



Strengthening U.S. Manufacturing Through Public Procurement Policies

How Procurement Policies Can Promote Innovation and Good Jobs



Photo: Deanne Fitzmaurice

By Robert Pollin, James Heintz, and Jeannette Wicks-Lim

Department of Economics and Political Economy Research Institute
UNIVERSITY OF MASSACHUSETTS-AMHERST

DECEMBER 2015



Strengthening U.S. Manufacturing Through Public Procurement Policies

How Procurement Policies Can Promote
Innovation and Good Jobs

By Robert Pollin, James Heintz, and Jeannette Wicks-Lim

Department of Economics and Political Economy Research Institute
University of Massachusetts-Amherst

DECEMBER 2015

TABLE OF CONTENTS

Acknowledgments	vi
Policy Highlights of Study.....	1
Summary of Study	3
Introduction	11
The Challenges Confronting U.S. Manufacturing.....	14
The U.S. Railcar Industry and Buy America Program.....	34
Estimating Domestic Content and Employment.....	41
Advancing Manufacturing through Procurement Policies	53
Appendices.....	56
Endnotes.....	69
References	73
About the Authors.....	77

ACKNOWLEDGMENTS

Many people made valuable contributions to our work on this study. We are happy to take this opportunity to acknowledge them.

We begin with Madeline Janis, Director of the Jobs to Move America program. We undertook this study at Madeline's urging. She then gave us many thoughtful suggestions and raised valuable challenges to our thinking at various stages of our work. Linda Nguyen and Erika Patterson at Jobs to Move America conducted extensive research on many aspects of the U.S. Buy America program. We drew at length from their work, as should be clear at various parts of this study.

We were able to deepen our understanding on a range of issues from Susan Helper and Ryan Noonan, Chief Economist and Economist at the U.S. Commerce Department; Bryna Helfer, Director of Public Engagement at the U.S. Transportation Department; and Victor Ramirez, the Interim Executive Officer of Vendor/Contract Management at the Los Angeles County Metropolitan Transit Authority.

We received generous financial support on this project from Amy Kenyon, Program Officer from the Ford Foundation; Helen Chin and Shawn Escoffery, Program Directors from the Surdna Foundation; and Scot Spencer, Program Officer at the Annie E. Casey Foundation.

Kim Weinstein did her usual outstanding job of converting our multiple typescript files of text, tables, and figures into one clear, readable, well-organized document.

Among our PERI co-workers, Heidi Garrett-Peltier and Shouvik Chakraborty made important contributions to our quantitative modeling work to estimate both domestic content levels for U.S. railcar manufacturing and the employment effects of railcar investments. Emily Bloch was very helpful in copyediting the manuscript and organizing our communications efforts. Against stiff odds, Judy Fogg maintained something approximating coherence around the administration of this project, as she does with everything that happens at PERI.

Policy Highlights

This study advances a policy framework capable of supporting a major revival of the United States manufacturing sector. We are especially focused on the prospects for greatly expanding good job opportunities for U.S. workers that would result through the revival of the U.S. manufacturing sector. We focus, further, on using one set of policy tools—U.S. public sector purchases of manufactured goods, or procurement policies—to promote growth and expanding job opportunities within one manufacturing industry, i.e. the production of railcar transportation equipment. We show how some significant, though still straightforward, reforms of the official U.S. Department of Transportation (DOT) procurement program known as Buy America are capable of generating major benefits to domestic railcar manufacturers as well as to workers in this sector.

Of course, improving the DOT's Buy America program is only one of several policy initiatives that are needed to support a U.S. manufacturing revival, in the railcar industry and more generally. Other important measures that are needed in behalf of the U.S. manufacturing sector include 1) research and development support; 2) targeted credit policies; 3) better job training programs and job ladders within firms; and 4) more support for developing regional manufacturing eco-systems, which help form mutually supportive local supply chains.

Procurement policies can play a central role among these various initiatives. This is because they are the means through which the government can help establish more stable domestic markets for U.S. manufacturing firms. This, in turn, enables the firms to operate with longer time horizons, which creates an environment supportive of innovation and building a skilled and stable workforce.

We reach the following main conclusions with respect to the Buy America procurement program as it operates presently throughout the U.S.:

- 1 Domestic content standards are too low.** The official domestic content requirements include 60 percent domestic production for components and 100 percent for final assembly in railcar manufacturing. But as we show, these standards amount to an overall requirement of only 40 percent domestic production. That is, up to 60 percent of production can be provided by imports.
- 2 Monitoring and enforcement standards are too weak.** The monitoring and enforcement levels for even these low domestic content requirements are weak. Moreover, few local transit agencies have adequate capacity to conduct audits in-house and public interest groups face major obstacles in obtaining relevant compliance information.
- 3 Too many waivers are granted.** The available evidence suggests that the Department of Transportation has been too willing to grant waivers to contractors bidding on transportation procurement projects covered under Buy America. The Department of Transportation needs to keep systematic records on waiver applications and decisions and to establish consistently high thresholds for granting waivers.

- 4 Lowest-price standards are too narrow.** Procurement contracts under Buy America are predominantly awarded to firms offering the lowest-price bids. This pattern suggests that the broader benefits generated by domestically-based manufacturing projects are likely being undervalued. These are tangible benefits that accrue to U.S. taxpayers—in terms of strengthening innovative manufacturing firms in the U.S., as well as generating more jobs, better jobs, and better access to job opportunities, including for women, minorities and recent labor market entrants with lower formal credentials. The U.S. Employment Plan developed initially in 2010 by the Los Angeles County Metropolitan Authority demonstrates how these other important considerations can be readily incorporated into an employment-enhanced best-value evaluation system.

From a broader perspective, we conclude that strengthening the DOT's Buy America procurement policies, and combining these stronger policies with employment-enhanced best-value contract evaluation criteria, can make major contributions toward promoting a revival of the manufacturing sector in the United States and creating millions of good manufacturing jobs for U.S. workers.

Summary

The purpose of this study is to advance a policy framework capable of supporting a major revival of the United States manufacturing sector. We are especially focused on the prospects for greatly expanding good job opportunities for U.S. workers that would result through the revival of the U.S. manufacturing sector.

Even more specifically, this study focuses on using one set of policy tools—U.S. public sector purchases of manufactured goods, or *procurement policies*—to promote growth and expanding job opportunities within one manufacturing industry, i.e. the production of railcar transportation equipment. We show how some significant, though still straightforward, reforms of the official U.S. Department of Transportation procurement program known as Buy America are capable of generating major benefits to domestic railcar manufacturers as well as to workers in this sector.

Overall, state, municipal and the federal government in the United States constitute the largest single purchaser of goods and services in the world. In 2013, total government purchases amounted to \$1.1 trillion, equal to 6.5 percent of U.S. GDP. Manufacturing procurement contracts alone were at approximately \$400 billion, which was 2.4 percent of U.S. GDP and roughly equal to the entire GDP of Austria that year. Our aim is to show how the U.S. public sector can utilize this tremendous resource to promote the revival of U.S. manufacturing and expand good job opportunities. This includes a resurgence of manufacturing in regions of the U.S. that have been badly hurt by declines in their manufacturing sectors over the past generation.

We argue that initiatives to significantly improve the Buy America program should be seen as one critical component of a broader set of policies for reviving U.S. manufacturing. This broader policy framework for reviving manufacturing needs to include support for research and development in manufacturing innovation; financial policies capable of delivering affordable credit for manufacturing investors; effective job training and job ladder programs; increased manufacturing job opportunities for women, minorities, and new labor market entrants with lesser credentials; and the strengthening of regional manufacturing eco-systems, which help develop mutually supportive local supply chains.

But within this full set of manufacturing sector initiatives, we argue that procurement policies can make uniquely important contributions. This is because procurement policies can be undertaken rapidly and can therefore have a major positive impact within a 3- to 5-year period. As such, procurement policies can serve as a catalyst to promote a more comprehensive set of initiatives to revive manufacturing in the United States economy.

In addition to an introductory Section 1, this study is divided into four sections: The Challenges Confronting U.S. Manufacturing; The U.S. Railcar Industry and Buy America Program; Estimating Domestic Content and Employment Impacts; and Advancing Manufacturing through Procurement Policies. This summary gives a brief overview of the full study.

THE CHALLENGES CONFRONTING U.S. MANUFACTURING

The U.S. economy continues to face enormous questions and challenges in attempting to fully recover from the financial crisis and Great Recession of 2007-09. One fundamental question is: Can the U.S. economy establish a growth engine whose foundation is something other than financial bubbles—that is, the types of excessive financial speculation that drove growth in the late 1990s, before the 2001 recession; and most emphatically, from 2002-07, before the financial crash and Great Recession?

We need to focus on the U.S. manufacturing sector in addressing this question. Since the early 1980s, leading analysts from across the political spectrum have consistently expressed alarm over the decline of U.S. manufacturing. The main patterns identified by these authors include: 1) the sharp declines in former manufacturing strongholds, most dramatically the U.S. auto industry, but more broadly throughout both what is now termed the “rustbelt” Midwest and Northeast, as well as the South; 2) the losses of millions of manufacturing jobs, including 5 million jobs lost between 2000 and 2014; and 3) the persistent U.S. manufacturing trade deficit—i.e. the pattern of the U.S. economy importing far more manufactured products than it is selling as exports to other countries.

These analysts argue that a revival of the manufacturing sector is critical to establishing a healthy long-term U.S. growth trajectory. A revived manufacturing sector could generate millions of good jobs in all regions of the country and reduce the country’s trade deficit. A strong manufacturing sector is also necessary to advance technical innovation in the U.S. economy. This is because producing manufactured goods is the most important site in which technical innovations—the fruits of investment in research and development—are tested, refined, commercialized and ultimately integrated into the overall stream of economic activity.

The rise of outsourcing and offshoring have been major factors behind the U.S. manufacturing decline. Outsourcing refers to U.S. companies choosing to subcontract out part of their operations, as opposed to undertaking that operation in-house. Offshoring refers to when U.S. firms conduct their outsourcing operations in other countries. The most careful empirical research on these patterns finds that offshoring led to a drop of 3.5 million full-time equivalent jobs between 1998 and 2006 as well as a substantial rise in overall income inequality.

At the same time, not all indicators on U.S. manufacturing are negative. For example, as of 2013, U.S. manufacturing production was at \$2.2 trillion, greater than all other countries other than China, and greater than the total GDP of all but five other countries. U.S. manufacturing exports alone were at \$1.6 trillion, a level that is itself greater than the total GDP of all but 11 countries. The range of U.S. manufacturing exports is also wide, including automobile vehicles, parts, and engines; civilian aircrafts; medical equipment; pharmaceutical products; industrial engines; plastic materials; and cell phones. This is despite the fact that U.S. manufacturing imports remain substantially greater than exports. In addition, major innovations have emerged out of the U.S. manufacturing sector in recent decades, especially in various high-tech fields, including information and communications, electronics, flexible manufacturing, aerospace, and medical diagnosis.

Finally, there is already evidence of a reversal of the longstanding offshoring trend, with early signs of a reverse *onshoring*, or *reshoring* pattern beginning to emerge. The main driver of this reshoring trend is that some major manufacturing firms, such as General Electric, are finding that, increasingly, they can produce at competitive cost levels through U.S.-based operations. This is especially

significant since the main factor behind the offshoring trend was that firms such as General Electric were convinced that they could significantly lower their overall costs by producing in other countries, including especially China and other low-wage countries.

We examine a range of evidence on these issues. For example, we consider the sharply varying perspectives over whether the reshoring pattern is likely to become significant on its own, without the support of major policy interventions. Our conclusion is that the reshoring pattern remains modest, and is not likely to gain significant momentum on its own. We therefore conclude that active and effective public policies are needed to deliver a true U.S. manufacturing revival.

What are the key policy areas that need to be strengthened? The German economy has been highly successful over the past two decades in advancing production and exports for its manufacturing sector, even while average manufacturing labor costs are 30 percent higher than those in the U.S. Several researchers, including Susan Helper, the current Chief Economist at the U.S. Commerce Department, have identified four main elements behind the successful German model: These include: 1) the federal government has provided strong support for research and development; 2) German workers and employers benefit from a system of continuous vocational training; 3) German manufacturing firms enjoy stable access to finance; and 4) steady worker protections ensure German employers and unions work together to adopt high-road solutions that strengthen competitiveness in the long term.

Building in part from the German experience, the MIT political scientist Suzanne Berger, advances policy ideas focused on the issue of promoting manufacturing innovation at all levels of the U.S. economy—among both high-tech as well as Main Street firms. Across all types of firms, Berger describes the need for policies that engage a wide range of actors in the economy, not just government initiatives. The types of public and private sector measures that she emphasizes include “incentivizing efforts to bring together existing but isolated actors; connecting schools that are educating future workers with the employers who hire them; pooling and reducing the risks associated with developing new technologies; getting the benefits of economies of scale by sharing facilities too expensive for any but the largest firm to have in-house; and creating and diffusing technology before there’s a clear path to commercializing it or a firm willing to commit to developing it.” Berger herself does not explore the role of procurement policies as one government policy tool that can serve to “convene, coordinate, and reduce risk by pooling risk.” But producing a well-structured, stable market with long-term horizons and that is consistently supportive of U.S. manufacturing development can play a central role in “reducing risk by pooling risk.”

This becomes clear through the research of the economist Vernon Ruttan, who explicitly examines the role of procurement policies in advancing manufacturing innovation as one central factor in promoting the U.S. economy’s long-term development. Ruttan’s particular focus is how, *operating in combination*, R&D and procurement policies worked effectively within the U.S. military to produce major breakthroughs—indeed spectacular innovations—in the technological development and commercialization of manufactured products. Over the past century, these military-based innovations included nuclear energy and electric power; jet aviation; the computer industry; the space industries; and the internet. Ruttan also makes clear that the history of manufacturing innovation that he describes emerging out of U.S. military-based industrial policies also has broader applicability in other manufacturing sectors, such as agriculture and biotech.

The policy challenge now is to utilize procurement policies in the most effective way to strengthen the broader effort in support of a U.S. manufacturing revival.

THE U.S. RAILCAR INDUSTRY AND BUY AMERICA PROGRAM

In this section, we focus on the role of procurement policies as they operate within the U.S. railcar manufacturing sector. We address broad considerations on both the long-term and more recent trajectories of the U.S. railcar manufacturing sector as well as detailed issues around Buy America procurement policies as they apply to railcar manufacturing.

During the early 20th Century, the United States was a global leader in the intercity passenger rail industry. Innovations of the U.S. passenger rail industry in the first part of the 20th Century were strongly supported by federal funding, in particular, funds from the New Deal Public Works Administration. But beginning in the mid-1950s, the federal government shifted its infrastructure spending priorities away from intercity passenger travel, focusing instead on the development of highways and airports. Passenger rail equipment manufacturers started sourcing parts globally, hollowing out their domestic supply chain. As a consequence, the U.S. industry was unable to keep pace with rail manufacturing innovations in other countries. In addition, smaller U.S. manufacturers of components, such as castings, parts, and wirings, shifted their focus away from rail manufacturing in favor of the auto and aerospace industries.

At present, none of the world's largest rail equipment manufacturers are U.S.-based companies. In the U.S., the lack of public sector support for the industry contributed to the decline in the quality of equipment and the service provided. In response to this decline, the U.S. Department of Transportation (DOT) introduced Buy America as a provision of the 1982 Surface Transportation Act, later codified in Title 49 of the United States Code. The Buy America standards apply to a wide range of activities within the DOT's administrative domain. We focus here on the operations of Buy America, as it operates specifically under the Federal Transit Administration's (FTA) provisions. These are the measures that apply to the production of buses and rolling stock for U.S. public procurement projects.

The two basic features of the FTA Buy America program are that 1) At least 60 percent of all railcar components must be produced in the United States; and 2) 100 percent of all final assembly of railcars be performed in the United States. In principle, these procurement requirements should provide significant benefits to U.S. railcar manufacturers. However, in practice, the Buy America program is weaker than these basic outline features suggest.

First of all, as we show, the actual level of domestic content required for overall railcar manufacturing procurement projects is only 40 percent. This is, first, because of the specifics through which subcomponents are determined as being either domestically produced or imported; and, second, because design and administration activities are exempt from Buy America requirements. In addition, monitoring and enforcement activities are inadequate, in part because the regional agencies charged with enforcement do not have sufficient staffing and expertise to perform this work adequately. Manufacturers have also been able to regularly obtain waivers from the Buy America requirements.

Another significant problem with procurement policies beyond the Buy America program itself results through government agencies adopting a "lowest price, technically acceptable" evaluation procedure for awarding procurement contracts. Under this framework, the firm offering the proposal with the lowest bottom line wins the contract, as long as it also meets the minimal technical require-

ments as a manufacturer. The goal with this approach is to minimize the direct costs to government agencies, and thereby ultimately to taxpayers, of a procurement project. But this approach is likely to overlook other important considerations. These other considerations may include the past performance record of the contractor offering the lowest bid. They could also include broader social and economic factors, such as the job opportunities, opportunities for small and minority-owned businesses, and positive community spillover impacts of various proposals from any given procurement contract.

An alternative evaluation procedure is the “best-value” approach. Under the best-value approach, additional criteria—such as the past performance of firms and employment impacts—can be formally integrated into the evaluation process. Interest in the use of best-value procurement has been rising in recent years. Nevertheless, in actual practice over recent years, most railcar manufacturing contracts in the U.S. have continued to be awarded to the lowest price bidder.

There have also been recent important developments in integrating employment criteria into best-value evaluations. The Los Angeles County Metropolitan Transit Authority, in particular, has been an innovator in expanding the best value standards to include employment impacts of procurement projects. In 2010, LA MTA created what they termed a “U.S. Employment Program” that required all firms bidding on public procurement contracts to estimate how many jobs they would create for U.S. workers and to explain how they would open job opportunities as widely as possible. Similar employment criteria have also been recently incorporated into proposal evaluations by Amtrak, the Chicago Transit Authority and the Maryland Transportation Authority.

ESTIMATING DOMESTIC CONTENT AND EMPLOYMENT IMPACTS

In this section, we first review a range of evidence on the actual level of domestic content in public procurement contracts for railroad rolling stock. We then estimate the job impacts of public investments in this sector of the economy.

For estimating domestic content levels, we consider evidence both from the U.S. Department of Commerce statistical tables as well as from audits submitted by firms competing for procurement contracts that fall under the Buy America requirements. We find from this review that, on average, overall domestic content level for U.S. railcar manufacturing under public procurement is about 60 percent—that is, about 20 percentage points higher than the 40 percent minimum required under Buy America. We work with this result both in terms of estimating employment impacts of domestic content requirements as well as addressing broader policy issues around strengthening Buy America.

Among other considerations, we show that, even if the average level of domestic content is around 60 percent for Buy America procurement contracts, it is still possible for this percentage to fall well below this average figure. We review one important case in point. This was a large contract to build railcars for a major urban metropolitan transit authority. For various reasons, the names of the specific transit agency involved as well as the firms that bid on the contract need to remain anonymous. In fact, such details are unimportant for the purposes of our research, while the bidding patterns and outcome of the process are quite significant. As we show, it is clear in this case that the domestic

content level for the company that received the contract was almost certainly substantially below that of one of its major competitors.

The importance for overall community welfare of higher domestic content levels becomes clear in evaluating job creation levels under varying domestic content levels. We show that raising domestic content levels for railcar manufacturing projects from 40 to 60 percent will increase U.S. job creation by nearly 30 percent. If we were to strengthen Buy America by increasing the domestic content level to 90 percent in railcar manufacturing, the impact would be to raise job creation by 71 percent relative to a 40 percent domestic content standard and by 33 percent relative to a 60 percent standard.

We also examine the quality of jobs generated by railcar manufacturing investments. We find that, on average, manufacturing jobs are higher quality than the average job within the U.S. labor market. Average wages, first, are 13 percent higher. In addition, between 12 and 15 percent more workers hold full-time jobs, receive health insurance and retirement benefits from their jobs. Jobs generated through railcar manufacturing investments also offer greater opportunities than average for raises and advancement among workers having low formal educational credentials.

However, we also found that jobs generated by railcar manufacturing investments offer fewer opportunities for non-white and/or Latino workers and for women than average. Especially because these jobs do have a history of providing better wages and benefits than average, it is important that procurement policies include provisions that promote equal access for groups that have been under-represented in these sectors.

ADVANCING MANUFACTURING THROUGH PROCUREMENT POLICIES

The various perspectives that we review in the previous sections of this study lead us to some clear overarching conclusions. First, Buy America standards need to be raised above the current effective threshold of 40 percent. It is beyond the scope of this study to recommend what the appropriate threshold should be, but it is a question that could be effectively answered through further research. In addition, Buy America needs to operate with higher monitoring and enforcement standards, and with more stringent requirements for granting waiver requests.

The fact that, as a national average, actual current domestic content levels for transportation procurement are above 40 percent—and are probably closer to about 60 percent—does not mean that the Buy America standards are adequate. The 60 percent domestic content average still means that many projects will be below this average figure, as is almost certainly the case with the major project that we discuss above and review in some detail later in the study.

In addition, even if the current average level of domestic content is within the range of 60 percent, we do not have in place a sufficiently supportive policy environment to maintain that average current domestic content level moving forward, much less prevent the domestic content share from falling to lower levels. U.S. manufacturing today is hovering between two distinct future trajectories. The U.S. has lost approximately 5 million manufacturing jobs since 2000, and the primary cause of these job losses has been offshoring. There is also a modest reshoring pattern emerging among U.S. manu-

facturers, as the overall cost gap between production overseas versus production in the U.S. may be diminishing in some situations. But it is not clear which tendency—further offshoring and job losses or reshoring and job gains—will become stronger over time.

This is precisely where effective policy interventions on behalf of U.S. manufacturing in general, and railcar and rolling stock manufacturing in particular, remain critical. The establishment of a higher Buy America threshold should be supported by complementary policies that can help increase the number of domestic firms that are able to compete effectively for manufacturing procurement projects. As mentioned above, these policies should include 1) research and development support; 2) targeted credit policies; 3) better job training programs and job ladders within firms; and 4) more support for developing regional manufacturing eco-systems, which help form mutually supportive local supply chains.

Procurement policies play a central role among these other initiatives, because procurement policies are the means through which the government can help establish more stable domestic markets for U.S. manufacturing firms. This, in turn, enables the firms to operate with longer time horizons, which creates an environment supportive of innovation and building a skilled and stable workforce. It is equally critical that the benefits of a U.S. manufacturing revival be shared as widely as possible. This is why procurement policies need to work within a best-value evaluation system as opposed to a lowest-cost system. In addition, a U.S. Employment Plan, as pioneered by the LA Metropolitan Transit Authority and, to date, adopted as well in Chicago, Maryland and with AMTRAK, strengthens the best-value framework.

Considered overall, the project of strengthening the Department of Transportation's Buy America procurement policies, and combining these stronger policies with employment enhanced best-value contract evaluation criteria, can make major contributions toward promoting a revival of the manufacturing sector in the United States and creating millions of good manufacturing jobs for U.S. workers.

Introduction

The purpose of this study is to advance a policy framework capable of supporting a major revival of the United States manufacturing sector. We are especially focused on the prospects for greatly expanding good job opportunities for U.S. workers that would result through the revival of the U.S. manufacturing sector.

Even more specifically, this study focuses on using one policy tool—U.S. public sector purchases of manufactured goods, or *procurement policies*—to promote growth and expanding job opportunities within one manufacturing industry, i.e. the production of railcar transportation equipment. We show how some significant, though still straightforward, reforms of the official U.S. Department of Transportation procurement program known as Buy America are capable of generating major benefits to domestic railcar manufacturers as well as to workers in this sector.

Overall, state, municipal and the federal government in the United States constitute the largest single purchaser of goods and services in the world. In 2013, total government purchases amounted to \$1.1 trillion, equal to 6.5 percent of U.S. Gross Domestic Product (GDP). Manufacturing procurement contracts alone were at approximately \$400 billion, which was 2.4 percent of U.S. GDP and roughly equal to the entire GDP of Austria that year.¹ Our aim in this study is to show how the U.S. public sector can utilize this tremendous resource in the most effective ways possible to promote the revival of U.S. manufacturing and expand good job opportunities. This includes a resurgence of manufacturing in regions of the U.S. that have been badly hurt by declines in their manufacturing sectors over the past generation.

A program to significantly improve the Buy America program should be seen as one critical component of a broader set of policies for reviving U.S. manufacturing. This broader policy

framework for reviving manufacturing needs to include support for research and development in manufacturing innovation; financial policies capable of delivering affordable credit for manufacturing investors; effective job training and job ladder programs; increased manufacturing job opportunities for women, minorities, and new labor market entrants with lesser credentials; and the strengthening of regional manufacturing eco-systems, which help develop mutually supportive local supply chains.

A vibrant literature exploring this range of policy approaches has emerged in recent years. We briefly review some of the important contributions to this literature in what follows. We conclude from this review that, among the other policy measures, strengthening U.S. procurement policies in support of a manufacturing revival can make uniquely important contributions. This is because procurement policies alone have the capacity to create both a growing and stable market environment for U.S. manufacturers. This, in turn, enables firms to plan, innovate, build mutually supportive relationships with other local manufacturers, and commit long-term to their workforce. As such, strengthening of U.S. manufacturing procurement policies can provide foundational support for a fuller set of policy initiatives aimed at reviving U.S. manufacturing.

Expanding public railcar manufacturing represents an especially important area for manufacturing growth since it entails a rising commitment to public transportation in the U.S. As such, public railcar investments serve as one major element of the larger ecological project—i.e. to transform the U.S. transportation infrastructure so that it operates at much higher levels of energy efficiency while relying increasingly on clean renewable energy sources for power.² The fact is that, in the U.S. and throughout the world, we have no choice but to dramatically re-

duce greenhouse gas emissions that are producing climate change. The U.S. must embrace this project most aggressively, since, on a per capita basis, we produce emissions at much higher levels than even most other advanced economies. Building more clean-energy powered railcars, as well as more clean-energy powered buses, and ensuring that more people utilize such high-quality public transportation modes, can make a major contribution in support of global climate stabilization.

We believe that the most desirable and sustainable growth trajectory moving forward is one in which expanding job opportunities at rising wages in all countries will provide the foundation for buoyant markets in those countries.

We need to clarify one other issue before proceeding further. This study is about ways to improve U.S. procurement policies so that they can successfully support a U.S. manufacturing revival. Yet we are by no means opposed to foreign manufacturers succeeding and creating good jobs for workers in their own countries. Quite the contrary: Especially with respect to many developing countries, we applaud the fact that average living standards and job opportunities have improved dramatically because manufacturers in these countries have been successful in selling exports in the U.S. and global markets.³ Still, as an overarching policy framework, we believe that the most desirable and sustainable growth trajectory moving forward is one in which expanding job opportunities at rising wages in all countries will provide the foundation for buoyant markets in those countries.

In addition, it is appropriate that the majority of public procurement spending within the United States be channeled into the communities in which the taxpayers themselves reside. This is the justification for procurement policies

such as Buy America that set limits on the extent of imported versus domestically produced manufactured products. But how far to go with such standards cannot be determined by appeals to general principles—either that U.S. taxpayer-funded projects should *only* purchase U.S.-made products, or that publicly-funded projects should be free of any Buy America provisions. We want to ensure that U.S. procurement policies, in combination with other measures, do indeed create increased opportunities for U.S. manufacturing firms to compete effectively within the U.S. market and globally. But what if some U.S. businesses still are unable to compete against foreign producers, even after receiving these policy advantages? Certainly at that point, these U.S. firms should not be given further advantages relative to foreign manufacturers.

These broader questions of a fair and well-functioning global trade regime are beyond the scope of this study. But it is important to keep such matters in mind within our more narrow context of considering the most effective ways of supporting a U.S. manufacturing revival.

The rest of this study proceeds as follows. Section 2 is titled “The Challenges Confronting U.S. Manufacturing.” We examine here the overall state of U.S. manufacturing, including the fact that the U.S. economy has lost 5 million manufacturing jobs since 2000. We also present evidence on the persistent U.S. trade deficit since 1976, and the growth in that deficit through offshoring. We then consider evidence on overall U.S. manufacturing production, productivity growth, innovations, and manufacturing labor costs relative to those in other countries. Within this context, we examine the extent to which a “reshoring” trend has already begun in earnest among U.S. manufacturers, as has been argued by some industry leaders and analysts. Following from these discussions, we next examine alternative policy approaches for supporting a U.S. manufacturing revival. It is within the framework of this discussion that the centrality of procurement policies becomes clear.

Section 3 is titled “The U.S. Railcar Industry and ‘Buy America’ Program.” In this section, we first provide some historical background on the U.S. industry. In particular, we discuss how the industry has experienced a long-term decline from a position of global dominance in the first half of the 20th Century. Since the second half of the 20th Century, U.S. public policies have not supported this industry. This was while policies in several other countries did provide major forms of support. We then consider the establishment of the Buy America program in 1982 within the Federal Transit Administration at the Department of Transportation and how this policy has operated in practice since then. We focus on three basic problems with Buy America as it has been practiced to date: 1) domestic content standards are too low; 2) monitoring and enforcement standards are too weak; and 3) waivers from the requirements of the law are provided too readily. As a related point, we also argue that the lowest-price contract evaluation system with Buy America project bids overlooks the broader benefits generated by domestically-based manufacturing projects. An alternative “best-value” evaluation system enables government bodies to take account of these broader benefits, including the expansion of job opportunities and the sharing of these increased opportunities broadly.

We next present evidence on the actual levels of domestic content for public railcar manufacturing projects and the effects that varying

levels of domestic content have on generating jobs for U.S. workers. Our major findings are that raising domestic content requirements will lead to significant increases in job opportunities. Of course, as we also show, the extent of any such job impacts will also increase as the level of spending on railcar production rises. We also find that, on average, jobs created through railcar manufacturing investments are of higher quality than the average job within the U.S. labor market—specifically, that wages are higher; benefits are more extensive and generous; and more jobs provide advancement opportunities among workers with lower formal credentials. But we also find that jobs generated by railcar manufacturing investments offer fewer opportunities for non-white and/or Latino workers and for women. Especially because these jobs do have a history of providing better wages and benefits than average, it is important that procurement policies include provisions that promote equal access for groups that have been underrepresented in these sectors.

In the concluding Section 4, we review the range of findings and policy proposals that we have developed throughout the study. Overall, we find that the project of strengthening the Department of Transportation’s Buy America procurement policies and combining these stronger policies with best-value contract evaluation systems can make major contributions toward promoting a revival of U.S. manufacturing and creating millions of good manufacturing jobs for U.S. workers.

The Challenges Confronting U.S. Manufacturing

The U.S. economy continues to face enormous questions and challenges in attempting to fully recover from the financial crisis and Great Recession of 2007-09. Some of these questions are focused within the standard framework of macroeconomic policy. They include: What is the appropriate level of federal deficit spending and public debt that would support an effective public sector, financial stability, and a healthy economic growth trajectory? At what point should the Federal Reserve begin to prioritize inflation control as opposed to employment expansion? How do we define full employment, and what is the best combination of tools to sustain the economy at this properly defined full employment level?

But equally challenging are a series of structural challenges. The most fundamental one is: can the U.S. economy establish a growth engine whose foundation is something other than financial bubbles—that is, the types of excessive financial speculation that drove growth in the late 1990s, before the 2001 recession; and most emphatically, from 2002-07, before the financial crash and Great Recession?

In addressing this fundamental question, we need to bring concentrated attention to the U.S. manufacturing sector. For roughly two generations now, widespread alarm has been expressed over the decline of U.S. manufacturing. Such concerns were forcefully presented, for example 33 years ago in the classic 1982 book, *The Deindustrialization of America* by the U.S. economists Barry Bluestone and Bennett Harrison. They introduce their book in terms that remain applicable today:

Underlying the high rate of unemployment, the sluggish growth in the domestic economy, and the failure to successfully compete in the international market is the deindustrialization of America. By deindustrialization is meant a widespread systemic divestment in the nation's basic

productive capacity....The essential problem with the U.S. economy can be traced to the way capital—in the form of financial resources and of real plant and equipment—has been diverted from productive investment in our basic national industries and into unproductive speculation, mergers and acquisitions, and foreign investment. Left behind are shuttered factories, displaced workers, and a newly emerging group of ghost towns (1982, p. 6).

Similarly, five years later, in 1987, Stephen S. Cohen and John Zysman, scholars from the UC Berkeley Roundtable on the International Economy published *Manufacturing Matters: The Myth of the Post-Industrial Economy*. They began their book as follows:

Manufacturing matters. Manufacturing is critical to the health of the economy; lose manufacturing and you will lose—not develop—high-wage service jobs. The wealth and power of the United States economy would decline drastically if major segments of manufacturing were to shut down or to move offshore....America is not adjusting well to the changes in the world economy. Evidence from a variety of indicators and perspectives suggests serious competitiveness problems....Manufacturing capabilities are decisive to the competitiveness of industrial firms; over time, you can't control what you can't produce. American firms will have to give priority to redeveloping their productive skills (p. xiii – xiv).

Another five years later, in 1992, the National Research Council again raised these same concerns. Their study, titled *Dispelling the Manufacturing Myth* begins as follows:

U.S. firms have lost market share in industries they once dominated, such as consumer electronics, semiconductors, and automobiles....

American manufacturers have been steadily locating manufacturing capacity offshore over the past two decades to serve both foreign and domestic markets (p. 9).

We can then move forward 21 years, to 2013, to a study, *Making in America* by the MIT political scientist Susan Berger, which summarizes the research of an interdisciplinary team at MIT on “Production in the Innovative Economy” (PIE). Berger’s book opens as follows:

Over the past decade, as millions of jobs disappeared in a flood of Asian imports and a severe financial and economic crisis, pessimism about the future of production in the United States swept across the country. People started to question whether U.S. manufacturing could ever compete with Asian low-wage production... Everyone agreed that the United States needed a higher rate of good job creation, but no one seemed to know where jobs could come from... What could Americans do to leverage their strengths in new science and technology to rebuild a dynamic economy? Would production capabilities at home be needed to capture the flow of benefits from invention and entrepreneurship? Which capabilities? And how could they be created and sustained? (p. 1).

WHY MANUFACTURING MATTERS

There is a key premise underlying the range of studies describing the decline of U.S. manufacturing since the 1970s: that a healthy manufacturing sector is critical to the success of the overall U.S. economy. As the passages cited above convey in various ways, there are three basic reasons why a revival of manufacturing is critical to establishing a healthy long-term U.S. growth trajectory. They are:

1 Innovation. Producing manufactured goods is the most important site in which

technical innovations—the fruits of investment in research and development—are tested, refined, commercialized and ultimately integrated into the overall stream of economic activity.

2 Jobs. The manufacturing sector has been the most important sector producing relatively good jobs for U.S. workers, in particular for those workers who are highly skilled but do not necessarily have extensive formal educational credentials.

3 U.S. trade balance. Most global trade still is based on importing and exporting manufactured products. The relative decline of U.S. manufacturing has created a persistent U.S. manufacturing trade deficit, with our manufactured imports far exceeding our exports.

Given these three ways in which manufacturing is central to U.S. economic well-being, it then also follows that a decline in U.S. manufacturing has meant a loss of innovative capacity; a decline in the availability of good jobs; and persistent problems with the U.S. trade balance. It correspondingly follows that a manufacturing revival would also then support greater innovation, more good job opportunities for U.S. workers, and a healthier U.S. trade situation for the long run.

MEASURES OF U.S. MANUFACTURING DECLINE

The studies cited above also share a common broad perspective as to the main indicators of U.S. manufacturing decline, as this pattern has proceeded over roughly the past 30 years. These are: 1) the sharp declines in former manufacturing strongholds, most dramatically the U.S. auto industry; 2) the losses of millions of good jobs; and 3) the persistent U.S. manufacturing trade deficit—i.e. the pattern of the U.S. economy

importing far more manufactured products than it is selling as exports to other countries. We discuss each of these briefly in turn.

Industries and Communities in Crisis

The most visible case of industrial and community decline is with the U.S. auto industry. As of 1950, about 95 percent of cars sold in the U.S. were made by U.S. companies. Sixty years later, more than half of all cars sold in the U.S. were built by foreign manufacturers. U.S. car manufacturers reached a low point in 2009, when General Motors and Chrysler faced bankruptcy and had to be bailed out by the federal government to avoid shutting down altogether. The federal government took over majority ownership of GM at that time. The government completed the sale of its GM shares to private ownership in December 2013.⁴

The U.S. auto industry's decline is also reflected in the figures on employment levels for U.S. auto workers. As of 2000, the U.S. auto industry employed 1.3 million workers in manufacturing. As of July 2009, during the Great Recession, that figure had fallen by half, to 624,000. There has been a significant recovery in auto manufacturing employment since the end of the recession. But even with that, as of April 2015, auto manufacturing was at 911,000. That is, six years after the recession had officially ended, there were still 420,000 fewer U.S. workers employed in auto manufacturing relative to 2000—a 32 percent decline.

The contraction of the U.S. auto industry is symbolized by the decimation of Detroit, which, 40 years ago, had been the nerve center of the auto industry as well as a thriving cultural hub. Detroit's population peaked in 1950 at 1.8 million and was still at 1.5 million as of 1970 and 1.2 million as of 1980. As of 2010, Detroit's population had fallen to 714,000, i.e. less than half of the 1970 figure. As of 2009, the Detroit Residential Parcel Survey had found that 91,000 lots and nearly 34,000 houses were vacant. This meant that more than 25 percent

of the city's nearly 344,000 lots had either no structures or no inhabitants (Smil, p. 140). The city declared bankruptcy in 2012, carrying \$12 billion in debt.

This well-known trajectory for the U.S. auto industry and the City of Detroit has been experienced in other industries as well, including electronics, textiles, shoes, furniture, car parts, steelmaking and metalworks. Indeed, in these cases, the declines have been even more dramatic, since, unlike GM and Chrysler, the firms in these other manufacturing sectors were not considered “too big to fail” and therefore did not receive government bailouts. Further, the communities that had been dependent on these industries have also faced major declines, including large cities such as Cleveland; medium-sized cities such as Youngstown, Ohio, and Gary, Indiana; and smaller communities such as Spartanburg, South Carolina, and Kannapolis, North Carolina.⁵

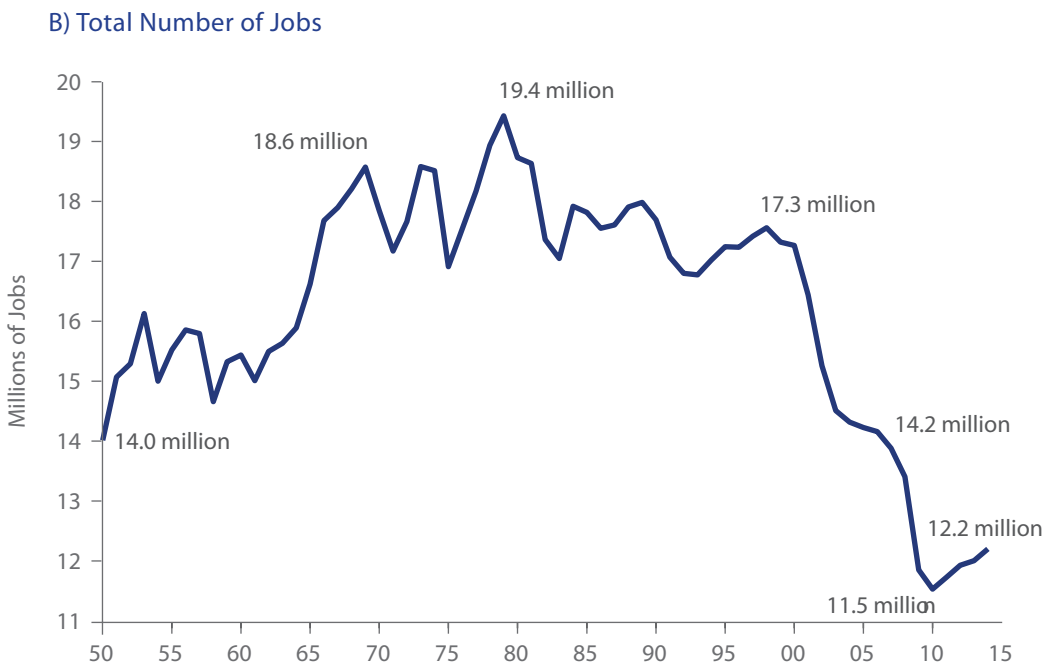
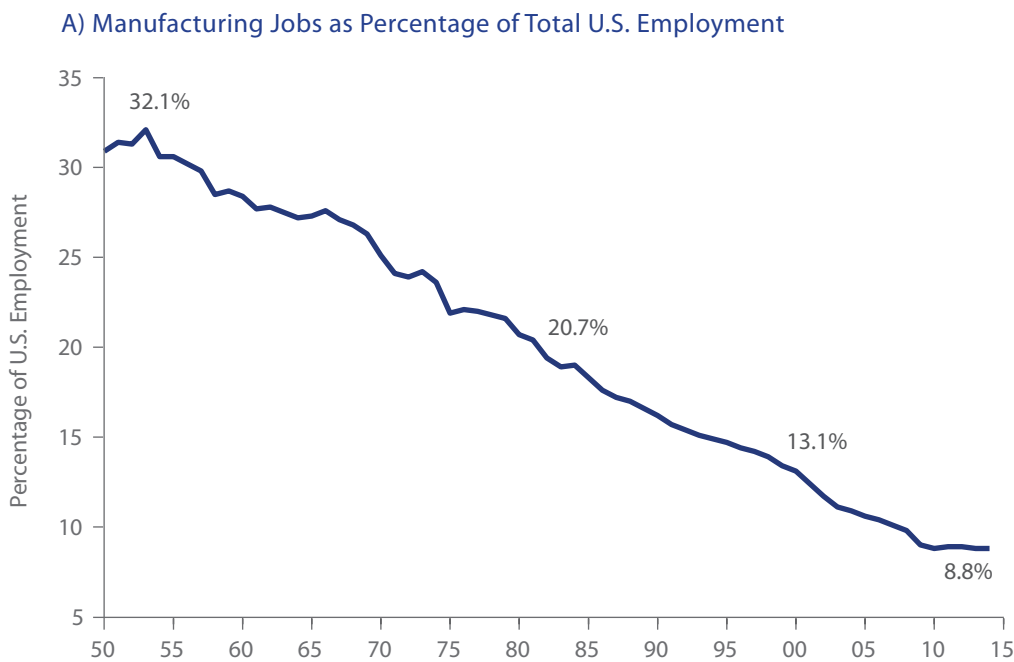
Job Losses

The decline or outright demise of these U.S. manufacturing sectors have generated major employment losses throughout the country. We can observe the path of U.S. manufacturing employment from 1950 to the present in Figure 1. The figure plots movement of U.S. manufacturing jobs both as a share of total employment in the U.S. and in terms of overall number of people employed.

First, as a share of overall U.S. employment, we see that, as of 1953, 32.1 percent of all U.S. workers were employed in manufacturing. That figure then begins a long-term sustained descent. As of 1980, the manufacturing share of employment was 20.7 percent, and as of 2000, it was 13.1 percent. Since 2000, the manufacturing share has declined further, hitting a low of 8.8 percent in 2014.

In terms of absolute numbers of jobs, the pattern was relatively stable from 1950 – 2000. As we see in the lower panel of Figure 1, manufacturing employment was at 14 million people

FIGURE 1: Employment in U.S. Manufacturing, 1950-2014



Source: U.S. Bureau of Labor Statistics

in 1950. That figure for total numbers of jobs then rises through 1980, to 19.4 million, before declining to 17.3 million in 2000.

But after 2000, manufacturing employment begins to decline sharply in absolute terms. From 2001 – 2006, i.e. still *before* the onset of the Great Recession, manufacturing employment fell to 14.2 million, i.e. a decline of 3 million jobs over five years only. The recession did then produce further sharp losses. Manufacturing employment reached a low of 11.5 million jobs in 2011, which means 2.4 million more jobs lost from 2007 – 11. Manufacturing employment did pick up after 2011, but only modestly. By 2014, manufacturing employment was at 12.2 million, an increase of 400,000 jobs since the 2011 low point. Still, this rate of employment expansion since the recession ended in 2009 has been far below the trend from all previous post World War II recessions.⁶

The pattern on job losses is still more dramatic when considered with respect to specific states. Smil (2013) summarized the situation as follows: “Between 2000 and 2010 Michigan lost nearly 47 percent of its manufacturing jobs (mostly in the auto industry), and North Carolina lost almost 44 percent (mostly in textiles). The losses were in excess of 35 percent in such populous states as Ohio, New Jersey and New York, and only 10 states had losses below 20 percent” (p. 134).

Manufacturing Trade Deficit and Outsourcing

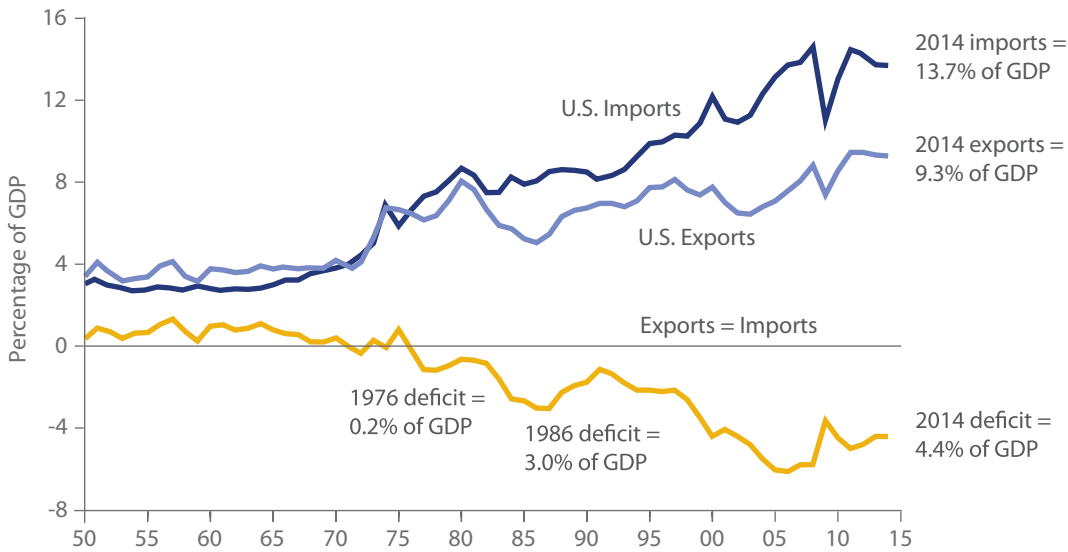
The U.S. has run a manufacturing trade deficit—i.e. it has imported from the rest of the world more manufactured goods than it has sold as exports—every year since 1976. We can see the movements of the U.S. trade deficit from 1950 to 2014 in Figure 2, expressed as a share of U.S. GDP. As of 1976, the U.S. manufacturing trade deficit was small—\$3.1 billion, which was equal to only 0.2 percent of U.S. GDP in 1976. However, as we see in Figure 2, the trade deficit grew over the next decade rapidly, reaching 3.0 percent of GDP by 1986. It continued

to increase in the subsequent two decades. By 2006, the manufacturing trade deficit was at 6.1 percent of GDP. The deficit did then fall substantially over the Great Recession, declining to 3.6 percent of GDP in 2009, as the spending power of Americans also declined. But the trade deficit then started rising again during the recovery, reaching 4.4 percent of GDP by 2014. What is clear from this pattern is that the manufacturing trade deficit is a long-term structural issue, not a result of the most recent, or any previous, recession.

Outsourcing and offshoring have been one aspect of the rising trade deficit. Outsourcing refers to U.S. companies choosing to subcontract out part of their operations, as opposed to undertaking that operation in-house. Offshoring refers to when U.S. firms conduct their outsourcing operations in other countries. The impacts of outsourcing and offshoring have been, and remain, the subject of heated debates among economists and other analysts. The majority of mainstream economists share the position of Harvard economist Gregory Mankiw that offshoring has been beneficial overall to the U.S. economy. But this position has been challenged by other economists, including such major mainstream figures as the late Nobel Laureate Paul Samuelson and Alan Blinder of Princeton.⁷

The most careful recent empirical research on the question is developed in the 2013 book by William Milberg and Deborah Winkler, *Outsourcing Economics*. Milberg and Winkler’s research suggests that for the United States between 1998 and 2006, offshoring measured in over thirty manufacturing and service sectors led to a drop of employment of approximately 3.5 million full-time equivalent jobs. It also led to a substantial rise in income inequality.⁸ These impacts have also led to a shift in relative bargaining power in favor of businesses in their negotiations with workers in the U.S., which in turn has played an important role in exerting downward pressure on the wages of U.S. workers. Indeed, former Federal Reserve Chair

FIGURE 2: U.S. Manufacturing Exports, Imports and Trade Balance (Exports - Imports) as pct. of GDP, 1950 - 2014



Source: U.S. Bureau of Labor Statistics

Alan Greenspan recognized this effect in the late 1990s, when he referred to “traumatized” U.S. workers as being unable to bargain up their wages even when unemployment was low.⁹

One widely-held view is that the negative effects of offshoring on U.S. workers has been mainly confined within low-tech activities such as making clothes and fabricating metal plates. In fact, corporations have been offshoring a high proportion of their high-tech activities as well. Thus, MacPherson and Vanchan (2010) surveyed the 100 top U.S. producers of durable goods and found that between 1995 and 2005, their share of externalized design activity had doubled for product design (to 26 percent), increased 3.5 fold for design research (to about 40 percent) and grown by 68 percent for all design activities.¹⁰

MORE MIXED PERSPECTIVES

In addition to these unambiguously negative indicators, we need to also consider other perspectives on the U.S. manufacturing sector which are more mixed—that is, perspectives in which the major problems in U.S. manufacturing are still recognized, but where more favorable patterns are also given weight. For example, despite the negative patterns we have surveyed, the U.S. manufacturing sector still remains formidably large, both in terms of the overall level of production as well as its export sales. In addition, productivity growth in the manufacturing sector has been rapid for decades. This remains true, even though, as we will review, there are major problems with the way manufacturing productivity is measured. These mismeasurements have led to overstatements as to the

extent of manufacturing productivity growth. Major innovations have also emerged out of the U.S. manufacturing sector in recent decades, in several specific areas. Finally, there is already evidence of a reversal of the longstanding offshoring patterns—with early signs of a reverse pattern of *onshoring*, or *reshoring*, beginning to emerge. We consider these in turn.

Magnitude of U.S. Manufacturing

Despite its difficulties, which are serious and protracted, the U.S. manufacturing sector remains a huge engine of production. As of 2013, U.S. manufacturing production was at \$2.2 trillion, equal to 13 percent of U.S. GDP. China was the only country in the world with a higher overall level of manufacturing output in 2013, at \$2.9 trillion. As recently as 2010, the U.S. had been the largest global manufacturer, including China. With \$2.2 trillion in overall production in 2013, the U.S. manufacturing sector was greater than the entire GDP of all but five other countries. U.S. manufacturing production was roughly equal in 2013 to total GDP in Brazil, and was greater than total GDP in Italy, Russia, and India.

U.S. manufacturing exports also remain formidable in absolute sale amounts, at \$1.6 trillion for 2014. As is shown in Figure 2, this amounted to about 9.3 percent of U.S. GDP in 2014. Again, for comparison, U.S. manufacturing exports alone were larger than the total GDP of all but 11 other countries. The range of U.S. manufacturing exports is wide—including automobile vehicles, parts and engines; civilian aircraft; medical equipment; pharmaceutical products; industrial engines; plastic materials; and cell phones.¹¹ Of course, as we have seen, U.S. manufacturing imports are substantially greater than exports, across virtually all sectors, including capital goods. Nevertheless, the fact that exports run so large in absolute terms makes clear that a strong foundation remains for a U.S. manufacturing revival.

Manufacturing Productivity

The official rate of productivity growth in U.S. manufacturing has consistently exceeded that of the U.S. economy overall. According to Baily and Bosworth (2014), *labor* productivity in manufacturing—i.e. the value of goods produced for a given amount of employment—grew between 1987 and 2011 at an average annual rate of 3.3 percent. This figure for manufacturing is 50 percent higher than the 2.2 percent average growth rate for all non-farm U.S. businesses. In considering so-called *multifactor* productivity—measuring the level of product output achieved relative to the combination of all inputs, including machinery, energy, buildings and land, as well as labor—is also nearly 50 percent higher than that for the overall U.S. private business sector.

These productivity figures convey a sense of long-term dynamism within the U.S. manufacturing sector. There is validity to this perspective. But the situation is also more complex than these aggregate productivity figures suggest. Understanding these complexities provides important perspective on the overall condition of U.S. manufacturing and its prospects moving forward. The most critical issues at play are as follows:

Computers versus everything else. According to Baily and Bosworth's estimates, the *sole driver* of the rapid increase in manufacturing productivity has been the computer industry. Over the full 1987 – 2011 period that they study, labor productivity in the computer sector rose at a rapid annual rate of 10.6 percent. The average annual growth rate of labor productivity over 1987 – 2011 for the non-computer sectors within manufacturing, at 2.3 percent, was basically equal to the rest of the U.S. private business sector. These figures make clear that we need to separate out the trajectory for computers from that of the rest of the manufacturing sector.

The impact of offshoring on measured productivity growth. Research by Susan Houseman et al. (2007, 2010) has shown that the officially measured rate of manufacturing productivity growth has been overstated, due to the increasing impact of offshoring on U.S. manufacturing. This is because U.S. manufacturers have been using more and more imported components, and the value of these foreign inputs is not accurately captured in U.S. statistics. When a U.S. manufacturer starts buying foreign-made components that are cheaper than the U.S.-made components that are incorporated into the final product, this will appear in the statistics like a productivity gain. But in fact, the U.S. producer may just be using cheaper foreign inputs. Houseman et al. estimate that between 1997 and 2006, this effect has led to an overstatement of manufacturing productivity other than with computers and electronics by one-fifth to one-half. Based on these findings by Houseman et al., it appears that productivity growth in the non-computer U.S. manufacturing industries has actually been slower than the private business sector overall.

Manufacturing productivity and jobs. The Houseman conclusions on measuring U.S. manufacturing productivity are especially significant because of their implications in understanding manufacturing employment patterns. As a purely definitional matter, when labor productivity increases, the number of workers that are needed to accomplish a given task diminishes. Because of this, it is not surprising that many analysts have attributed a large share of the decline in U.S. manufacturing employment to a corresponding rise in manufacturing productivity. For example, Rowthorn and Ramaswamy (1997) estimated that between 1970 and 1994, 65 percent of the decline in U.S. manufacturing employment (from 26.4 to 16.0 percent) was due to productivity growth in the U.S. manufacturing. However, outside of the computer sector, this more recent research by Houseman suggests most of what appears as productivity

growth is actually a statistical illusion created through offshoring patterns—that is, with lower labor costs from imported components appearing as increases in domestic manufacturing productivity. This means that, more broadly, outside of the computer sector, the main cause of declining U.S. manufacturing employment is not any measured rise in productivity growth within U.S. manufacturing, but rather the increasing reliance on offshoring by U.S. firms.

The main cause of declining U.S. manufacturing employment is not any measured rise in productivity growth within U.S. manufacturing, but rather the increasing reliance on offshoring by U.S. firms.

There is a second, equally important factor at play. That is, even if U.S. manufacturing productivity growth outside of the computer industry had actually been rapid, it does not follow that rising productivity necessarily generates employment losses, in the U.S. manufacturing sector itself, or more broadly. Rising productivity generally means that the costs will decline for producing a given amount of goods. The decline in costs can also lead to a fall in prices and a consequent increase in the demand for goods. This rise in the demand for goods associated with falling prices could, in turn, produce an increase in manufacturing employment opportunities.

Research by Nordhaus (2005) found that, between 1948 and 2003, increases in the rate of U.S. manufacturing productivity growth were associated with increases in manufacturing job growth, not declines in manufacturing output. More recent research by Helper, Krueger and Wial (2012) found that there was no pattern at all between productivity growth and job growth (or job loss) between 2001 and 2009 in U.S. manufacturing. Taking a global perspec-

tive, the U.S. Labor Department observed wide differences between countries in the relationship between productivity and manufacturing employment growth. For example, over the 1990s, Canada and Italy experienced employment gains along with rising productivity levels. But in the Netherlands and Japan, employment fell in conjunction with manufacturing productivity increases.

Overall, it does not necessarily follow that increases in U.S. manufacturing productivity will generate job losses in the manufacturing sector. This is especially true after we measure manufacturing productivity patterns accurately, which means properly incorporating the effects of offshoring on the measurement of productivity growth. The policy implication of this conclusion is clear. That is, the critical factor for expanding job opportunities in U.S. manufacturing will be the policy environment in which the U.S. manufacturing sector is operating, not whether increases in labor productivity necessarily drives employers to shed workers. Does the U.S. policy environment support innovation in the U.S. manufacturing sector and a growing market for innovative manufactured products? We return to examining these policy questions below.

Manufacturing Innovations

However one interprets the figures on the U.S. manufacturing trade balance and productivity, it is nevertheless true that U.S. manufacturing firms have succeeded in producing innovations in a range of areas in recent decades. The most apparent successes have been in the fields of high-tech manufacturing, or what the U.S. Census Bureau calls “advanced technology products.” These are modern goods produced primarily in the following industries: information and communications, electronics, flexible manufacturing, advanced materials, aerospace, weapons, nuclear power, optoelectronics, biotechnology, medical diagnosis, and the manufacture of drugs. But, once again, the overall

situation with manufacturing innovation is more mixed than what would appear through observing only the product breakthroughs in advanced technology products.

Two additional issues, in particular, need to be recognized. The first is that the innovations in the U.S. advanced technology manufacturing sectors has not led to comparable gains in U.S. production, net exports, or employment. The U.S. trade balance—dollar volume of exports relative to imports—in advanced technology products turned to a deficit as of 2002. This deficit peaked at \$100 billion as of 2012, amounting to 7.8 percent of the full U.S. manufacturing trade deficit.

Smil’s 2013 assessment of the state of U.S. advanced technology manufacturing is sobering:

During the past two decades nearly all American ATP [Available to Promise] manufacturing has followed one of two trajectories, with neither one pointing upward. The first one has been a total sectoral capitulation; that is, the United States does not make a single unit of those products. The second one traces a substantial retreat from what was once a position of undisputed dominance and has resulted in a state that could best be described as “hanging on”...The best examples of the first trajectory are computers and electronic products. Not a single flat-screen, laptop, or tablet computer, nor a single cell phone, not a single digital camera is now made in the United States, although many parts...from which some of these items are assembled in China, Taiwan, South Korea, Malaysia, or Indonesia come from US-based plants or from American-owned factories abroad....Computers and electronics formed the manufacturing sector with the highest absolute job losses during the past two decades: with 760,000 workers gone between 1990 and 2010, it surpassed the total of 719,000 jobs lost in apparel-making (p. 142).

The overall point with advanced technology manufacturing is that while U.S.-based firms are

designing a wide range of innovative products that have been commercially successful, the actual manufacturing of these products has been occurring increasingly in other countries.¹²

The situation is similarly mixed with respect to Main Street firms operating low- and medium-tech manufacturing operations in the U.S., though the specific issues at hand are different. In fact, there are thousands of low- and medium-tech firms within the U.S. that have been successful in recent years. Berger (2013) identified about 3,600 such manufacturing firms. From 2004-2008, these firms had doubled both their sales and employment; had at least \$5 million annually in sales, and employed at least 20 people. Berger and her colleagues distinguished these firms as having been successful by following three broad approaches:

- 1 **Successful innovators in their own plants.** An example Berger gives of such firms is U.S. Endoscopy, a medical device company in Mentor, Ohio that employs 380 workers. They make high-quality medical devices that they initially sold only to hospitals in Cleveland. Subsequently, they then successfully broadened their market scope.
- 2 **Repurposing as innovation.** One of the firms Berger cites in this group is a metal fabricating company in Ohio, with 220 employees, and has been growing by about 30 – 40 employees per year. As of 1970s, this firm was primarily fabricating metal for construction companies. They then expanded into fabricating light metals for aircraft carriers. The company introduces new materials into different industries, and conducts the initial testing of these materials for their customers.
- 3 **Combining manufacturing and services.** Berger writes: “In the most innovative companies we visited, the distinction between manufacturing and services is becoming more and more blurred, and value

derives from the ability to bundle these capabilities. In a way, even a traditional machine shop provides a “service” when it customizes a component for a specific customer and works with the customer to modify and improve the customer’s original drawing and specifications,” (2013, p. 111). Berger observed further that companies that have expanded their capacity to both customize products and maintain them over time are frequently earning over half their total revenues from repairs. These firms maintain unique advantages in repair capability precisely because they were the original product manufacturer.

Despite the successes that Berger identifies with Main Street manufacturers, she also emphasizes that none of the successful firms she examined have been experiencing rapid growth, at the level, for example, of comparable low- to medium-tech manufacturers in Germany. She makes clear that she does not expect these firms to experience astronomical growth along a Facebook-type trajectory. She cites two factors as inhibiting growth for these firms. The first is the limited number of similar manufacturers within a given region. This is what she, and others, refer to as a “clustering” effect. Berger argues that unlike in Silicon Valley, successful U.S. Main Street manufacturers face a lack of general knowledge, public information and a work force that could be supportive of a whole industry. The second, related, factor according to Berger is the lack of support from local financial institutions. She argues that the globalization of U.S. financial institutions in recent decades has increased the difficulty for Main Street manufacturers to receive the kind of “patient capital” support from financial institutions that understand their operations and are supportive of regional development (2013, p. 120).

DEBATES OVER WHAT TO DO

Just as there are major differences in perspective regarding the U.S. manufacturing sector—for example, whether productivity increases or offshoring are primarily responsible for the undisputed loss of U.S. manufacturing jobs—there are equally large differences as to what should be the appropriate policy responses to the observed trends. In particular, there are large differences over whether U.S. policies should actively support its domestic manufacturing sector, and if so, how; and, similarly, whether U.S. policy should attempt to support employment opportunities in the domestic manufacturing sector, and if so, how.

One widely-held position among economists is that the trajectory for the U.S. manufacturing sector should not be considered as a serious matter of concern. In any case, these economists argue that active supportive policies in manufacturing are more likely to create more problems than the ones they are capable of solving. This position is well represented in the writings of leading specialists on globalization such as Jadish Bhagwati (2009) and macroeconomists such as Gregory Mankiw (2006, 2015)

From this perspective, the reason that manufacturing production has declined in the U.S. and correspondingly increased elsewhere is straightforward: manufactured goods of acceptable quality are being produced at lower costs elsewhere. Further, the main reason that manufacturing production costs are lower in other countries is that wages for manufacturing workers are themselves lower in other countries relative to the U.S. The dramatic declines in information and communications technologies over recent decades have facilitated the relocation of production operations by U.S. firms to sites where labor costs are lower. That is, global coordination and shipping costs are being kept manageable through information technologies, so that labor cost differences between locations become more significant in establishing the

lowest-cost production platform for U.S. manufacturing firms.

Moreover, from this perspective, U.S. consumers benefit when manufactured goods are produced more cheaply elsewhere, then shipped inexpensively to the United States as imports. This pattern enables U.S. consumers to purchase manufactured goods at lower prices, which in turn raises living standards for U.S. residents. It also follows from this perspective that manufacturing production will return to the U.S. once the costs of production within the U.S. fall to levels that are equivalent to those in other countries. This would mean that labor costs in the U.S. would need to fall to levels closer to the global averages.

From this perspective, given that 1) U.S. consumers benefit from cheap imports; and 2) firms will relocate to the U.S. once production costs within the U.S. become more globally competitive, there is no need for the U.S. to take strong policy measures to support U.S. manufacturing.

Indeed, proponents of this view point to the evidence that the *insourcing*, or *reshoring*, of manufacturing production by U.S. firms is already occurring. The most widely cited case is General Electric. In March 2012, GE CEO Jeffrey Immelt published an article in the *Harvard Business Review* in which he wrote:

Today at GE we are outsourcing less and producing more in the U.S. We created more than 7,000 American manufacturing jobs in 2010 and 2011. Our success on the factory floor rests on human innovation and technical innovation—the keys to leading an American manufacturing renewal. When we are deciding where to manufacture, we ask, “Will our people and technology in the U.S. provide us with a competitive advantage? Increasingly, the answer is yes (2012, no page).

The developments at GE to which Immelt was referring include, since, 2009, a new locomotive plant in Fort Worth, Texas; a solar panel

factory in Aurora, Colorado; and an engine manufacturing facility in Pennsylvania. Their largest new investment has been the revival of their Appliance Park facility in Louisville, Kentucky, where they are producing water heaters, high-end refrigerators, and dishwashers. Other major manufacturers which have expanded their U.S. manufacturing operation within the U.S. in recent years include Whirlpool, Intel, Canon, Caterpillar, DuPont and Apple.¹³

Evidence on U.S. Manufacturing Wages

Have the excessively high wages of U.S. manufacturing workers been the predominant source of problems with the U.S. manufacturing sector? Are these problems now getting resolved, as evidenced by the emerging insourcing/reshoring trend for U.S. manufacturers? The short answer to these questions is “no.” In fact, we need to tell a much fuller story in order to understand both the long-term trajec-

tory for U.S. manufacturing and the prospects moving forward.

To begin with, it is not the case that U.S. manufacturing workers receive high compensation relative to workers in other advanced economies. We can see this in Table 1. The table reports figures on both average total compensation—including wages and benefits paid directly by employers as well as social benefits covered by government programs—as well as “direct pay,” which includes only funds provided by employers, i.e. exclusive of government-funded social benefits. We show figures for 12 comparative economies in addition to the U.S. itself. Starting with total compensation figures in columns 2 and 3 of the table, we see that, of the 12 comparative economies, 9 provide higher amounts of total compensation to their manufacturing workers than are provided to U.S. manufacturing workers. Total compensation is nearly 40 percent higher in Sweden, 34 percent higher in Australia, 28 percent higher in

TABLE 1
Hourly Compensation and Direct Pay from Businesses for U.S. Manufacturing Workers Relative to Other Advanced Economies, 2012

(1)	(2) Compensation (including social benefits)	(3) Hourly Compensation relative to U.S.	(4) Direct Pay (exclusive of social benefits)	(5) Direct Pay relative to U.S.
United States	\$35.67	---	\$27.15	---
Sweden	\$49.80	+39.6%	\$32.20	+18.6%
Australia	\$47.68	+33.7%	\$38.29	+41.0%
Germany	\$45.79	+28.4%	\$36.07	+32.8%
Finland	\$42.60	+19.4%	\$33.10	+21.9%
Austria	\$41.53	+16.4%	\$30.88	+13.7%
France	\$39.81	+11.6%	\$27.89	+2.7%
Netherlands	\$39.62	+11.1%	\$31.06	+14.4%
Ireland	\$38.17	+7.2%	\$31.50	+16.0%
Canada	\$36.59	+2.6%	\$29.30	+7.9%
Japan	\$35.34	-0.7%	\$28.94	+6.6%
Italy	\$34.18	-5.2%	\$24.29	-10.5%
United Kingdom	\$31.23	-12.4%	\$26.37	-2.9%

Source: U.S. Bureau of Labor Statistics (2013a).

Note: “Direct Pay” includes wages, overtime pay, regular bonuses and premiums, cost-of-living adjustments, pay for leave time, and pay in kind.

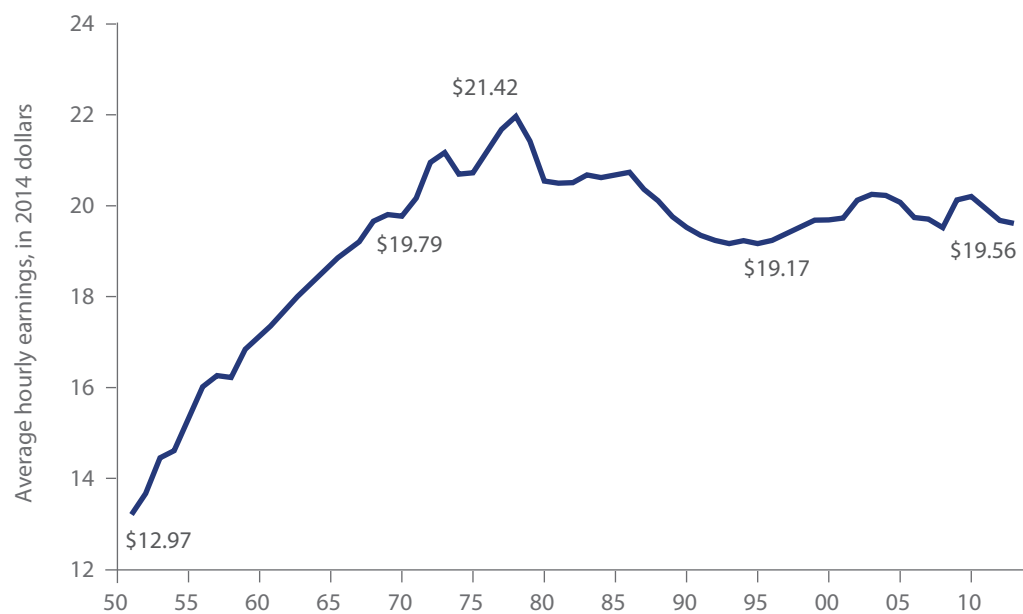
Germany, and 12 percent higher in France. Pay levels are roughly equal in Canada and Japan. Among the countries listed, only Italy and the U.K. pay less than in the U.S. Moreover, as we see in the columns 3 and 4 of Table 1, the pattern does not change substantially when we exclude social benefits from the compensation measure. In this case, for example, manufacturing workers are paid 41 percent more in Australia, 33 percent more in Germany, 19 percent more in Sweden, 8 percent more in Canada and 7 percent more in Japan.

It is also the case that wages for U.S. manufacturing workers have not been increasing over time, but rather have been stagnant for 40 years. We can see this in Figure 3. As we see, average manufacturing wages peaked in 1973, at \$21.42 (in 2014 dollars). As of 2014, the average manufacturing wage was \$19.56, 8.7 percent lower than the 1973 peak figure. This long-term pattern of wage stagnation clearly argues against the notion that U.S. manufacturing wages have

to be pushed down further than they have been already to support a revival of U.S. manufacturing.

It is of course true that, despite 40 years of wage stagnation for U.S. manufacturing workers, the U.S. compensation levels remain far above those for manufacturing workers in low- and middle-income economies. In Table 2, we show hourly compensation figures for six low- and middle-income economies, Brazil, Taiwan, Mexico, the Philippines, China, and India. As we see, average hourly manufacturing compensation in these countries range between \$1.46 for India and \$11.20 for Brazil—i.e. between about 4 and 30 percent of the U.S. level. However, it is clearly no solution for U.S. manufacturing to set as a policy goal that U.S. manufacturing compensation should decline further than it has already since the 1970s, until it approaches parity with Brazil, Taiwan or Mexico, much less the Philippines, China or India.

FIGURE 3: Average Hourly Earnings of U.S. Production and Non-Supervisory Manufacturing Workers, 1950 - 2014 (in 2014 dollars)



Source: U.S. Bureau of Labor Statistics

TABLE 2
Hourly Compensation and Direct Pay from Businesses for U.S. Manufacturing Workers Relative to Selected Middle-Income and Developing Countries

	Hourly Compensation (including social benefits)	Hourly Compensation relative to U.S.
United States, 2012	\$35.67	---
Brazil, 2012	\$11.20	-68.6%
Taiwan, 2012	\$9.46	-75.3%
Mexico, 2012	\$6.46	-81.9%
Philippines, 2012	\$2.10	-94.1%
China, 2009*	\$1.74	-95.1%
India, 2010*	\$1.46	-95.9%

Source: U.S. Bureau of Labor Statistics (2013a, 2013b, 2013c).

*Note: BLS reports that the "...figures for China and India are not directly comparable to each other or with the data for other countries found in this report."

Evidence on Reshoring

Do the reports cited above on insourcing/reshoring by General Electric and other major U.S. manufacturers suggest that the problems of U.S. manufacturing are getting resolved on their own? Clearly, to date, the pattern of reshoring by major U.S. manufacturers has not made a significant difference in either the level of U.S. manufacturing production, trade or employment. This may happen in the future. But survey evidence of U.S. manufacturers that conduct some of their operations through offshoring remains mixed.

The most extensive recent survey on these issues was conducted in 2012 by Tate et al. on behalf of the Council of Supply Chain Management Professionals (the results of this Tate et al. survey were published in 2014). This survey of U.S.-based manufacturing firms included 319 firms providing valid responses to the survey questions. The main findings of this survey were as follows:

- 1 40 percent of the respondents said that there was an increased movement of manufacturing plants back to the United States. In other words, 60 percent either disagreed that there was a movement of manufacturing back to the U.S. or were neutral on the

matter (with 33 percent disagreeing and 27 percent being neutral).

- 2 Focusing on plants within given industries, in this case, only 30 percent of respondents agreed with the question "new manufacturing plants in my industry are being built in the U.S." 70 percent either disagreed with the statement or were neutral, with 38 percent disagreeing and 32 percent neutral.

A 2011 survey by the global management consulting firm Accenture (Ferreira and Heilala 2011) provides a somewhat more favorable assessment. This survey found that 61 percent of the 287 manufacturing firms in their survey were considering "shifting their manufacturing operations closer to customers." However, this does not mean that these firms would then necessarily choose to relocate to the United States, given that demand for manufactured goods are likely to be growing rapidly in middle-income countries such as China and Brazil.

A key factor in determining how strong the reshoring trend becomes is the overall cost gap in manufacturing operations within the U.S. versus other countries. The overall cost gap derived from locations of manufacturing operations includes labor costs, of course—including productivity levels as well as compensation—as

one major component. But it also includes several other factors. Tate et al. describe the other significant factors as including the following: energy costs; currency exchange; shipping time; proximity advantages; intellectual property rights; and the relationship of manufacturing to the overall economy (2014, p. 14). Many of these other cost factors are more difficult to quantify than labor costs. For example, Helper et al. cite a case of a shoe manufacturer who opened his plant in Florida in 1995 but found it difficult to produce there because of the absence of an adequate local set of suppliers—what Berger has termed, as we noted above, the benefits of regional “clustering” in manufacturing production. This particular situation would be counted as a proximity disadvantage through locating in Florida. This manufacturer closed his operation in 2008. Helper et al. write that:

Labor costs in his factory were competitive; the problem was that the industry’s supply chain had long moved far away. He had to fly in technicians to repair machines, and could not find domestic supplies like eyelets and shoelaces. Since his strategy relied on customization, he was particularly hurt by the lack of variety available in these components. Because customers were few, suppliers could not afford to incur the fixed costs for more than a few varieties (2013, pp. 13-14).

Working from their survey of the 319 U.S. manufacturing firms, Tate et al. have developed estimates of these overall cost factors, which

they term “total landed costs,”—i.e. the total costs that businesses face in delivering their final products to their U.S.-based customers. We present in Table 3 some of their key results. As we see, they find that the cost gap of producing in the United States has been closing to a substantial extent with China, but only modestly with other emerging economies. Thus, with respect to China, the labor cost gap—again, including total compensation costs relative to labor productivity rates—has fallen dramatically in only eight years, from 51 to 16 percent between 2005 and 2013. However, the trend of declining costs for U.S. manufacturing production relative to other emerging markets is much more modest. As we see, the total labor cost gap for producing in the U.S. relative to those with other emerging markets fell from 39 to 34 percent, while the total landed cost gap fell from 21 to 18 percent.

These findings convey an impression that, based on total landed cost calculations, a motivation in support of reshoring has indeed been developing for U.S.-based firms, especially with respect to their operations in China. However, any such movement is likely to remain modest without a policy environment in the U.S. that is strongly supportive of manufacturing. This is especially true since, in comparison with developing countries overall, total landed costs, on average, remain significantly lower than those in the United States. Producing in the U.S. is also still likely to face difficulties with weakened supply chains and manufacturing clusters, as was the experience with the Florida shoe manufacturer.

TABLE 3
Labor and Total Landed Cost Gaps in Delivering Manufactured Products to the U.S. Market

	U.S. cost gap relative to China		U.S. cost gap relative to other emerging markets	
	2005	2013	2005	2013
Labor Costs	51%	16%	39%	34%
Total Landed Costs	31%	16%	21%	18%

Source: Tate et al. (2014), p. 9.

ALTERNATIVE POLICY FRAMEWORKS

There is a growing literature on proposals for reviving U.S. manufacturing. It will be useful to provide an overview of these proposals and, for our specific purposes, see where our proposal concerning the existing Buy America program for transportation procurement fits within this broader policy framework.

We have already discussed the views of those, such as Bhagwati and Mankiw, who favor no government interventions to support U.S. manufacturing. We focus in this section on various approaches that do support government interventions of some sort.

Tariffs and exchange rates¹⁴

One approach is to impose tariffs on imported manufactured goods, which would increase the prices of manufactured imports, making them less attractive to U.S. consumers. Another would be to lower the value of the dollar by, say, 20 percent relative to the euro, Japanese yen, and Chinese yuan. Assuming this could be accomplished, the cheaper dollar would mean that the prices of foreign-made goods would rise in the U.S. market, while the prices that foreigners would pay for U.S. products would fall. This should discourage U.S. imports and encourage exports. However, neither raising tariffs nor lowering the value of the dollar, on their own, is likely to produce any significant improvements for the U.S. manufacturing sector. What are the main problems?

The issue is more straightforward in the case of tariffs. Any such tariffs would have to be set relatively high, like the 10 percent surcharge imposed by President Richard Nixon in 1971, in order to seriously discourage U.S. consumers and businesses from purchasing imported manufactured goods. But setting a high tariff barrier against foreign producers seeking access to U.S. markets would no doubt provoke other countries to retaliate. This would reduce our exports as well as our imports. The

net result could still be some gain in overall U.S. employment, since the U.S. market is larger than those of the countries we trade with. But this would be uncertain and, in any case, the act would be seen as a provocation to our trading partners.

Lowering the value of the dollar is a less overtly aggressive act than imposing new tariffs. But it is not even clear that the U.S. could keep the dollar at a significantly lower level on a sustained basis, even if the Europeans, Japanese, and Chinese did not retaliate directly against such a U.S. initiative. The ongoing economic stagnation in Europe has pushed down the euro relative to the dollar. In such situations, global traders continue to prefer dollar-based assets, which in turn props up the value of the dollar in currency markets.

But even if we could succeed in lowering the dollar on a sustained basis, it still would not follow that our imports would fall and our exports would rise significantly. The evidence on this question is decidedly mixed. Especially as regards the type of high-end products which will be the foundation of a revival for U.S. manufacturing, the key to competitive success is producing high-quality products, not modestly cheaper domestic versions of products that foreigners produce at higher quality.

Moreover, maintaining a lower dollar will still not prevent foreign competitors from outcompeting U.S. producers on price itself. Consider now lower-end products, such as garments and textiles, and the situation for businesses in developing countries seeking to export these products into the U.S. When a fall in the dollar produces stiffening price competition for business owners in developing countries, they will likely respond by lowering their own costs and prices to remain competitive. They could do this either by increasing productivity in their factories or simply cutting wages of their workers. Here, then, is one major instance where an aggressive U.S. trade stance can end up worsening conditions for workers in developing countries without even expanding employment in the U.S.

Because of these reasons, the focus of reviving U.S. manufacturing will need to be around promoting innovations and new market opportunities for U.S. firms. What are the best ways to accomplish these goals?

Lessons from the German Experience

What is evident from the survey findings of U.S.-based manufacturing firms and related evidence on offshoring/reshoring is that there is a range of factors within the U.S. domestic economy that will influence firms' production location decisions. What are the most significant of these, and how can the policy environment influence them, given that the U.S. is going to remain a high-cost producer relative to developing countries? The performance of the German economy provides an instructive case in point on how a large advanced economy can succeed with manufacturing production and exports, despite the fact that it operates with high labor costs.

What are the main factors behind the success of Germany's manufacturing sector? As Berger writes, "There are certainly multiple factors at work in accounting for why German manufacturing remains so strong, and experts do not agree," (2013, p. 125). Some analysts hold that the primary factor supporting Germany's manufacturing success is that its currency, the euro, remains persistently undervalued. This is because Germany, as an export powerhouse, shares the euro with the other Eurozone member countries, most of whom are relatively weak export performers.¹⁵ Another factor that is cited is that Germany has aggressively maintained a policy of constraining wage increases even while they are succeeding in export markets.

These factors certainly are playing a role. But it remains the case that German labor costs are among the highest in the world. As we have seen, total compensation for manufacturing workers in Germany is, on average, nearly 30 percent higher than in the U.S. The other key

difference is that Germany pursues active industrial policies in support of its manufacturing sector and the employees within it. Helper et al. write as follows:

Germany's manufacturing success is not accidental; public policy has played an important role. Four main elements make up the German system. First, the federal government has facilitated the formation of rich networks for research and development. Second, German workers and employers benefit from a system of continuous vocational training. Third, Germany manufacturing firms enjoy stable access to finance. Fourth steady worker protections ensure that instead of solving problems through short-term cost-cutting, German employers and unions work together to adopt high-road solutions that strengthen competitiveness in the long term (2012, p. 26).

Similarly, Scott (2015) finds that Germany spends \$2.4 billion on manufacturing research and outreach, which is more than 10 times the amount spent within the U.S. on its equivalent program. This is despite the fact that Germany's GDP is less than one-fourth that of the United States. These authors, and others (e.g. Rattner 2011, Wessner 2013) provide valuable discussions on the various factors contributing to Germany's manufacturing success.

The perspective from IG Metall is also valuable here. IG Metall is the dominant metalworkers' union in Germany as well as the largest industrial union in all of Europe. IG Metall has long been actively involved in designing and implementing industrial policies throughout Germany, at both the federal level and, even more so, at the regional government level. Their involvement has been to advance policies that both promote Germany's industrial competitiveness while also supporting the rights and well-being of Germany's industrial workers. An extensive 2014 report, *Industrial Policies Today: Regional Examples from IG Metall*, describes the range of their activities in depth. They summarize their policy-setting engagements as follows:

Local IG Metall branches provide valuable impetus to regional industrial policies, notably on significant questions regarding economic and urban development, the planning of infrastructure and the promotion of cluster, technological and innovative initiatives as well as regional job markets and educational, environmental and living conditions (2014, p. 4).

Of course, none of the authors examining the operations of Germany's manufacturing sector and the industrial policies supporting it suggests that the U.S. can simply appropriate the German framework wholesale. Rather, the successful German policy framework provides useful guidelines as to how U.S. policy needs to proceed to revive manufacturing.

Manufacturing Industrial Policies for the U.S.

Berger. Building in part from the German experience, Berger (2013) advances policy ideas focused on the issue of promoting manufacturing innovation, at all levels of the economy—among both high-tech as well as Main Street firms. Across all firm types, she describes the need for policies that encompass a wide range of groups, not just government initiatives. She writes that:

Although the term policy usually implies government action, the “first movers” ... have often been private firms, trade associations, local community colleges, dynamic individuals, as well as public authorities. The set of cases we have examined encompasses a portfolio of private and public initiatives that include incentivizing efforts to bring together existing but isolated actors; connecting schools that are educating future workers with the employers who hire them; pooling and reducing the risks associated with developing new technologies; getting the benefits of economies of scale by sharing facilities too expensive for any but the largest firm to have in-house; and creating and diffusing technology before there's a clear path to

commercializing it or a firm willing to commit to developing it. However diverse the cases and circumstances, we see at work the same common underlying functions being performed: convening, coordinating, and reducing risk by pooling risk. (2013, p. 208).

Berger herself does not explore the role of procurement policies as one form of government intervention in manufacturing that can serve to “convene, coordinate, and reduce risk by pooling risk.” But clearly, as we discuss below, producing a well-structured, stable market with long-term horizons and that is consistently supportive of U.S. manufacturing development can play a central role in “reducing risk by pooling risk.”

Helper, Krueger, and Wial. Helper et al. (2012) offer a somewhat broader set of proposals than Berger, while still building from the overall framework that has succeeded in Germany and elsewhere. They argue that “U.S. manufacturing needs strengthening in four areas: 1) research and development; 2) lifelong training of workers at all levels; 3) improved access to finance; and 4) an increased role for workers and communities in creating and sharing the gains from innovative manufacturing,” (p. 1).

The policies they propose to support this strengthening have three areas of focus:

- 1 **Promoting high-road production.** They define high-road firms as those that pay high wages, which support the high skill levels that production workers need. Public policy should then help workers obtain and maintain appropriately high skill levels through the lifelong training programs.
- 2 **Including a mix of policies that operate at the level of the entire economy, individual industries, and individual manufacturers.** The approach of Helper et al. stresses common problems and policy solutions among manufacturing firms, as

noted above—that is, the need for better policies with respect to research/development, financing, worker training, and a framework in which the gains from innovation are shared. At the same time, they also emphasize the obvious, but critical, point that manufacturing firms also differ in a wide variety of ways, and that policies need to take these differences into account. As they write, “What works for pharmaceutical manufacturers may not be appropriate for auto suppliers. The problems that high-road firms face in getting better at high-road production are not the same as the problems that other firms face in getting onto the high road in the first place,” (p. 25).

3 Sharing both responsibilities for and gains from reviving manufacturing.

Helper et al. recognize that business owners are the most immediate decision makers on issues of R&D, finance, and creating most worker training opportunities. But they also emphasize that they are not the only relevant decision makers in the economy. They are also not the only ones who need to shoulder responsibility for reviving manufacturing; nor are they the only group that should receive rewards when manufacturing firms achieve innovations, export success or raise standards for environmental sustainability. They argue that both the responsibilities for and gains from reviving manufacturing should, in particular, include the workers employed by the manufacturing firms.¹⁶

Like Berger, Helper et al. do not focus on the role of procurement policies within their proposed set of policies. But they are also focused on sharing, at all levels of the economy, both the responsibilities for advancing U.S. manufacturing as well as the gains from a manufacturing revival. It therefore follows that the government, operating in the market as a

purchaser of manufactured goods—i.e. operating through procurement policies—can play a key role in supporting their overall agenda.

Pisano and Shih. In their 2012 book, *Producing Prosperity: Why America Needs a Manufacturing Renaissance*, Harvard Business School professors Gary Pisano and Willy Shih focus on a narrower set of policies than either Berger or Helper et al. These are spending on both R&D and creating a skilled workforce. Pisano and Shih argue in behalf of these two policy areas because they believe they are most critical for promoting innovation in processing, in which the location of manufacturing activity is a critical part of the overall development. But Pisano and Shih do also make clear that one major part of government intervention to move technical innovations into commercial operations is through government procurement policies. Thus, they write that, “government has been effective in supporting innovation when it has acted as a customer seeking a solution to a concrete, compelling need (e.g. that of the military),” (p.123).

The Centrality of Procurement Policies in Manufacturing Innovation

Vernon Ruttan’s important 2006 book, *Is War Necessary for Economic Growth? Military Procurement and Technology Development*, goes further than the other works cited by explicitly examining the role of procurement policies in advancing manufacturing innovation in the United States. As the book’s subtitle indicates, Ruttan’s particular focus is how, *operating in combination*, R&D and procurement policies worked effectively within the Pentagon to produce major breakthroughs—indeed spectacular innovations—in the technological development and commercialization of manufactured products. He writes that “military and defense-related procurement has been a major source of technology development across a broad spectrum of industries that account for an important share of U.S. industrial production,” (2006, p. vii). Over the past cen-

ture, these military-based innovations included nuclear energy and electric power; jet aviation; the computer industry; the space industries; and the internet. But Ruttan also makes clear that the history of manufacturing innovation that he describes emerging out of U.S. military-based industrial policies also has broader applicability beyond the Pentagon.

According to Ruttan, the first key to the success of manufacturing developments coming out of the Pentagon has been R&D funding. As he makes clear, virtually all major technical innovations within the U.S. economy have entailed huge expenses over long gestation periods. Individual business firms are unable to sustain expenses at this level on their own. This is especially the case because there is never a guarantee that those investors who assumed the initial burden of long time horizon, high-risk ventures will end up as the prime beneficiaries from such endeavors. This point is similar to Berger's focus on reducing risks by pooling risks within U.S. manufacturing.

Ruttan's second point of emphasis is the relationship between technical advances, commercialization of new technologies and productivity growth. Though individual businesses cannot be expected to develop major new technologies on their own, the pace at which individual firms incorporate technical innovations becomes a main engine of an economy's overall rate of productivity growth. As such, industrial policies that not only help develop new technologies but that can also help move them to the stage of commercial application can also raise a country's overall level of productivity. Raising productivity within a country will, in turn, improve the country's competitiveness in global markets.

Here is where the role of Pentagon procurement policies become central to the success of U.S. manufacturing development. Ruttan emphasizes that R&D alone would not have

brought new technologies to the point of commercial success. It was also necessary that, over the course of decades, the military provided a guaranteed market for new technologies. This enabled the technologies to incubate over time without having to prematurely face the test of the private market. The internet as a technology incubated for 35 years before it began to move into commercialization.

Further, this combination of supporting both R&D as well as commercialization through procurement policies that has been successful for the Pentagon has also been successful in other areas within the U.S. One major example is in the area of biotechnology, with applications both in health care and agriculture. The biotechnology revolution followed the same basic trajectory as the internet, with R&D support sustained over decades until pharmaceutical and agricultural industries entered the field in the 1970s.

Procurement policies, in short, have long been foundational to industrial development in the United States. It is not surprising that procurement policies should therefore also be necessary as one component within the full range of measures that policymakers should deploy at present to promote a U.S. manufacturing revival. Moreover, among the full set of key policy initiatives that could be advanced on behalf of the U.S. manufacturing industry—including R&D, financing, worker training, and supporting regional clusters—implementing reforms in Buy America and other procurement measures is the one policy tool that can be undertaken most rapidly and can therefore have the greatest positive impact within a 3- to 5-year period. As such, this policy initiative can serve as a catalyst to promote a more comprehensive set of initiatives to revive manufacturing in the United States economy.

The U.S. Railcar Industry and Buy America Program

In this section, we focus on the role of procurement policies as they operate within the U.S. railcar manufacturing sector. We address here broad considerations on both the long-term and more recent trajectories of the U.S. railcar manufacturing sector as well as detailed issues around Buy America procurement policies as they apply to railcar manufacturing.

THE U.S. RAIL TRANSIT MANUFACTURING INDUSTRY

During the early 20th Century, the United States was a global leader in the intercity passenger rail industry. As Pages et al. write:

During the 1930s and 1940s, U.S. intercity passenger trains were leading the world in terms of innovations, miles of track, and speed. Inventions such as diesel-electric locomotives, lightweight cars, improved wheel sets, and reliable braking systems positioned U.S. manufacturers at the cutting edge of train travel (2013, p. 5).¹⁷

The innovations of the U.S. passenger rail industry in the first part of the 20th Century were strongly supported by federal funding, in particular, funds from the New Deal Public Works Administration (Reutter 1994, p. 17). However, beginning in the mid-1950s, the federal government shifted its infrastructure spending priorities away from intercity passenger travel, focusing instead on the development of highways and airports. Passenger rail equipment manufacturers started sourcing parts globally, hollowing out their domestic supply chain. As a consequence, the U.S. industry was unable to keep pace with rail manufacturing innovations in other countries. In addition, smaller U.S. manufacturers of components, such as cast-

ings, parts, and wirings, shifted their focus away from rail manufacturing in favor of the auto and aerospace industries.

At present, none of the world's largest rail equipment manufacturers are U.S.-based companies. Rather, they include Alstom (France), Bombardier (Canada), CSR and CNR (China, which merged into one company in 2015), Siemens (Germany), Kawasaki and Hitachi (Japan), CAF and Talgo (Spain), Transmasholding (Russia), Ansaldo-Breda (Italy, which was purchased by Hitachi in 2015), and Hyundai Rotem (South Korea).¹⁸ The success of these European and Asian firms have been tied to policies that supported domestic manufacturers as well as the domestic market for passenger rail transit. For example, the Japanese industry advanced rapidly on the basis of government support. They began by enhancing technologies originally developed in the U.S. to build high-speed electric trains, including the record breaking "bullet train" between Tokyo and Osaka in 1964.¹⁹ Moving forward to 2004, in Spain, policymakers created a 15-year Strategic Plan in 2004 for infrastructure and transportation. Investments that emerged out of this program provided direct benefits to Spain's rail manufacturers.²⁰

In the U.S., the lack of public sector support for the industry contributed to the decline in the quality of equipment and the service provided. Transit agencies were chronically short of funds needed to refurbish and replace their aging fleet of cars, and to maintain tracks, stations and other critical infrastructure requirements. This, in turn, contributed to further declines in passenger demand and funds available for quality upgrades.²¹

POLICIES FOR THE RAILCAR INDUSTRY

In response to this decline of the United States' domestic transit vehicle manufacturing base, the U.S. Department of Transportation (DOT) introduced Buy America as a provision of the 1982 Surface Transportation Act, later codified in Title 49 of the United States Code. The Buy America standards apply to a wide range of activities within the DOT's domain of administrative responsibility. These include all projects administered under the Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), National Railroad Passenger Corporation (AMTRAK), and Federal Transit Agency (FTA). With all of these agencies, Buy America standards generally require that iron and steel products be purchased entirely from domestic sources. In addition, in general, manufactured products for projects administered within these agencies are required to include components and subcomponents whose domestic content is at least 60 percent of the overall cost of components/subcomponents.²²

At the same time, understanding how the Buy America standards operate in practice entails further considerations. For one thing, all of these separate agency-based Buy America requirements also contain provisions that allow for waivers from the requirements. In addition, it is difficult to establish in general terms how exactly the 60 percent domestic content requirement for components and subcomponents in the production of manufactured products needs to be implemented. The requirements become much more clear when one works through the details of these provisions as they apply in particular cases. We therefore focus here on the operations of Buy America, as it operates specifically under the FTA's provisions. These are the measures that apply to the production of buses and rolling stock for U.S. public procurement projects.

The two basic features of the FTA Buy America program are that 1) At least 60 percent

of all railcar components must be produced in the United States; and 2) 100 percent of all final assembly of railcars must be performed in the United States. In principle, these procurement requirements should provide significant benefits to U.S. railcar manufacturers. At the same time, in practice, the DOT Buy America program is weaker than these basic outline features suggest.

To understand how Buy America has been operating in practice, Linda Nguyen and Erika Patterson of Jobs to Move America conducted in-depth research on 54 FTA contracts awarded under Buy America requirements between 2006 and 2012. The details of Nguyen and Patterson's research are provided in Appendix 1. The main conclusions we derive from examining this research and related materials are as follows.

Overall Domestic Content Requirements Too Low

As noted above, the official Buy America domestic content requirements include 60 percent for components and 100 percent for final assembly. Nevertheless, in practice, these standards amount to an overall domestic content requirement of only 40 percent, considering all the facets of manufacturing railcars. The reasons why overall domestic content is only 40 percent for overall manufacturing production activity are as follows:

- 1 Detailed data gathered by Nguyen and Patterson shows that, on average, Buy America requirements cover only 85 percent of the value of a railcar contract, including final assembly and the cost of components. On average, the remaining 15 percent of the overall cost of manufacturing a railcar includes mainly administration and design activities. Buy America does not include any domestic content requirements for administration and design activities.²³
- 2 Of the 85 percent of overall costs that are covered by Buy America, final assembly accounts, on average, for 15 percent of overall

manufacturing costs. The domestic content requirement for final assembly is, again, 100 percent.

- 3 This leaves an average of 70 percent of overall manufacturing costs for components, of which Buy America stipulates that 60 percent must be of domestic origin. However, for a component to qualify as being of “domestic origin,” only 60 percent of its subcomponents need to be U.S.-made. Hence, the total component requirement is actually only 36 percent (i.e. 60 percent component requirement, of which 60 percent of the subcomponents must be of domestic origin).²⁴ In Table 4, we show all the calculations through which we conclude that the overall domestic content requirement for railcar contracts is 40 percent.

Weak Monitoring and Enforcement

Railcar manufacturing contracts rewarded under Buy America include both a pre-award audit and a post-delivery review process. According to the FTA handbook, the burden of Buy America certification and compliance falls upon the relevant regional transit agencies that are receiving federal funding to procure new railcars.²⁵

The pre-award audit regulations first require that regional transit agencies estimate the actual cost of producing the vehicles and identify the

domestic components required in production. The regional agency then needs to certify that the transit vehicles procured will meet all the Buy America domestic content requirements. The regional agencies must also certify that the manufacturers are capable of producing the railcars to specifications. The post-delivery review process requires that the regional agency certify that the manufacturer has produced the railcar in full compliance with the Buy America domestic content requirements. The contracting regional agency is also responsible for establishing that federal safety requirements and technical specifications are met.

Notwithstanding these general auditing and compliance standards, in practice, it has been difficult for public officials to effectively monitor compliance. One major source of difficulty has been that the federal government has not provided standardized forms for regional agencies to collect domestic content information from railcar manufacturers. Rather, they have provided only a suggested template that the agencies may choose to consult as a guideline. Further, until recently, the federal government’s compliance stipulations were not explicit in describing the level of documentation contractors must provide as to the domestic content proportions and production location of components and subcomponents.

In February 2015, the FTA released a draft revised version of its 1995 “Pre-Award and

TABLE 4
Total Railcar Manufacturing Domestic Content Requirement under Buy America Program

	1) Domestic content requirement	2) Share of contract	3) Domestic content level
1) Components	36% (= 60% subcomponent requirement x 60% component requirement)	70%	25% (= 36% x 70%)
2) Administration and Design	0%	15%	0%
3) Final Assembly	100%	15%	15%
4) Total Domestic Content Requirement	---	---	40% (= rows 1+2+3)

Post-Delivery Audits for Rolling Stock Procurements Handbook.” The revised handbook aims to bring greater uniformity to the auditing and documenting processes used for rolling stock purchases. For example, the revised handbook includes specific examples of documents transit agencies should use when conducting both a Pre-Award Audit Report and a Post-Delivery Buy America Certification review to establish whether contract bidders are in compliance with Buy America, (2015, pg. 15). But the Handbook also makes clear that they are only providing recommendations, not directives.²⁶ In other words, it is unclear the extent to which transit agencies will use the recommended practices detailed in this handbook rather than utilize other standards and forms of documentation.

In addition, if manufacturers express concerns to government compliance officials about having to release proprietary business information, the manufacturers can then avoid oversight to a substantial extent through contracting with a third party to certify compliance. Such third party certification procedures enable manufacturers to avoid disclosing its component and subcomponent calculations and documentation.²⁷

Overall then, Buy America relies primarily on self-certification by the contracting firms. The burden for enforcement then rests with regional transit authorities. Few local transit agencies have adequate capacity within their in-house staffing to perform this task adequately. This has forced some regional agencies to rely on industry consultants to determine whether manufacturers have adhered to the Buy America requirements.²⁸ Some transit agencies choose not to hire consultants, in some cases, because of the high costs of doing so. It is unclear from the public records how these agencies are then able to verify compliance on their own.

Monitoring of compliance by public interest groups can also face major obstacles. In many cases, the public is able to access only minimal amounts of relevant information. Details regarding the location of manufacturing activity

by country, the cost of components, and domestic content shares of overall production are rarely available publicly. Local agencies may also determine that various types of information should be treated as proprietary. In such cases, the regional transit agency managing a particular Buy America project may be able to deny public access to relevant records.²⁹

Because of all these factors, it is not surprising that there is substantial variation in the quality of reporting across contracts, companies, and agencies. This creates major barriers for the public to independently assess the extent to which, in practice, railcar manufacturers are meeting the Buy America domestic content requirements.³⁰

Granting Buy America Waivers

The FTA has the authority to waive Buy America requirements under three conditions:³¹

- 1 If the FTA determines that meeting the Buy America requirements are, in any given situation, inconsistent with the public interest. Such waivers may be granted at the discretion of local agencies, with FTA approval.
- 2 If the FTA finds that an item or material is not produced in the U.S. in a sufficient and reasonably available quantity.
- 3 If the FTA establishes that adhering to the Buy America requirements will increase the cost of the contract by more than 25 percent.

The FTA does not keep systematic records of all the Buy America waivers that have been granted or denied.³² Moreover, the evidence that is available, both publicly online and provided to us by request, does not show a consistent pattern. Rather, according to the publicly available data, it appears that waivers have been granted regularly in recent years.³³ The data that

was provided directly to us suggests, however, that waivers were regularly granted from 2008 – 10, but that the FTA sharply curtailed the granting of waivers from 2011 – 2014.³⁴ This latter pattern is consistent with what we were told by Undersecretary of Transportation Peter Rogoff at a 5/19/15 meeting.

What is evident is that the FTA has not maintained consistent patterns of evaluation, monitoring, or even data collection on Buy America waivers. As a result, the Buy America program cannot possibly have operated as effectively as it would otherwise in its overall goal of supporting a revival of U.S. manufacturing.

Overall, then, the Buy America program as it applies to railcar manufacturing procurement operates with a series of major deficiencies. As we have seen, the actual level of domestic content required for overall production of railcars is too low, at 40 percent. The monitoring and enforcement systems are not strong enough, in part because the regional agencies charged with enforcement do not have sufficient staffing and expertise to perform this work adequately. In addition, prior to the Obama presidency, manufacturers had regularly obtained waivers from the Buy America requirements. Some evidence shows that, starting in 2011, the Obama administration became less willing to grant waivers. But as we have seen, Buy America monitoring and enforcement standards still need to be strengthened considerably in many ways.

LOWEST-PRICE VERSUS BEST-VALUE PROPOSAL EVALUATION FRAMEWORKS

In addition to these weaknesses in the implementation of the DOT's Buy America standards, there are additional problems with U.S. procurement practices, with respect to railcar manufacturing contracting specifically, as well as more generally. The most significant set of problems emerge when government agencies adopt a “lowest price, technically acceptable”

evaluation procedure for awarding procurement contracts. approach.

Under the lowest price, technically acceptable framework, the firm offering the proposal with the lowest bottom line wins the contract under consideration, as long as it also meets the minimal technical requirements for implementing the project under consideration.³⁵ The goal with this approach is to minimize the direct costs to government agencies, and thereby ultimately to taxpayers, of a procurement project. But this approach is likely to overlook other important considerations. These other considerations may include the past performance record of the contractor offering the lowest bid. They could also include broader social and economic factors, such as the job opportunities, opportunities for small and minority-owned businesses, and positive community spillover impacts of various proposals from any given procurement contract.

An alternative evaluation procedure is the “best-value” approach. Under the best value approach, additional criteria—such as the past performance of firms and employment impacts—can be formally integrated into the evaluation process, along with the cost factors which, of course, remain critical in all cases.³⁶ The Federal Acquisition Regulation, which defines the standards for assessing federal procurement, allows for the application of the best value approach.³⁷ Several procurement programs at the state level also allow for the use of best value procurement, although the specific way in which best value practices can be applied vary from one state to the next.³⁸ For example, the 2014 New York State Procurement Guidelines stipulate that that a best value approach should be applied to procurement of services in general and for rolling stock manufacturing projects. Otherwise, the lowest price criterion must be applied for procurement of commodities.³⁹ In general, interest in the use of best value procurement appears to be on the rise. A study by the U.S. Transportation Board reviewed best value procurement practices at the

federal, state, and local level and concluded that, “legislation at the federal, state, and local levels is moving toward allowing the use of best-value procurement strategies that include price and other factors when these are deemed to be in the best interests of the agency” (p. S-3).⁴⁰

Despite this growing level of interest in best-value procurement evaluation procedures, the research by Nguyen and Patterson has found that, in actual practice over recent years, most railcar manufacturing contracts in the U.S. have continued to be awarded to the lowest price bidder. This is true even in cases where agencies were working within a best-value evaluation framework. Specifically, Nguyen and Patterson’s analysis of passenger rail procurement contracts awarded between 2006 and 2012 finds that U.S. transit officials awarded contracts to the lowest bidder in 87 percent of the cases.⁴¹

Because price appears to still be the dominant criterion on which railcar manufacturers are being evaluated, the manufacturers competing to win procurement contracts consequently work aggressively to cut costs in all possible ways, including sourcing cheaper technologies, materials, and components. They also have moved production offshore if they assess that this will enable them to bring in their bids at lower prices. Some manufacturers have also been willing to accept losses on projects as part of a longer-term strategy of gaining entry into new markets and positioning themselves to win future contracts.⁴² Such a low-cost bidding standard can lead to a situation in which all parties end up worse off—the quality of final products suffers while manufacturers are often unable to return a profit.

More generally, the continued reliance on the lowest price standard means that the the positive spillover effects of public-sector manufacturing production projects continue to be neglected in awarding procurement contracts. The most obvious of these spillover effects is the range of employment benefits that results from high domestic content levels. This of course includes the jobs created within the manufacturing firms

themselves as well as the jobs created within the firms producing components and sub-components domestically. It also includes the indirect multiplier effects generated by U.S. manufacturing workers having higher incomes, which are then spent within the domestic economy, generating, in turn, further employment opportunities within the U.S. Jobs that pay decently and offer benefits will create further benefits for workers, their families and their communities. When job opportunities in manufacturing are expanding, this also opens more opportunities for historically disadvantaged groups—including women and people of color—to gain footholds in manufacturing employment.

The continued reliance on the lowest price standard means that the the positive spillover effects of public-sector manufacturing production projects continue to be neglected in awarding procurement contracts.

The recent experiences in which best-value standards have been used for awarding procurement contracts have also, for the most part, not focused on the employment impacts of these projects. They have rather concentrated on assessing the past performance indicators and management capabilities of the various bidding firms along with their bid prices. Nevertheless, there have also been recent important developments in integrating employment criteria into best value evaluations. The Los Angeles County Metropolitan Transit Authority, in particular, has been an innovator in expanding the best value standards to include employment impacts of procurement projects. In 2010, LA MTA created what they termed a “U.S. Employment Program” that required all firms bidding on public procurement contracts to respond on the following issues with their proposals:

- 1 Demonstrating an understanding of employment conditions in the U.S.;
- 2 Outlining a plan to coordinate efforts with workforce development, apprenticeship and training programs to open new job opportunities as widely as possible through the project;
- 3 Estimating the number of full-time equivalent U.S. jobs that firms will create through their project; and
- 4 Describing the quality and range of opportunities associated with these newly-created jobs.⁴³

LA MTA makes clear in their *U.S. Employment Program* brochure that “only proposers with responsive U.S. Employment Plans will be considered for contract award,” (2015, p. 4). The brochure also lays out in detail the method they

use to quantify the economic benefits of each proposer’s employment plan. Since 2010, LA MTA has utilized this employment-enhanced best value approach in awarding and managing several recent contracts. Similar employment criteria have also been incorporated into proposal evaluations by Amtrak, the Chicago Transit Authority and the Maryland Transportation Authority.⁴⁴

In April 2015, LA MTA began to also develop a pilot program for a “Local Employment Program.” This proposal is based on the 2015 initiative by the DOT to permit local/geographic-based hiring preferences and economic-based hiring preferences into the requirements for awarding procurement contracts. The LA MTA program would require a commitment to hire workers from the local communities, to invest in workforce development, and to hire “disadvantaged workers” at a level that would amount to at least 10 percent of the total wages and benefits going to all local workers.⁴⁵

Estimating Domestic Content and Employment

In this section, we consider how both domestic content levels and best-value evaluation standards can impact manufacturing job opportunities for U.S. workers.

The first specific question we address is: what are the actual levels of domestic content in U.S. railcar manufacturing? As we have seen, the minimum legal level for public procurement contracts under Buy America is 40 percent of the total contract value. But it does not follow that the actual domestic content levels in U.S. railcar production for public transit agencies will necessarily fall to this minimum threshold. It is also possible that the actual domestic content level could fall below the legal minimum, given the weak enforcement standards and opportunities for waivers.

The information on actual domestic content levels can then be a starting point for estimating the impact of raising the minimum domestic content standards. In particular, we will be able to observe the extent to which higher levels of domestic content will generate an expansion of job opportunities for U.S. manufacturing workers. Once we have estimates on numbers of jobs created through railcar manufacturing, we then consider the characteristics of the jobs being created. That is, what types of jobs are being created, what are the wage and benefit levels associated with these jobs, and which groups in the economy are most likely to be able to obtain these jobs?

DOMESTIC CONTENT LEVELS

The most reliable in-depth evidence on the average domestic content proportions within any industrial activity in the United States come from the large-scale surveys of public and private enterprises within the United States conducted by the U.S. Department of Commerce. The results of these surveys are organized systemati-

cally within the input-output model produced by the Commerce Department. The “inputs” within this model are all the employees, materials, land, energy, and other products that are utilized in economic activities by U.S. enterprises—public and private—to create goods and services. These inputs are divided, among other ways, according to whether they are domestically produced or imported. The “outputs” are the goods and services that result from these activities, which are then made available to households, private businesses, and governments as consumers. These data enable researchers to observe the extent to which all inputs along the full supply chain are produced from either domestically supplied goods or imports. We are also able to observe how workers were hired to produce a given set of products or services and what kinds of materials were purchased in the process.

Here are some of the specific questions we can answer in applying the input/output model to the specific case of U.S. railcar manufacturing for public procurement. First, if a public transit agency invests \$1 billion to purchase new railcars, will this be a U.S. or foreign firm producing the railcars? How much will this contracting firm—whether U.S. or foreign-based—utilize the \$1 billion they receive to actually produce the railcars? To what extent will this contracting firm spend on hiring workers, as opposed to purchasing materials, including machinery, components and energy? Moreover, when the contracting firm spends money on inputs other than hiring workers, what are the domestic content and employment effects of giving orders to suppliers, such as door, glass, car-shell or gear producers?

Working with these government data sources, we are able to estimate the overall level of domestic content for railcar manufacturing production purchased by all government agencies within the U.S. However, in working through the details of this data set, we also face some

difficulties in terms of incomplete coverage with the most recent 2012 Department of Commerce survey results. Because of this, we have had to combine figures from the 2012 survey with other, more detailed figures that come from the previous 2007 survey. We discuss our approach to working with these two data sets in Appendix 2.

The net effect of these calculations is that we estimate the average overall domestic content level for U.S. railcar manufacturing production under public procurement contracts is about 60 percent. This figure is modestly higher than the 56 percent average figure estimated for the broader “other manufacturing equipment” category, as estimated by Nicholson and Noonan of the U.S. Department of Commerce.⁴⁶ More importantly, it is substantially higher than the 40 percent minimum domestic content level requirement through the Buy America program. This is a key finding. To underscore it again: based on the best available survey evidence, it appears that actual average domestic content levels for public-sector railcar manufacturing projects is 20 percentage points higher than what is required under Buy America—i.e., 60 percent actual average domestic content versus 40 percent required under Buy America. We will work with this result both in terms of estimating employment impacts of domestic content requirements as well as addressing broader policy issues around strengthening Buy America. At the same time we note that the 60 percent figure for average domestic

content implies, by definition, that there will be projects in which the domestic content levels will be either above or below this average figure.⁴⁷

Evidence from Buy America Pre-Award Audits

Firms that submit proposals to compete for DOT-funded procurement contracts are required to prepare “pre-award audits” under the terms of the Buy America program. These audits usually include information on the levels of domestic content that the firms expect to reach in fulfilling the terms of their contract. For our purposes, these Buy America audits can be valuable when they provide detailed information on the domestic content of each component and each component’s share of total component costs. Using this information, we can then calculate an overall figure for the domestic content of components and compare this to the minimum threshold (36 percent for components) required by Buy America.

For example, in the Bombardier Pre-Award Buy America Audit for a contract with Bay Area Rapid Transit (BART), the brake hydraulics components for production cars are reported to have 100 percent domestic content, suspension for the air compressor is reported to have 70 percent domestic content, and the doors have zero domestic content. Across all car types, the Bombardier pre-award audit reports the domestic content of components is 66.8 to 70.4 percent. Table 5

TABLE 5
Domestic Content Levels of Components as Reported in Pre-Award Audits

Buy America Audit	Reported Domestic Content of Components/Materials
Bombardier Pre-Award Audit (BART)	66.8 to 70.4%
Hyundai Rotem Pre-Award Audit (MBTA)	60.5 to 62.3%
Siemens Pre-Award Audit (Metropolitan Council Central Corridor)	74.8%
Hyundai Rotem Interim Compliance Report (SCRRA)	65.4 to 67.8%
Nippon Sharyo Pre-Award Audit (SMART)	67.2 to 67.7%
Kawasaki (WMATA) – Proto and Production Cars	65.4 to 77.7%
SELF-REPORTED DOMESTIC CONTENT RANGE	60.5 to 77.7%

Sources: BART (Bay Area Rapid Transit), MBTA (Massachusetts Bay Transportation Authority), SCRRA (Southern California Regional Rail Authority), SMART (Sonoma-Marín Area Rail Transit), WMATA (Washington Metro Area Transit Authority).

summarizes the reported domestic content for 6 Buy America audits for which there is sufficiently detailed information to calculate domestic content estimates.

As Table 5 shows, the domestic content of components reported in the Buy America audits ranges from approximately 60 to 78 percent. This is similar to the estimate of the domestic content of components of 67 percent that we derived from other data sources including the Department of Commerce (see Appendix 2). At the same time, we need to be cautious when using the figures from the Buy America audits. The domestic content figures in these documents are self-reported by the manufacturers themselves. They were never independently verified. In addition, note again that these figures are taken from *pre-award* audits. The actual domestic content of the delivered railcars could differ from these reported figures. It is therefore certainly possible for the final domestic content percentages to be either lower or higher than these reported estimates. Nevertheless, it is notable that these domestic content figures are

basically in line with the data generated by the Department of Commerce.

Domestic Sourcing Figures on a Specific Contract Bid

We can obtain additional, and distinct, useful perspectives on domestic sourcing levels by comparing contract proposals by two companies that bid on a recent major contract with a large metropolitan transit authority. For various reasons, the names of the bidding firms and contracting agency as well as other key details of the contract that could reveal its identity, must remain anonymous in this study. In fact, such details are irrelevant for the purposes of this study, while the key statistical patterns provide highly useful information. We therefore refer here, generically, to the agency involved as Urban MTA and the two firms bidding for the Urban MTA contract as Firms A and B.

Firms A and B, along with a third firm, were competing to build a large number of new rail cars for Urban MTA. Table 6 shows the detailed spending levels and sourcing—either

TABLE 6
Domestic Sourcing Levels for Components on Two Railcar Contract Bids for “URBAN MTA”

	Firm A		Firm B	
	Domestically-sourced component?	Percentage of total value of contract bid	Domestically-sourced component?	Percentage of total value of contract bid
1. Truck/Bogie	Yes	24%	No	6%
2. Carshell	Yes	12%	Mixed	12% domestic; 6% foreign
3. Exterior, Interior, and Underfloor Items	Yes	11%	Uncertain	9%
4. Propulsion system and controls	Yes	6%	Yes	9%
5. Friction Brake and Pneumatic Control	Yes	6%	Yes	4%
6. Passenger Doors and Controls	Yes	4%	Yes	3%
7. Automatic Train Protection and Train-to-Wayside Communications	Yes	4%	Yes	2%
8. Coupler and Draft Gear	Yes	3%	Yes	2%
Totals: Domestic Sourcing for Listed Components as Share of Overall Contract Bid	---	70%	---	32 - 41%

Source: See Appendix 3. Note: The remaining major contract elements include components not listed, amounting to 12 percent for Firm A and 13 percent for Firm B, of final contract bids; as well design/engineering, and final assembly.

domestic or foreign—for eight major components of the railcars they were proposing to build. It is important to emphasize that the figures shown are for domestic *sourcing*, not domestic content. As we have discussed, under Buy America requirements, the domestic sourcing requirement for components is 60 percent. Moreover, in order for a component to qualify as domestic, its subcomponents, needs to include only 60 percent domestic content.

As the table shows, Firm A had proposed that all of these eight components would be domestically sourced. Under this Firm A bid, total domestic sourcing from these eight components alone would be 70 percent of the total value of the project. With Firm B's bid, the confirmed level of domestic sourcing of components was only 32 percent. As the table shows, Firm B stated that the truck/bogie and some carshells would be sourced from foreign producers, equal to 12 percent of the total project costs. Firm B was also unable to determine at the time whether the exterior/interior/underfoot items would be sourced domestically or from foreign producers. This component represented 9 percent of the total value of the contract. If we include this component as being domestically sourced, that still brings the total domestic sourcing for these eight components to only 41 percent for Firm B.

Of course, from these figures, we are unable to establish what the overall level of domestic *content* would be with either proposal. This is for two reasons: 1) we do not know the levels of domestic content, as opposed to domestic sourcing, for the components listed; and 2) we do not know the levels of domestic content for the components that are not listed or for the design and engineering work on the project. It is reasonable to assume that domestic content levels for design and engineering would have been very low, if not zero. We can also assume that in both cases, the domestic content for final assembly would be 100 percent.

From the partial evidence that we do have, it is nearly certain that Firm A was offering to manufacture the railcars at a significantly higher level of overall domestic content than Firm B. To illustrate, we can work with some simple assumptions about the source of the components not listed in Table 6.

Starting with Firm A, let's assume that the components missing from Table 6 all come from foreign sources—the least favorable assumption about the origin of the components for which we have no information. These missing components make up 12 percent of the total railcar value. Under this assumption, Firm A's total of domestically-sourced components would equal 70 percent of the total railcar value. For Firm B, we then assume that 100 percent of components for which we do not have information will be domestically sourced—i.e. the most favorable possible assumption about the origin of the components absent from Table 6. With that assumption, Firm B's domestically-sourced components equal 54 percent of the total railcar's value since the missing components make up 13 percent of the total railcar value (41 percent + 13 percent). Overall then, despite making the most favorable assumption about the source of Firm B's components and the least favorable assumption about Firm A, Firm B's 54 percent level of domestic-sourcing, based on components, would fall well below the 70 percent figure for Firm A. It is further reasonable to assume that domestically-sourced components have a higher domestic content than components provided by foreign companies. Therefore, we can conclude that the domestic content levels under the Firm A proposal would have been substantially greater than under the Firm B proposal.

Despite this Urban MTA awarded the contract to Firm B. One reason, no doubt, was that Firm B's bid was significantly lower than Firm A's. At the same time, it is notable that Firm B's bid was not the lowest for this contract. The third bidder had bid substantially lower than even Firm B, but still was not

awarded the contract. We cannot establish from these figures the extent to which Firm B's apparently substantially lower level of domestic content was a factor in underbidding Firm A. This would be an important issue to sort out through further research.

From the overall evidence that we have reviewed with this contract, we are able to reach three broad conclusions with respect to the implementation of the Buy America program:

- 1 If Buy America standards are going to be adequately enforced, data must be available for domestic content for overall manufacturing costs, not just domestic sourcing for a subset of components. These data must also be fully available to the public.
- 2 Given the evidence we have with this particular case, we can see that Firm B was proposing to build railcars at levels of domestic content that were significantly lower than the competing bid by Firm A. Firm B's components would at most be 54 percent domestically sourced compared to in excess of 70 percent for Firm A. It would be valuable to understand in detail the sources of variation in domestic content for a wide range of projects.
- 3 It would be critical to establish, in turn, how variations in domestic content affect overall project costs; and how public policy interventions can serve to promote higher levels of domestic content that are also consistent with competitive project costs.

DOMESTIC CONTENT LEVELS AND JOB CREATION

What is the impact of producing railcars, buses and other rolling stock in the U.S. with different levels of domestic content in the manufacturing process? As mentioned above, the U.S. input/

output tables enable us to generate reliable estimates on this issue. In Tables 7 and 8 below, we report on the employment effects when domestic content varies for rolling stock manufacturing.

Employment Effects: Direct, Indirect and Induced Jobs

Spending money in any area of the U.S. economy will create jobs since people are needed to produce any good or service that the economy supplies. This is true regardless of whether the spending is done by private businesses, households, or a government entity. There are three sources of job creation associated with any expansion of spending—direct, indirect, and induced jobs. For purposes of our discussion, consider these categories in terms of investments in manufacturing railcars:

- 1 **Direct jobs:** the jobs created through designing, building components, and the final assembly of railcars;
- 2 **Indirect jobs:** the jobs associated with industries that supply intermediate products along the supply chain that are needed to create the railcar components, such as steel, glass, and energy;
- 3 **Induced jobs:** the expansion of employment that results when people who are paid in the railcar manufacturing sector itself or in glass production spend the money they have earned on other products in the economy. The generation of induced jobs is generally referred to as the “multiplier effect” in the economics literature.

Within the framework of these three categories of job creation, how is it that spending a given amount of money in any given set of activities could generate more or less employment relative to other activities? As a matter of simple arithmetic, there are only three possibilities.

Compensation per worker. If there is \$1 million total to spend in a given year, and one employee earns \$1 million per year at a given business enterprise, then that obviously means that only one job is created through spending the \$1 million. However, if, at another enterprise, the average pay is \$50,000 per year, then the same \$1 million will generate 20 jobs at \$50,000 per employee.

Labor intensity. When proportionally more money of a given overall amount of funds is spent on hiring people—as opposed to spending on machinery, buildings, energy, land, and other inputs—then spending this given amount of overall funds will create more jobs.

Domestic content. When a higher proportion of a given amount of funds is spent within the United States as opposed to spending on imports or activities in other countries, the given amount of money will, again, create more jobs.

The focus of our present discussion is on how this third factor, variations in domestic content, will affect job opportunities for U.S. workers through railcar manufacturing investments. That is, for the purposes of the discussion in this section, we do not examine the impact on employment opportunities of changing either the levels of compensation for workers tied to railcar manufacturing or the labor intensity of railcar production methods. Of course, these are also important considerations in their own right, that deserve further analysis by researchers.

We show estimates of total employment creation—i.e. the total of direct, indirect and induced jobs—resulting from two budgetary levels: spending \$1 million, as a simple reference level; and spending at the actual average budgetary levels over 2003-12 (measured in constant 2012 dollars). We also report two sets of figures. The first is for railroad rolling stock expenditures only. The second includes both rail and bus manufacturing figures. On aver-

age, all U.S. government entities spent about \$2 billion per year on purchasing new railcar rolling stock between 2003 and 2012, and about \$4.6 billion per year on all rolling stock—i.e. buses as well as railcars.

We consider first the figures on railroad rolling stock only in Table 7. Table 8 shows the same set of calculations for all rolling stock investments, including bus as well as railcar investments. Column 1 of Table 7 shows total direct, indirect and induced job creation levels per \$1 million in spending. In Case 1, we assume domestic content is at 40 percent, the legal minimum under existing Buy America standards.⁴⁸ This 40 percent domestic content level consists of 15 percent of total project spending on final assembly, in which domestic content is at 100 percent; 15 percent of total project spending on design and administration, none of which is domestically produced; and 70 percent of total product spending goes to components and subcomponents; in which domestic content is 36 percent. At this level, we estimate that U.S. railcar manufacturing will generate 5.2 jobs per \$1 million in spending.

Moving down column 1, we then see the impact on total direct, indirect and induced job creation through raising domestic content to the actual level we observe from the input-output tables for U.S. railcar production, i.e. to 60 percent. In this scenario, we still assume that final assembly is at 15 percent of the total value of the cost of producing the railcar, and that the domestic content of final assembly is 100 percent. In this scenario, we then also assume that design, administration and other costs remain at 15 percent and that all of this work is conducted outside the U.S. economy. Components also remain at 70 percent of the overall costs of production. The difference in this scenario is that the domestic content of components rises to 65 percent.⁴⁹ As we see, the effect of this increase in the domestic content of manufacturing components and subcomponents is to raise employment to 6.7 jobs per \$1 million in spending, a 29 percent increase relative to the Buy

TABLE 7
Total Direct, Indirect and Induced Jobs Created through Rolling Stock Procurement with Alternative Domestic Content Scenarios: Rail Rolling Stock Investments Only

Average capital expenditures, 2003-12 = \$2.0 billion		
	U.S. Job Creation per \$1 million in spending	U.S. Job Creation per \$2.0 billion in spending
1) Buy America minimum content = 40% domestic content	5.2 jobs	10,400 jobs
2) Current domestic content level for rolling stock = 60% domestic content	6.7 jobs	13,400 jobs
3) Raising Buy America domestic content minimum = 90% domestic content	8.9 jobs	17,800 jobs

Net Job Creation through Raising Domestic Content Standards, \$2.0 billion annual budget

Impact of Raising Domestic Content from 40 – 60%	+ 3,000 jobs
Impact of Raising Domestic Content from 40 – 90%	+ 7,400 jobs

Sources: IMPLAN, APTA (2014). See Appendix 4 for details.

America minimum domestic content standard of 40 percent.

We then also consider a third scenario in row 3 of Table 7. This is a hypothetical scenario, in which overall domestic content rises to 90 percent. Through this scenario, domestic content of both final assembly and components rise to 100 percent. In addition, 35 percent of design and administration is now also performed domestically. As we see in Table 7, the result is that employment creation per \$1 million rises to 8.9 jobs. This is a 71 percent increase in job creation relative to the current Buy America minimum of 40 percent domestic content. It is also a 29 percent increase in jobs relative to the 60 percent level of domestic content in railcar manufacturing that we observe from the input/output tables. It is clear from these figures that raising domestic content levels can be a strong source of new job creation in U.S. railcar manufacturing, even assuming a fixed level of spending.

We now consider our estimates of the job impacts of raising domestic content levels resulting from \$2 billion in annual spending—the actual average spending level for 2003 - 2012—on manufacturing new publicly owned railroad

rolling stock. These figures are in column 2 of Table 7. As we see, when domestic content is at the Buy America minimum of 40 percent, a total of 10,400 jobs are created through spending \$2 billion on railcar rolling stock manufacturing. Employment creation then rises to 13,400 jobs when domestic content in railcar rolling stock manufacturing rises to its actual current average level of 60 percent, then to 17,800 jobs when we allow that domestic content rises to 90 percent.

The lower panel of Table 7 then shows the impact of raising domestic content in railcar rolling stock manufacturing from, respectively, 40 to 60 percent; and from 40 to 90 percent. As we see, raising domestic content levels from the Buy America minimum of 40 percent to the current actual level of 60 percent generates about 3,000 more domestic jobs within the U.S, given a fixed level of investments of \$2 billion. When domestic content levels rise from the Buy America minimum of 40 percent to 90 percent, this produces 7,400 more jobs, assuming the given budget of \$2 billion on public railroad rolling stock manufacturing.

Assuming that the overall level of public spending on railcar rolling stock is fixed at

\$2 billion, these increases in total jobs created through raising domestic content levels are quite substantial. Of course, the gains in job creation would grow proportionally to the extent that the public budget levels for manufacturing new railcars within the U.S. were to increase.

We can see this in Table 8, in which we combine the budget for public bus manufacturing procurement along with that for railcars. As noted above, the average annual budget for all public procurement rolling stock manufacturing between 2003 – 12—i.e. including all bus as well as railcar orders—was \$4.6 billion. In this case, the number of jobs generated per million dollars of spending goes down modestly. This is because the levels of employment per dollar of overall spending for bus manufacturing are somewhat below those for railcars. Otherwise, we consider the same three scenarios in terms of domestic content levels—i.e. 40 percent, 60 percent and 90 percent domestic content, now for all public rolling stock purchases.

As we see in Table 8, when we more than double the level of expenditure, from \$2 billion to \$4.6 billion, the impact on total direct,

indirect and induced job creation rises correspondingly. With domestic content at the Buy America minimum of 40 percent, 22,600 jobs are generated through the \$4.6 billion budget. The job creation figure rises up to 38,600 jobs when \$4.6 billion are spent on all rolling stock production, and the overall domestic content for this manufacturing activity is at 90 percent. The lower panel of Table 8 shows the differences in job creation when we move from 40 percent, to 60 percent, and then to 90 percent domestic content, with the \$4.6 billion average annual budget for all rolling stock procurement projects. As we see, the increase from 40 – 60 percent domestic content generates an increase of 6,500 jobs; and the increase from 40 – 90 percent domestic content produces a net gain of 16,000 jobs.

Overall, Tables 6 and 7 document clearly the net gains in employment creation through two considerations: 1) increasing the level of public procurement spending in this area; and 2) raising domestic content standards for these manufacturing projects.

TABLE 8
Total Direct, Indirect and Induced Jobs Created through Rolling Stock Procurement with Alternative Domestic Content Scenarios: Bus plus Rail Rolling Stock Investments

Average capital expenditures, 2003-12 = \$4.6 billion		
	U.S. Job Creation per \$1 million in spending	U.S. Job Creation per \$4.6 billion in spending
1) Buy America minimum content = 40% domestic content	4.9 jobs	22,600 jobs
2) Current domestic content level for rolling stock = 60% domestic content	6.3 jobs	29,100 jobs
3) Raising Buy America domestic content minimum = 90% domestic content	8.4 jobs	38,600 jobs

Net Job Creation through Raising Domestic Content Standards, \$4.6 billion annual budget

Impact of Raising Domestic Content from 40 – 60%	+ 6,500 jobs
Impact of Raising Domestic Content from 40 – 90%	+ 16,000 jobs

Sources: IMPLAN, APTA (2014). See Appendix 4 for details.

MEASURES OF JOB QUALITIES THROUGH ROLLING STOCK INVESTMENTS

Types of Jobs Generated

To obtain some qualitative perspectives on the range of job opportunities generated by investments in railcar rolling stock and bus equipment manufacturing, we first present in Table 9 a listing of a representative sample of jobs that are likely to expand significantly through such investments. In this table, we are focused only on the direct plus indirect jobs creation through railcar manufacturing investments, leaving aside the induced jobs. By definition, the induced jobs created

through rolling stock manufacturing investments—i.e. the jobs generated through aggregate “multiplier effects”—will not have any distinct characteristics relative to the induced jobs created by any other activity in the economy.

Given our focus on creating job opportunities for workers at all levels of the U.S. labor market, it is useful to consider the profile of direct plus indirect jobs created according to the range of educational credential levels required to move into any given job type. As such, we have sorted our set of representative occupations according to three educational credential categories—“college-degree jobs,” requiring at least a BA degree; “some college jobs,” requir-

TABLE 9
Representative Occupations Generated by Rolling Stock Manufacturing Investments

(Direct and Indirect/ Supply-chain Jobs)

High-credentialed Jobs (BA or above) = 32% of all direct and indirect jobs	
Electrical engineers	Financial managers
Accountants	Chief executives
Mechanical engineers	Wholesale and retail buyers
Stationary engineers and boiler operators	Software developers
Marketing managers	Lawyers
Mid-credentialed Jobs (Some college but not B.A.) = 28% of all direct and indirect jobs	
Metalworkers	Customer service representatives
First-line supervisors of production workers	Secretaries
Inspectors and testers	Machinists
Industrial truck operators	Bookkeeping clerk
Manufacturing sales representatives	First-line supervisors non-retail sales workers
Low-credentialed Jobs with Decent Job Ladders (High school degree or less) = 31% of all direct and indirect jobs	
Computer control operators	Heavy vehicle service technician
Painters	Welders
Crane operators	Assemblers
Industrial machinery mechanics	First-line supervisor of construction workers
Production clerks	Shipping clerk
Other Low-Credentialed Jobs (High school degree or less) = 9% of all direct and indirect jobs	
Janitors	Driver/sales workers
Grounds maintenance workers	Cutting/punching machine setters
Stock clerks	First-line supervisors of office support workers
Packagers	Laborers
Production workers	General repair workers

Source: IMPLAN, 2013-2014 Current Population Survey (CPS). See Appendix 4 for details.

ing some college but not a BA; and “high school or less jobs,” requiring a high school degree or less.⁵⁰ We also include as a final sub-category the “high school or less” jobs that offer decent opportunities for advancement and higher wages over time. As we will discuss in some detail below, these are jobs primarily in durable manufacturing, such as rolling stock production itself, as well as in construction and transportation, where, among other factors, opportunities for job training are more widely available.

To estimate these types of jobs with decent future opportunities, we work from the 2005 study by Andersson, Holzer and Lane titled *Moving Up or Moving On: Who Advances in the Low-Wage Labor Market?* They define jobs that lead to decent earnings growth as those in which low-wage workers have a high probability of obtaining at least a 25 percent pay raise after about three years of first becoming employed. According to Andersson et al., durable manufacturing is one of the major segments of the U.S. labor market in which such jobs are located.⁵¹

Considering this listing of occupations as a whole, some of the jobs associated with rolling stock manufacturing will be in specialized areas, such as electrical and mechanical engineering or software development. Overall, high credentialed jobs account for about 32 percent of the overall job creation generated by rolling stock investments. Mid-credentialed jobs account for another 28 percent. These jobs include metalworkers, first-line supervisors, industrial truck operators, machinists, and within offices, customer service representatives, manufacturing sales representatives, and bookkeepers. Low-credentialed jobs, finally, account for 40 percent of the total; and of these, the low-credential jobs with decent opportunities for raises and advancements account for 31 percent. These jobs include computer control operators, painters, welders, assemblers, and equipment service technicians. The other low-credentialed jobs, amounting to 9 percent of the total, that offer less opportunities for advancement include laborers, packagers, stock clerks, and drivers.

Characteristics of Jobs Generated by Rolling Stock Investments

In Table 10, we provide statistics on a series of key characteristics of direct and indirect jobs generated by U.S. railroad rolling stock manufacturing investments. We present figures for each of these characteristics for workers associated both through direct and indirect jobs with manufacturing rolling stock production in comparison with the overall U.S. workforce.

We also present data on workers grouped according to educational credential levels, both with respect to rolling stock workers and for the overall U.S. workforce. Specifically, in Panel A of Table 10, we first present figures for the entire workforce at all educational credential levels. For these full sets of workers, we consider seven characteristics: average hourly wage; share of full-time jobs; share of jobs with health insurance benefits; share of jobs with retirement plans; the percentage of workers who are union members; the share of workers who are non-white and/or Latino; and the share of workers who are women.

In Panel B, we show figures only for workers who are low-credentialed. We focus on this group of workers in particular, because the U.S. manufacturing sector has historically been a major source of good job opportunities for workers with lower formal credentials.

Given this focus on job opportunities for low-credentialed workers, with Panel B, we also incorporate one additional characteristic to the seven included in Panel A. This is our measure of jobs available to low-credentialed workers with decent opportunities for raises and advancement—i.e. employment areas that offer reasonably strong job ladders.

We see first, in Panel A of Table 10, that, relative to the overall U.S. labor market, direct plus indirect jobs generated by rolling stock manufacturing investments are, on average, of higher quality than the average jobs in the U.S. economy along most dimensions. As we see, the average hourly wage associated with rolling

TABLE 10
Indicators of Job Quality for U.S. Railroad Rolling Stock Production Employment

(Direct and Indirect Jobs)

A) Workers at All Educational Credential Levels

	1) U.S. Railroad Rolling Stock Manufacturing Employment	2) Total U.S. Employment	3) Railroad Rolling Stock Employment relative to Total U.S. Employment (column 1 – 2)
Average Hourly Wage	\$23.80	\$21.10	+\$2.70
Full-Time Jobs (%)	93.4%	81.8%	+11.6%
Health Insurance Benefits (%)	62.4%	47.3%	+15.1%
Retirement Plan (%)	53.0%	41.0%	+12.0%
Union Membership (%)	12.6%	12.5%	+0.1%
Nonwhite and/or Latino (%)	30.9%	34.7%	- 3.8%
Women (%)	28.9%	47.2%	-18.3%

B) Workers at Low Educational Credentialed Jobs

	1) U.S. Railroad Rolling Stock Manufacturing Employment	2) Total U.S. Employment	3) Railroad Rolling Stock Employment relative to Total U.S. Employment (column 1 – 2)
Average Hourly Wage	\$17.50	\$15.20	+\$2.30
Full-Time Jobs (%)	93.5%	79.5%	+14.0%
Health Insurance Benefits (%)	56.0%	36.8%	+19.2%
Retirement Plan (%)	44.5%	28.9%	+15.6%
Union Membership (%)	15.6%	10.6%	+5.0%
Nonwhite and/or Latino (%)	37.4%	43.8%	-6.4%
Women (%)	26.1%	41.3%	-15.2%
Jobs with decent opportunities for raises and advancement (%)	31.0%	12.1%	+18.9%

Sources: IMPLAN, 2013-2014 Current Population Survey (CPS). See Appendix 4 for details.

stock production at \$23.80, is \$2.70 higher than the economy-wide average. Jobs in rolling stock manufacturing also offer significantly higher percentages of full-time jobs, as well as jobs that offer health insurance and retirement plans—i.e. between 12 and 15 percent higher percentages. However, in the area of union coverage, we see that the share of union jobs generated by railcar manufacturing investments, at 12.6 percent, is nearly identical to that for the overall economy.⁵²

Overall, as we see, direct and indirect jobs generated by railcar manufacturing investments

are better than average across key measures. It is therefore a matter of concern that the shares of minorities and women employed as a result of these investments are low relative to the overall economy. As we see, the share of non-white and/or Latino workers is 30.9 percent, 3.8 percentage points lower than the 34.7 percent for the economy overall. The situation is worse still for women. Only 28.9 percent of workers employed directly or indirectly as a result of railcar manufacturing investments are women. This compares with 47.2 percent for the economy overall.⁵³

Turning now to Panel B of Table 10, focusing on low-credentialed workers only, the same overall pattern holds in terms of average wages and benefits. On average, low-credentialed jobs generated by rolling stock manufacturing investments earn \$2.30 per hour more than low-credentialed workers in the economy overall. More low-credentialed workers tied to rolling stock manufacturing have full-time jobs, and receive health benefits and retirement plans from their jobs. For this group of workers, there is also a higher percentage that is unionized—15.6 percent for railcar manufacturing versus 10.6 percent for all low-credentialed workers.

However, with this category of workers as well, we find that minorities and women are underrepresented. As Panel B shows, 37.4 percent of the direct plus indirect jobs generated by railcar manufacturing investments are held by minorities, versus 43.8 percent for the economy overall. Low-credentialed women with jobs tied to railcar manufacturing represent only 26.1 percent of the overall pool of low-credentialed workers in the industry. This is 15.2 percentage points below the U.S. economy overall.

BUY AMERICA AND JOBS

These are the main overall findings from our review of the employment impacts of Buy America program as it applies both generally and specifically to the U.S. railcar industry:

1 Raising domestic content requirements will have a major impact in terms of generating manufacturing job opportunities for U.S. workers. As we have seen, we estimate that, on average, with a given level of procurement spending, the level of total jobs generated through public transportation projects rises by roughly 70 percent when domestic content rises from 40 to 90 percent. Even when domestic content rises just from 60 to 90 percent, overall job creation still increases by roughly 30 percent.

2 The total number of jobs generated by any given level of domestic content will depend, of course, on the amount of money that is spent. As we have seen, with a \$4.6 billion average level of annual spending on public rolling stock, the difference in job creation between a 40 percent and 90 percent Buy America standard is about 16,000 jobs. If we were to raise domestic content levels by similar amounts with respect to all U.S. \$400 billion in annual U.S. manufacturing procurement projects, a conservative estimate of the net gain in U.S. employment would be about of 1.5 million jobs.

3 On average, manufacturing jobs are higher quality than the average job within the U.S. labor market. Average wages, first, are 13 percent higher. In addition, between 12 and 15 percent more workers hold full-time jobs, receive health insurance and retirement benefits from their jobs. Jobs generated through railcar manufacturing investments also offer greater opportunities than average for raises and advancement among workers having low formal educational credentials. This remains the case, even though, as we have seen above, average wages in U.S. manufacturing have remained stagnant for a generation. It will be important to build from the ongoing relative strengths of U.S. manufacturing jobs to expand good job opportunities throughout the U.S. economy, including for young people who may have lower educational credentials.

Jobs generated by railcar manufacturing investments offer fewer opportunities for non-white and/or Latino workers and for women than average. Especially because these jobs do have a history of providing better wages and benefits than average, it is important that procurement policies include provisions that promote equal access for groups that have been underrepresented in these sectors.

Advancing Manufacturing Through Procurement Policies

Our four most basic conclusions with respect to the Department of Transportation's Buy America procurement policies, specifically as they apply to the U.S. railcar industry but more generally as well, are as follows:

1 Domestic content standards are too low.

The official domestic content requirements include 60 percent for components and 100 percent for final assembly in railcar manufacturing. But as we have seen, effectively, these standards amount to an overall requirement of 40 percent. This results after we incorporate the requirement on sub-components as also being 60 percent only, and that all other aspects of production, including design and administration, having no domestic requirement.

2 Monitoring and enforcement standards are too weak.

The monitoring and enforcement levels for even these low domestic content requirements are weak. Local transit agencies face significant challenges in monitoring and enforcing compliance due to their limited capacity and the absence of uniform reporting requirements. Public interest groups are also limited in their ability to scrutinize the public procurement process due to obstacles in obtaining relevant compliance information.

3 Too many waivers are granted.

The available evidence strongly suggests that the Department of Transportation has been too willing to grant waivers to contractors bidding on transportation procurement projects covered under Buy America. Since 2011, the DOT appears to have significantly reduced awarding waivers. But the overall evidence on this, both before and after 2011, is mixed and, in any case, incomplete.

The general point is that, for Buy America to operate effectively to support U.S. manufacturing, the Department of Transportation needs to keep systematic records on waiver applications and decisions; and to establish consistently high thresholds for granting waivers.

4 Lowest-price standards are too narrow.

The lowest-price standard for evaluating procurement contract bids under Buy America appears to predominate with Buy America manufacturing contracts. This procedure overlooks the broader benefits generated by domestically-based manufacturing projects. These are tangible benefits that accrue to U.S. taxpayers—in terms of strengthening innovative manufacturing firms in the U.S., as well as generating more jobs, better jobs, and better access to job opportunities, including for women, minorities and recent labor market entrants with lower formal credentials. These other important considerations can be readily incorporated into an employment-enhanced best-value evaluation system—that is, an evaluation system that incorporates procedures along the lines of the U.S. Employment Plan adopted in 2010 by the Los Angeles County Metropolitan Transit Authority.

THE POLICY CHOICES

These perspectives on Buy America policies as currently practiced lead to some clear overarching conclusions. First, most simply, Buy America standards need to be raised above the current effective threshold of 40 percent. It is beyond the scope of this study to recommend what the appropriate threshold should be, but it

is a question that could be effectively answered through further research. For now however, we are clear that, in addition to raising the threshold, Buy America needs to operate with higher monitoring and enforcement standards, and with more stringent requirements for granting waiver requests.

It is not clear which tendency—further offshoring and job losses or reshoring and job gains—will become stronger over time. This is precisely where effective policy interventions remain critical.

The fact that, as a national average, current domestic content levels for transportation procurement are above 40 percent—and are probably closer to about 60 percent—does not mean that the Buy America standards are adequate. For one thing, as we have seen, the project that we have described in detail for “Urban MTA,” demonstrates how firms can win major procurement contracts even though the domestic content level at which they intend to produce is substantially below that offered by a qualified competitor. Moreover, it is difficult to determine the extent to which similar situations have occurred elsewhere, due to the weak monitoring and enforcement standards that prevail with procurement contracts. These conditions are depriving communities and workers of the benefits of procurement projects which they are financing as taxpayers.

But in addition, even if the current average level of domestic content is within the range of 60 percent, we do not have in place a sufficiently supportive policy environment to maintain that current domestic content level moving forward, much less prevent the domestic content share from falling to lower levels. As we have reviewed, U.S. manufacturing today is hovering between two distinct future trajectories. We

know that the U.S. has lost approximately 5 million manufacturing jobs since 2000, and that the primary cause of these job losses has been offshoring, not domestic productivity gains. But we have also reviewed evidence of a modest reshoring pattern emerging among U.S. manufacturers, as the overall cost gap between production overseas versus production in the U.S. may be closing in some situations. It is not clear which tendency—further offshoring and job losses or reshoring and job gains—will become stronger over time.

This is precisely where effective policy interventions on behalf of U.S. manufacturing in general, and rolling stock manufacturing in particular, remain critical. The establishment of a higher Buy America threshold should be supported by complementary policies that can help increase the number of domestic firms that are able to compete effectively for manufacturing procurement projects, in the area of railcar manufacturing and other areas. As we have discussed above, these policies should include 1) research and development support; 2) targeted credit policies; 3) better job training programs and job ladders within firms; and 4) more support for developing regional manufacturing ecosystems, which help form mutually supportive local supply chains.

Procurement policies play a central role among these other initiatives, because procurement policies are the means through which the government can help establish more stable domestic markets for U.S. manufacturing firms. This, in turn, enables the firms to operate with longer time horizons, which creates an environment supportive of innovation and building a skilled and stable workforce. Procurement policies, in short, are fundamental to achieving what Berger has expressed as what should be the overarching purpose of U.S. policymakers in the manufacturing sector—i.e. “convening, coordinating, and reducing risk by pooling risk,” (2013, p. 208).

But it is equally critical that the benefits of a U.S. manufacturing revival be shared as widely as

possible. This is why procurement policies need to work within a best-value evaluation system as opposed to a lowest-cost system. The criteria that can be considered in their best-value approach include: quality and timeliness of prior work, technical capabilities, and customer satisfaction, in addition, of course, to price. But in addition, a U.S. Employment Plan, as pioneered by the LA Metropolitan Transit Authority and, to date, adopted as well in Chicago, Maryland and with AMTRAK, strengthens the best-value framework. It does so by explicitly incorporating the employment benefits, within the domestic economy, of awarding publicly funded manufacturing project, to one particular competing firm rather than other competitors. The LA MTA is now advancing a further important development, their Local Employment Program, which would also generate benefits within specific local communities and among different groups within these local communities. This Local Employment Program approach builds from the March 2015 decision by the DOT to allow, on a trial basis, local employment impacts as included among the evaluation procedures in awarding contracts.

Considered overall, the project of strengthening the Department of Transportation's Buy America procurement policies, and combining these stronger policies with employment enhanced best-value contract evaluation criteria,

can make major contributions toward promoting a revival of the manufacturing sector in the United States and creating millions of good manufacturing jobs for U.S. workers.

The challenges facing the U.S. manufacturing sector are formidable. This is true, even while manufacturing production within the U.S. remains a huge, \$2.2 trillion enterprise, and that, according to some evidence, a reshoring trend has already begun.

As we stated at the outset of this study, the U.S. economy has yet to develop a long-term growth engine whose foundation is something other than financial bubbles. A U.S. manufacturing revival is capable of becoming one powerful force among others in establishing that long-term engine. Another critical initiative has to be the transition to a clean energy economy, entailing major new investments in energy efficiency and clean renewable energy sources. But the imperative of a clean energy transition, in the U.S. and elsewhere, is fully complementary with the strengthening of domestic manufacturing production in the United States. In short, there are many important reasons why a revival of U.S. manufacturing production and job opportunities needs to be supported as effectively as possible through strengthening the Department of Transportation's Buy America program as well as related U.S. government procurement policies.

APPENDIX 1

DESCRIPTION OF FEDERAL TRANSIT ADMINISTRATION CONTRACT SURVEY DATA

Background

To date, little research has been done to understand the dynamics of the railcar procurement process and its implications for the industry more broadly. To fill this gap, between April 2013 and April 2014, Linda Nguyen and Erika Patterson of the Jobs to Move America Project developed a database of 54 new passenger railcar contracts issued by public transit agencies. Their database includes basic contract information such as award dates, contracting agency, vehicle type, number of vehicles, contract value, contract framework and basis of award. They used a range of data sources to collect this information, including public records requests to regional transit agencies for contract related information, the websites and online records of transit properties, industry press, popular press, telephone interviews with public officials, and railcar manufacturing company websites.

Nguyen and Patterson identified the 54 purchases by reviewing the reports in *Railway Age's* "Passenger Car Market: At a Glance Surveys" on railcar deliveries over 2011 to 2013. *Railway Age* is a widely-recognized American trade journal of the rail transport industry. Through a search of company websites, news sources, and communication with transit agencies, Nguyen and Patterson found that these 54 purchases resulted from railcar contracts issued over 2006 to 2012. In order to focus on contracts for new transit railcars, Nguyen and Patterson excluded rebuilds, retrofitting, and automated people movers from this survey.

In addition to the basic railcar procurement related and contract information for the 54 contracts, Nguyen and Patterson sampled the top three highest value contracts for the top five industry leaders (by contract volume). Because domestic content related passenger

railcar information of these contracts is not readily available, Nguyen and Patterson, as representatives of Job to Move America, submitted public records requests to the contracting transit agencies of the fifteen sampled passenger railcar contracts. The public records requests yielded highly varied results and required follow up through telephone interviews and written communications.

Examining Actual Domestic Content Requirements of Buy America

As noted in the main text, Buy America requirements cover only final assembly and components. We use detailed cost information on six vehicle proposals to generate an average estimate of the proportion of total costs of a railcar that consist of final assembly activities and the purchase of components and subcomponents. Specifically, we use the data collected by Nguyen and Patterson on the costs of three different vehicle proposals for each of two different contracts.

As noted in the main text, in one or more cases, it is necessary that the names of the bidding firms and the transit agency remain anonymous. At the same time, such details on the names of the firms and agencies is not important for the purposes of our discussion, while the data on the contract bidding patterns is significant. We therefore refer here to the two contracts as Contract 1 and Contract 2; the three firms bidding on Contract 1 are Firms 1-X, 1-Y and 1-Z; and the firms bidding on Contract 2 as 2-X, 2-Y and 2-Z.

In Panel A of Table A1.1, we present details on Contract 1. For each manufacturer, we show the share of the total railcar value made up by each of three broad cost categories: components, final assembly, and other activities including design and engineering. Based on the price forms submitted by these manufacturers, we estimate that, on average, components make up about 70 percent of the total railcar value, final assembly activities make up about another

TABLE A1.1
Average Costs as a Percent of Total Railcar Value

Manufacturer	% of Railcar Value		
	Components	Final Assembly	Design/Engineering/Admin.
A. Contract 1			
1. Firm 1-X	81.7%	7.4%	10.9%
2. Firm 1-Y	65.7%	15.3%	19.0%
3. Firm 1-Z	57.3%	20.5%	22.2%
<i>Average</i>	68.2%	14.4%	17.4%
B. Contract 2			
1. Firm 2-X	80.6%	2.1%	17.3%
2. Firm 2-Y	83.3%	2.8%	13.8%
3. Firm 2-Z	77.4%	0.0%	22.6%
<i>Average</i>	80.4%	1.6%	17.9%

Note: These figures are based on the base contract figures only. The base contract is for the vehicles that the transit agency clearly intends to purchase. Proposals for additional vehicles (options) are for vehicles that transit agencies want the option to purchase in the future.

15 percent, and other activities including design and engineering roughly make up the remaining 15 percent.

In Panel B of Table A.1 we present details for the three vehicle proposals for Contract 2. We see that the figures in Panel B differ significantly from those presented in Panel A. Specifically, final assembly activities make up a much smaller share of the railcar value with Contract 2 (between 0 and 3 percent) compared to Contract 1 (between 7 and 21 percent). Components, on the other hand, make up a much larger share of the railcar value among the Contract 2 proposals—between 77 and 83 percent compared to between 57 percent and 82 percent among the Contract 1 proposals. In fact, the increase in the components' average share of the railcar value between Contract 1 and Contract 2 proposals—68 percent to 80 percent—is equal to the decrease in the final assembly activities' average share of the railcar value—from 14 percent to 2 percent. Design and engineering activities take up roughly the same share of the total rail car value among the Contract 1 and Contract 2 proposals—17.4 percent versus 17.9 percent respectively.

What accounts for the large differences between the components and final assembly activity values across the two different contracts? There clearly appears to be a difference in the accounting method for final assembly activities between the two sets of contract bids. In particular, it appears that in the case of the Contract 2 proposals, final assembly costs are combined with component costs. This is apparent for the following reasons:

1. The structure of the price forms for the Contract 2 proposal only specifies a cost for “final assembly facilities” rather than “final assembly.” Moreover, the final assembly facility cost item is reported as a lump sum, rather than per vehicle. This implies that the final assembly facility cost item is for modifications and/or investments in a facility in which assembly activities will take place rather than the cost for the assembly activity itself. In contrast, the Contract 1 price forms specifically list per vehicle “car final assembly” and “truck final assembly” costs.
2. The cost figure for final assembly facilities only appears for the base contracts of

the Contract 2 project. No final assembly cost items appear in the options contracts. In other words, even though the options contracts account for the additional costs of producing more vehicles, the costs of assembling those additional vehicles do not appear as a separate cost item in the options contracts vehicle price forms. Therefore, the assembly costs of the additional vehicles must be incorporated in other cost items. In contrast, all the Contract 1 price forms—for the base contract as well as the options contracts—explicitly list final assembly costs per vehicle.

3. Firm 2-Z for Contract 2 indicates zero costs associated with its final assembly facility. Since it is implausible that Firm 2-Z would have no final assembly costs, this is further evidence that the “final assembly facility” cost item refers to fixed costs for a facility rather than the variable costs associated with producing railcars. Firm 2-Z could, in other words, have a facility that basically needs no modifications to support final assembly activities, and hence a zero final assembly facility cost. However, it cannot have zero final assembly activities whatso-

ever. In contrast, all three of the Contract 1 bids include substantial final assembly costs.

We can reach the following conclusions from these figures about how much final assembly, components and other activities contribute to the value of a railcar. First, across these six proposals, the “other” activities appear to consistently take up roughly 15 percent of the total rail car value. Second, final assembly and components, combined, take up the remaining 85 percent. Third, the three Contract 1 bid proposals suggest that about 70 percent of this 85 percent can be attributed to components, while the remaining 15 percent is taken up by the costs of final assembly activities.

We therefore conclude that, on average, Buy America regulates about 85 percent of the total railcar value: this includes final assembly activities which make up about 15 percent of the total railcar value, and components which make up about 70 percent of the total railcar value. This means that the other activities that are unregulated by Buy America—such as design, engineering and administrative activities—make up about 15 percent of the total railcar value, a meaningful share.

APPENDIX 2

ESTIMATING DOMESTIC CONTENT LEVELS OF GOVERNMENT RAILCAR PURCHASES USING U.S. INPUT/OUTPUT TABLES

Our aim is to estimate as accurately as possible the actual domestic content for U.S. railcar manufacturing production under public procurement contracts regulated by the FTA’s Buy America policy. It is critical to recognize, first of all, that there is no single definitive source of data to determine this figure. In the absence

of a definitive data source, we draw on three alternative data sources to approximate the actual domestic content for railcars produced for FTA-regulated public procurement contracts. We find that these three sources generate roughly the same result—a domestic content level of about 60 percent for U.S. railcar manufacturing projects produced under public procurement contracts. The consistency of these estimates increases our confidence that this 60 percent domestic content figure is reasonably accurate.

The three data sources we use are: (1) the Commerce Department’s own published figures

based on 2012 I/O tables, (2) our own analysis of more detailed 2007 I/O tables, combined with supplemental material on Buy America regulations, and railcar contracts recently awarded by public transit agencies, and (3) pre-award audit reports from manufacturers bidding for public procurement contracts. We discuss each in turn below.

The first data source we discuss in the main text: the 2014 U.S. Commerce Department report, “What’s Made in America,” by Nicholson and Noonan. In this report, Nicholson and Noonan estimate that the domestic content for the general category, “other transportation equipment” is 56 percent using the 2012 I/O data. “Other transportation equipment” includes railroad rolling stock, but also equipment for other modes of transportation such as airplanes and boats (this category excludes autos). These other types of transportation equipment, according to Noonan, tend to have lower domestic content than rolling stock and therefore 56 percent is a lower-bound estimate for railroad rolling stock.⁵⁴

The second data source is 2007 I/O data, integrated with two other sources of information. We use the older 2007 I/O data set because, as of this writing, it contains the most recent data available for analyzing the domestic content of railroad rolling stock manufacturing (at the 6-digit NAICS level) specifically. Currently, published I/O data from 2012 is only available for the broader “other transportation equipment” sector. We combine this more detailed 2007 I/O data with what we know about recent railcar contracts awarded by public transit agencies covered by the policy and Buy America requirements.

As we discuss in the main text, data from recent public procurement contracts indicate that, on average, the total railcar value breaks down into the following: 70 percent components, 15 percent final assembly, and 15 percent all other activities. We use this basic framework combined with what we know about Buy America regulations and industry practices for each of these activities to determine the actual

level of domestic content.

Final assembly activities. Buy America regulations require that all final assembly activities for public procurement contracts take place domestically. Therefore, we assume all final assembly activities take place domestically.

Components. We use data from the 2007 U.S. Department of Commerce’s I/O modeling to characterize the domestic sourcing and content for the components. This involves two steps.

We first produce estimates of the percentage of government procurement that is domestically sourced. Then, we determine the domestic content of the components used as inputs for those domestic purchases. Specifically, we use the results presented in its 2007 Benchmark Use Table and Import Matrix published by the U.S. Bureau of Economic Analysis, an agency of the Commerce Department. The methodology to produce these figures is relatively straightforward.

The BEA’s Use table shows the supply chain of each industry and the purchases by each type of final demand. We can thus form a vector of final demand by government, aggregating all levels and types of government spending (federal, state, local, defense, non-defense). We do this for the industry of railroad rolling stock manufacturing. Similarly, the BEA’s import matrix shows purchases of imports by each industry and by each type of final demand. We form our vectors of government purchases of imports for rolling stock specifically. We can thus net out the imported goods and calculate the percentage of government purchases that are domestically sourced. We find that approximately 91 percent of government purchases of railroad rolling stock are domestically sourced.

We next estimate the level of domestic content of the components used as inputs for railcars (the most detailed estimates we can get for the domestic content of components for railcars include both public and private purchases). To calculate domestic content, we use the same two matrices from the BEA. We can aggregate

the industries in the Use table into the category of “railcar components” and form a vector of demand, i.e., its supply chain. Doing this with both the Use and the Import tables, we can net out imports and calculate the percentage of the aggregated “railcar component” industry’s domestic content. This shows us how much of the components’ supply chain is domestic. We estimate that the domestic content of these components is 73.1 percent.

We combine this figure (73 percent) with the estimate of the percent of railroad rolling stock government purchases that are domestically sourced (91 percent) to get a final level of domestic content for components (67 percent), i.e., the domestic content of components when both the level of domestic-sourcing and the domestic content of the domestically-sourced products of government purchases are taken into account.

Other activities. Less clear is how to handle the category of “other activities” which are unregulated by FTA’s Buy America. Lowe et al.’s 2010 study of the passenger and urban transit indicate that these activities primarily take place outside the U.S. Based on in-depth interviews of 11 original equipment manufacturers (OEMs) of passenger and urban transit vehicles that produce for the U.S. market, Lowe et al. observe that:

OEMs tend to keep the high-value roles—such as design, engineering, and systems integra-

tion—near their home headquarters, or at least near the largest markets they serve. In the case of a small U.S. rail market dominated by foreign-owned companies, this means offshore (p. 28).

Therefore, we assume that these activities do not take place domestically.

Combining estimates to determine actual domestic content. We now have the figures we need to approximate the actual domestic content of passenger and transit railcars regulated by Buy America. We present these figures in Table A2.1 (this table is analogous to Table 4 in the main text). We estimate that the actual domestic content is about 60 percent.

The third data source comes from our analysis of six pre-award audits discussed in the main text (see section, “Evidence for Buy America Pre-Award Audits”). As noted in our discussion of Table 5 in that section of the main text, the pre-award audits reveal that the manufacturers expect that their railcars will contain components that have a domestic content level in the range of 61 to 78 percent. The mid-point figure of this range—69.5 percent—is only slightly higher than the 67 percent figure we used in Table A2.1. As a result, if we now incorporate this estimate on the domestic content of components from our third data source, we find again that the total domestic content of railcars regulated by FTA’s Buy America is roughly 60 percent.

TABLE A2.1
Estimate of Actual Domestic Content of Government Purchases of Passenger and Transit Railcars

	1) Domestic content within activity	2) Share of total contract value	3) Domestic content level as share of total contract (col. 1 x col. 2)
1) Components	67%	70%	47%
2) Administration and Design	0%	15%	0%
3) Final Assembly	100%	15%	15%
4) Total Domestic Content	---	---	62%

APPENDIX 3 DOMESTIC SOURCING AND CONTRACT FIGURES FOR SPECIFIC CONTRACT BIDS BY FIRMS A AND B TO URBAN MTA

As noted in the main text, in one or more cases, it is necessary that the names of the bidding firms and the transit agency remain anonymous. At the same time, such details on the names of the firms and agencies is not important for the purposes of our discussion, while the data on the contract bidding patterns is significant. We therefore refer here to two firms that submitted bids to a public transit agency as Firm A and Firm B, and the transit agency as Urban MTA.

In addition to the detailed component cost information from various bid proposals described in Appendix 1, Linda Nguyen and Erika Patterson obtained information related to the domestic origin of components for two specific proposals. Nguyen and Patterson obtained information from several sources including supplementary forms submitted with bid proposals, personal (confidential) communications with high level managers at bidding firms, and, where necessary, internet searches to determine location of component suppliers.

Tables A3.1 and A3.2 provide itemized cost data as a share of the overall rail car's value from Firm A and Firm B's original price forms. These data are for the base buy contracts of these bids. The original price form details each company's estimated cost of major vehicle systems and components, as well as assembly, design and engineering, tests, and freight costs. The form also provides the overall total cost per car. The options contracts have largely similar values, and therefore we do not reproduce them here.

TABLE A3.1.
Firm A: Base Buy Price Form

Description of Item	Proposed Price Estimate as % of Total Railcar Value
COMPONENTS	
Trucks	23.78%
Car body	11.78%
Other exterior/interior/under	11.42%
Propulsion	6.47%
Friction Brake	5.97%
Passenger Doors & Controls	4.39%
ATP & TWC Equip	3.73%
Coupler and Draft Gear	3.11%
Aux Electrical	2.57%
HVAC	2.35%
Lighting	1.74%
Windows	1.54%
Seats	1.32%
Communications	0.86%
Storage Battery	0.38%
Pantograph	0.32%
Wheels	0.00%
Info Signs	0.00%
ALL OTHER	
Car final assembly	7%
Truck Final assembly	0%
Mock ups	0%
Project Mgmt	2%
Design and Engineering	5%
Testing	1%
Carbody test	0%
Floor and roof test	0%
Vehicle test	0%
System assurance	2%
Warranty	0%
Freight	0%
Taxes	0%
Misc.	0%
Total railcar value	100%

TABLE A3.2.
Firm B: Base Buy Price Form

Description of Item	Proposed Price Estimate as % of Total Railcar Value
COMPONENTS	
Trucks	6.18%
Carbody	18.01%
Other exterior/interior/under	9.17%
Propulsion	8.95%
Friction Brake	4.07%
Passenger Doors & Controls	2.74%
ATP & TWC Equip	1.75%
Coupler and Draft Gear	2.31%
Aux Electrical	2.11%
HVAC	2.25%
Lighting	0.72%
Windows	0.75%
Seats	0.90%
Communications	2.59%
Storage Battery	0.20%
Pantograph	0.25%
Wheels	2.21%
Info Signs	0.58%
ALL OTHER	
Car final assembly	14.42%
Truck Final assembly	0.88%
Mock ups	0.17%
Project Mgmt	1.96%
Design and Engineering	7.19%
Testing	2.07%
Car body test	0.08%
Floor and roof test	0.05%
Vehicle test	0.23%
System assurance	0.32%
Warranty	0.20%
Freight	5.39%
Taxes	1.25%
Misc.	0.05%
Total railcar value	100%

APPENDIX 4 METHODOLOGY FOR GENERATING JOB CREATION ESTIMATES

The employment estimates in this report are derived from an input-output model. The input-output model allows us to observe relationships between different industries in the production of goods and services. We can also observe relationships between consumers of goods and services, including households and governments, and the various producing industries. For our purposes specifically, the input-output modeling approach enables us to estimate the effects on employment resulting from an increase in final demand for the products of a given industry. For example, we can estimate the number of jobs directly created in the railroad rolling stock manufacturing industry for each \$1 million of spending on railcars. We can also estimate the jobs that are indirectly created in other industries through the \$1 million in spending on railcars—industries such as iron and steel and motor manufacturing. Overall, the input-output model allows us to estimate the economy-wide employment results from a given level of spending.

We used the IMPLAN 3.0 software and IMPLAN 2010 data set constructed by the Minnesota IMPLAN Group, Inc. This data provides 440-industry level detail and is based on the Bureau of Economic Analysis of the U.S. Department of Commerce (BEA) input-output tables. We use IMPLAN to model a \$1.0 million (in 2012\$) increase in demand for railway vehicles and locomotives (NAICS 336510) and estimate direct and indirect employment multipliers. All the figures are based on a national model. Employment multipliers for induced jobs are described separately further below.

The employment figures in this report are expressed in terms of full-time equivalent positions (FTEs), equal to 2080 hours per position (52 weeks x 40 hrs./wk.). We convert IMPLAN's job (headcount) estimates into FTE

positions by using IMPLAN's conversion factors. These factors are sector specific national averages.

We generate job creation estimates separately for three different activities within the railroad rolling stock manufacturing sector, following the discussion in the main text on these three distinct activities. These three activities are final assembly, component manufacturing, and "other" activities. This "other" category includes such activities as design and engineering. IMPLAN, however, does not provide separate employment multipliers for different activities within an industry. As a result, except for the component manufacturing activities, we use the employment multipliers published by IMPLAN for the entire sector to estimate the number of direct and indirect jobs created by \$1 million in spending.

We treat component manufacturing activities differently due to the specific details of Buy America's regulations. As noted in the main text, Buy America requires that 60 percent of components must be of domestic origin. However, a component can be considered of domestic origin even if its subcomponents only have 60 percent domestic content.⁵⁵ As a result, Buy America effectively only requires that components have a domestic content of about 36 percent (60 percent domestically-sourced components x 60 percent domestic content of subcomponents among domestically-sourced components = 36 percent domestic content among components).

Due to these features of Buy America, for the three different scenarios we describe in the main text, we use employment multipliers for component manufacturing activities that are adjusted specifically by the domestic content level of the components' subcomponents.

To estimate the employment multipliers for different levels of domestic content of subcomponents involves three basic steps:

1. We start with the railroad rolling stock manufacturing sector and use this to proxy

for railcar component manufacturing, as we did for final assembly and other activities.

2. We identify the top 15 manufacturing sectors with the largest amount of indirect output associated with an increase in demand in railroad rolling stock manufacturing based on the IMPLAN output. I assume that subcomponents for railcar components are supplied by these top 15 manufacturing sectors.
3. We use the average of IMPLAN's Regional Purchase Coefficient (RPC) for these 15 manufacturing sectors to adjust the number of jobs that would result if U.S. firms supplied 60 percent, for example, of the indirect output (i.e., subcomponents) from these 15 manufacturing sectors.⁵⁶

We use the top 15 manufacturing sectors because firms that supply parts for railcars are scattered across various sectors. For example, in the 2010 report by Lowe et al., the researchers found that among the 159 firms that identified as Tier 2 firms that provide railway vehicle and locomotive firms with parts, they only identified 26 through rail-related NAICS codes. Therefore, in order to capture the suppliers of subcomponents, I use a broad category: any manufacturing sector that produces a significant share (i.e., within the top 15) of indirect output to railroad rolling stock manufacturers.

Induced jobs. There are a variety of ways to estimate the number of induced jobs from increased spending.

The IMPLAN model uses the following approach, as described in Pollin et al. (2009), "Induced effects are often estimated by endogenizing the household sector in the input-output model. The assumption is that increases in employee compensation (or value added) finance greater household spending, as reflected in the vector of household consumption in overall final demand."⁵⁷ In the literature, there exists a range

of estimates as to the ratio of induced jobs to the number of direct and indirect jobs produced by investments. Those based on endogenizing the household sector in the way just described tend to produce high-end estimates. As Pollin et al. (2009) explain, “The endogenous household model often yields very large induced effects, in part because the propensity to consume out of employee compensation (or value-added) implicit in the endogenous household input-output model is large.”⁵⁸ As a result, instead of using IMPLAN’s estimates directly, we use the methodology developed by Pollin et al. (2009). See pages 52-55 the technical appendix of that report for details (http://www.peri.umass.edu/fileadmin/pdf/other_publication_types/green_economics/economic_benefits/economic_benefits.PDF).⁵⁹

Specifically, we begin with the basic IMPLAN estimates of the employment and output generated (and associated labor income) from \$1.0 million in spending in railway vehicles and locomotives. We then use these figures combined with Pollin et al.’s (2009) finding that about \$1 million in increased labor income (in 2009\$) generates sufficient economic activity to support 8.7 (induced) jobs.⁶⁰

Table A4.1 presents the job creation figures for final assembly/other activities and also for component manufacturing for the three differ-

ent scenarios described above in the main text. Note that these jobs figures are per \$1 million spending on *domestic sources*, with varying levels of domestic content. The final job creation numbers presented in Table 7 of the main text reflect varying levels of domestically-sourced purchases, as well as domestic content. We discuss this in more detail below.

Starting with the Buy America minimum content scenario, note that the figures for the two different sets of activities do not vary in terms of direct jobs. This is because these are the jobs created at the U.S. firms where money is spent directly (e.g., jobs at a U.S.-based final assembly facility or the U.S.-based component manufacturing factory) and we do not have activity-specific employment multipliers. As noted above, we use direct job creation figures for the railroad rolling stock manufacturing sector as it existed in 2010 (the most recent model in IMPLAN).

The indirect jobs, however, vary between the final assembly/other activities and component manufacturing because we adjust the domestic content of the *inputs* of components to reflect the Buy America requirements as described above. For the final assembly activities, we simply use the current level of indirect jobs created per \$1 million in domestic spending

TABLE A4.1.
Jobs Created Per \$1 million of Spending on Domestic Sources

	Direct	Indirect	Induced
Scenario 1: Buy America minimum content			
Final Assembly and Other Activities	2.0 jobs	3.8 jobs	3.7 jobs
Component Manufacture (60 percent domestic content for subcomponents)	2.0 jobs	3.6 jobs	3.5 jobs
Scenario 2: Current domestic content level for rolling stock			
Final Assembly and Other Activities	2.0 jobs	3.8 jobs	3.7 jobs
Component Manufacture (81 percent domestic content for subcomponents)	2.0 jobs	3.8 jobs	3.7 jobs
Scenario 3: Raising Buy America domestic content minimum			
Final Assembly and Other Activities	2.0 jobs	3.8 jobs	3.7 jobs
Component Manufacture (100 percent domestic content for subcomponents)	2.0 jobs	4.1 jobs	3.9 jobs

Source: IMPLAN. See discussion in Appendix text.

in the railroad rolling stock sector as it existed in 2010. This is why the indirect jobs figures do not vary across the scenarios for final assembly/other activities. The components manufacturing, on the other hand, creates fewer indirect jobs because we limit the domestic content of the inputs of this activity (i.e., the domestic content of the subcomponents). Accordingly, the number of induced jobs created is also lower for the components manufacturing activities compared to the final assembly/other activities.

Next, we consider the “current domestic content level” scenario. For this scenario, the employment multipliers are the same across activities. This is because we simply use IMPLAN’s current domestic content level for the subcomponents (81 percent) for our components manufacturing jobs figures, i.e., we make

no adjustments the IMPLAN’s assumptions about domestic content.

Finally, for the third scenario, “Raising Buy America,” we increase the domestic content level of the inputs to component manufacturing to 100 percent. This has the effect of raising the number of indirect jobs created (and therefore also induced jobs) for every dollar spent domestically on this activity.

Overall job estimates for alternative domestic content scenarios. To produce job estimates reported for each of the three alternative scenarios described in the main text, we will now combine our assumptions about domestic sourcing, domestic content, and the jobs figures above.

In Table A4.2, we present for each scenario our assumptions about the share of railcar value

TABLE A4.2.
Domestic Content by Alternative Scenario

	(1)% of contract	(2)% of activity domestically-sourced	(3)% of contract domestically-sourced (col. 1 x col. 2)	(4)% of domestic source with domestic content	(5)% contract with domestic content (col. 3 x col. 4)
Scenario 1: Buy America minimum content					
Final Assembly	15%	100%	15%	100%	15%
Component Manufacture	70%	60%	42%	60%	25%
Other (e.g., design, engineering)	15%	0%	0%	0%	0%
Total Domestic Content as Share of Railcar Value					40%
Scenario 2: Current domestic content level for rolling stock					
Final Assembly	15%	100%	15%	100%	15%
Component Manufacture	70%	80%	56%	81%	45%
Other (e.g., design, engineering)	15%	0%	0%	0%	0%
Total Domestic Content as Share of Railcar Value					60%
Scenario 3: Raising Buy America domestic content minimum					
Final Assembly	15%	100%	15%	100%	15%
Component Manufacture	70%	100%	70%	100%	70%
Other (e.g., design, engineering)	15%	35%	5%	100%	5%
Total Domestic Content as Share of Railcar Value					90%

Source: IMPLAN. See discussion in Appendix text.

taken up by each activity (col. 1), each activity's level of domestic sourcing (col. 2), and the domestic content of the domestic spending (col. 4). The last column combines the figures in these columns and shows the overall level of domestic content as a share of the railcar's total value. As discussed in the main text, the domestic content level in the Buy America minimum scenario is about 40 percent, it is 60 percent under the current situation, and 90 percent with stronger Buy America standards.

Note that for the current situation, we derived our domestic source figure for components (80 percent) based on the following. We assume that 15 percent of a railcar's value has domestic content due to final assembly activities, and 0 percent due to "other" activities. In order to achieve a domestic content level of 60 percent overall—our best estimate based on Department of Commerce input-output figures (see p. 42 in the main text)—compo-

nents should add domestic content equal to 45 percent of total railcar value. IMPLAN's current domestic *content* of domestically-sourced components is about 81 percent. Therefore, in order for components, which make up 70 percent of the overall railcar value, to add domestic content equal to 45 percent of total railcar value, 80 percent of these components must be purchased domestically (45 percent = 70 percent x 81 percent x 80 percent).

We next apply the proportion of domestic spending (i.e., col. 3) indicated in Table A4.2 for each activity and scenario, to the relevant job creation figure per \$1 million in domestic spending in Table A4.1. This exercise produces the job creation figures per \$1 million in overall spending reported in Table A4.3. These are the job creation figures also reported in Table 7.

Job creation estimates for railcar and bus spending. We know from IMPLAN data that

TABLE A4.3
Total Job Creation Per \$1 million of Overall Railcar Spending

	Direct	Indirect	Induced
Scenario 1: Buy America minimum content			
Final Assembly	0.3	0.6	0.6
Component Manufacture	0.8	1.5	1.5
Other (e.g., design, engineering)	0.0	0.0	0.0
Subtotals	1.1	2.1	2.0
Total jobs created:			5.2
Scenario 2: Current domestic content level for rolling stock			
Final Assembly	0.3	0.6	0.6
Component Manufacture	1.1	2.2	2.1
Other (e.g., design, engineering)	0.0	0.0	0.0
Subtotals	1.4	2.7	2.6
Total jobs created:			6.7
Scenario 3: Raising Buy America domestic content minimum			
Final Assembly	0.3	0.6	0.6
Component Manufacture	1.4	2.9	2.7
Other (e.g., design, engineering)	0.1	0.2	0.2
Subtotals	1.8	3.6	3.5
Total jobs created:			8.9

Sources: Tables A4.1 and Tables A4.2.

the job creation potential from spending on buses is slightly lower than for spending on railcars. IMPLAN data indicate that investing in buses creates about 10 percent fewer jobs compared to investing in railcars. Therefore, for our job creation figures for both bus and railcar investments presented in Table 8 in the main text, we assume that spending on buses creates 10 percent fewer jobs than the same type of spending on railcars. In other words, \$1 million in spending on buses only would create 4.7 jobs, 6.0 jobs, and 8.0 jobs for the scenarios respectively. We then weight these job creation figures based on the average shares of overall public spending on railcars and buses over 2003 to 2012 to produce the jobs figures in Table 8. According to the American Public Transportation Association (APTA), these shares are 57 percent on buses and 43 percent on railcars.⁶¹

Estimating Job Characteristics. We estimate the job characteristics of the new employment created by an investment in railcars with a high level of domestic content. Specifically, we assume that the railcars are domestically sourced and have components and subcomponents with 100 percent domestic content.

Our basic strategy for identifying the types of jobs that would be added to the economy due to an investment in railcars involves two steps. The first step is to calculate each industry's share of total employment created by the investment. We calculated the percentage of new employment generated in each of the 440 sectors in our input-output model (as described above) from an increase in spending on railcars.⁶² These industry shares take into account the direct and indirect effects. The second step is to combine this information on the industry composition of new employment created by investing in railcars with data on workers currently employed in these industries. We use the characteristics of these workers to determine the types of occupations (and the credential requirements of these occupations) that will add

jobs with the investment in railcars. Our data on current workers comes from the 2013-2014 Basic Monthly and Annual Social and Economic (ASEC) data files of the Current Population Survey (CPS).

The CPS is a monthly household survey conducted for the Bureau of Labor Statistics by the U.S. Census Bureau. The basic monthly survey of the CPS collects information from about 50,000 households every month on a wide range of topics including demographic characteristics, current employment status, union status, wages and work schedules. The ASEC survey, conducted only in March as a supplement to the March basic monthly survey, provides additional data, including on workers' health and retirement benefits.⁶³

Specifically, we used the industry shares to weight the worker data in the CPS so that the industry composition of the workers in the CPS sample matches the industry composition of the new jobs that will be added by investing in railcars. We do this by using the industry shares to adjust the CPS-provided sampling weights. The CPS-provided sampling weights weight the survey sample so that it is nationally representative. We use the industry shares to adjust these sampling weights so that the sample of workers in the CPS is representative of the industrial mix of jobs that IMPLAN estimates will be produced by new investments in railcars. In order to create the weights, we merge the industry share data to the CPS worker data using the most detailed industry variable provided in the CPS.

We adjust the CPS-provided sampling weights by multiplying each individual worker's sampling weight with the following:

$$S \times \frac{\text{IMPLAN's estimate of the share of new jobs in worker's industry } I}{\sum (\text{CPS sampling weights of all workers in industry } I)}$$

where S is a scalar equal to the number of jobs produced overall by the investment.

We use these adjusted sampling weights to estimate the proportions of workers that have 1) a high school degree, and no college experience, 2) some college, but no B.A. degree, and 3) a BA degree or more. We then assume that these same proportions of jobs generated by an investment in railcars require each level of education credentials.

The average (mean) wage data presented in the main text of the report are based on the 2013-14 CPS outgoing rotation files (ORG) of the basic monthly survey. These data files have detailed information about hourly rates for hourly-paid workers, and weekly earnings and weekly hours for non-hourly paid workers. We divide weekly earnings by weekly hours to estimate hourly rates for non-hourly paid workers. For some non-hourly paid workers, we do not have data on their usual weekly hours (some report usual hours vary). For these workers, we impute their usual weekly hours by assigning their *actual* hours worked as their usual hours worked *if* their actual hours worked is consistent with what they report is their usual work schedule – part-time or full-time. For example, if a worker reports that his hours usually vary, but he reports that he worked 15 hours last

week and that he usually works part-time, we impute that worker’s usual hours to be 15 hours per week. However, if this worker reports that he usually works full-time, we assigned his usual hours as missing. Roughly five percent of the hours, and thus hourly wages, in our data set are imputed in this fashion.

To get these same figures for the overall national economy, we simply use the CPS provided weights instead of adjusting these weights.

Identifying Representative Occupations.

We also use our adjusted sampling weights to produce a list of the representative occupations among the new jobs created by an investment in railcars. Specifically, we estimate the share of these new jobs in each occupation category in the CPS (4-digit occupation code), and sort these occupations from the largest to lowest share. We do this separately for each educational credential category (described above). The top 50 occupations guide our selection of representative occupations.

ENDNOTES

- 1 Figures are from the U.S. Department of Commerce's Use Table of the 2013 U.S. Input/Output Tables (see: http://www.bea.gov/iTable/index_industry_io.cfm)
- 2 These themes are also explored in Feldman (2009) and Pollin and Baker (2010).
- 3 Amsden (2003) is an outstanding study on this historic development.
- 4 The information on Detroit from this and the next two paragraphs are from Smil (2013) pp. 166-67.
- 5 The information on Youngstown is from Smil (2013), p. 140; on Spartanburg and Kannapolis from Holmes (2011). McCormick (2009) provides a valuable overview on "the plight of American manufacturing."
- 6 Smil (2013, p. 134), with underlying data from Atkinson et al. (2012).
- 7 See Mankiw (2006, 2015), Samuelson (2004) and Blinder (2009). Among commentators, the former CNN and current Fox News commentator and lifelong Republican Lou Dobbs expressed the view that "the proponents of outsourcing and free trade will tell you that it's all a win-win proposition. It's been my experience that you should reach for your wallet when anyone says "win-win", (2004, p. 64).
- 8 Specifically, Milberg and Winkler found that a 10 percent increase in services and materials offshoring is associated with a 2.6 percent reduction in the share of total value added going to workers.
- 9 See Pollin 2003, Chapter 3 and Pollin 2012, Chapter 3 for further development on this point.
- 10 Smil (2013, p. 203) expands further on the findings of MacPherson and Vachan, writing that the pattern they have observed "will only get more common, and while it may actually boost innovation originating under the corporate labels of Apple, Boeing, Caterpillar, Dell or IBM, it surely does not create jobs in the United States."
- 11 Figures are from U.S. Census Bureau (2015).
- 12 Smil's assessment is broadly shared in a recent study published by the Brookings Institute (Muro et al. 2015). For example, Muro et al. write that "Since 2000, the sector's employment and output as a share of the total U.S. economy has shrunk, and the nation's standing on these measures now lags world leaders. Equally worrisome is the balance of trade in the sector. Although advanced industries export \$1.1 trillion worth of goods and services each year and account for roughly 60 percent of total U.S. exports, the United States ran a \$632 billion trade deficit in the sector in 2012, in line with similar yearly balances since 1999," (2015, p. 6). Reflecting these patterns, if primarily only implicitly, the President's Council of Advisors on Science and Technology issued a Report to the President on *Accelerating U.S. Advanced Manufacturing* (2014).
- 13 Kim (2013) provides a good overview report on U.S. reshoring trends.
- 14 This discussion draws from Pollin (2012), Ch. 3.
- 15 Trade balances within the Eurozone are well summarized in the 3/2/15 blog by Prof. Josh Mason: <http://slackwire.blogspot.com/2015/03/what-has-happened-to-trade-balances-in.html>.
- 16 This point is also emphasized by Freeman (2009).
- 17 See also Fitzgerald et al. (2010) and Renner and Gardner (2010) for related discussions on the U.S. railcar industry.
- 18 Pages et al. (2013).
- 19 The classic study on overall Japanese industrial policies between 1925 and 1975 is Johnston (1982). For more recent details on the Japanese rolling stock industry see Mizoguchi (2005).
- 20 See Renner and Gardner (2010) for discussions and additional references on contemporary industrial policies for the railcar industry in Spain and throughout Europe.
- 21 The classic discussion of this pattern is in Hirschman (1970).
- 22 See Manuel et al. (2014) for details on Buy America legislation. The DOT website also provides useful materials on the provisions of Buy America. The DOT's overview presentation is here: <https://www.transportation.gov/highlights/buyamerica> Their "side-by-side" presentation of provisions as they apply, respectively to the FAA, FHWA, FRA, AMTRAK, and FTA is here: https://www.transportation.gov/sites/dot.dev/files/docs/buy_america_provisions_side_by_side.pdf As noted in this side-by-side presentation, provisions of Buy America also applied to the implementation of the American Recovery and Reinvestment Act of 2009—i.e. the Obama Administration's \$800 billion stimulus program in the aftermath of the 2007-09 financial crisis and subsequent Great Recession.
- 23 Buy America requirements, found in 49 C.F.R. 661.11(g), are strictly limited to components and final assembly. See Appendix 1 for details on the component and final assembly activities' shares of the total railcar value.
- 24 Buy America requirements, found in 49 C.F.R. 661.11(g), state, "For a component to be of domestic origin, more than 60 percent of the subcomponents of that component, by cost, must be of domestic origin, and the manufacture of the component must take place in the United States. If, under the terms of this part, a component is determined to be of domes-

- tic origin, its entire cost may be used in calculating the cost of domestic content of an end product.” Note that in the case of components, we do not know how much of a component’s cost is comprised specifically of subcomponents (as opposed to profits or the manufacturing activity of the component). However, it is reasonable to assume that subcomponents make up the large majority of a component’s value. Therefore, we use the domestic content of the subcomponents to proxy for the domestic content of components.
- 25 See: “Buy America, Conducting Pre-Award and Post-Delivery Reviews for Rail Vehicle Procurements,” at http://www.fta.dot.gov/legislation_law/12921_5424.html
- 26 The forward to the Handbook states clearly that “This is a best practices handbook (a non-binding guidance document) for use by auditors as well as grantees, vendors, and interested members of the public (p.1).”
- 27 Frequently Asked Questions about the Pre-Award and Post-Delivery Review http://www.fta.dot.gov/legislation_law/12921_5450.html
- 28 Number 56 FR 926, Buy America rulemaking includes a discussion of the cost and expertise required to perform a Buy America audit and the inability of most regional transit properties to perform the necessary audit activities. Telephone interviews with several contract administrators at various U.S. transit properties regarding pre-delivery and post-award audits corroborate this lack of capacity. Audit documents by regional transit properties show a regular reliance on consultants for verification of compliance, one audit provided evidence of work performed to cross check actual domestic content by the awarded manufacturer, while most other audits did not demonstrate how compliance was determined. http://www.fta.dot.gov/legislation_law/12316_574.html
- 29 These observations are based on the experience of Linda Nguyen and Erika Patterson of the Jobs to Move America project, in developing their database of the 54 new railcar contracts issued during 2006 to 2012 by public transit agencies (see Appendix 1 for a description of this research).
- 30 In an April 2015 formal memorandum to the County Counsel for the Los Angeles County Transportation Division, the UCLA Community Economic Development Law Clinic provides a careful review of public disclosure legal requirements as they apply to procurement contracts. They find that, with respect to the categories of information that are required for the public to independently assess procurement contracts, that “the public interest in disclosure—specifically, the interest in public participation in the advancement of significant public policy related to transit production—strongly outweighs the interest in nondisclosure.” (2015, p. 22).
- 31 See: <http://www.transportation.gov/highlights/buy-america>
- 32 A private correspondence on 6/15/15 from a Department of Transportation official to Robert Pollin states that “FTA does not have a comprehensive list of all of the Buy America waivers granted or denied. Prior to FY2011, most Buy America waiver requests were handled in the regional offices and were not tracked by FTA. MAP-21 required that all waivers be published in the Federal Register for notice and comment before issuing a final waiver. . . . Thus, beginning in October 2012, all waivers issued by FTA were published in the Federal Register and are available on FTA’s website.
- 33 One DOT website lists that, in the area of highway construction, 34 waivers were granted between 7/25/11 and 12/18 14, while 4 waivers were denied between 3/7/08 and 7/16/10. See: <http://www.fhwa.dot.gov/construction/contracts/waivers.cfm>
- 34 According to this evidence provided directly to Robert Pollin, the FTA granted between 37 and 52 waivers annually between 2008 and 2010. But the number of granted waivers fell to 14 in 2011, 3 in 2012, 0 in 2013, and 7 in 2014. We are grateful to Dr. Bryna Helfer of the DOT for providing this information and the comment cited in footnote 33 above.
- 35 See U.S. Government Publishing Office (2015).
- 36 See Scott et al. (2006).
- 37 See U.S. Government Publishing Office (2015).
- 38 See Scott et al. (2006).
- 39 See New York State (2014) and <http://web.mta.info/mta/procurement/doingbusiness.htm>.
- 40 Ibid.
- 41 Among the 54 railcar contracts in Nguyen and Patterson’s database, 31 had information about whether a contract was awarded to the lowest bidder. Among these 31 contracts, 27 were awarded to the lowest bidder, i.e., 87 percent. See Appendix 1 for details on Nguyen and Patterson’s database of railcar procurement contracts.
- 42 This observation is based on confidential telephone communications between Linda Nguyen and high-level managers at two major railcar manufacturers in November/December 2012.
- 43 The basic information on the LA MTA U.S. Employment plan is presented in its 2/17/15 brochure, *U.S. Employment Program*. We have also benefitted greatly from direct communications that Robert Pollin held in August 2015 with Victor Ramirez, the Interim Executive Officer at LA MTA.
- 44 Information on these programs is at: <http://jobstomoveamerica.org/resources/>

- 45 See LA MTA's 4/9/15 brochure *Local Employment Program* for details on this. In addition to these approaches to adding an employment component to best-value procurement practices, federal procurement policy also allows for the setting of specific goals and targets to meet other government objectives. An example of this is the federal small business "goaling" program, in which federal executive agencies set statutory targets for a certain percentage of contracts to be awarded to small businesses. These overall targets are further broken down and goals are set for small businesses owned by women, veterans, and people from disadvantaged groups. Actual performance of each agency is then evaluated using a Small Business Procurement Scorecard. The dollar value of contracts awarded to small businesses, supported by these goals, is substantial. In the 2014 fiscal year, \$91.7 billion in federal contracts were awarded to small businesses. Similar goals and evaluation processes could be developed that are linked to job creation targets. For details, see: <https://www.sba.gov/content/small-business-procurement-scorecards-0>
- 46 See Nicholson and Noonan (2014), p. 12. We are extremely grateful to Ryan Noonan for his assistance in guiding us through both his research findings presented in this paper as well as assisting us in undertaking our own modeling with both the 2012 and 2007 datasets.
- 47 It is possible that the Commerce Department's figures on the domestic content of U.S. manufacturing production could include an upward bias comparable to the bias we described above with respect to measuring manufacturing productivity. The most likely way in which a bias in measuring domestic content could emerge would be if, similar to the situation with the productivity figures, foreign-sourced subcomponents are being measured as domestically produced once these subcomponents are incorporated into a U.S.-based manufacturing operation. We have no evidence suggesting such a bias does exist. To evaluate this possibility would entail a research project comparable to that developed by Houseman on the measurement of manufacturing productivity. Such a research project is beyond the scope of this study.
- 48 As we have discussed, in practice, it is possible for the actual level of domestic content to fall below 40 percent. This could either be because of weak enforcement of or the granting of waivers from the Buy America requirements.
- 49 Details of these calculations are presented in Appendix 4.
- 50 We differentiate jobs using categories of "education credentials" as opposed to the more traditional categories denoting levels of "skill,"—such as "high" or "low-skilled" workers, for two reasons. For many jobs, such as those in manufacturing or construction, education credentials more accurately reflect their entry requirements for employment, even though such jobs can require significant training to become fully qualified. Such training, however, is frequently obtained on-the-job or through an employer- or employer/union- sponsored apprenticeship program. For this reason many of our "high school or less" jobs are classified by Holzer and Lerman (2007) as "middle-skilled" jobs: such jobs do not require college experience, but do require significant training. In addition, we believe the terms we are using more accurately reflect the actual distinctions between job categories. Many jobs are referred to as "low-skilled" only because they do not require high education credentials or formal training even while such jobs frequently require operating at a high skill level to deliver a satisfactory product or service. Many job types in durable manufacturing fit this description, as do jobs in other areas, such as construction, agriculture, needle trades, child-care and elderly care.
- 51 Other areas of the labor market where such jobs are likely to be found include construction, temporary employment agencies, health services, public administration, social services, transportation and administration and wholesale trade. Low-credentialed workers employed in industries such as apparel and textile manufacturing, hotels, personal services such as dry cleaning, and restaurants and bars have far less opportunity to improve their earnings over time.
- 52 The fact that, on average, jobs generated by railcar manufacturing investments provide relatively good wages and benefits despite the fact that union coverage rates are no higher than the national average raises a question. That is, throughout the U.S. economy overall and in transportation manufacturing in particular, unionized workers earn, on average, about 15 percent more than non-unionized workers (U.S. Bureau of Labor Statistics, 2015). It therefore appears inconsistent with this overall pattern with respect to a union wage premium that we observe this wage and benefit premium for jobs generated by railcar manufacturing investments even while unionization rates for these jobs are only at the national average. Further research will be necessary to explain this pattern.
- 53 Pastor and Sanchez (2015) also document the underrepresentation of women in manufacturing more generally, as well as in transportation equipment manufacturing, specifically. They find that women comprised 30 percent of the broader manufacturing workforce and 26 percent of the transportation equipment manufacturing over the years 2008-2012. This is consistent with our estimate that women make up 28.9 percent of the direct and indirect jobs produced by investing in railroad rolling stock—jobs primarily located in the transportation equipment manufacturing industry but also in the related sectors that produce the industry's inputs. We do also note that for the narrower category of "railroad rolling

- stock manufacturing”, the Bureau of Labor Statistics reports that the percentage of female employees was 11.3 percent in 2010 and 17.9 percent in 2012. The near-30 percent figures we are highlighting here are based on the broader statistical category of “transportation equipment manufacturing.”
- 54 This detail about other modes of transportation was provided in personal correspondence with the authors on June 8, 2015, with Ryan Noonan of the U.S. Commerce Department.
- 55 See:
http://www.fta.dot.gov/newsroom_4531.html
<http://www.gpo.gov/fdsys/pkg/CFR-2011-title49-vol7/pdf/CFR-2011-title49-vol7-sec661-11.pdf>
- 56 RPC is defined by IMPLAN as: “...the proportion of the total demand for a commodity by all users in the Study Area that is supplied by producers located within the Study Area. For example, if the RPC for the commodity “fish” is 0.8, then 80% of the demand by local fish processors, fish wholesalers, and other fish consumers are met by local fish producers. Conversely, 20% (1.0-RPC) of the demand for fish is satisfied by imports.” This definition is provided by IMPLAN’s glossary of terms, published on its website (see: http://www.implan.com/index.php?option=com_glossary&letter=R&id=198).
- 57 See Pollin et al. (2009).
- 58 Ibid., p. 53.
- 59 Ibid.
- 60 Ibid., p. 54.
- 61 These figures are from the APTA (2014).
- 62 Note that for this analysis we used the sector “transportation manufacturing” to estimate direct job characteristics in order to have sufficient sample sizes.
- 63 Workers with health benefits only include those whose employer pays some or all of the health insurance premium. Workers with retirement benefits include those whose employer may or may not contribute any retirement funds.

REFERENCES

- American Public Transit Association (2014) Public Transportation Fact Book, Appendix A: Historical Tables 2014. (Available online only at: <http://www.apta.com/resources/statistics/Documents/FactBook/2014-APTA-Fact-Book-Appendix-A.pdf>).
- Amsden, Alice (2003) *The Rise of “The Rest”: Challenges to the West from Late-Industrializing Economies*, New York: Oxford University Press.
- Andersson, Frederik, Harry Holzer and Julia Lane (2005) *Moving Up or Moving On: Who Advances in the Low-Wage Labor Market*. New York: Russell Sage Foundation.
- Atkinson, Robert D, Luke A. Stewart, Scott M. Ades and Stephen J. Ezell (2012) *Worse than the Great Depression: What Experts are Missing about American Manufacturing Decline*. Washington, DC: Information Technology and Innovation Foundation, <http://www2.itif.org/2012-american-manufacturing-decline.pdf>
- Baily, Martin Neil and Barry P. Bosworth (2014) “U.S. Manufacturing: Understanding Its Past and Its Potential Future,” *Journal of Economic Perspectives*, 28:1, pp. 3-26.
- Berger, Susan (2013) *Making in America: From Innovation to Market*, Cambridge, MA: MIT Press.
- Bhagwati, Jagdish (2009) “Don’t Cry for Free Trade,” in Benjamin Friedman ed., *Offshoring of American Jobs: What Response from U.S. Economic Policy*, Cambridge, MA: MIT Press, pp. 1-18.
- Blinder, Alan (2009) “Offshoring: Big Deal, or Business as Usual?” in Benjamin Friedman ed., *Offshoring of American Jobs: What Response from U.S. Economic Policy*, Cambridge, MA: MIT Press, pp. 19 – 60.
- Bluestone, Barry and Bennett Harrison (1982) *The Deindustrialization of America*, New York: Basic Books.
- Cohen, Stephen S. and John Zysman (1987) *Manufacturing Matters: The Myth of the Post-Industrial Economy*, New York: Basic Books.
- Dobbs, Lou (2004) *Exporting America: Why Corporate Greed is Shipping American Jobs Overseas*. New York: Warner Business Books.
- Feldman, Jonathan Michael (2009) “From Mass Transit to New Manufacturing,” *The American Prospect*, March 22, <http://prospect.org/article/mass-transit-new-manufacturing>
- Ferreira, John and Mike Heilala (2011) “Manufacturing’s Secret Shift: Gaining Competitive Advantage by Getting Closer to the Customer,” *Accenture*, http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture_Manufacturings_Secret_Shift.pdf
- Fitzgerald, Joan, Lisa Grandquist, Ishwar Khatiwada, Joe McLaughlin, Michael Renner and Andrew Sum (2010) *Reviving the U.S. Rail and Transit Industry: Investments and Job Creation*, Washington, DC: Worldwatch Institute.
- Freeman, Richard (2009) “Comment on Bhagwati and Blinder,” in Benjamin Friedman ed., *Offshoring of American Jobs: What Response from U.S. Economic Policy*, Cambridge, MA: MIT Press, pp. 61-70.
- Hirschman, Albert (1970) *Exit, Voice and Loyalty: Responses to Declines in Firms, Organizations and States*, Cambridge, MA: Harvard University Press.
- Helper, Susan, Timothy Krueger and Howard Wial (2012) *Why Does Manufacturing Matter? Which Manufacturing Matters?* Metropolitan Policy Program, Brookings Institution, http://www.brookings.edu/~media/research/files/papers/2012/2/22-manufacturing-helper-krueger-wial/0222_manufacturing_helper_krueger_wial.pdf
- Holmes, Thomas J. (2011) “The Case of the Disappearing Large Employer Manufacturing Plants: Not Much of a Mystery at All,” Minneapolis, MN: Federal Reserve Bank of Minneapolis, <https://www.minneapolisfed.org/research/economic-policy-papers/the-case-of-the-disappearing-largeemployer-manufacturing-plants-not-much-of-a-mystery-after-all>
- Holzer, Harry and Robert Lerman (2007) *America’s Forgotten Middle-Skill Jobs*. Washington DC: The Workforce Alliance.
- Housman, Susan (2007) “Outsourcing, Offshoring, and Productivity Measurement in the United States Manufacturing,” *International Labor Review*, 146, pp. 61-80.
- Housman, Susan, Christopher Kurz, Paul A. Lengermann, and Benjamin J. Mandel (2010) “Offshoring and the State of American Manufacturing,” Upjohn Institute Working Paper No. 10-166. Kalamazoo, MI: W.E. Upjohn Institute, http://research.upjohn.org/cgi/viewcontent.cgi?article=1183&context=up_workingpapers
- IG Metall (2014) *Industrial Policy Today: Regional Examples from IG Metall*, Frankfurt/Main, IG Metall Vorstand, http://www.igmetall.de/internet/Industrial%20Policy%20today_Regional%20examples%20from%20IG%20Metall_7aacbbfd063d1bb0bf35f25e97e59359c0a83c78.pdf
- Immelt, Jeffrey (2012) “The CEO of General Electric on Sparking an American Manufacturing Renewal,” *Harvard Business Review*, <https://hbr.org/2012/03/the-ceo-of-general-electric-on-sparking-an-american-manufacturing-renewal/ar>
- Johnston, Chalmers (1982) *MITI and the Japanese Miracle: The Growth of Industrial Policy, 1925-75*, Stanford, CA: Stanford University Press.

- Kim, Anne (2013) "Three Ways to Bring Manufacturing Back to America," *Washington Monthly*, April, http://www.washingtonmonthly.com/magazine/march_april_2013/features/three_ways_to_bring_manufacture043318.php?page=all
- Lowe, Marcy, Saori Tokuoka, Kristen Dubay, and Gary Gereffi (2010) *U.S. Manufacture of Rail Vehicles for Intercity Passenger Rail and Urban Transit*. Durham, NC: Center on Globalization, Governance and Competitiveness, Duke University.
- MacPherson, Alan and Vida Vanchan (2010) "The Outsourcing of Industrial Design Services by Large Manufacturing Companies," *International Regional Science Review*, 33, pp. 3-30.
- Mankiw, N. Gregory (2015) "Economists Actually Agree on This: The Wisdom of Free Trade," *New York Times*, April 24 (on-line), <http://www.nytimes.com/2015/04/26/upshot/economists-actually-agree-on-this-point-the-wisdom-of-free-trade.html?abt=0002&abg=1>
- Mankiw, N. Gregory and Philip Swagel (2006) "The Politics and Economics of Offshore Outsourcing," Cambridge, MA: National Bureau of Economic Research working paper #12398 <http://www.nber.org/papers/w12398.pdf>
- Manuel, Kate M., Alissa M. Dolan, Brandon J. Murrill and Rodney M. Perry (2014) *Domestic Content Restrictions: The Buy American Act and Complementary Provisions of Federal Law*, Washington, DC: Congressional Research Service, <https://www.hsdl.org/?view&did=749327>
- McCormick, Richard (2009) "The Plight of American Manufacturing," *The American Prospect*, p.A2, December 12, <http://prospect.org/article/plight-american-manufacturing>
- Milberg, William and Deborah Winkler (2013) *Outsourcing Economics: Global Value Chains in Capitalist Development*, New York: Cambridge University Press.
- Mizoguchi, Masahito (2005) "The Rolling Stock Manufacturing Industry in Japan," *Japanese Rail and Transport Review*, October, http://www.jrtr.net/jrtr41/pdf/f14_miz.pdf
- Muro, Mark, Jonathan Rothwell, Scott Andes, Kenan Fikri, and Siddharth Kulkarni (2015) *America's Advanced Industries: What They Are, Where They Are, and Why They Matter*, Washington, DC: Brookings Institution, Brookings Advanced Industries Project, http://www.brookings.edu/~media/Research/Files/Reports/2015/02/03-advanced-industries/final/AdvancedIndustry_FinalFeb2lores.pdf?la=en
- National Research Council (1992) *Dispelling the Manufacturing Myth: American Factories Can Compete in the Global Marketplace* Washington, DC: National Academy Press.
- New York State (2014) *New York State Procurement Guidelines*, May.
- Nicholson, Jessica R. and Ryan Noonan (2014) *What is Made in America?* Washington DC: Economics and Statistics Administration, U.S. Department of Commerce, http://www.esa.doc.gov/sites/default/files/whatismadeinamerica_0.pdf
- Nordhaus, William (2005) "The Sources of the Productivity Rebound and the Manufacturing Employment Puzzle," Cambridge, MA: National Bureau of Economic Research Working Paper #11354, <http://www.nber.org/papers/w11354.pdf>
- Pages, Erik R., Brian Lombardozzi, and Lindsey Woolsey (2012) *The Emerging U.S. Rail Industry: Opportunities to Support American Manufacturing and Spur Regional Development*, Washington, DC: National Institute for Standards and Technology, <http://www.nist.gov/mep/upload/Rail-Report.pdf>
- Pastor, Manuel and Jared Sanchez (2015) *#WomenCanBuild: Including women in the resurgence of good U.S. manufacturing jobs*. Los Angeles: USC Dornsife Program for Environmental and Regional Equity.
- Pisano, Gary P. and Willy C. Shih (2012) *Producing Prosperity: Why America Needs a Manufacturing Renaissance*, Boston, MA: Harvard Business Review Press.
- Pollin, Robert (2003) *Contours of Descent: U.S. Economic Fractures and the Landscape of Global Austerity*, New York: Verso Press.
- Pollin, Robert (2012) *Back to Full Employment*, Cambridge, MA: MIT Press.
- Pollin, Robert and Dean Baker (2010) "Reindustrializing America: A Proposal for Reviving U.S. Manufacturing and Creating Millions of Good Jobs," *New Labor Forum*, 19:2, pp. 17-34. http://www.peri.umass.edu/fileadmin/pdf/other_publication_types/magazine___journal_articles/final_Spring_2010_Pollin.pdf
- Pollin, Robert, James Heintz, and Heidi Garrett-Peltier (2009) *The Economic Benefits of a Clean Energy Economy*, Amherst, MA: Political Economy Research Institute. http://www.peri.umass.edu/fileadmin/pdf/other_publication_types/green_economics/economic_benefits/economic_benefits.PDF
- President's Council of Advisors on Science and Technology (2014) *Report to the President: Accelerating U.S. Advanced Manufacturing*, Washington, DC: Executive Office of the President, https://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/amp20_report_final.pdf

- Rattner, Stephen (2011) "The Secrets of Germany's Success," *Foreign Affairs*, July/August, <https://www.foreignaffairs.com/articles/germany/2011-06-16/secrets-germanys-success>
- Reutter, Mark (1994) "The Lost Promise of the American Railroad," *The Wilson Quarterly*, Winter, pp.10-35. <https://www.questia.com/magazine/1G1-15143910/the-lost-promise-of-the-american-railroad>
- Renner, Michael and Gary Gardner (2010) *Global Competitiveness in the Rail and Transit Industry*, Washington, DC: Worldwatch Institute.
- Rowthorn, Robert and R. Ramaswamy (1997) *Deindustrialization: Causes and Implications*, Washington, DC: International Monetary Fund.
- Ruttan, Vernon W. (2006) *Is War Necessary for Economic Growth? Military Procurement and Technology Development*, New York: Oxford University Press.
- Samuelson, Paul (2004) "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization," *Journal of Economic Perspectives*, (18:3) pp. 135-46.
- Scott, Robert E. (2015) *The Consequences of Neglecting Manufacturing*, Washington, DC: Economic Policy Institute, <http://www.epi.org/publication/the-consequences-of-neglecting-manufacturing-compared-with-other-nations-u-s-has-more-import-competition-in-leading-export-industries/>
- Scott, S., K. Molenaar, D. Gransberg, and N. Smith (2006) *Best Value Procurement Methods for Highway Construction Projects*. Transportation Research Board, Washington, D.C.
- Smil, Vaclav (2013) *Made in America: The Rise and Retreat of American Manufacturing*, Cambridge, MA: MIT Press.
- Tate, Wendy L., Lisa Ellram, Kenneth J. Petersen, and Tobias Schoenherr (2014) *Current Practices in Offshoring and Reshoring*, Lombard, IL: Council of Supply Chain Management Professionals.
- U.S. Bureau of Labor Statistics (2013a) "International Comparisons of Hourly Compensation Costs in Manufacturing, 2012," August 9, <http://www.bls.gov/fls/ichcc.htm#chart04>.
- U.S. Bureau of Labor Statistics (2013b) "International Labor Comparisons: India's Organized Manufacturing," August 28, <http://www.bls.gov/fls/ichcc.htm#chart04>.
- U.S. Bureau of Labor Statistics (2013c) "International Comparisons: Manufacturing in China," June 7, <http://www.bls.gov/fls/china.htm>.
- U.S. Bureau of Labor Statistics (2015) "Historical Database for the Tables of the Union Membership News Releases" Accessed August 2015, <http://www.bls.gov/cps/cpslutabs.htm>.
- U.S. Census Bureau (2015) *U.S. International Trade in Goods and Services*, February 2015, April 2, <https://www.census.gov/foreign-trade/Press-Release/2015pr/02/index.html>
- UCLA Community Economic Development Law Clinic (2015) "Memorandum RE: Public Records Disclosure Policy," unpublished, April.
- U.S. Government Publishing Office. 2015. *Electronic Code of Federal Regulations, Title 48 Federal Acquisition Regulations System, Chapter 1, Subchapter C, Part 15.101-2*, <http://www.ecfr.gov/>.
- Wessner, Charles (2013) "How Does Germany Do It?" *American Society of Mechanical Engineers*, <https://www.asme.org/engineering-topics/articles/manufacturing-processing/how-does-germany-do-it>

ABOUT THE AUTHORS

Robert Pollin is Distinguished Professor of Economics and Co-Director of the Political Economy Research Institute (PERI) at the University of Massachusetts-Amherst. He is also the founder and President of PEAR (Pollin Energy and Retrofits), an Amherst, MA-based green energy company operating throughout the United States. His books include *The Living Wage: Building a Fair Economy* (co-authored 1998); *Contours of Descent: U.S. Economic Fractures and the Landscape of Global Austerity* (2003); *An Employment-Targeted Economic Program for South Africa* (co-authored 2007); *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* (co-authored 2008), *Back to Full Employment* (2012), *Green Growth* (2014), *Global Green Growth* (2015) and *Greening the Global Economy* (2015). He has worked recently as a consultant for the U.S. Department of Energy, the International Labour Organization, the United Nations Industrial Development Organization and numerous non-governmental organizations in several countries on various aspects of building high-employment green economies. He has also directed projects on employment creation and poverty reduction in sub-Saharan Africa for the United Nations Development Program, and has worked with many U.S. non-governmental organizations on creating living wage statutes at both the statewide and municipal levels. He is presently a member of the Scientific Advisory Committee of the European Commission project on Financialization, Economy, Society, and Sustainable Development (FES-SUD). He was selected by *Foreign Policy* magazine as one of the “100 Leading Global Thinkers for 2013.”

James Heintz is Andrew Glyn Professor of Economics and Associate Director of the Political Economy Research Institute at the University of Massachusetts, Amherst. His current work focuses on employment policy; economics and human rights; informal and atypical employment; macro-economic policies for sub-Saharan Africa; and the links between economic policies and distributive outcomes, including race and gender dimensions.

Jeannette Wicks-Lim is an Assistant Research Professor at the Political Economy Research Institute at the University of Massachusetts, Amherst. Wicks-Lim specializes in labor economics. Her research focuses on low-wage workers in the U.S. economy and has an overlapping interest in the political economy of race. Her publications include *A Measure of Fairness: The Economics of Living Wages and Minimum Wages in the United States* (co-authored 2008), and the studies “Improving Population Health by Reducing Poverty: New York’s Earned Income Tax Credit” (2015), “An Assessment of the Fiscal Impact of the Proposed Sonoma County Living Wage Ordinance,” (2014); and “A Stimulus for Affirmative Action” (2013). She also writes regularly for *Dollars & Sense* magazine.