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REINDUSTRIALIZING AMERICA

A Proposal for Reviving U.S. Manufacturing and Creating Millions of Good Jobs

The U.S. economy faces enormous questions and challenges in attempting to recover from the collapse of 2008-2009. Some of the most pressing questions are short-term and cyclical: When will unemployment start falling? When will banks start lending at reasonable levels for productive purposes? At what level will the housing market stabilize and foreclosures fall off? Can an overall economic upswing be sustained?

But equally daunting are a series of longer-term, structural challenges: Can we establish a growth engine driven by something other than financial bubbles? Can we renew the automobile industry and, more generally, reestablish a healthy manufacturing sector? Can we accomplish these various tasks while also rebuilding the economy on a new foundation of clean energy as opposed to fossil fuel energy sources? Are all of these projects also compatible with expanding decent job opportunities throughout the U.S. economy? Addressing these longer-term challenges is the overarching theme on which we focus in this paper.

We begin by examining these questions within the general context of debates around public investment and industrial policy. This includes a brief review of the longstanding question as to whether public investments in the traditional areas of transportation, energy, and water management divert scarce resources that would otherwise be available to private investors, or whether these public investments create a nurturing environment that encourages more spending by private investors. We conclude from our review of this evidence that a large-scale commitment to public investment projects that are well-designed and implemented does indeed provide a crucial foundation supporting the healthy long-term growth of private investment, in addition to much higher levels of public safety and amenities.

New Labor Forum 19(2): 17-34, Spring 2010

ISSN: 1095-7960/10 print, DOI: 10.4179/NLF.192.0000005

We also review similar issues regarding industrial policies—that is, policies to promote research and development (R&D), moving technical innovations from R&D investments into commercial use, and raising productivity and competitiveness by getting businesses to adopt these innovations as rapidly as possible. Opponents of industrial policies in the U.S. context have long argued that government policymakers are singularly incapable of "picking winners" in the areas of technological innovations that will become commercially successful. But the historical record tells us that the U.S. government—and particularly the Pentagon—has been instrumental in developing all the most important commercially successful technologies of the last century, including jet aviation, the computer, the Internet, and bioengineering.

U.S. manufacturing capacity in rail products and renewable energy lags substantially behind other countries, including Germany, Spain, Japan, South Korea, and China.

The other factor we consider with respect to public investments and industrial policy—both in traditional areas of transportation, energy, and water management as well as new clean energy areas—is the impact of these investments on employment. In fact, investing money in anything will create at least some jobs. But as we show, spending on traditional infrastructure and clean energy development is a powerful source of job creation in the U.S. *relative* to major alternative spending targets, including the military and fossil fuel industries.

We then lay out a more specific plan to support the revival of the manufacturing sector, including the U.S. auto industry. We sketch a program to increase, by 50 percent over the next five years, the number of public transportation buses on the streets of our communities. This project would have four major benefits. It would make public ground transportation a much more practical day-to-day commuting option, especially for lower-income people for whom auto transportation costs currently place a major burden on their family budgets. It would also make a major contribution toward reducing the consumption of fossil fuels in the U.S. and the emissions of greenhouse gases into the atmosphere. The government procurement orders for this dramatically expanded supply of buses have the potential to also boost orders for the U.S. auto industry by about 5 percent above the most recent peak sales level of 2007, assuming at least some auto manufacturers see the opportunity to convert a portion of their production lines from private cars to public buses. And finally, all of these highly desirable ends could be accomplished within a relatively rapid time frame, with the first wave of major benefits occurring within one year.

Finally, we explore more briefly a longer-term project of expanding U.S. manufacturing capacity in rail transportation products and the renewable energy industry. These will certainly be major growth industries over the next twenty years, assuming U.S. and global policymakers proceed, as needed, with the epoch-defining project of creating clean energy-based economies. At present, U.S. manufacturing capacity in rail products and renewable energy lags substantially behind other countries, including Germany, Spain, Japan, South Korea, and China. But the U.S. cannot let these areas of

manufacturing continue to languish. We know they will be major focal points of technical innovation and global market dynamism for the coming generation. They also have the potential of providing millions of good employment opportunities over the long term.

DEBATES OVER PUBLIC INVESTMENT AND INDUSTRIAL POLICY

CONSIDERED BROADLY, ALL OF THE U.S. economy's longer-term challenges amount to variations on a single theme: whether the U.S. can begin to mobilize its enormous human, material, technical, and financial resources into more effectively promoting productive investment activity throughout the economy.[1] Few observers of any political persuasion dispute the idea that investments in physical plants, machinery, and information technologies are a driving force—if not the single most important engine—of economic progress. This is because any economy that aspires to long-run gains in average living standards must develop effective means of promoting such productive investments. They are the tools that can raise overall productivity and deliver technical innovations into the everyday stream of economic activity.

However, beyond this basic point of agreement the consensus breaks down immediately in considering the most effective ways that economic policies can promote productive investments.

For the past generation, the dominant view among economists was that giving businesses a free hand—that is, little regulation and low taxes—was the most important contribution governments could make to encouraging productive investments. The corollary to this view was that, as much as possible, overall investments in the economy should be undertaken by the private sector, as opposed to any sort of government entity. After all, according to this view, the private sector is where innovation occurs. Moreover, private investment decisions have to meet the test of the market. Sound investment decisions are rewarded by high levels of market demand and healthy profits, while bad investment decisions are punished by failure. By contrast, public investments are dominated by slow, ineffective, bureaucratic decision-making, and are not subject to the test of the market. To the contrary, public investments are financed by tax revenues. This means that tax burdens have to rise to pay for public investments. These considerations undergird the view that public investments "crowd out" private investments, since funds spent on public investments will drain away money, people, and equipment that could be better utilized by private business firms.

A strong public infrastructure is a necessary foundation for promoting private sector productivity.

The case for private investment over public investment has a parallel in discussions around industrial policy—whether the U.S. government should be actively engaged in promoting technologies and business competitiveness. Since governments are not capable of "picking winners," at least not on a consistent basis, industrial policy is therefore just a means for governments to distort both the investment decisions of private businesses and the primary role of competition to separate winners from losers in the investment market.

Serious counterarguments and contrary evidence suggest an alternative perspective. First, that a strong public infrastructure is a necessary foundation for promoting private

sector productivity—that is, having roads, bridges, airports, rail and bus systems, as well as water management, energy transmission, and communications systems operating effectively all lower the costs that private firms have to incur to operate their businesses. These productivity benefits and corresponding cost reductions for business are often substantial. As such, public investments do not, in fact, "crowd out" but actually "crowd in" private investments. And second, that industrial policy is the instrument through which we incubate new technologies and help private businesses make these innovations effective in the marketplace.

In the past few years, the real world has intervened dramatically to make the case on behalf of public investment and industrial policy. To begin with, a wide range of people had for years recognized that the stock of public infrastructure in the U.S. was deteriorating badly, and that this was holding back productivity advances. But the breaching of New Orleans' water levees in 2005 in the wake of Hurricane Katrina and the collapse of the I-35W bridge in Minneapolis in 2007 offered tragic testimony to this neglected reality. Amid these events, it became difficult to continue insisting that public infrastructure investments are a misuse of funds that could be deployed more effectively by private business investors.

Moreover, the conclusions that emerge about the importance of public investments from these episodes are also supported by the weight of statistical evidence. Thus, from 1950-1974, the real growth of traditional core infrastructure averaged 4.3 percent per year. Over this same period, overall GDP grew at a slightly lower 4.1 percent average rate. By contrast, from 1975-2007, core public infrastructure investments grew at only 2.3 percent per year—i.e., at half the 1950-1969 rate—while overall GDP growth in this period also slid, to 3.1 percent.

Was the high rate of public investment in the 1950-1969 period contributing to healthy overall economic growth in that period, or was it just a byproduct of the overall expansion? Similarly, was the slowdown in public investment from the 1980s onward—to a rate below even the tepid GDP growth rate—a cause, or primarily just an effect, of the overall growth slowdown?

Research on this question by Professor James Heintz of the University of Massachusetts does point clearly to a positive effect of public investment on GDP growth. In particular, Heintz found that sustained increases in public investment spending generate significant gains in overall productivity, which in turn brings faster GDP growth.[2] Consider the situation as of 2007. If overall public investment had grown at an average rate of 3.8 percent in the ten years between 1998-2007, as opposed to its actual rate of 2.8 percent (but still well below the 4.3 percent average rate over 1950-1974), the cumulative additions to the public investment stock would have produced an additional $64 billion in U.S. GDP in 2007.

In addition, the Wall Street collapse of 2008-2009 made clear that private investors, left to their own devices, do not allocate the economy's financial resources effectively. The 2008-2009 crisis was the culmination of a generation of financial deregulation measures in the U.S. supported by Democratic and Republican policymakers alike, following the claim that private financial managers, operating in a competitive market, will channel the economy's financial resources more effectively on their own than could be done through following government regulations and priorities. But the crisis demonstrated that the dazzling rewards of casino capitalism will always become irresistible to Wall Street operators relative to the slow, steady efforts to nurture the economy's productive investments. That is, government regulations are needed for the economy's financial resources to be crowded into productive

investments as opposed to being squandered on hyper-speculation.

The collapse and bailout of General Motors and Chrysler in 2009 underscored another related point—that, rhetoric aside, both the federal government, as well as state-level governments, are now, and have long been, practicing something that closely resembles a U.S. industrial policy. For example, the federal government first bailed out Chrysler in 1979 to prevent the firm from collapsing then. More generally, auto companies and other large manufacturers have regularly received favorable tax treatment and related concessions from state governments as a means of attracting the companies to their states. The problem with this approach to industrial policy is not the fact that it is being practiced per se, but rather that it is undertaken in an ad hoc manner—responding haphazardly amid crises, as with the auto companies in 2009; or seeking to promote jobs and economic growth in one state by attracting businesses away from locating in neighboring states.

At the same time, as we noted earlier, the U.S. federal government does also practice a long-term, consistent industrial policy to promote U.S. commercial technology. But this industrial policy is conducted primarily through the Pentagon. Indeed, a long, steady flow of new technological developments has been heavily supported by the Pentagon, then turned over to private business firms when these technologies had matured to the point where they could be successfully applied commercially. The Pentagon supported R&D activities within government labs, at universities, as well as at private business firms. Such arrangements have led to some spectacular successes, including the development and commercialization of jet airplanes and the Internet.

The key factor of Pentagon-centered industrial policy is the combination, on a massive scale and over a sustained time period, of R&D investment spending plus the maintaining of a guaranteed market through procurements. This idea is the main theme in the important 2006 book by the late Professor Vernon Ruttan, *Is War Necessary for Economic Growth?: Military Procurement and Technology Development*.[3] 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 market. There have been similar successes with industrial policy in the U.S. in the health care and agricultural sectors. The National Institute of Health and the agricultural extension colleges, respectively, have provided major support both for long-term basic research projects in the areas of health and agriculture, and for bringing the results of this research to the point where they are usable by private businesses.

A final, crucial real world consideration forcing new thinking on the questions of public investment and industrial policy is global climate change. The real and present threat of climate change has raised the stakes dramatically as to the importance of channeling our economy's resources into productive investments. And here we can be quite specific in referring to "productive investments." We mean channeling a significant share of the economy's resources into investments in energy efficiency and renewable sources of energy, and moving the economy away from its current dependence on oil, coal, and natural gas. The threat of climate change means that we do not have the luxury to wait and see whether private investors, on their own, will sufficiently embrace the project of shifting investments out of fossil fuel energy sources and into clean energy. The case for public investments that will crowd private investors into clean energy investments, and for industrial policies that

will nurture new forms of energy efficiency and affordable renewable energy supplies appears straightforward here.

With the passage of the American Recovery and Reinvestment Act (ARRA) in February 2009, the Obama administration and U.S. Congress gave an overwhelming endorsement on behalf of the central importance of public investment. Of the total $787 billion in stimulus funds, about $80 billion is devoted to clean energy investments and another $65 billion to traditional infrastructure improvements, including roads and bridges, the electrical grid, and water management systems. The initial jolt of this spending is occurring over 2009-2010, with most of the infrastructure and energy spending completed by 2015. Broadly defined, these are all crowding-in initiatives, designed to get private investors back in the business of spending money on productive investments as opposed to financial speculation. Thus, at least for the current moment, at the level of policymaking, the argument on behalf of public investment and crowding in has received new life. The clean energy and infrastructure components of the ARRA were divided between direct federal government spending initiatives and subsidy programs for private investors. For example, direct federal spending programs included measures such as investments in high-speed rail infrastructure. One major subsidy program provides private firms with tax credits to cover one-third of their overall investment in solar, wind, and other renewable energy manufacturing projects.

Despite the enormous amount of money that was committed, the ARRA is designed mainly as a short-run stimulus program, implemented under extraordinary economic circumstances. Within a longer-term framework, major questions remain open: how much of taxpayers' money should flow into public investments; how much, if at all, should the public sector actively support new technologies and a domestic manufacturing sector; and what are the appropriate levels of public spending and private-sector incentives needed to achieve a clean energy transformation over the next twenty to thirty years? Moreover, these issues are clearly interrelated. To take the single most pressing matter in terms of the long run: building a clean energy economy will certainly require sustained high levels of public investment, the channeling of a high level of private financial resources into productive clean energy investments, and government support for rapid technical innovations in energy efficiency and clean energy. What are the best ways to accomplish this with the resources and policy tools at hand?

JOB CREATION IN THE ARRA AND BEYOND

Of course, the traditional infrastructure and clean energy components of the ARRA, along with all the other components of the February 2009 stimulus program, were designed to create jobs. How well do investments in infrastructure and clean energy work as new sources of job creation, both in the short and long runs?

In fact, within a short-run framework such as a stimulus program, spending more money on *anything* within the U.S. economy—either by the private or public sector—will increase employment, as people will be newly hired into various activities to meet the expanded level of overall demand in the economy. To assess the impact of traditional infrastructure and clean energy investments on job creation, we first have to assess how they compare with other potential uses of the same amount of money—that is, in comparing various sectors of the U.S. economy, *how many* jobs are likely to be created for a given amount of spending.

In fact, there are sharp disparities in the relative job-creating potentials of traditional infrastructure and clean energy investments if these are compared with, for example, military

spending and the fossil fuel sector (i.e., oil, natural gas, and coal).[4] Both traditional infrastructure and clean energy investments will generate about seventeen jobs per $1 million in new spending. Spending on the military, by contrast, generates roughly 11.6 jobs per $1 million in spending, 32 percent less than for traditional infrastructure and clean energy. Spending within the fossil fuel sector is far weaker still as a source of job creation, generating about 5.3 jobs per $1 million, roughly 70 percent less than through traditional infrastructure or clean energy investments.

Both traditional infrastructure and clean energy investments will generate about seventeen jobs per $1 million in new spending.

Why do traditional infrastructure and clean energy investments create so many more jobs than the military or fossil fuel sectors? In comparison with military spending, a much higher proportion of overall spending takes place within the United States. This is clear if we contrast building a road or upgrading the electrical grid system in, say, Ohio versus maintaining military bases and combat operations in Iraq or Afghanistan.

As regards the fossil fuel industry, the low level of domestic job creation occurs for two reasons. The first is that about 50 percent of all crude oil consumed in the U.S. is imported. The domestic job creation from these crude oil imports is zero. In addition, the domestically-based oil industry activities tend to be highly capital intensive. This means less spending on people, and more on machines, buildings, supplies, and energy. For example, drilling for oil and refining crude oil requires huge amounts of sophisticated machinery, and relatively few people to operate that equipment. Building a road or bridge, upgrading an electrical grid system or—as we will later discuss in some detail—manufacturing public transportation or renewable energy equipment will also be fairly capital intensive activities, but substantially less so than the average for the oil industry.

Overall then—aside from their benefits in terms of productivity, safety, and fighting climate change—investments in infrastructure and clean energy can also serve as major new sources of job creation within the U.S. As a simple illustration of this, assume that the funding for the infrastructure and clean energy investments was taken dollar for dollar out of the Pentagon and fossil fuel sectors on a proportional basis. A net increase of about 5.5 jobs would result from moving $1 million from the Pentagon into infrastructure/clean energy (17 to 11.6 jobs) and 11.5 jobs would be created through moving $1 million out of the oil industry (17 to 5.3 jobs). Given that the military and fossil fuel industries accounted for roughly $1.2 trillion in total U.S. spending in 2008, this means that taking, say, 25 percent of their total and distributing it proportionally to traditional infrastructure and clean energy investments would generate a net increase of roughly 2.5 million jobs—enough to reduce U.S. unemployment, as of 2008, by more than 1.5 percentage points.

PUBLIC INVESTMENTS AND INDUSTRIAL POLICIES AS TOOLS OF U.S. INDUSTRIAL RENEWAL

Considering some of the specifics of the public investment component of the ARRA is a good place to begin. How does the roughly $64 billion dedicated to traditional infrastructure projects in the areas of transportation, water management, and construction of public buildings—and another $80 billion in clean energy investments—match up against our long-term public investment needs? It is more straightforward to draw this comparison with respect to the traditional infrastructure projects, since there is a higher level of certainty about the types of projects and the costs for the work that needs to be done. With the clean energy projects, the level of investment needed and the costs of these investments are generally uncertain, given that much of the investment activity will be aimed at developing new technologies as opposed to working with mature technologies. We return to this point later.

Meeting Public Infrastructure Needs

In recent years, various federal governmental agencies have developed assessments of the long-term infrastructure investments needed to close the gaps created by inadequate investment levels over the previous thirty years. Focusing on their specific areas of jurisdiction, these agencies include the U.S. Department of Transportation, Association of American Railroads, Federal Aviation Administration, Army Corps of Engineers, Environmental Protection Agency, and Energy Information Agency. In Table 1, we summarize the assessments made by these various agencies. The figures we report are for infrastructure investment needs over and above the investment

Taking 25 percent [of total military and fossil fuel industry spending] and distributing it proportionally to traditional infrastructure and clean energy investments would reduce U.S. unemployment by more than 1.5 percentage points.

which we would have expected to have taken place, given current patterns of spending.[5] These investments would come primarily from the public sector, but private infrastructure investments would also be important in the areas of railways, aviation, the electrical grid, and natural-gas pipelines.

Table 1.

Infrastructure Investment Needs in Traditional Transportation, Water, and Energy Areas

Annual Incremental Spending Levels Over 20 Years Based on Government Agency Assessments

	Annual Spending Levels (billions of dollars)	**Primary Source of Funding**
Transportation		
Roads and Bridges	$8.5 – 61.4	Public
Rail	$5.3	Private
Aviation	$3.2	Public/private
Mass transit	$3.2 – 9.2	Public
Inland waterways	$6.2	Public
Total Transportation	***$26.4 - $85.3***	---
Water		
Drinking water	$8.0	Public
Wastewater systems	$7.4	Public
Dams	$0.8	Public
Total Water	***$16.2***	---
Energy		
Electricity (including renewables)	$45.0	Private
Natural Gas	$12.8 – 19.2	Private
Total Energy	***$25.7***	---
Total Incremental Infrastructure Investment Needs	***$68 - $127 billion***	---

Sources: See Heintz, Pollin, and Garrett-Peltier (2009)

As Table 1 shows, our estimate of total infrastructure investments per year to meet the assessed needs in these priority areas—including both public and private-sector spending—is between $68 billion and $127 billion. These, again, are incremental investments above the trend levels for the past thirty years. Clearly, the needs assessments vary widely in some areas, most notably for road and bridge construction. But despite this range of assessments, the central point that emerges is that, even with the lower-end figure of $68 billion per year, the needs are large. Moreover, to adequately fill the gaps in investment as established by the various governmental assessments, we

would need to sustain this level of additional public investment over a period of twenty years. The total incremental investment required over a two-decade period would then be between $1.5 and $2.6 trillion.

From these figures, we can now gauge how far the 2009 ARRA program goes in meeting the economy's long-term infrastructure needs. In fact, the total of $65 billion in the ARRA for these traditional infrastructure spending projects roughly matches our $68 billion low-end figure of assessed needs. But we derived our figure on the assumption that this level of spending would be sustained over twenty years. In short, addressing the long-term gaps in traditional infrastructure investment areas will require a sustained level of spending for twenty years equal to the current two-year commitment established by the ARRA.

Public Transportation and the Clean Energy Transformation

Of course, in meeting the U.S. economy's long-term needs, we cannot simply frame the issue in terms of maintaining the existing priorities in public infrastructure. It is even more imperative that the next generation of public and private infrastructure be constructed on a clean energy foundation. Our public investments also need to be targeted toward reviving our manufacturing sector and auto industry, in particular.

One obvious initiative that is capable of combining these aims is to dramatically increase investments in public ground transportation systems. The environmental benefits of public ground transportation are strong. Transporting people via public transportation as opposed to private cars produces a net reduction in carbon emissions of about 45 percent per passenger mile. Increasing the availability of public transportation can also substantially reduce overall household spending needs since, on average, it costs a passenger about twenty-two cents to travel one mile by public transportation, while a private car costs about fifty-four cents per mile. That is, on average, public transportation is about 60 percent cheaper for passengers than traveling by private car.[6]

Despite these advantages of public over private transportation, public transportation accounts for an extremely low share of total travel in the United States. As of 2007, the average U.S. household spent about 94 percent of its total transportation budget on private automobiles, and only 6 percent on public transportation. This is even after including air travel as a component of households' overall public transportation budget. The share of public transportation spending by lower-income households is even less, with the lowest 20 percent income group spending only 5 percent, and the 21-40 percent income group spending a still lower 4 percent of their respective transportation budgets on public transportation.

Public transportation is about 60 percent cheaper for passengers than traveling by private car.

Recent increases in public transportation ridership still beg the broader question of why U.S. residents, especially those at lower income levels, haven't relied more on public transportation over time. The answers provided through formal surveys are not surprising. The main factor is that public transportation is much less convenient than driving—i.e., access is bad, off-peak-hours service is limited, and transferring is difficult. This makes public transportation particularly difficult for low-income people

who, as part of their regular routine, often need to commute between multiple jobs, as well as transport children to child care and school.

How can we build an effective public ground transportation system as quickly as possible, while also generating a large number of jobs in the process? First, considering employment effects, investments in public ground transportation overall are the most efficient generators of jobs among all clean energy sectors, creating about twenty-two jobs per $1 million in spending versus seventeen jobs for clean energy overall.[7] The reason for the stronger relative employment effects with public transportation is that the sector requires people working in a wide range of areas, including manufacturing, construction, and ongoing operations.

But what is the most appropriate combination of ground transportation investments, both in the short and longer terms? These investments break down into two broad categories: various sorts of rail systems, including subways, light rail, and inter-city high-speed trains; and bus systems, which also include smaller public-use vehicles like minivans and trolley cars.

Upgrading rail systems is crucial for meeting the country's long-term transportation needs, since they are both the cleanest and most efficient transportation mode. The ARRA did include major new investments in rail transport upgrades.

At the same time, particularly within a shorter-run framework, there are problems with relying too heavily on rail systems as the primary focus of public transportation investments. The most evident shorter-term concern is that these systems require years of planning and spending before they come on line and communities enjoy the benefits. But in addition, the United States, at present, has virtually no capacity to build mass transit systems and vehicles. Subway cars used in the U.S. are supplied by French, German, and Japanese companies. Other kinds of mass transit vehicles are built either in South Korea or Germany. As Jonathan Feldman reports, the U.S. was once a technological leader in this field and could become so again.[8] But this will take years of steady support, in terms of research and development as well as public procurement contracts.

Finally, to the extent that overall transportation funding is shifted to rail systems, this would represent an additional blow to the U.S. auto industry. While the transition away from the auto is needed, this has to be accomplished in a way that creates the least amount of harm to working people and communities that have already been suffering as a result of the auto industry and manufacturing sector crisis.

The U. S., at present, has virtually no capacity to build mass transit systems and vehicles.

Thus, as a short-term agenda, the most effective approach to expanding investments in public transportation would be to give immediate focus to markedly improving public bus services throughout the country. This project should be undertaken in conjunction with the continued strong commitment to also expanding rail services, as initiated with the ARRA. Over time, the most effective mass transit systems are those that integrate bus and rail systems. Public investments should therefore target the goal of building combined rail/bus public transportation systems.

But in the short term, it will be important to show tangible progress in raising support for public transportation. This can be done, first of all, by simply getting more buses available for service and out on the street. This would enable people to rely less heavily on their cars. It would also entail large-scale procurement contracts with the government. These procurement orders could also create a major sales boost for the U.S. auto companies as well as the firms that have traditionally manufactured buses in the U.S. In turn, combining all of these effects will be the most effective way of taking advantage of, as quickly as possible, the employment benefits available through large-scale investments in all forms of public transportation.

Bus Procurement Proposal

As of the most recent 2007 data, about 65,000 buses are operating in the United States. A program to significantly improve public transportation service would entail increasing the number of buses in operation by, say, 50 percent. That would mean raising the total number of buses serving U.S. public transportation consumers to about 100,000. It would be reasonable to allow this 50 percent expansion of available bus service to occur over five years. Table 2 (opposite) presents some of the key data relevant for evaluating the costs and impact of a U.S. bus procurement program of this magnitude.

This is not the place to explore the details as to what this expansion in service would mean in terms of accessibility of public transportation in communities throughout the U.S. Suffice it to say that something on the order of a 50 percent improvement in accessibility would represent a major benefit, especially for lower-income families. Millions of lower-income families would be able to significantly reduce their reliance on auto transportation, saving them up to around $2,000 per year in overall transportation expenses—that is, up to a 10 percent reduction in their total household expenditures.[9]

The program would also be focused on improving the energy efficiency and quality of the operating bus fleet. The average bus in service is designed to operate for about 7.5 years. If the entire existing fleet of 65,000 buses were to be replaced within 7.5 years, just under 9,000 old buses would be replaced per year with new vehicles. In fact, however, the fleet has been aging significantly since the level of orders peaked in 2001 at about 8,100 new buses. In 2007, only about 3,600 new buses were produced in the U.S. Finally, as we will see, the program can be a major new source of jobs.

An ambitious, but reasonable, aim of the new program would be to replace the entire fleet within the next five years, while also expanding the total number of buses in operation to 100,000. This would then mean a procurement order of 100,000 buses over the next five years, or 20,000 new bus orders per year for five years.

As the top panel of Table 2 shows, as of 2007, the average cost to produce a bus in the United States was $425,000. Thus, the overall cost to build 100,000 new buses would be about $42.5 billion, or $8.5 billion per year for five years. But only 35,000 of the new purchases—7,000 per year—would be for expanding beyond the existing supply of buses. The expansion of bus service would therefore cost about $15 billion total, or $3 billion per year over five years. The remaining $5 billion per year in expenditures, to build 13,000 replacement buses per year, would represent a somewhat accelerated depreciation expense, most of which would already have been incorporated into the budgets of the government

Table 2.
Figures on Expanding U.S. Bus Transportation Services and Manufacturing Orders

A) Production Costs

Number of buses in service throughout the U.S. (approximate for 2007)	65,000
Average bus manufacturing costs in the U.S. (2007)	$425,000
Total costs for manufacturing 100,000 buses	$42.5 billion
Total costs per year of five-year 100,000 bus procurement program (20,000 buses per year)	$8.5 billion/year
Total costs per year of procurements net of replacement purchases (13,000 replacement buses and 7,000 net expansion of bus supply per year)	$3 billion/year

Source: American Public Transit Association Vehicles Database

B) Impact on Manufacturers' Sales

Sales increase for existing U.S. bus manufacturers for 5,000 bus procurement order	+ 38.9% from 2007 levels
For auto manufacturers: Average manufacturing costs for conventional gas-fueled car (2007)	$13,000
Ratio of production costs for autos relative to buses	33 autos/1 bus
Sales increase for U.S. auto producers for 15,000 bus procurement order	+ 5.2% from 2008 levels

Sources: American Public Transit Association Vehicles Database; Arthur D. Little, Guidance for Transportation Technologies: Fuel Choice for Fuel Cell Vehicles *(2002), available at http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/fuel_choice_fcvs.pdf)*

C) Impact on Employment

	Manufacturing Employment	Total Employment
Employment creation from $8.5 billion bus procurement order (produces 20,000 buses)	29,050	79,900
Employment creation from $8.5 billion military armed vehicles/tanks	35,501	70,210

Source: IMPLAN

agencies administering the country's various public transportation systems.

How would such an initiative impact the overall situation in the auto and bus production industry, and manufacturing more generally, including the creation of new job opportunities in manufacturing? The Buy American Act requires that all federally-funded transit investments be built with at least 60 percent of their components produced in the U.S., and that the assembly also be performed within the U.S. As such, any initiative such as this to expand bus production and bus service throughout the United States would necessarily mean most of the production will be done by U.S. workers.[10]

At present, the major suppliers of buses in the U.S. are the U.S. companies Gillig and North American Bus, and two Canadian companies with major U.S. operations, New Flyer and Orion. Given that these existing companies produced only about 3,600 buses in 2007, it would be unrealistic to assume they could expand up to 20,000 buses per year in a brief period of time. As a rough estimate, we assume that the existing producers could, at most, increase their rates of production by 50 percent above their 2007 levels, to 5,400 buses per year. For simplicity, we assume the existing bus manufacturers would increase their production to 5,000 buses per year—i.e., 25 percent of the overall procurement order of 20,000.

The remaining roughly 15,000 new buses per year would then be built by the automobile manufacturers in the U.S. To begin with, we include here all thirteen companies manufacturing cars in the U.S. as potentially eligible to undertake this project of converting part of their auto production operations into building buses. Of these firms, the U.S. firms General Motors, Ford, and Chrysler accounted for 60 percent of all cars built in the U.S. as of 2007. The remaining manufacturers producing in the U.S. are Japanese, German, and South Korean firms. With auto companies, in general, facing a severe slump—with a high percentage of both their productive equipment and labor force sitting idle or underutilized—we would anticipate that at least some of the companies would eagerly compete to obtain a major government procurement order, even if fulfilling the order means converting some of their production facilities from autos to buses.

What would be the impact, for the car companies, of receiving a procurement order to produce 15,000 buses per year for the next five years? To estimate this, we have to compare the production costs of the average bus, at $425,000, with the production costs of the average automobile, which are about $13,000 (as shown in the middle panel of Table 2). This means that producing one bus would have an impact on domestic manufacturing equal to producing about thirty-three new autos. For simplicity, we round this cost difference to thirty-to-one.

Based on this roughly thirty-to-one cost differential between buses and autos, for auto manufacturers to receive a procurement order of 15,000 buses per year would mean the equivalent of 450,000 in new automobile production orders. Total U.S. auto production was 10.8 million in 2007 but fell to 8.7 million in 2008. Therefore, an order of 450,000 new cars would be the equivalent of an increase in car orders of about 5 percent relative to the 2008 level. It would mean that the equivalent of about 9.2 million cars would be produced, which would still be 1.6 million fewer than in 2007.

In short, depending on the details, the program could provide a major increase in sales for the car companies as well as the existing bus manufacturers. It could also encourage the auto companies to become focused around the idea of converting a segment of their overall operations to manufacturing products other than automobiles. Moreover, once they have obtained experience in converting part of their production line to buses, they should then be better equipped to undertake additional conversion projects—for example, rail production or even clean energy-generating equipment, such as wind turbines and various sorts of solar energy systems.

Manufacturing 20,000 new buses per year would also generate a total of about 80,000 jobs, including nearly 30,000 in manufacturing, as we show in the lower panel of Table 2. Of course, returning to a point emphasized earlier, spending $8.5 billion per year on *anything* will produce thousands of jobs. Moreover, as Table 2 shows, the overall employment impact of manufacturing buses would not be significantly different from putting the same

amount of money into producing tanks or missile components for the U.S. military. But the overall economic impact would obviously be dramatically different—for the environment, for low-income households, as well as for reviving our manufacturing base through conversion to clean energy investments.

Manufacturing Renewable Energy Equipment

The connections we have seen between bus procurement as a shorter-term public investment focal point and rail investments as a longer-term project also offer useful parallels for advancing U.S. manufacturing opportunities in the area of renewable energy. It is clear, to begin with, that the U.S. needs to build a competitive renewable energy manufacturing sector. Over the long term, the U.S. is going to be a major consumer, perhaps the largest market in the world, of manufactured renewable energy products. These products will be a cornerstone of the clean energy economy. At the same time, similar to the situation with the rail sector, U.S. producers, at present, are well behind European and Asian manufacturers as competitive suppliers.[11]

For example, at the major new wind and solar energy project sites in the states of Washington and Nevada, all the major capital equipment was imported from Europe and Southeast Asia. Of course, the installation work on these projects could only be handled on site. Still, roughly half of the jobs directly associated with these projects occur at the manufacturing stage.[12] Therefore, for renewable energy to serve as an engine of U.S. job creation, it needs to also be focused on reviving manufacturing activity within the U.S.

The clean energy components of the 2009 ARRA program did include roughly $8 billion to subsidize renewable energy manufacturing projects throughout the country, including investments in solar thin-film technology, wind turbine plants, and advanced batteries for electrical cars. An example of a very large-scale renewable energy project with enormous potential is the still preliminary effort to develop the offshore wind potential of the Great Lakes.[13] The National Renewable Energy Lab estimates that, technically, up to 250,000 megawatts of wind power can be developed in the Great Lakes region. This represents twelve times the amount of already installed wind-energy capacity throughout the U.S. The level of investment needed to develop the site ranges between $500 billion and $1 trillion. Assuming the work would be conducted over about ten years, the total number of jobs generated per year would range between about 660,000 (spending $50 billion per year for ten years) and 1.3 million jobs (spending $100 billion per year for ten years). These figures include both the jobs directly associated with the project, as well as the "indirect" job creation (jobs created for businesses supplying materials for the project) and "induced" job creation (the job expansion that occurs when workers who are newly employed by the project spend their additional income). The total number of manufacturing jobs generated—including direct, indirect, and induced job creation—would range between about 165,000 (at $50

The U.S. is going to be a major consumer, perhaps the largest market in the world, of manufactured renewable energy products.

billion per year in spending) and 325,000 (at $100 billion per year.)

In short, a project like this could serve as a major new engine of job creation throughout the Midwest. But this can happen only if there are business firms in the Midwest willing and able to build the needed equipment. Certainly today's auto manufacturers have the technical capacity and scale to participate in such a project. General Motors itself, perhaps especially operating under its present arrangement with the government as the major shareholder of the firm, would be well positioned to take the lead here. Of course, major challenges would have to be overcome in converting the auto production lines into building wind turbines, just as there would be comparable challenges in converting the auto lines into manufacturing buses, subway cars, and trains. We would expect that converting auto production lines into manufacturing competitive renewable energy products would proceed relatively slowly—less like converting to bus production and more similar to producing various sorts of rail cars and equipment.

For renewable energy to serve as an engine of U.S. job creation, it needs to also be focused on reviving manufacturing activity within the U.S.

As we have discussed, the basic outlines of how to proceed with such large-scale initiatives have already been developed and proven successful by U.S. policymakers, particularly within the Pentagon. That is, the U.S. government needs to be committed to providing support for research, development, and commercialization for these projects, within government labs, at universities, and in private businesses, as has been done by the Pentagon. The government also needs to ensure that robust markets are ready and waiting with their own procurement orders. Without each of these levels of support, the overall enterprise could face insurmountable obstacles.

At the same time, the institutional infrastructure already exists for pursuing major new initiatives in public investment and industrial policies outside the Pentagon. For example, the U.S. Department of Energy is already effectively operating as the nerve center for public investments and industrial policies tied to the green economy, starting with the clean energy investment programs flowing out of the ARRA. Similarly, all states and municipalities already have departments of public works. Federal and state-level labor departments are also already in place, with the responsibility of enforcing existing labor standards that apply to all public investment and industrial policy projects among all other activities in the economy. Labor standards certainly need to be raised throughout the U.S. economy. But doing so will be, first and foremost, a matter of political will, not institutional restructuring.

Yet all of these institutions will no doubt need to evolve—and perhaps even develop into new, recombined structures—to successfully meet the interlocking challenges of reviving manufacturing, building a clean energy economy, and creating tens of millions of decent new job opportunities. But the only way we will know how to develop the institutional support structure behind such a scaling-up of public investments and industrial policies will be through practice—that is, through attempting to address the specific requirements of the various projects as they emerge. The fundamental concern for the moment should therefore, again, be about building and

sustaining political will—the will to advance public investments and industrial policies that are capable of delivering a revived manufacturing sector and a clean energy economy, and to ensure that these epoch-defining projects serve the interests of working people throughout the country.

**The writing of this article has benefited greatly from comments by James Heintz, Ted Nordhaus, Michael Shellenberger, Steve Fraser, an anonymous referee, and from research assistance by Josh Mason and Ben Zipperer. We are grateful to the Nathan Cummings Foundation for generous financial support.*

Notes

1. The issues summarized in this section are developed at much more length, including a full set of references, in our joint working paper, Robert Pollin and Dean Baker, "Public Investment, Industrial Policy, and U.S. Economic Renewal," PERI Working Paper #211 (Amherst, MA: Political Economy Research Institute and Center for Economic Policy Research, 2009), available at http://www.peri.umass.edu/fileadmin/pdf/working_papers/working_papers_201-250/WP211.pdf.

2. James Heintz, "The Impact of Public Capital on the U.S. Private Economy: New Evidence and Analysis," *International Review of Applied Economics* (2010, forthcoming).

3. Vernon Ruttan, *Is War Necessary for Economic Growth?: Military Procurement and Technology Development* (New York: Oxford University Press, 2006).

4. The figures in this paragraph are derived in detail in Robert Pollin, James Heintz, and Heidi Garrett-Peltier, *The Economic Benefits of Clean Energy Investments* (Amherst, MA: Political Economy Research Institute, 2009), available at http://www.peri.umass.edu/economic_benefits; and Robert Pollin and Heidi Garrett-Peltier, *The U.S. Employment Effects of Military and Domestic Spending Priorities: An Updated Analysis* (Amherst, MA: Political Economy Research Institute, October 2009), available at http://www.peri.umass.edu/fileadmin/pdf/published_study/spending_priorities_PERI.pdf. The category of "traditional infrastructure" consists, in equal parts, of investments in transportation, water management, and institutional structures, including educational buildings. The category "green investments" consists of three areas of energy efficiency—building retrofits (40 percent of total); public transportation (20 percent); "smart grid" electrical transmission systems (10 percent)—and three sources of renewable energy, wind power (10 percent), solar power (10 percent), and non-food biomass fuels (10 percent). The fossil fuel industry consists of spending on oil, coal, and natural gas in the actual proportions in which oil, natural gas, and coal were each consumed within the U.S. economy as of 2007.

5. The figures reported in the table are based on research in James Heintz, Robert Pollin, and Heidi Garrett-Peltier, "How Infrastructure Investments Support the U.S. Economy: Employment, Productivity, and Growth," Political Economy Research Institute and Alliance for American Manufacturing (2009), available at http://www.peri.umass.edu/fileadmin/pdf/other_publication_types/green_economics/PERI_Infrastructure_Investments).

6. The material in this and the following two paragraphs (including full citations for the data presented) is taken from Robert Pollin, Jeannette Wicks-Lim, and Heidi Garrett-Peltier, *Green Prosperity: How Clean-Energy Policies Can Fight Poverty and Raise Living Standards in the United States*, Political Economy Research Institute, Natural Resources Defense Council, and Green for All (2009), 31-33.

7. Pollin, Heintz, and Garrett-Peltier, *The Economic Benefits of Clean Energy Investments*, Political Economy Research Institute and Center for American Progress (2009), available at http://peri.umass.edu/economic_benefits.

8. Jonathan Feldman, "From Mass Transit to New Manufacturing," *American Prospect*, March 2009, available at http://www.prospect.org/cs/articles?article=from_mass_transit_to_new_manufacturing.

9. This figure is derived in Pollin, Wicks-Lim, and Garrett-Peltier (2009), 33.

10. For details on the provisions of the Buy American standards, see http://www.fta.dot.gov/about/about_FTA_464.html.

11. This situation is well documented in Joan Fitzgerald, "Losing Our Future," *American Prospect*, January/February 2010, available at http://www.prospect.org/cs/articles?article=losing_our_future; and, from a broader perspective, Richard McCormick, "The Plight of American Manufacturing," *American Prospect*, January/February 2010, available at http://www.prospect.org/cs/articles?article=the_plight_of_american_manufacturing.

12. To measure *total*, as opposed to *direct,* job creation through these or any other kinds of investments within the U.S. economy, we would also need to account for *indirect* and *induced* job creation. Indirect job creation refers to jobs generated when suppliers to the investment project under consideration receive additional orders. Induced job creation results when the workers who are newly employed—either through the direct or indirect employment effects—in turn spend their additional income. See, e.g., Pollin, Heintz, and Garrett-Peltier (2009) for a detailed discussion of these distinct effects.

13. George Sterzinger, "Beyond Sunny Hopes and Windy Rhetoric," *American Prospect*, March 2009, available at http://www.prospect.org/cs/articles?article=beyond_sunny_hopes_and_windy_rhetoric.