Melt it Here:
The Benefits of Expanding Steel Production in the United States

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Introduction

The United States is unique among the major steel producers in the world in that it is a net importer of steel, even though it is a low-cost steel producer and has sufficient capacity to satisfy domestic demand.[1] The United States is one of the world's largest producers of scrap, and is by far the world's largest exporter of steel scrap. If the United States were to expand steel production to take advantage of its supplies of scrap, the U.S. economy would capture all of the economic benefits of processing a valuable raw material in this country – benefits that are largely lost by exporting scrap.

This paper uses standard economic models, and builds upon research performed for the Institute of Scrap Recycling Industries and the American Iron and Steel Institute. These models show that expanding domestic steel production to match domestic consumption would create as many as 87,000 new jobs, directly and indirectly, and could increase GDP by approximately $26 - $29 billion per year. This would contribute significantly to raising employment in the United States, while reducing the trade deficit. By replacing imported steel with steel produced in efficient U.S. mills, expansion of domestic steel production could also substantially lower global greenhouse gas emissions.

The United States could encourage the expansion of domestic steel production by investing in infrastructure – an investment that is absolutely necessary to maintain American competitiveness – and through sensible changes to various regulations.

Finally, the United States should address practices by other countries that give their steel industries non-market-based advantages in international competition. These policies include high tariffs on imports of steel products, restrictions on scrap and other raw material exports, currency manipulation, and various other subsidies. The effect of these policies is to discourage U.S. steel production and encourage greater U.S. exports of scrap. Because converting scrap to steel in the United States yields greater economic advantages than exporting scrap, those policies harm the U.S. economy and cost American workers good-paying jobs.

[1] This paper was sponsored by the Steel Manufacturers Association and the American Scrap Coalition.

U.S. Steel Imports and Domestic Production Capacity

In 2012, the United States consumed 102 million metric tons of steel, but produced only 88.7 million tons, a difference of 13.3 million tons.[2] The difference between production and consumption was made up by imports.

The United States imported 30.9 million tons of steel in 2012,[3] and exported 13.6 million tons.[4] Since 2003, imports have accounted for an average of 26 percent of U.S. steel consumption.[5] While a limited quantity of steel imports would be expected due to factors such as geography, trade flows within North America, and the need for specialized products not produced in the United States, this percentage of imports is significantly higher than that of other major steel producing countries, as the following table shows.[6]

Table 1

Steel Imports as a Percentage of Consumption, 2012

Producer	Import Share
United States	30.27%
Russia	14.21%
India	12.12%
Japan	8.33%
China	2.05%

In 2012, domestic consumption of steel exceeded domestic production by 13.3 million tons. Put another way, the United States would have needed to produce an additional 13.3 million tons of steel for production to equal consumption. Between 2003 and 2012, the average dif-

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2 *See* World Steel Association, *Steel Statistical Yearbook 2013* 1 (production), 78 (consumption (2013) ("*Steel Statistical Yearbook 2013*"). Unless otherwise noted, all quantities are in metric tons.

3 *Id.* at 55.

4 *Id*. at 52. Both production and consumption are expressed as the equivalent amount of crude steel contained in steel products produced and consumed. The difference between apparent consumption as reported in Steel Statistical Yearbook 2012, and the normal measure of apparent consumption (production + imports – exports) is accounted for by various factors, including yield loss, inventories, double-counting of imported steel products, such as slabs that are converted into finished steel products in the United States, and delays between production and shipment.

5 *Id*. at 55, 78.

6 *Id*. at 54 – 56, 77 – 79.

ference between production and consumption was 14.6 million tons.[7] With around 109 million metric tons of annual production capacity and only 88.7 million tons of actual production, the industry could produce another 20 million tons of steel per year using just existing capacity.[8] By importing large quantities of steel, while domestic production capacity sits idle, the United States is foregoing billions of dollars' worth of economic activity.

This is true with respect to imports of semifinished steel products in particular. A substantial portion of U.S. steel imports in 2012 – 7 million tons or approximately 23 percent of all imports – was of steel ingots, slabs, and other semifinished products.[9] These imports could not be used in their current imported form; rather, they were rolled or otherwise converted into finished steel products in the United States. These imports were overwhelmingly of products that could have been produced in the United States, but were not.

For example, the cost of slab represents approximately 91 percent of the total cost of producing hot-rolled coil, a basic steel product used in a broad array of goods, including automobiles, appliances, and construction.[10] By importing slab, instead of producing crude steel here in the United States, the American economy loses as much as 90 percent of the economic activity associated with the production of the final steel product.

The Comparative Advantage of the U.S. Steel Industry

Besides having the capacity to expand steel production, the United States has a strong comparative advantage in steel production.[11] The main cost components of steel are capital, raw

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7 *Id*. at 1, 78.

8 According to the American Iron and Steel Institute, U.S. steel production for the year ending November 30, 2013 was 90.5 million short tons, or 82.1 million metric tons, at a capacity utilization rate of 75.2 percent. This implies a production capacity of 109 million metric tons. American Iron and Steel Institute, *This Week's Raw Steel Production*, December 7, 2013, http://www.steel.org/en/About%20AISI/Statistics.aspx. This calculation is based on a conversion rate of 1.1023 short tons per metric ton.

9 *Steel Statistical Yearbook 2013* at 60.

10 *See* Steel on the Net, *Conversion Cost Model – Slab to Hot Rolled Coil*, http://www.steelonthenet.com/cost-hrc.html.

11 According to modern economic theory, a country's advantage in the production of a given commodity depends upon its endowment of the factors needed to produce the commodity. Factors of production include land, labor, capital, intellectual property, and other elements of human capital. "Comparative" advantage refers to the ability of a country to produce the commodity at a lower cost relative to other commodities that could be produced using the same factors.

materials, energy, and labor.[12] The U.S. steel industry possesses distinct advantages with respect to each of these factors:

- Over 60 percent of the steel made in the United States is produced in electric arc furnaces ("EAFs"), using scrap as the main raw material. Capital costs to build an EAF steel mill are only about one-third of the cost to build an integrated steel mill that produces steel from iron ore and coke.
- The United States is largely self-sufficient in all of the major raw materials for steelmaking, including iron ore, coal, and, especially, steel scrap.[13]
- Energy prices in the United States are generally lower than those in other countries.[14] Moreover, EAFs use less than half the energy required to make steel from iron ore and coke.[15]
- Because U.S. labor is so efficient, labor accounts for less than 10 percent of the cost of producing steel.[16]
- The United States has the largest capital market, in terms of debt and equity outstanding, of any country in the world.[17]

Despite these advantages, the U.S. share of total world steel production has fallen steadily. In 2003, the United States accounted for 9.6 percent of world steel production. By 2012, this figure had fallen to 5.7 percent.[18] Over the same period, U.S. imports as a percentage of domestic consumption rose by nearly 10 percentage points.

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[12] For a typical cost model for steel production, *see* Steel on the Net, *Blast Furnace Route Steelmaking Costs 2013*, http://www.steelonthenet.com/cost-bof.html (cost model for basic oxygen furnace); Steel on the Net, *Electric Arc Furnace Steelmaking Costs 2013*, http://www.steelonthenet.com/cost-eaf.html (cost model for electric arc furnace).

[13] *See* U.S. Geological Survey, *Mineral Commodity Summaries* 80 (steel scrap), 84 (iron ore) (2013) ("*Mineral Commodity Summaries 2013*"); U.S. Energy Information Administration, *Quarterly Coal Report April – June 2013* at 2 (Oct. 2013).

[14] *See* U.S. Energy Information Administration, *Electricity Prices for Industry in Selected Countries*, http://www.eia.gov/countries/prices/electricity_industry.cfm; U.S. Energy Information Administration, *Natural Gas Prices for Industry for Selected Countries*, http://www.eia.gov/countries/prices/natgasprice_industry.cfm.

[15] *See* Laplace Conseil, *The Future of Steel: How Will the Industry Evolve?*, OECD Directorate for Science, Technology, and Industry – Steel Committee, DSTI/SU/SC(2012)21, at 13 (Nov. 21, 2012) ("*The Future of Steel*").

[16] *See, e.g.*, Steel Manufacturers Association, *2011 – 2012 Policy Statement* 7 (Aug. 2011) ("*2011 – 2012 Policy Statement*").

[17] Charles Roxburgh *et al.*, McKinsey Global Institute, *Mapping Global Capital Markets 2011* 25 (2011).

[18] *See Steel Statistical Yearbook 2013* at 1, 2.

The Role of Scrap

The United States is in a particularly strong position with respect to the main raw material used for steel production in EAFs, steel scrap.[19] The United States is the third largest producer of scrap in the world, behind only China and the European Union.[20] In 2012, the United States generated 82 million tons of scrap, while domestic steel production consumed only about 57 million tons.[21] The United States exported an estimated 23 million tons of scrap in 2012, making it by far the largest net exporter of scrap in the world.[22] If some of this exported scrap were instead consumed domestically, the United States could increase steel production while remaining a major exporter of scrap.

Global demand for steel scrap is expected to grow steadily in the years ahead, due to overall growth in global steel production as well as the efforts of many nations to increase their share of steel produced in EAFs. Steel producers in the OECD countries in particular are facing increasing challenges from both energy costs and environmental regulation.[23] According to a recent study by Laplace Conseil:

> [A] solution to these challenges is technological: replace (part of) virgin iron ore by recycled scrap and (part of) coking coal by gas. This means going DRI[24] and EAF wherever possible.[25]

The United States already produces most of its steel from EAFs. In addition, with plentiful supplies of both iron ore and natural gas, the United States is well-positioned to increase its use of DRI as well. This combination of factors gives the United States a decided comparative

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19 Steel scrap is also used in integrated steel mills, where it represents a much smaller share of total inputs.

20 *Steelmaking Raw Materials: Market and Policy Developments*, OECD Directorate for Science, Technology, and Industry – Steel Committee, DSTI/SU/SC(2012)1/FINAL, at 14 (Oct. 11, 2012) ("*Steelmaking Raw Materials*"). While the United States possesses a substantial reserve of obsolete scrap, according to World Steel Dynamics there are indications that this reservoir is being drawn down faster than it is being replenished.

21 *Mineral Commodity Summaries 2013* at 80.

22 *See id*.; World Steel Association, *World Steel in Figures 2013* 27 (2013) ("*World Steel in Figures 2013*") (Showing scrap exports by country). According to *World Steel in Figures 2013*, the United States exported 21.4 million tons of scrap in 2012.

23 *The Future of Steel* at 11.

24 "DRI" refers to direct reduced iron, a process where iron ore is converted to iron using natural gas rather than coke, as occurs in a traditional blast furnace.

25 *The Future of Steel* at 11.

advantage in steel production.[26] It can utilize this advantage, however, only if scrap is converted to steel in the United States, rather than exported.

The production of steel in an EAF consumes about 1.085 tons of steel scrap per ton of crude steel produced.[27] Thus, total elimination of the difference between U.S. steel production and consumption, which was 13.3 million tons in 2012, would require an additional 14.4 million tons of steel scrap (if all of the steel were produced in EAFs). If scrap had to be diverted from exports to domestic production, the loss of exports would offset, in part, the economic benefits of expanded steel production. An analysis of U.S. scrap resources, though, indicates that an expansion in domestic steel production would result in only a modest, if any, decline in scrap exports.

Part of the additional scrap needed would come from expanded production itself. The U.S. steel industry has become very efficient in recovering and recycling steel lost in the production process ("yield loss"). In 2012, scrap recovered during the production process (so-called "home scrap") averaged 11 percent of production.[28] An increase in steel production of 13.3 million tons would therefore result in the generation of an additional 1.4 million tons of scrap, reducing the amount of additional scrap needed to 13.0 million tons.[29]

The United States has a reservoir of obsolete scrap of approximately 1.1 billion tons.[30] This indicates that the United States could process for recycling significantly more scrap than it has in the past. Under these circumstances, it is reasonable to assume that increased scrap production would provide at least 50 percent, or 6.5 million tons, of the additional scrap needed to

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[26] *See id.* at 7.

[27] *See* Steel on the Net, *Electric Arc Furnace Steelmaking Costs 2013*, http://www.steelonthenet.com/cost-eaf.html.

[28] This figure was derived by dividing home scrap produced in 2012, 10 million tons, by U.S. raw steel production, 91 million tons. *See Mineral Commodity Summaries 2013* at 79 – 80.

[29] While scrap is by far the predominant raw material used in the production of steel in EAFs, some pig iron and DRI is also used. Worldwide, pig iron accounts for 5 – 10 percent of the total weight of raw materials used in EAFs. Jeremy Jones, International Pig Iron Association, *Utilization of Pig Iron in the Electric Arc Furnace* 2 (2007). The utilization of these additional materials explains why the amount of steel produced plus the amount of scrap recovered slightly exceeds the amount of scrap used. Effectively, some of the pig iron and DRI used in EAFs are converted into home scrap.

[30] "Obsolete" scrap is scrap obtained from products at the end of their useful lives, including automobiles, appliances, and buildings. Obviously, years may pass between the manufacture of the product and the time when the scrap is available for recycling. *See* American Iron and Steel Institute, *Steel is the World's Most Recycled Material*, http://www.steel.org/Sustainability/Steel%20Recycling.aspx. In addition to home scrap and obsolete scrap, there is a third category, "prompt" scrap, which is a by-product of the production of manufactured articles from steel.

expand steel production by 13.3 million tons per year. This would mean that a like amount of 6.5 million tons would be diverted from exports to domestic steel production. Given these figures, even if the United States produced enough steel to satisfy 100 percent of domestic demand, it would still have 16.5 million tons of steel scrap available for export, and it would still be the single largest exporter of scrap in the world.

Economic Impact of Increased Domestic Steel Production

The expansion of domestic steel production to match domestic consumption would have a measurable impact on the U.S. economy. The most immediate impact would be in the creation of jobs. Increased domestic production would have significant multiplier effects on GDP. By replacing imports with domestic production, expansion of U.S. steel production would also reduce the trade deficit of the United States. These consequences would far outweigh any losses from reduced exports of steel scrap.

The following analysis is based on the difference between U.S. steel production and consumption in 2012, 13.3 million tons. Obviously, the positive economic impact would be even greater if domestic production were expanded further. If production expanded by 14.6 million tons per year – the average difference between domestic production and consumption from 2003 through 2012 – the economic effects would be around 10 percent greater than those described below.

Employment Effects

An expansion of domestic steel production by 13.3 million tons would obviously require additional labor. Such an expansion would create additional jobs within the steel industry. It would create even more jobs upstream and downstream, with the industry's suppliers and customers.

In 2012, the steel mills segment of the steel industry employed approximately 93,000 workers.[31] Steel production in the United States in 2012 was 88.7 million tons,[32] so that an expansion of 13.3 million tons would represent an increase in production of 15 percent. An in-

[31] Bureau of Labor Statistics, *May 2012 National Industry-Specific Occupational Employment and Wage Estimates: NAICS 331100 - Iron and Steel Mills and Ferroalloy Manufacturing* (Mar. 29, 2013) ("*May 2012 Employment Estimates*").

[32] *Steel Statistical Yearbook 2013* at 1.

crease in production of 15 percent, though, would not necessarily require a full 15 percent increase in employment as well.

In the EAF sector of the steel industry, production of one ton of steel requires approximately 1.65 man hours.[33] The production of 13.3 million tons of steel would require approximately 21.9 million man hours of labor. The U.S. Bureau of Labor Statistics calculates wages based upon a notional work year of 2080 hours.[34] Using this figure, 21.9 million man hours would represent 10,528 new jobs. However, this figure only accounts for workers engaged directly in the production of steel.

The industry would also need additional workers to perform a variety of associated tasks, including maintenance, sales, and administrative support. The Bureau of Labor Statistics reports that only 49.2 percent of workers in the steel industry are production workers.[35] The creation of 10,528 new production jobs would give rise to an additional 10,870 non-production jobs. In all, expansion of U.S. steel production by 13.3 million tons would create 21,398 new jobs just in the steel industry.

As of May 2012, the mean annual wage in the steel industry was $49,150.[36] Expanded steel production of 13.3 million tons per year would create some $1.05 billion in wages annually. This figure does not include the value of benefits, such as health care, that workers would receive as well.

Even the figures of 21,398 new jobs and $1.05 billion in wages, however, dramatically understate the economic impact of increased steel production. “Since steel is the most prevalent material in our economy, the steel industry is highly interrelated with other economic sectors, as reflected in the ripple effect on employment.”[37] In converting inputs to steel, the steel industry purchases a variety of goods and services.[38] Both upstream and downstream, the effect of in-

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33 This number is based on data provided by the Steel Manufacturers Association’s member companies.

34 *May 2012 Employment Estimates*.

35 *Id*.

36 *Id*.

37 Timothy Considine, American Iron and Steel Institute, *Economic Impacts of the American Steel Industry* 1 (2012) (“*Economic Impacts of the American Steel Industry*”).

38 *Id.* at 5 – 6.

creased employment in the steel industry is the creation of additional jobs in industries supplying inputs to and buying steel from the steel industry.

In a recent analysis of the economic impact of the domestic steel industry, Professor Timothy Considine of the University of Wyoming concluded that each additional job in the steel industry helps support another 2.7 jobs in the supply chain among suppliers and customers.[39] Thus, additional steel production of 13.3 million tons would also help support another 57,775 new jobs outside of the steel sector. Altogether, with jobs created directly in the steel sector, an expansion of domestic steel production so that the United States produced as much steel as it consumes would help support 79,173 jobs in the United States. An expansion of production by the 2003 – 2012 average difference between production and consumption, 14.6 million tons, would help support more than 87,000 jobs.

Potential Contribution to GDP

Expanded steel production in the United States would have a strong, positive effect on the American economy in general. When the steel industry converts inputs into finished steel products, it creates value. In 2012, the U.S. iron and steel industry produced products worth a total of $112 billion.[40] Given 2012 production of 88.7 million tons of products (in crude steel equivalent),[41] each ton of steel produced in the United States is worth about $1,263. At this value, the production of an additional 13.3 million tons of steel in the United States would contribute $16.8 billion directly to the GDP of the United States.

The majority of this amount reflects payments to suppliers and workers. Around 80 percent of each additional dollar of output by the industry is used to pay for raw materials, services, energy, and other inputs.[42] Thus, additional domestic steel production of 13.3 million tons would require payments of around $13.4 billion to input suppliers, for everything from steel scrap to contracted services.[43] The following table shows the approximate distribution of these purchases throughout the U.S. economy. The values are based on the percentage of purchases from steel

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39 *Id.* at 1.

40 *Mineral Commodity Summaries 2013* at 78.

41 *Steel Statistical Yearbook 2013* at 1.

42 *Economic Impacts of the American Steel Industry* at 6.

43 *See id.* at 5 – 6 for a detailed discussion of inter-industry purchases by the steel industry.

industry suppliers identified by Considine,[44] multiplied by the estimated total of $13.4 billion in purchases that production of an additional 13.3 million tons of steel would require.

Table 2[45]

Upstream Economic Impact of Expanded Domestic Steel Production

Supplier	Value ($ Million)
Materials	$6,941
Services	$1,868
Energy	$1,167
Machinery	$1,052
Wholesale and Retail Trade	$1,040
Transportation	$959
Computers and Electronics	$372
Total	$13,399

The remaining 20 percent of the value of the additional output – in this case, $3.4 billion – would represent true "value added" to the U.S. economy. It would include wages to employees, profits, and dividends, including funds available for reinvestment and expansion, as well as indirect business taxes paid to the government. Using the ratios found by Considine, this would result in $2.24 billion in income (direct and indirect) by employees of the industry, and $1.16 billion in profits.[46]

The direct economic impact of expanded steel production must be reduced, though, by the value of the exports of scrap that would be foregone. As discussed above, a reasonable assumption is that the production of 13.3 million tons of steel would require the diversion of 6.5 million tons of scrap from export to domestic use. In 2012, the average value of scrap exported from the United States was $439.13 per ton.[47] To avoid double-counting, it is necessary to deduct the value of the 6.5 million tons of scrap that would otherwise have been exported, $2.9 bil-

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44 *Economic Impacts of the American Steel Industry* at 6.

45 Calculated based on *Economic Impacts of the American Steel Industry* at 6.

46 *See id.* at 2 (labor income comprises 66 percent of value added in the U.S. steel industry).

47 *Mineral Commodity Summaries 2013* at 80 – 81 (Total value of scrap exports divided by quantity of scrap exports).

lion, from the direct economic impact of expanded steel production. This yields a direct economic impact of $13.9 billion from the production of an additional 13.3 million tons of steel per year.

The economic effects of increasing steel production are not limited to the value of that additional production. The economic output generated through the expansion of production will have a multiplier effect, as the enterprises, workers, and owners in both the steel industry and its supply chain will earn additional income as a result of increased steel production, and will then spend this income on goods and services throughout the economy. This "household" spending further expands GDP.

"Manufacturing has a larger multiplier effect than any other major economic activity."[48] A recent study examines the multiplier effects arising from expanded government spending, finding an average multiplier of 1.9.[49] This figure is consistent with another recent study, originating at the Federal Reserve Bank of San Francisco, which found a multiplier of 2 for highway spending.[50] Other sources indicate that the multiplier from manufacturing activity may be higher still.[51]

In calculating the full economic impact of an expansion in steel production, therefore, the use of a multiplier of 1.9 is reasonable. As discussed above, expansion of U.S. steel production by 13.3 million tons would represent a net increase of $13.9 billion in economic output. Application of a multiplier of 1.9 yields a total economic effect of $26.4 billion per year. If production were to expand by 14.6 million tons per year, the total annual economic impact would be $28.7 billion.

The Trade Deficit

A final general economic benefit of expanded steel production in the United States would be a reduction in the trade deficit. In 2012, U.S. imports of steel were worth $34.05 billion.[52] If

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[48] National Science and Technology Council, *A National Strategic Plan for Advanced Manufacturing* 4 (2012) (*"A National Strategic Plan for Advanced Manufacturing").*

[49] *See* Christina Romer, *Fiscal Policy in the Crisis: Lessons and Policy Implications* 17 (Apr. 16, 2012).

[50] Sylvain Leduc & Daniel Wilson, *Highway Grants: Roads to Prosperity?*, FRBSF Economic Letter at 4 (Nov. 26, 2012).

[51] *See A National Strategic Plan for Advanced Manufacturing* at 4.

[52] U.S. Department of Commerce, *Steel Import Trade Monitor*, http://ia.ita.doc.gov/steel/license/SMP/Census/Annual/gdesc52/M$Sum_ALL_ALL_9Y.htm.

the entire expanded production in the United States were consumed domestically, the U.S. trade deficit would decline by an amount equal to the value of the steel, $16.8 billion, minus the value of scrap exports diverted to domestic production, $2.9 billion, or $13.9 billion. In addition, the steel industry might need to import additional quantities of some inputs, such as alloying elements like chromium, nickel, and vanadium that are not produced in adequate quantities in the United States. Overall, it is reasonable to conclude that an expansion of steel production by 13.3 million tons per year would reduce the trade deficit by approximately $13 billion.

Taxes

Expansion of steel production in the United States would also result in increased tax revenues for the federal, state, and local governments. In 2010, the steel sector (iron and steel mills, ferroalloys, and industries producing steel products from purchased steel) and its employees paid direct and indirect taxes of $3.7 billion.[53] These taxes included social security on workers' income; indirect business taxes, including excise taxes and customs duties; corporate income tax; and personal income tax at the federal, state, and local levels.[54]

The iron and steel industry's output was worth $83.47 billion in 2010,[55] with 4.4 percent of the total value of that output paid in taxes. An expansion of steel production worth $16.8 billion would result in an additional $739 million in taxes paid by the industry and its employees to various levels of government. This figure significantly understates the full tax impacts of expanded steel production, though, as it does not take into account the additional taxes that would be paid by the industry's suppliers and their employees, as well as the greater tax revenues that would flow from the induced impact of increased spending by steel industry households.

Environmental Impact

Expanded steel production in the United States will inevitably have an environmental impact. For example, increased production will result in greater greenhouse gas ("GHG") emissions by the domestic steel industry. To the extent that expanded U.S. production replaces imports, however, the net result would actually be lower total GHG emissions, precisely because the

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53 *Economic Impacts of the American Steel Industry* at 3.

54 *Id*.

55 *Id*. at 2.

United States is one of the most efficient producers of steel in the world. Indeed, the American Iron and Steel Institute calculates that the U.S. steel industry uses the least amount of energy per ton of any steel industry in the world.[56] Greater U.S. production of steel would also reduce pollution from the production and use of coke, a major raw material used in integrated mills.

U.S. Steel Production and Greenhouse Gas Emissions

The World Steel Association estimates that, on average, 1.9 metric tons of carbon dioxide are emitted for each ton of steel produced worldwide.[57] Direct GHG emissions per ton by the U.S. steel industry are slightly more than one-third of this amount. In 2011, the last year for which full data is available, the U.S. steel industry produced 86.4 million tons of steel and emitted 64.8 million tons of GHGs (including emissions from the production of metallurgical coke).[58] Direct GHG emissions by the U.S. steel industry are only 0.75 tons per ton of steel produced, primarily because the U.S. industry produces approximately two-thirds of its steel using EAFs.

Expanded production of steel in the United States would have a second positive impact on GHG emissions. Steel imported into the United States must be transported to the United States. This is normally done on ships, especially for sources outside of North America. The bunker fuels burned by international shipping are a significant source of GHG emissions.[59] Transporting steel produced inside the United States to consumers in the United States could noticeably reduce the emissions associated with shipping steel.

Environmental Impact of Reduced Coke Use

Another major source of pollution from steel production arises not from the production of steel itself, but from the manufacture of the coke used in basic oxygen furnaces ("BOFs"). Indeed, "[c]oke production is one of the major pollution sources from steel production."[60] Major

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[56] American Iron and Steel Institute, *Steel Industry Reductions in CO2 Directly Tied To Energy Intensity Reductions* (2012), http://www.steel.org/en/Sustainability/CO2%20Reduction.aspx.

[57] World Steel Association, *Steel's Contribution to a Low Carbon Future* 1 (2012).

[58] U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2011* at 4-51 – 4-52 (Apr. 12, 2013).

[59] *See id. at* 3-19 – 3-20.

[60] Illinois Sustainable Technology Center, *Pollution Prevention in the Primary Metals Industry* (2013), http://www.istc.illinois.edu/info/library_docs/manuals/primmetals/chapter2.htm.

pollutants from coke production include coke oven gas, naphthalene, ammonium compounds, crude light oil, sulfur, and coke dust.[61] Not surprisingly, the best way to limit emissions from coke-making is to reduce the amount of coke used in the steelmaking process.[62]

EAFs use little to no coke. Because a majority of the steel produced in the United States is produced in EAFs, the U.S. steel industry uses less coke per ton of steel produced than do the industries in other countries. In addition, U.S. steel producers are actively exploring ways to use plentiful natural gas rather than coal and coke even in the BOF process.[63] By replacing coke with natural gas, increased steel production in the United States could therefore lead to lower world-wide emissions from coke production as well.[64]

Steel Production and the Scrap Industry

The expansion of steel production in the United States would require the increased consumption of steel scrap domestically. While expansion would benefit the domestic scrap industry by increasing demand for steel scrap, it could also reduce scrap exports by the United States. The Institute of Scrap Recycling Industries ("ISRI") has recently highlighted the contributions of scrap exports to both employment in the United States and to reduction of the trade deficit.[65] Indeed, ISRI claims that the "economic benefits of exporting scrap commodities are no different than those that occur [from] exporting any other product."[66]

Exports of steel scrap provide a meaningful contribution to the United States' trade balance. Under any circumstance, the United States would continue to be a major exporter of steel scrap. On balance, however, the conversion of more steel scrap to steel in the United States

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61 *Id*.

62 *Id*.

63 *See, e.g.*, Bowdeya Tweh, *U.S. Steel to reduce coke, use natural gas*, Northwest Indiana Times (Aug. 28, 2011), http://www.nwitimes.com/niche/inbusiness/newsletter-featured-articles/u-s-steel-to-reduce-coke-use-natural-gas/article_b8b9f34d-a0fe-5671-a653-b1cd4a2cdb3a.html.

64 *See The Future of Steel* at 11.

65 *See, e.g.*, Institute of Scrap Recycling Industries, Inc., *Economic Impact Study U.S.-Based Scrap Recycling Industry* 3 (2011), http://www.isri.org/ISRI/Home/Jobs_Industry/ISRI/Job_Industry.aspx?hkey=bc2e8f55-f751-4da1-bcc3-3ab5a86e53c5.

66 *Id.* at 4.

would clearly yield greater economic benefits than the continued export of the same amount of steel scrap.

Overall, the expansion of domestic steel production would have a positive impact on the American scrap industry. As discussed above, given the presence of an estimated 1.1 billion tons of obsolete scrap in the United States, it is reasonable to assume that at least half of the scrap requirements for expanded steel production would be satisfied through increased scrap recovery. As of November 11, 2013, the average price for #1 heavy melting scrap (the type of scrap obtained from recycling vehicles, appliances, and building materials) was $335.83 per gross ton during the previous 18 months.[67] The sale of an additional 6.5 million metric tons of steel scrap would earn the domestic scrap industry approximately $2.1 billion.[68]

While expanded domestic steel production would require the diversion of some scrap from exports, this should have a positive impact on the domestic scrap industry. Scrap is an internationally traded commodity, and scrap exports from the United States are not subject to any restrictions. The domestic steel industry would have to buy the scrap on the open market, so that profits in the scrap industry would not fall.

Expansion of domestic steel production would also have a significant positive impact on employment in the U.S. scrap industry. The expansion of scrap generation would cause employment in the industry to increase. There are a variety of jobs associated with scrap collection, sorting, compacting, packaging, and shipment. Even to the extent that scrap sales were diverted from exports to domestic use, the vast majority of these jobs would be unaffected by expansion of domestic steelmaking. The same scrap would be collected and processed; it would simply be used domestically instead of exported.

Increasing Demand for Domestic Steel

Of course, steel production in the United States also reflects the state of demand for steel. American steel consumption in 2012 was actually 3.6 percent below what it was ten years earlier, in 2003.[69] While there is no point in increasing steel consumption simply for the sake of in-

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67 SteelBenchmarker, *Price History Tables and Charts* 11 (Nov. 13, 2013).

68 This calculation is based on a conversion rate of 0.9839 metric tons per gross ton.

69 *Steel Statistical Yearbook 2013* at 78.

creasing consumption, the United States faces an immediate need to repair and upgrade much of its physical infrastructure.[70] Investment on the scale needed would require millions of tons of steel, and would provide a significant source of demand for more steel in the United States.

The Need for Investment in Infrastructure

"[I]nfrastructure is the backbone of our nation's economy."[71] Once the envy of the world, America's infrastructure "has been starved by a generation of under-investment," as an article in the *Financial Times* explained.[72] The roads, airports, and electricity grid of the United States are increasingly coming to resemble those of a developing country rather than of the world's largest economy.

Deterioration of the country's infrastructure is not simply a matter of inconvenience for Americans; it is negatively affecting the ability of American companies to operate in an efficient manner.[73] The World Economic Forum ranks the United States as only 15th in infrastructure worldwide, and 19th in quality of overall infrastructure.[74] The United States received particularly low marks for quality of air transport infrastructure (18th) and quality of electricity supply (30th).[75] American business has identified the adequacy of infrastructure as a significant obstacle to doing business in the United States.[76] The American Society of Civil Engineers ("ASCE") has estimated that the United States will need to spend $3.6 trillion through 2020 simply to maintain a state of good repair.[77]

The Economic Impact of Investments in Infrastructure

In addition to increasing competitiveness in even the short-term, investment in infrastructure is also a very cost-efficient way to increase jobs. Every $1 billion invested in highway con-

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70 American Society of Civil Engineers, *Report Card for America's Infrastructure* 4 (2013) ("*Infrastructure Report Card*") (giving U.S. infrastructure an overall "GPA" of D+).

71 *2011 – 2012 Policy Statement* at 35.

72 Edward Luce, *Washington must stop the creeping rust*, Financial Times (Nov. 25, 2012).

73 *2011 – 2012 Policy Statement* at 9.

74 Klaus Schwab, World Economic Forum, *Global Competitiveness Report 2013 – 2014* 382 – 83 (2013).

75 *Id.* at 383.

76 *Id.* at 382.

77 *Infrastructure Report Card* at 65.

struction and repair, for example, creates 35,000 new jobs.[78] The multiplier effect from infrastructure spending has been estimated at 2,[79] meaning each dollar spent on infrastructure creates two dollars in economic activity.[80] Nor do the economic benefits accrue only in the short-term; rather, a recent paper from the Federal Reserve Bank of San Francisco found that highway spending also has medium-term effects by increasing the economy's overall productive capacity. Once these effects are taken into account, this paper estimates that the multiplier from highway spending may be as high as 3 in the short term, and as high as eight in the medium run.[81]

Any concerted effort to repair and upgrade America's infrastructure will require vast amounts of steel. While the United States might not spend the entire $514 billion per year needed,[82] even a lesser level of spending would allow substantial upgrades to the nation's infrastructure. This would in turn require large amounts of steel. Increased infrastructure spending, combined with "Buy America" policies, would increase demand for domestically produced steel, aiding the creation of tens of thousands of new jobs.

Obstacles to the Expansion of Steel Production in the United States

Although the U.S. steel industry enjoys a number of comparative advantages, steel production in the United States has remained essentially flat over the past decade. On the other hand, production has increased dramatically in a number of other countries, including China (up by 222 percent from 2003 to 2012) and India (a 144 percent increase during the same period),[83] even though they lack the advantages of the U.S. steel industry. As a result, the United States' share of world steel production has fallen by nearly half, from 9.6 percent in 2003 to 5.7 percent in 2012.[84] This relative decline in U.S. steel production reflects in part the interplay between

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78 *2011 – 2012 Public Policy Statement* at 35.

79 Sylvain Leduc & Daniel Wilson, *Highway Grants: Roads to Prosperity?*, FRBSF Economic Letter at 2 (Nov. 26, 2012).

80 *Id.* at 3 ("The fiscal multiplier represents the dollar change in economic output for each additional dollar of government spending.").

81 *Id.* at 4.

82 This figure was calculated by dividing the total investment recommended by the ASCE through 2020, $3.6 trillion, by 7 years (2014 – 2020).

83 *See Steel Statistical Yearbook 2013* at 2.

84 *See id.* at 1, 2.

domestic policies that discourage the production of steel in the United States and policies in other countries that encourage domestic production and discourage imports.

Domestic Policies

The United States has implemented a range of policies that put American steel producers at a competitive disadvantage internationally. These policies include:

- *The U.S. tax system*: Because steel producers who export products to the United States generally receive rebates of value added taxes paid in their home country, but are not subject to U.S. corporate tax, they have a competitive advantage over U.S. producers.
- *Energy policy*: Conflicting policies at federal, state, and local levels have made it difficult to upgrade the U.S. electrical grid and to take full advantage of the U.S. advantage in natural gas production.
- *Environmental regulation*: Cumbersome environmental regulations make it difficult or even impossible to build new facilities, even when those facilities would be more energy efficient and environmentally friendly than existing facilities.
- *Health care costs:* Unlike steel producers in other countries, U.S. steel producers bear most of the burden of health care costs for their employees.

Adjusting these policies to achieve their goals in the most efficient manner possible would make it easier to produce more steel in the United States without sacrificing the objectives of the regulations.

Import Tariffs

In addition, misguided trade policies have also harmed the competitiveness of the American steel industry. The United States has long pursued a policy of increasing liberalization of international trade, on the assumption that American competitiveness would ensure that liberalized trade would result in economic benefits for the United States. However, this approach assumes that other countries reciprocate. This has not been the case. The United States, for example, imposes no tariffs on imports of steel products from most countries. Other major steel producing countries, including China, India, and Brazil, impose significant tariffs on imports of steel. Brazil's tariffs, for example, are as high as 20 percent.[85] Given the competitiveness of the global steel industry, even seemingly low tariff levels can provide significant protection to domestic

[85] Both bound and effective tariff rates are available from the World Trade Organization at https://tariffanalysis.wto.org/welcome.aspx?ReturnUrl=%2f%3fui%3d1&ui=1.

steel producers. The steel industries in these countries are among the most modern in the world, so that this discrepancy in treatment of imports gives them a substantial competitive advantage over the United States.

The tariffs the United States imposes on steel imports are bound by international agreement, and raising those tariffs would require international negotiation. The United States should ensure in future trade negotiations that it does not put its manufacturers at a comparative disadvantage by surrendering greater concessions than it receives. With respect to steel in particular, it should insist on full reciprocity, with all parties agreeing to impose no tariffs on steel imports.

Export Tariffs, Quotas, and Other Subsidies

The ability of the domestic steel industry to expand production is also affected by policies of foreign countries that encourage steel production and exports, while making it more difficult for American steel producers to enter their markets. These policies include various forms of subsidies. Two of the most significant are currency manipulation and restrictions on exports of raw materials. Many countries, especially China, actively manage the value of their currencies to make their exports cheaper in foreign markets, and imports more expensive in domestic markets.[86] Many countries also limit exports of scrap, iron ore, coke, and other raw materials through such measures as export taxes. The effect of these restrictions is to make these raw materials cheaper for their domestic steelmakers, and to draw exports of scrap and other steelmaking raw materials out of countries like the United States that do not restrict exports.[87] Finally, some countries, again including China, provide outright subsidies to their steel industries.[88]

The United States has consistently followed a policy of discouraging barriers to international trade in scrap, and of encouraging recycling and the efficient use of raw materials.[89] If individual countries are unwilling to remove these obstacles, the United States should consider a

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[86] For a discussion of currency manipulation by various countries and the impact of those practices on the United States, *see, e.g.*, Robert E. Scott et al., Economic Policy Institute, *Reducing U.S. Trade Deficits Will Generate a Manufacturing-Based Recovery for the United States and Ohio* (2013); U.S. Department of the Treasury, *Report to Congress on International Economic and Exchange Rate Policies* (Oct. 20, 2013), http://www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/2013-10-30_FULL%20FX%20REPORT_FINAL.pdf.

[87] *Steelmaking Raw Materials* at 56 – 57.

[88] *See, e.g.*, Usha C.V. Haley and George T. Haley, Subsidies to Chinese Industry 56 – 74 (2013).

[89] *2011 – 2012 Policy Statement* at 7.

policy of reciprocity, where exports of steelmaking raw materials from the United States would be limited or prohibited to countries that themselves limit or prohibit such exports. Similarly, the United States should continue to press other countries to reform or eliminate other policies that distort international trade in steel, including currency manipulation and subsidies to their steel industries.[90]

Conclusion

The United States faces a number of related challenges, including creating good paying jobs, rebuilding our decaying infrastructure, and combating climate change. Expanding steel production in the United States through the conversion of scrap into steel in this country would contribute to meeting all of these challenges. Expanding domestic steel production to match consumption would create as many as 87,000 new jobs, directly and indirectly, and would increase GDP by nearly $29 billion. It would reduce the trade deficit as well. By replacing imported steel with steel produced in efficient U.S. mills, expansion of domestic steel production could actually lower greenhouse gas emissions. While using steel scrap domestically, instead of exporting it, might cost a small number of jobs, these lost jobs would be more than offset by more jobs in the steel industry and its suppliers.

The United States can encourage the expansion of domestic steel production through a pair of related policies. First, it should work to increase the global supply of steel scrap by pressuring China, Russia, and other countries to dismantle their barriers to scrap exports. This will lead to the creation of recycling networks worldwide, driving both scrap prices and GHG emissions down. The United States should also stimulate demand for steel by investing in infrastructure – an investment that is absolutely necessary to maintain American competitiveness.

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90 *Id*. at *7*.