-2.45449
	p-value	0.62085	0.00008	0.63331	0.45651	0.66936	0.01736
	HO (5%)	accepted	rejected	accepted	accepted	accepted	rejected
<b>Manufacturing jobs are clean and safe.</b>	R	0.00074	-0.02924	0.20488	-0.19588	0.27887	-0.23484
	R Standard Error	0.01852	0.0185	0.01774	0.01781	0.01962	0.0175
	t	0.00547	-0.21499	1.5382	-1.46786	1.99079	-1.7754
	p-value	0.99565	0.83059	0.12984	0.14794	0.05157	0.08147
	HO (5%)	accepted	accepted	accepted	accepted	accepted	accepted
<b>Jobs in manufacturing are stable and secure relative to jobs in other industries.</b>	R	-0.2219	-0.19071	-0.07367	-0.09702	0.22926	-0.1535
	R Standard Error	0.01761	0.01785	0.01842	0.01834	0.02016	0.01808
	t	-1.67233	-1.4276	-0.54282	-0.7463	1.61477	-1.14149
	p-value	0.10024	0.15917	0.58949	0.47689	0.11219	0.2587
	HO (5%)	accepted	accepted	accepted	accepted	accepted	accepted
<b>The manufacturing industry is very important to my region's economic prosperity.</b>	R	-0.20219	-0.067	0.16851	-0.21275	0.02283	-0.23133
	R Standard Error	0.01776	0.01844	0.01799	0.01768	0.02127	0.01753
	t	-1.51713	-0.49344	1.25629	-1.6	0.15657	-1.74731
	p-value	0.13507	0.6237	0.21442	0.11543	0.87617	0.08627
	HO (5%)	accepted	accepted	accepted	accepted	accepted	accepted

Correlation Coefficients Matrix

Missing values removal

Pairwise deletion

		Manufacturing jobs are both interesting and rewarding.	I would encourage my child to pursue a career in manufacturing.	If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	Manufacturing jobs are available and accessible within thirty miles of where I live.	Manufacturing jobs are clean and safe.	Jobs in manufacturing are stable and secure relative to jobs in other industries.	The manufacturing industry is very important to my region's economic prosperity.
GENDER	R R Standard Error t p-value HO (5%)							
AGE RANGE	R R Standard Error t p-value HO (5%)							
LEVEL OF EDUCATION	R R Standard Error t p-value HO (5%)							
Do you currently work in manufacturing?	R R Standard Error t p-value HO (5%)							
Have you ever worked in manufacturing?	R R Standard Error t p-value HO (5%)							
Do you have any close friends or family members who / currently or formerly worked in the manufactu...	R R Standard Error t p-value HO (5%)							
Manufacturing jobs are both interesting and rewarding.	R R Standard Error t p-value HO (5%)	1.						
I would encourage my child to pursue a career in manufacturing.	R R Standard Error t p-value HO (5%)	0.62817 0.01121 5.93274 2.18565E-7 rejected	1.					
If I were starting my career now, I would be interested in entering a manufacturing skills vocational program.	R R Standard Error t p-value HO (5%)	0.68914 0.00972 6.98854 4.30042E-9 rejected	0.74537 0.00623 8.21614 4.42533E-11 rejected	1.				
Manufacturing jobs are available and accessible within thirty miles of where I live.	R R Standard Error t p-value HO (5%)	0.63881 0.01849 0.2707 0.78765 accepted	0.25744 0.01729 1.95776 0.05543 accepted	0.16211 0.01803 1.20723 0.2326 accepted	1.			
Manufacturing jobs are clean and safe.	R R Standard Error t p-value HO (5%)	0.32243 0.01659 2.50306 0.01537 rejected	0.27812 0.01709 2.12773 0.03794 rejected	0.12927 0.01821 0.95796 0.34235 accepted	0.26174 0.01725 1.99283 0.05134 accepted	1.		
Jobs in manufacturing are stable and secure relative to jobs in other industries.	R R Standard Error t p-value HO (5%)	0.32602 0.01678 2.36213 0.0218 rejected	0.41325 0.01536 3.33483 0.00155 rejected	0.43527 0.01509 3.50263 0.00093 rejected	0.09654 0.01835 0.71272 0.47969 accepted	0.20185 0.01776 1.51443 0.13575 accepted	1.	
The manufacturing industry is very important to my region's economic prosperity.	R R Standard Error t p-value HO (5%)	0.26033 0.01726 1.98136 0.06266 accepted	0.20453 0.01774 1.53543 0.13062 accepted	0.29721 0.01688 2.28744 0.02611 rejected	0.26462 0.01722 2.0164 0.04874 accepted	0.16044 0.01804 1.19448 0.23751 accepted	0.31304 0.0167 2.42211 0.01862 rejected	1.

## **Bibliography**

Adamic, Louis. 1931. "Tragic Towns of New England." *Harper's Monthly* (May 1931): 748-760.

"AMP It Up!" Mass Development, 2015, accessed August 19, 2015, <http://ampitupma.com/>.

Bluestone, Barry, A. Gartsman, D. Walsh, R. Eckel, J. Huessy, and A. Clayton-Matthews. 2012. "Staying Power II: A Report Card on Manufacturing in Massachusetts 2012." *Dukakis Center for Urban and Regional Policy. Northeastern University*.

Bluestone, Barry and Bennett Harrison. 1982. *The Deindustrialization of America*. New York: Basic Books, Inc.

Buhrmester, Michael, Tracy Kwang, and Samuel D. Gosling. 2011. "Amazon's Mechanical Turk a New Source of Inexpensive, Yet High-Quality, Data?" *Perspectives on Psychological Science* 6 (1): 3-5.

Clarke, Susan E. and Gary L. Gaile. 1998. *The Work of Cities*. Vol. 1 University of Minnesota Press.

Cumbler, John T. 1979. *Working-Class Community in Industrial America: Work, Leisure, and Struggle in Two Industrial Cities, 1880-1930*. Vol. 8 Westport, Conn.: Greenwood Press.

"Dream It. Do It." The Manufacturing Institute, 2015, accessed August 19, 2015, <http://www.themanufacturinginstitute.org/Image/Dream-It-Do-It/Best-Practices/Best-Practices.aspx>

English, Beth Anne. 2003. "A Common Thread: Labor, Politics and Capital Mobility in the Massachusetts Textile Industry, 1880-1934." Doctor of Philosophy, College of William and Mary.

Galesic, Mirta and Michael Bosnjak. 2009. "Effects of Questionnaire Length on Participation and Indicators of Response Quality in a Web Survey." *Public Opinion Quarterly* 73 (2): 349-360.

Giffi, Craig A. and Emily Stover DeRocco. 2011. *Unwavering Commitment: The Public's View of the Manufacturing Industry Today*. Deloitte; The Manufacturing Institute.

- Giloth, Robert. 1998. *Jobs & Economic Development*. Thousand Oaks, CA: Sage Publications.
- Harper-Anderson, Elsie. 2008. "Measuring the Connection between Workforce Development and Economic Development Examining the Role of Sectors for Local Outcomes." *Economic Development Quarterly* 22 (2): 119-135.
- Harris, Seymour Edwin. 1952. *The Economics of New England: Case Study of an Older Area*. Cambridge, MA: Harvard University Press.
- Koistinen, David. 2013. *Confronting Decline: The Political Economy of Deindustrialization in Twentieth Century New England*. Gainesville, FL: University Press of Florida.
- Koistinen, David. 2005. "Public Relations as Redevelopment Tool: Accentuating the Positive in Deindustrializing New England." *Business and Economic History Online* 3.
- Manufacturing Alliance of Connecticut. 2014. *Connecticut Manufacturing Industry Survey*.
- Manufacturing Day, Hollings Manufacturing Extension Partnership, 2015, accessed September 25, 2015, <http://www.nist.gov/mep/mfgday.cfm>.
- Mathur, Vijay K. 1999. "Human Capital-Based Strategy for Regional Economic Development." *Economic Development Quarterly* 13 (3): 203-216.
- "New Study to Determine Impact of Manufacturing Day." The Manufacturing Institute, accessed October 10, 2015, <http://www.themanufacturinginstitute.org/News-Articles/2015/10/02-MFG-Day-Survey.aspx>.
- Overell, Stephen. 2008. "Inwardness: The Rise of Meaningful Work." The Work Foundation, accessed November 29, 2015, [http://www.theworkfoundation.com/assets/docs/publications/32\\_inwardness\\_final.pdf](http://www.theworkfoundation.com/assets/docs/publications/32_inwardness_final.pdf).
- Paolacci, Gabriele, Jesse Chandler, and Panagiotis G. Ipeiros. 2010. "Running Experiments on Amazon Mechanical Turk." *Judgment and Decision Making* 5 (5): 411-419.
- Porter, Michael E. 1990. "The Competitive Advantage of Nations." *Harvard Business Review*.

- Ross, Joel, Lilly Irani, M. Silberman, Andrew Zaldivar, and Bill Tomlinson. 2010. "Who are the Crowdworkers?: Shifting Demographics in Mechanical Turk." ACM, .
- Russo, Richard. 2002. *Empire Falls*. New York: Vintage.
- Saxenian, AnnaLee. 1996. *Regional Advantage*. Cambridge, MA: Harvard University Press.
- Schrock, Greg. 2013. "Reworking Workforce Development Chicago's Sectoral Workforce Centers." *Economic Development Quarterly* 27 (3): 163-178.
- Scott, Robert E. 2015. "The Manufacturing Footprint and the Importance of U.S. Manufacturing Jobs." Economic Policy Institute, <http://www.epi.org/publication/the-manufacturing-footprint-and-the-importance-of-u-s-manufacturing-jobs/>
- Sudman, Seymour and Norman M. Bradburn. 1982. "Asking Questions: A Practical Guide to Questionnaire Design."
- Towles, John Ker. 1908. *Factory Legislation of Rhode Island*. Vol. 9 American Economic Association.
- "Women in Manufacturing," The Manufacturing Institute, 2015, accessed October 20, 2015, <http://www.themanufacturinginstitute.org/Initiatives/Women-in-Manufacturing/~media/9E6ED78EACB84084BD7A7C98B52B0E5C.ashx>.
- Wright, Gavin. 2010. "The New Deal and the Modernization of the South." *Federal History* 2: 58-73.
- "Young Manufacturers Academy," The Manufacturing Institute, 2015, accessed September 9, 2015, [http://www.themanufacturinginstitute.org/~media/8FC45DFC52CE42158C4C4A84A2E39B69/DIDI\\_YMA.pdf](http://www.themanufacturinginstitute.org/~media/8FC45DFC52CE42158C4C4A84A2E39B69/DIDI_YMA.pdf).