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The Unintended Consequences of U.S. Steel Import Tariffs: A Quantification of the Impact During 2002

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and

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Executive Summary

As a result of a Section 201 ("safeguard") investigation brought at the behest of the U.S. steel industry, President Bush in March 2002 imposed tariffs on imports of certain steel products for three years and one day. The tariffs, combined with other challenges present in the marketplace at the time and in the months that followed, boosted steel costs to the detriment of American companies that use steel to produce goods in the United States. The resulting negative impact included job losses for thousands of American workers.

The Consuming Industries Trade Action Coalition (CITAC) Foundation requested a formal examination of the impact of higher steel costs on American steel-consuming industries,[1] and in particular, a quantification of employment losses at those companies. This study employed straight-forward and widely-accepted regression analysis using a variety of price and employment data to maximize the reliability of the results.[2] We found that:

- 200,000 Americans lost their jobs to higher steel prices during 2002. These lost jobs represent approximately $4 billion in lost wages from February to November 2002.[3]

- One out of four (50,000) of these job losses occurred in the metal manufacturing, machinery and equipment and transportation equipment and parts sectors.

- Job losses escalated steadily over 2002, peaking in November (at 202,000 jobs), and slightly declining to 197,000 jobs in December.[4]

- More American workers lost their jobs in 2002 to higher steel prices than the total number employed by the U.S. steel industry itself (187,500 Americans were employed by U.S. steel producers in December 2002).

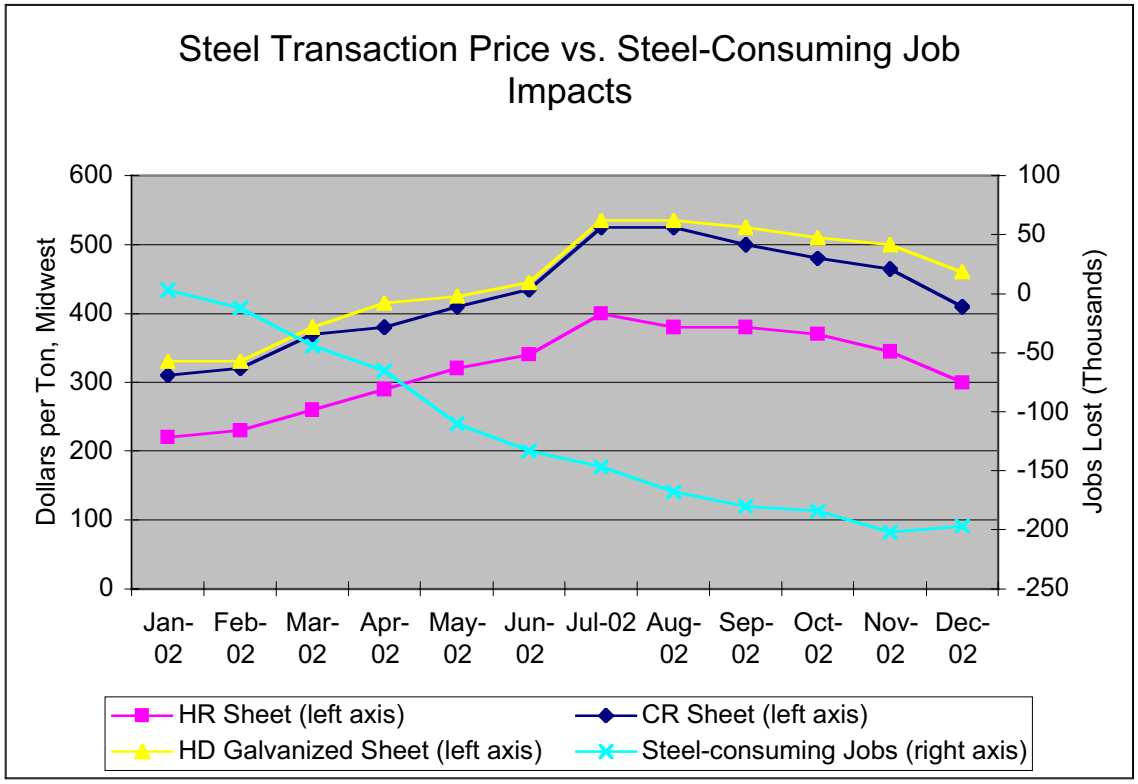
- Every U.S. state experienced employment losses from higher steel costs, with the highest losses occurring in California (19,392 jobs lost), Texas (15,826 jobs lost), Ohio (10,553 jobs lost), Michigan (9,829 jobs lost), Illinois (9,621 jobs lost), Pennsylvania (8,400 jobs lost), New York (8,901 jobs lost) and Florida (8,370 jobs lost). Sixteen states lost at least 4,500 steel consuming jobs each over the course of 2002 from higher steel prices.

- While insufficient data exist at this time to measure the precise role steel tariffs played in causing such significant price increases, relative to the other factors, it is clear that the Section 201 tariffs played a leading role in

pushing prices up. Steel tariffs caused shortages of imported product and put U.S. manufacturers of steel-containing products at a disadvantage relative to their foreign competitors. In the absence of the tariffs, the damage to steel consuming employment would have been significantly less than it was in 2002.

- The analysis shows that American steel consumers have borne heavy costs from higher steel prices caused by shortages, tariffs and trade remedy duties, among other factors. Some customers of steel consumers have moved sourcing offshore as U.S. producers of steel-containing products became less reliable and more expensive. Other customers refused to accept higher prices from their suppliers and forced them to absorb the higher steel costs, which put many in a precarious (or worse) financial condition. The impact on steel-consuming industries has been significant.

In making policy for the revitalization of manufacturing, including the steel industry, our conclusions suggest that the effects across the full industrial spectrum should be considered. The lessons of the impact of higher steel costs should counsel a good deal of caution when import barriers are considered.



Source: Trade Partnership Worldwide, LLC

About the Authors

Among other positions, Dr. Joseph Francois is a professor of economics at Erasmus University in Rotterdam, the Rotterdam School of Management and the University of Adelaide, and Managing Director of Trade Partnership Worldwide. He specializes in assessing the economic effects of trade policies and actions. These include bilateral and multilateral trade liberalization, the imposition of antidumping or countervailing duty orders, as well as quotas and tariffs resulting, for example, from a safeguard action. He co-authored the U.S. International Trade Commission's COMPAS model during his tenure at the ITC's Office of Economics. He also ran the modeling team at the GATT/WTO during the Uruguay Round. Francois holds a Ph.D. in economics from the University of Maryland (1988). He can be reached by e-mail at francois@tradepartnership.com.

Laura M. Baughman is President of Trade Partnership Worldwide. She prepares studies and other analyses designed to help Washington policy makers better understand the ramifications of U.S. trade policy actions. She holds degrees in economics from Columbia (1978) and Georgetown (1977) Universities. She can be reached by e-mail at baughman@tradepartnership.com.

Endnotes

[1] Our definitions of steel consumers are conservative. Generally, it includes manufacturers in the following sectors: fabricated metal products (SIC 34); industrial machinery and equipment (SIC 35); electric distribution equipment (SIC 361); electrical industrial apparatus (SIC 362); household appliances (SIC 363); electric lighting and wiring equipment (SIC 364); transportation equipment (SIC 37); chemicals and related products (SIC 28); tires (SIC 301); petroleum refining (SIC 291), and nonresidential construction (SIC 15 –17 minus SIC 152). These sectors should be included in any definition of steel consumers because they use important quantities of steel as inputs to production. For example, according to 1998 input-output tables, steel products represent 5.8 percent of the non-petroleum intermediate inputs in the petroleum sector, 18.0 percent in the new construction sector, and 5.0 percent in the industrial and other chemicals sector. See Table 2, "The Use of Commodities by Industries, 1998," Mark A. Planting and Peter D. Kuhbach, "Annual Input-Output Accounts of the U.S. Economy, 1998," *Survey of Current Business*, December 2001, page 62.

[2] Regression analysis is a standard and widely-accepted technique for quantifying relationships between data (such as economic price and quantity data). It involves finding the equation that best fits a set of data points. This "best-fit" estimate is then used to measure quantitative relationships within the data. In other words, we look for an equation that generates as closely as possible the actual data sets examined, in this case employment and general economic conditions. A good "fit" means that the equation soundly predicts actual data within the sample. In the present case, we are more than 99 percent certain that the relationships modeled are significant, and over 95 percent

certain that the negative relationship we identified, with respect to steel prices, is significant (based on a one-sided “t-test”). See the Annex for further detail.

[3] Assuming workers found new jobs after four weeks.

[4] The losses in each month are relative to actual employment in December 2001.

The Unintended Consequences of U.S. Steel Import Tariffs: A Quantification of the Impact During 2002

The Cause

On March 5, 2002, President Bush imposed tariffs on imports of many steel products into the United States for three years and one day. The duties became effective March 20, 2002.[1] They affect a wide range of steel products used by American manufacturers to produce steel-containing products in the United States, which in turn are sold to U.S. and international customers.

Steel Products Subject to Import Tariffs, March 20, 2002-March 19, 2003

Plate	30.0%
Hot-rolled sheet	30.0
Cold-rolled sheet	30.0
Coated sheet	30.0
Tin mill products	30.0
Hot-rolled bar	30.0
Cold-finished bar	30.0
Rebar	15.0
Certain welded tubular product	15.0
Carbon and alloy fittings and flanges	13.0
Stainless steel bar	15.0
Stainless steel rod	15.0
Stainless steel wire	8.0
Slab	A quota of 5.4 million short tons, plus a tariff of 30.0% for shipments in excess of quota

Source: Office of the U.S. Trade Representative, "Background Information," March 5, 2002.

The Effect

To understand the impact of the steel tariffs on steel consumers, it is helpful first to understand the dynamics of U.S. steel-consuming industries. Steel-consuming industries in the United States span a broad range of manufacturing sectors, including fabricated metal products, machinery and equipment, and transportation equipment and parts. Companies in these sectors often produce parts, components and subassemblies to very exacting customer

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[1] *See* Proclamation 7529, 67 Fed. Reg. No. 45 (March 7, 2002); Department of the Treasury, Customs Service, "Payment of Duties on Certain Steel Products," *Federal Register*, Vol. 67, No. 54, March 20, 2002.

specifications (such as original equipment manufacturers or aftermarket suppliers of parts and components for automobiles and appliances). But steel consumers also include chemical manufacturers, who use steel products extensively to store and transport the products they manufacture; petroleum refiners and their contractors, who use steel pipe and oil field equipment to drill for and transport petroleum and natural gas; tire manufacturers, which put steel belts and beads in tires for safety and durability; and nonresidential construction companies, which use a variety of steel products to build office buildings, bridges, and roads. All these industries need to purchase steel and steel-containing products readily at internationally competitive prices or lose business. The ability to do so is crucial to the economic health of these sectors.[2] This analysis focuses on the impact of higher steel prices on these industries.

The vast majority of steel-consuming manufacturers are small businesses. In fact, 98 percent of all the 193,000 U.S. firms in steel-consuming sectors employ less than 500 workers, according to the Small Business Administration.[3]

Thus, most significantly, the majority of these companies are generally described as "price takers." This means that they have little or no influence over the prices at which they can sell the products they make. They are simply too small to be able to demand that their customers pay more for the products they sell because their input costs, for example, have gone up.[4] Indeed, the prices of

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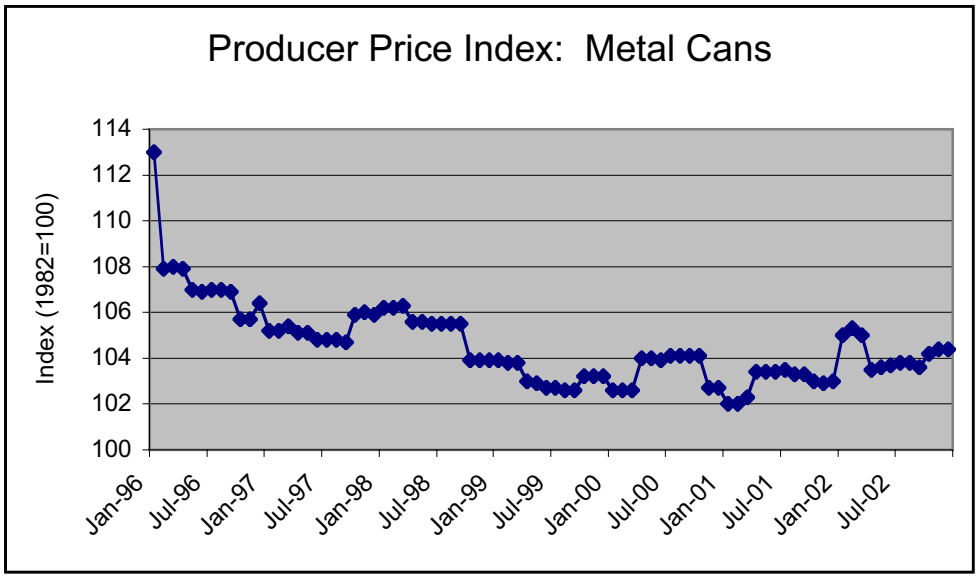
[2] Our definitions of steel consumers are conservative. The narrow definition includes manufacturers and workers in the metal manufacturing sector (Standard Industrial Classification Code 34), machinery manufacturing (SCI code 35) and motor vehicle equipment and parts (SIC 37). The broader definition includes manufacturers in the following sectors: fabricated metal products (SIC 34); industrial machinery and equipment (SIC 35); electric distribution equipment (SIC 361); electrical industrial apparatus (SIC 362); household appliances (SIC 363); electric lighting and wiring equipment (SIC 364); transportation equipment (SIC 37); chemicals and related products (SIC 28); tires (SIC 301); petroleum refining (SIC 291), and nonresidential construction (SIC 15 –17 minus SIC 152). These other sectors should be included in any definition of steel consumers because they use important quantities of steel as inputs to production. For example, according to 1998 input-output tables, steel products represent 5.8 percent of the non-petroleum intermediate inputs in the petroleum sector, 18.0 percent in the new construction sector, and 5.0 percent in the industrial and other chemicals sector. See Table 2, "The Use of Commodities by Industries, 1998," Mark A. Planting and Peter D. Kuhbach, "Annual Input-Output Accounts of the U.S. Economy, 1998," *Survey of Current Business*, December 2001, page 62.

[3] Small Business Administration, Office of Advocacy, www.sba.gov/advo/stats/us99_n6.pdf.

[4] Even U.S. automobile producers are becoming "price takers" in today's marketplace. Car purchasers have become accustomed to zero-percent financing, cash-back discounts, and other incentives that eat into auto-producer profits. There is very little leeway for auto makers to increase prices, despite material cost increases. Over the last four quarters for which data are available (fourth quarter of 2001 through

key products made by steel consumers have been dropping significantly over recent years. Charts below show that producer prices for metal cans today are 7.6 percent lower than they were in January 1996, motor vehicle parts prices are 3.4 percent lower, and machinery and equipment prices are 3.8 percent lower. Steel consumers have been reducing prices in recent years because of intense competitive pressures; and they are in no position to exact higher prices from their customers now because their steel costs have soared.



Source: U.S. Department of Labor, Bureau of Labor Statistics.

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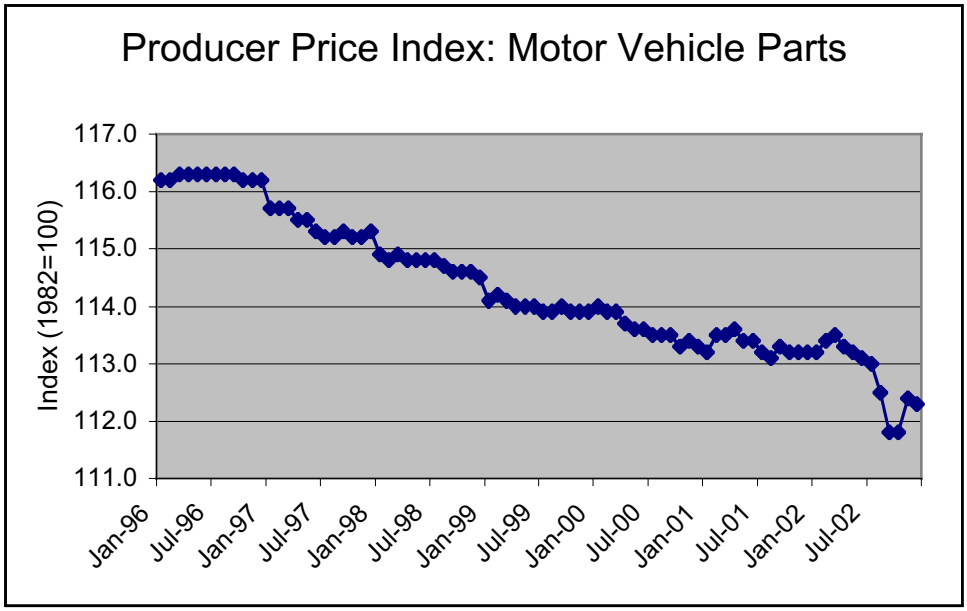
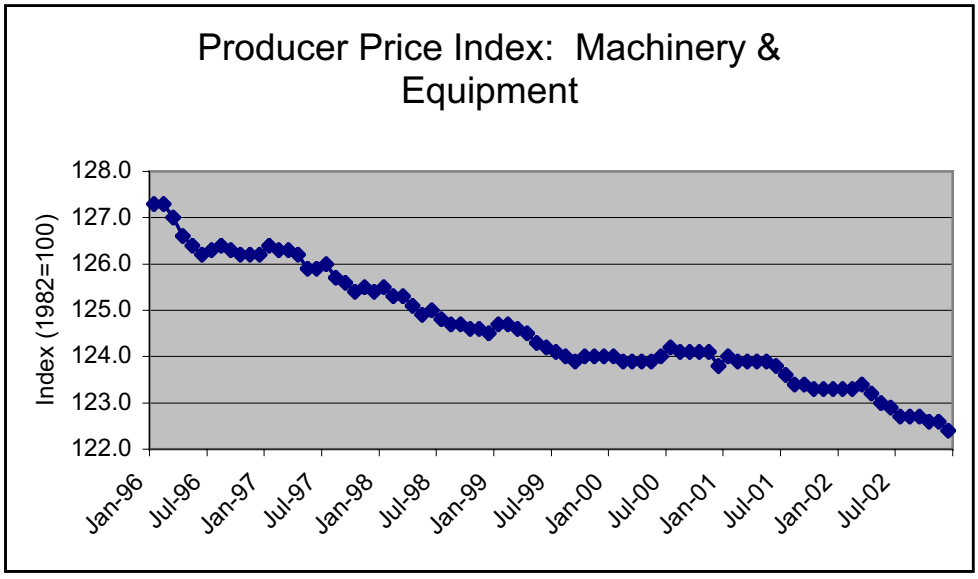
third quarter of 2002), companies in the motor vehicles and equipment sector lost a total of $36.1 billion (U.S. Department of Commerce, *Survey of Current Business*, "Table 6.16C, Corporate Profits by Industry Group," January 2003). *See*, for example, Sholnn Freeman, "Clearing the Lot: Detroit Rolls out Best Deals Yet," *The Wall Street Journal*, December 24, 3002 ("I've never seen it like this. It is truly a buyers' market,' says Ronald Thomas, a Cadillac sales manager in New Orleans. 'The competition is very fierce.'"); Jeremy Grant, "Car chiefs expect recovery in two years," *Financial Times*, January 2, 2003 ("the global automotive industry is not expected to return to the record levels of profitability seen three years ago until at least 2005, according to a survey released today by KPMG, the auditing and consulting group").



Source: U.S. Department of Labor, Bureau of Labor Statistics.



Source: U.S. Department of Labor, Bureau of Labor Statistics.

It is also important to note that other events were affecting steel markets immediately before and after the Section 201 steel tariff remedies were imposed. In early 2002, steel supplies were beginning to tighten. Several million tons of steel-making capacity had shut down over recent years, with significant amounts at LTV Steel, one of the largest U.S. producers, leaving the market in the last half of 2001, most notably in December 2001. Total U.S. steel shipments dropped from 8.6 million tons in October 2001, to just 6.9 million in December 2001.[5]

[5] American Iron and Steel Institute (AISI), "Steel Industry Data," www.steel.org/stats.

International Steel Group ultimately purchased LTV and other failing steel companies, and brought some of that production back on line, but it did not start resupplying the market in any significant manner until May 2002. So during the first quarter of the year steel producers began to push for higher prices and they had the market power of steel shortages to force through some price increases.[6]

In addition, a host of antidumping and countervailing duties went into effect at the end of 2001, raising steel costs. Antidumping and countervailing duties were imposed on imports of hot-rolled carbon steel flat products imported from 11 countries between September and December 2001, boosting costs – or eliminating foreign supply -- of this important product. Antidumping or countervailing duties were imposed on imports of stainless steel bar from five countries in March 2002 with the same consequences. These duties were imposed in addition to the steel tariffs. Ultimately unsuccessful investigations were launched against imports of oil country tubular goods and cold rolled carbon sheet, disrupting supplies and prices of these products during the course of the investigations.

The steel supply shortage problem deepened because of uncertainty associated with the tariffs. Importers stopped ordering steel in January waiting to see what the President would decide. Thus, product that would have been entering the market in March, April and May was absent. Import supply did not recover to the benefit of steel-consumers until September (and it has since fallen off again). Steel consumers scrambled to order steel from U.S. producers, many of whom would not or could not supply them with needed product, and spot prices for steel soared.[7] Domestic steel supplies were so tight that in May 2002 U.S. producers supplied over 90 percent of the market, when 80-85 percent is more typical.[8]

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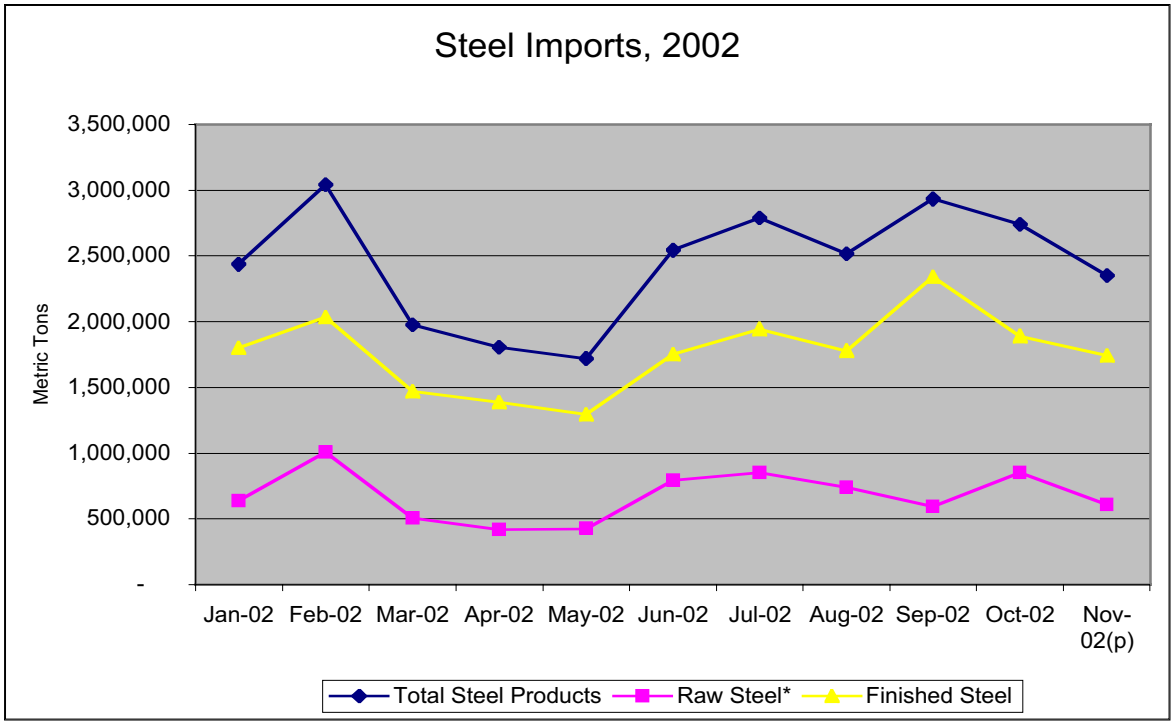
[6] Tom Stundza, "Steel Flash Report: No End to Confusion About Pricing," *Purchasing Magazine Online*, 2/28/2002.

[7] In April, it was reported that some U.S. steelmakers were rationing sheet steel to their customers because their main steelmaking plants were near capacity and their rolling mills were fully booked through June. Tom Stundza, "Steel Flash Report: Short-Term Spot Prices Will Continue to Escalate," *Purchasing Magazine Online*, 4/30/2002.

[8] Derived from AISI data, www.steel.org/stats.



* "Raw Steel" includes ingots, steel for castings, blooms, billets and slab – products imported for use by the steel industry.
Source: U.S. Department of Commerce.

The results: shortages and very high prices, particularly last Summer and Fall. Steel transaction (spot) prices – more than half of major carbon and stainless steel producers purchase steel on the spot market[9] -- began to accelerate in March, reaching a peak in July and August. According to price tracking data from *Purchasing Magazine*, hot-rolled sheet transaction prices were 81.8 percent higher in July 2002 than in January 2002; cold-rolled sheet prices were 69.4 percent higher, and hot-dipped galvanized prices 62.1 percent higher. These are key products, used to make products ranging from cars to lawn-mower blades. Increases in the prices of steel sold directly by steel manufacturers (the so-called "producer price index") to their customers also showed strong increases over the period. In December 2002, the producer price index for hot-rolled steel was 27 percent above the index recorded in December 2001, and the index for cold-rolled steel was 19 percent higher over the same period. [10]

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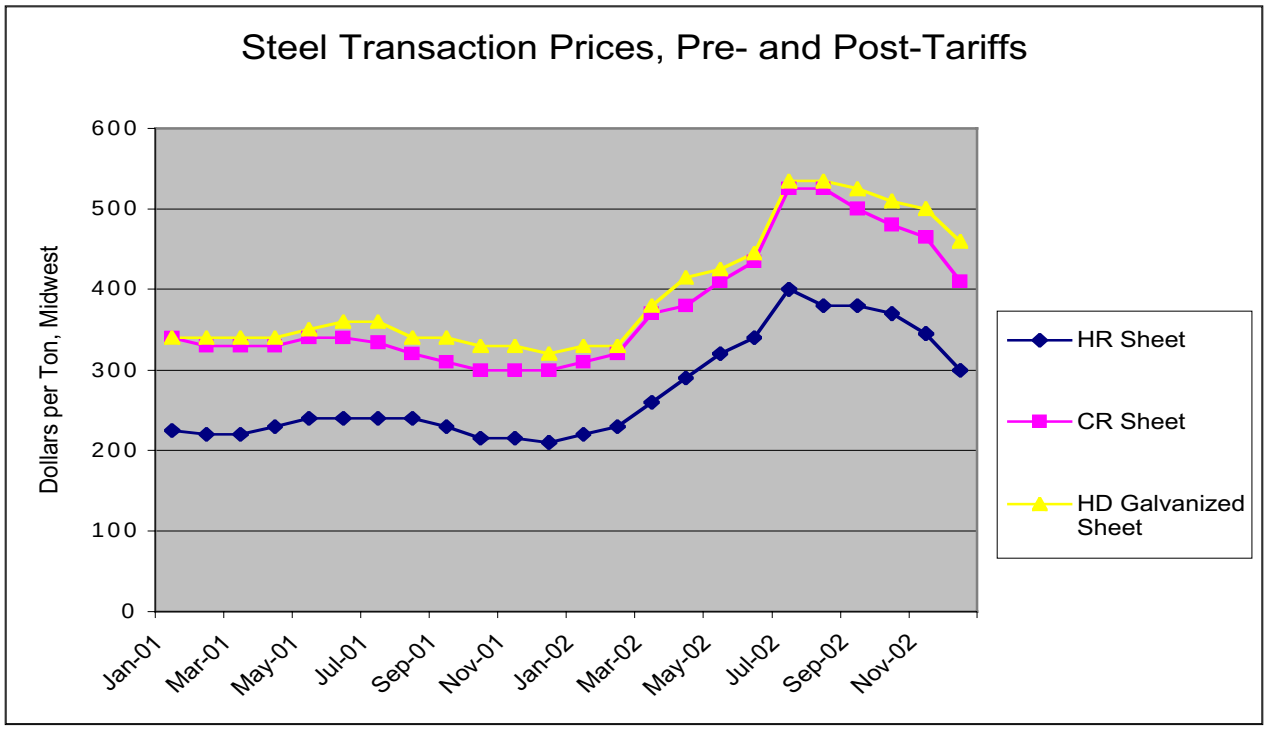
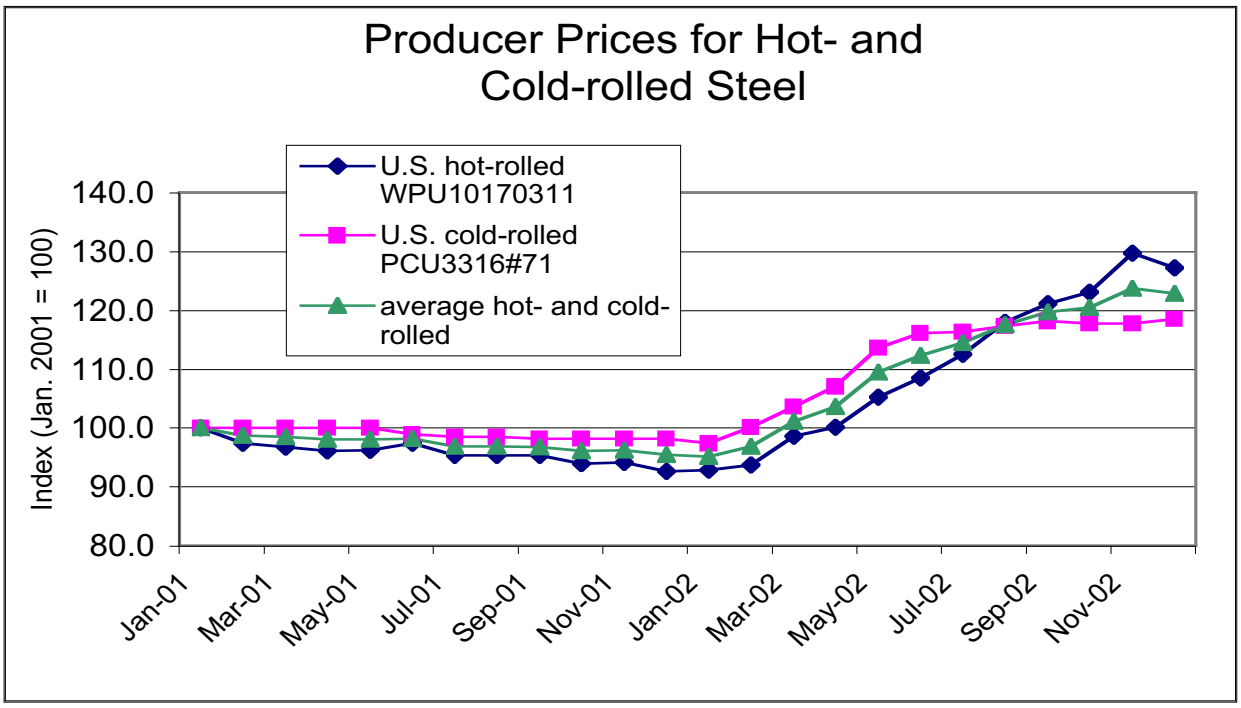
[9] Steel Service Center Institute, "Statement of The Steel Service Center Institute Before the Congressional Steel Caucus," March 21, 2001, found at Internet address http://www.ssci.org/final_caucus.adp, cited in International Trade Commission, op.cit., OVERVIEW-53.

[10] In light of pressures to cut end-product prices noted earlier, the steel industry's effort to suggest that recent increases in the cost of steel are unimpressive because steel prices today are still lower than they were in the mid-1990s is hardly persuasive. (See, for example, Peter Morici, "The Impact of Steel Import Relief on U.S. and World



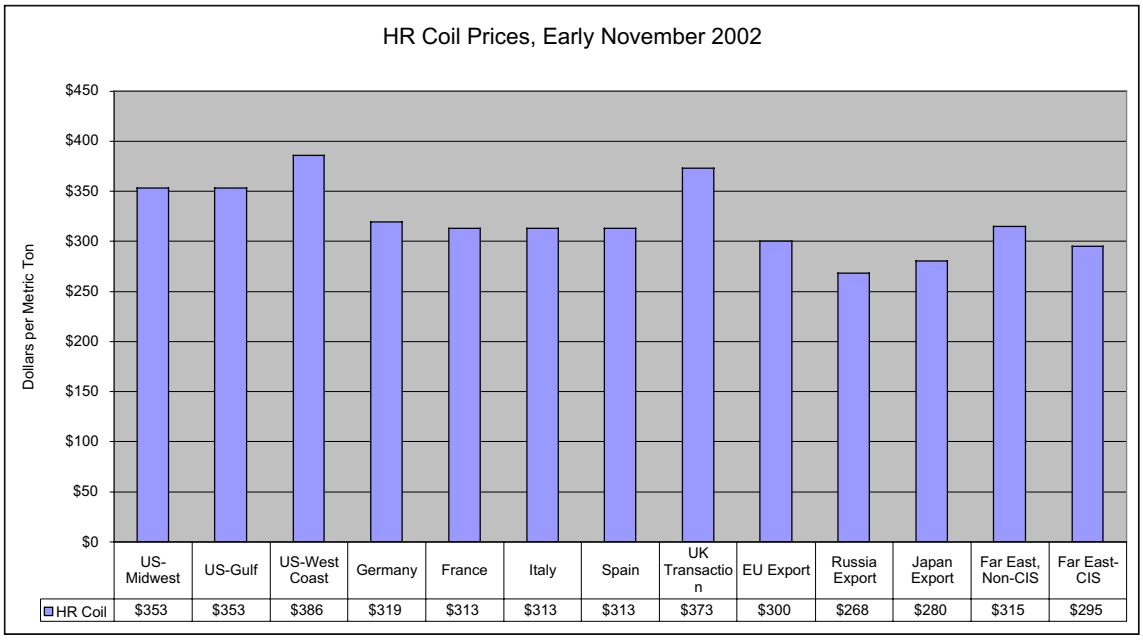
Source: Purchasing Magazine, Flash Reports, various issues.

Steel Prices: A Survey of Some Counterintuitive Results," July 2002, www.steel.org.) It matters little what steel costs were six to 10 years ago. What matters is what steel-containing products can be sold for today and how U.S. steel costs compare to those abroad (see next page).

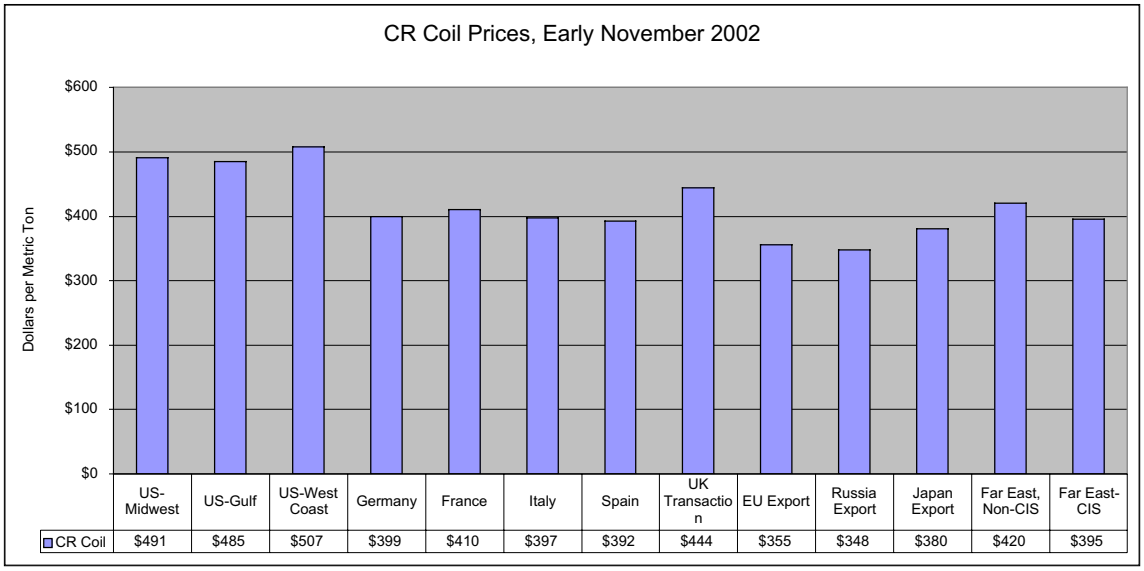


Source: Bureau of Labor Statistics

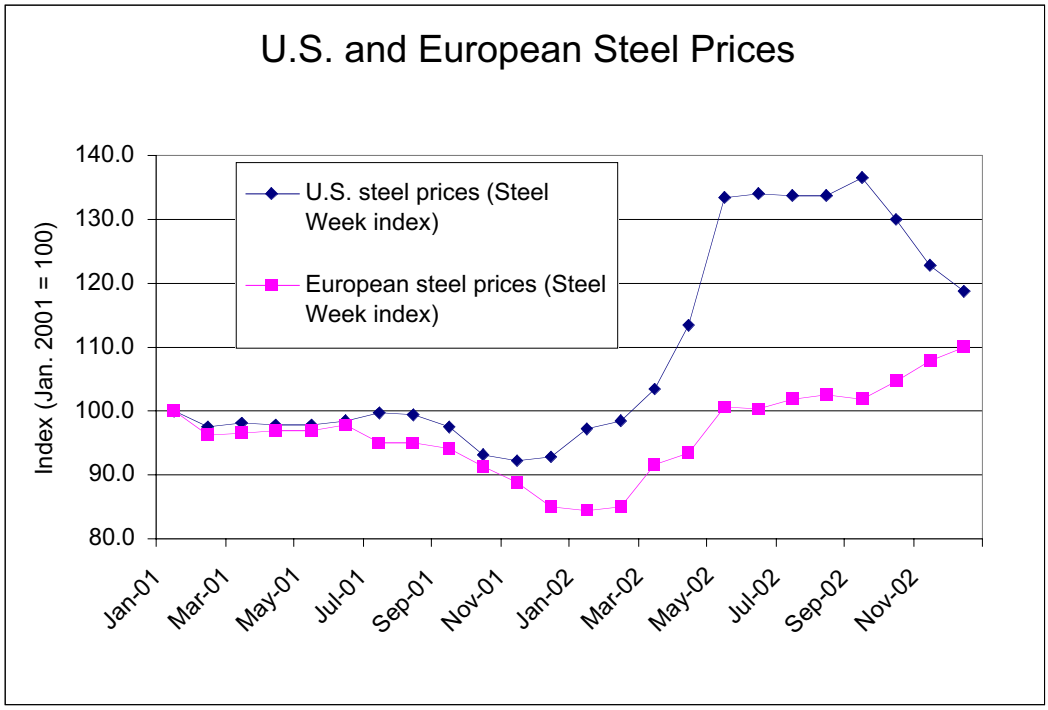
On top of a domestic competitive squeeze, steel consumers faced an international squeeze as well. U.S. steel market prices were generally higher than steel prices paid by competitors abroad (the only major exception was the price of steel in the United Kingdom, see charts), so foreign producers of steel-containing products maintain a cost advantage over U.S. producers of steel-containing products. The result: customers began to shift orders for steel-containing products from U.S. manufacturers to foreign manufacturers.



Source: CRU Monitor



Source: CRU Monitor



Source: CRUspi (Steel Week Online), January 2003

Quantifying the Unintended Consequences

Thus, American steel consumers have borne heavy costs from higher steel prices caused by shortages, tariffs and trade remedy duties. Some customers of steel consumers moved sourcing offshore as U.S. producers of steel-containing products became less reliable and more expensive, due to steel supply problems. Other customers refused to accept higher prices from their suppliers and forced them to absorb the higher steel costs, which put many in a precarious financial condition. The worry of many proved true: that the high prices would cancel or delay the manufacturing recovery that had begun to show signs of finally materializing.[11]

[11] A March 2002 *Purchasing Magazine* survey on the business environment found that 71 percent of metals buyers thought business was the same or better than the month before, leading the publication to conclude that "the metalworking recession appears to be over." Tom Stundza, "Steel Flash Report: Spot Prices Exploded in March," *Purchasing Magazine Online*, 3/29/2002. However, by June the same publication was reporting that metalworking growth had slipped for two consecutive months. Tom Stundza, "Steel Flash Report: 'Steel Has Become a Major Headache,' Say Buyers," *Purchasing Magazine Online*, 6/28/2002.

Steel Consumers' Corporate Profits Evaporated
(Billions of Dollars)

			Seasonally Adjusted at Annual Rates				
			2001		2002		
	2000	2001	III	IV	I	II	III
Primary metals industries*	$1.0	$-1.6	$-0.1	$-2.2	$0.5	$0.3	$1.3
Steel consumers**	27.4	-1.0	-3.1	-14.2	-11.5	-1.5	-2.0

* Largely, steel producers.
** Narrowly defined as fabricated metals producers, industrial machinery and equipment manufacturers, and motor vehicle and equipment manufacturers.
Source: U.S. Department of Commerce, *Survey of Current Business*, "Table 6.16C, Corporate Profits by Industry Group," January 2003.

Eventually steel-consuming manufacturers lost business due to the high steel prices. And while it was delayed as long as possible, some steel consumers were forced to lay off workers. The continuing recession also cost jobs. Over the last two years, total employment in steel-consuming sectors dropped by about 915,000 jobs. In just the last year (2002), 224,400 jobs were lost in the metal manufacturing, machinery and equipment manufacturing and transportation equipment and parts manufacturing sectors alone.[12]

How many of these job losses are attributable to high steel prices?

This is not an easy question to answer. To explore the apparent linkages over the 2001-2002 period between steel prices and downstream employment, we employed a straightforward log-linear regression model.[13] (We used a variety of combinations of price and employment data to maximize the reliability of the

[12] Bureau of Labor Statistics, Covered Employment and Statistics Survey, total employment, not seasonally adjusted.

[13] Regression analysis is a standard and widely-accepted technique for quantifying relationships between data (like economic price and quantity data). It involves finding the equation that best fits a set of data points. This "best-fit" estimate is then used to measure quantitative relationships within the data. In other words, we look for an equation that generates as closely as possible the actual data sets examined, in this case employment and general economic conditions. "Log linear" regression analysis involves evaluating the relationships between data in natural logs. It is a standard approach in economics because the resulting coefficients can be interpreted as "elasticities" that measure relative sensitivities – in this case, the sensitivity between steel prices and employment levels. A good "fit" means that the equation soundly predicts actual data within the sample. In the present case, model "F-statistics" tell us that we are more than 99 percent certain that the relationships modeled are significant, and over 95 percent certain that the negative relationship we identify with respect to steel prices is significant (based on a one-sided "t-test"). See the Annex for more detail.

results.) Our methodology and results are detailed in Annex A. Briefly, we disaggregated the impact on steel-consuming sector employment of general conditions in the manufacturing sector (i.e., the recession), and steel price changes.[14] The results give an estimate of the recent sensitivity of employment in steel-consuming industries to price changes in steel.

Despite the fact that the tariffs and other factors raising prices have not been in place long, some simple relationships are apparent in the data, no matter which data sets are used. To gauge these relationships, we used the estimated steel price elasticity of employment (the value α_2 in Annex Tables A-1 and A-2) to calculate the apparent impact of steel price increases on downstream employment. If we take December 2001 as a "benchmark" for steel prices, then higher steel costs reduced steel-consuming sector employment in December 2002 by roughly 200,000 (of that, 50,000 jobs were lost to higher steel costs in the metal manufacturing, machinery and equipment and transportation equipment and parts sectors). Steel-consumers have lost more jobs to higher steel costs than the total number employed by steel producers in December 2002 (187,500).

These lost jobs represent about $4 billion in lost wages from February-November 2002, assuming workers found new jobs within four weeks.[15]

Charts 1 and 2 show actual employment relative to what employment would have been in the absence of increases in steel prices on a monthly basis.

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[14] We present here results based on a composite price index, representing the average of PPI price data for hot-rolled and cold-rolled steel. Almost identical results hold for alternative steel price indexes (other BLS series, and CRUspi index data).

[15] We multiplied the number of job losses for a given month by the average monthly wage for steel-consumers during that month, and then summed the results from February 2002 (the first year of price-related job losses) through November 2002 (the last year wage data for all these relevant SICs are available). Unpublished Bureau of Labor Statistics data indicate that in 2001 (the most recent year for which data are available) manufacturing workers went a median 4.4 weeks without work. Data are from the Bureau of Labor Statistics, National Employment, Hours and Earnings Database, and Table A-3 of this study (in Annex).

Chart 1

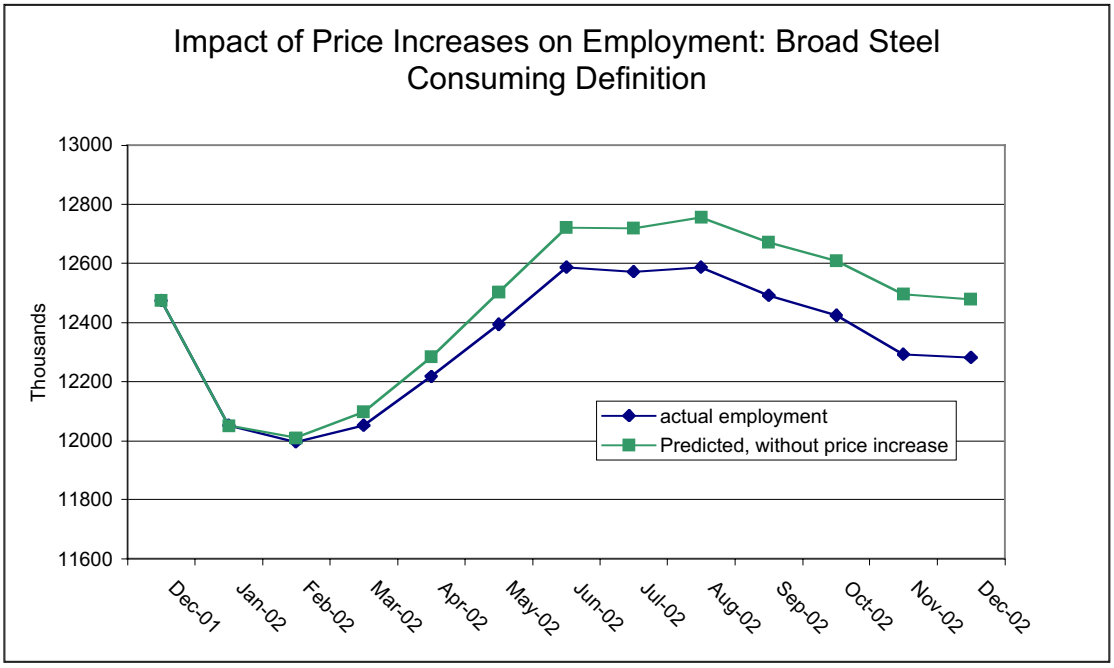
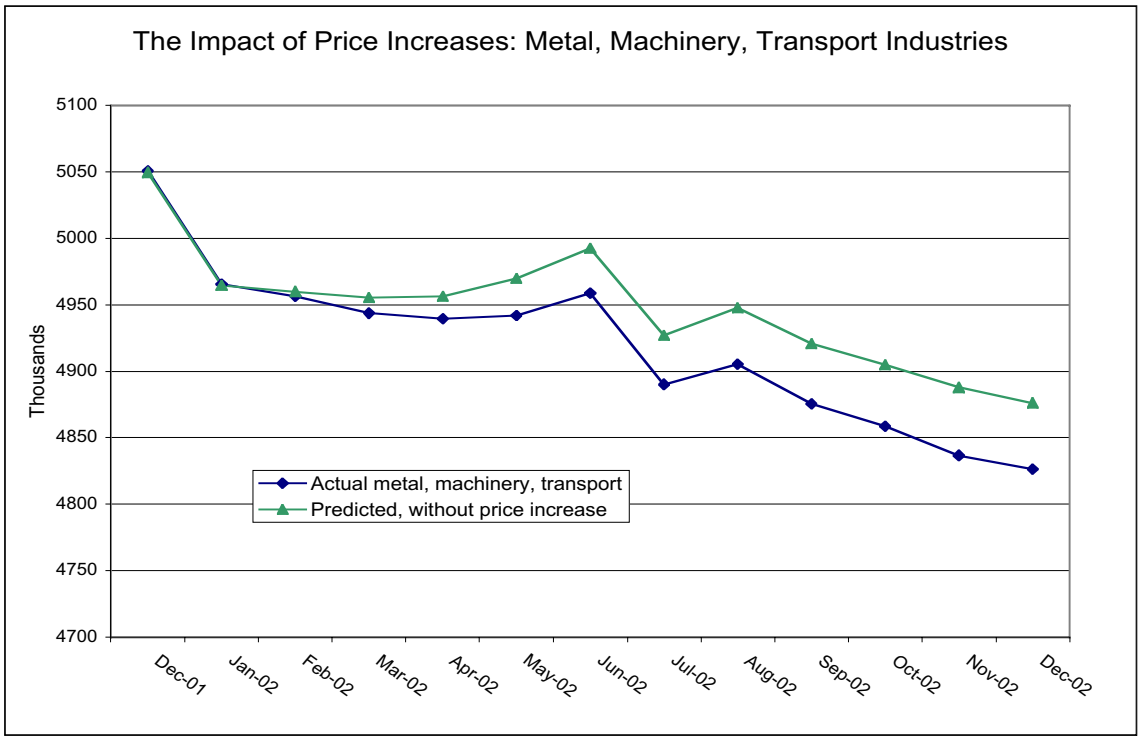


Chart 2



State Impacts

Statewide employment effects were estimated on the basis of national effects and the state distribution of employment by sector. Every state lost jobs due to higher steel costs. The states experiencing the greatest employment losses in steel consuming industries resulting from higher steel prices include California (19,392 jobs), Texas (15,826 jobs), Ohio (10,553 jobs), Michigan (9,829 jobs), Illinois (9,621 jobs), New York (8,901 jobs), Pennsylvania (8,402 jobs) and Florida (8,370) jobs. Sixteen states lost at least 4,500 steel consuming jobs each over the course of 2002.

Employment Effects by State
(Number of jobs)

State	**Fabricated Metals, Machinery, and Tranport. Equipment** SIC: 34, 35, 37	**Other Steel Consuming** SIC: 15(less152), 16, 17, 291, 301, 331, 361, 362, 364	**Total Steel Consuming** SIC: 15(less152), 16, 17, 291, 301, 331, 34, 35, 37, 361, 362, 364
Alabama	-731	-2,459	-3,190
Alaska	-6	-284	-290
Arizona	-632	-3,023	-3,655
Arkansas	-522	-1,279	-1,800
California	-4,628	-14,764	-19,392
Colorado	-516	-3,009	-3,524
Connecticut	-1,011	-1,820	-2,831
Delaware	-86	-833	-919
Florida	-1,140	-7,230	-8,370
Georgia	-1,032	-4,335	-5,367
Hawaii	-9	-388	-397
Idaho	-144	-679	-824
Illinois	-2,760	-6,861	-9,621
Indiana	-2,419	-3,624	-6,043
Iowa	-732	-1,551	-2,283
Kansas	-821	-1,363	-2,184
Kentucky	-991	-2,085	-3,076
Louisiana	-496	-3,157	-3,653
Maine	-167	-531	-698
Maryland	-341	-2,999	-3,339
Massachusetts	-1,031	-2,843	-3,874
	Fabricated Metals,	**Other Steel Consuming**	**Total Steel Consuming**

	Machinery, and Tranport. Equipment		
Michigan	-5,127	-4,703	-9,829
Minnesota	-1,157	-2,451	-3,607
Mississippi	-487	-1,472	-1,960
Missouri	-1,192	-3,332	-4,524
Montana	-34	-327	-361
Nebraska	-268	-915	-1,183
Nevada	-74	-1,575	-1,649
New Hampshire	-259	-534	-793
New Jersey	-677	-4,560	-5,237
New Mexico	-59	-779	-838
New York	-1,660	-7,241	-8,901
North Carolina	-1,293	-5,540	-6,833
North Dakota	-88	-314	-403
Ohio	-3,855	-6,699	-10,553
Oklahoma	-666	-1,397	-2,064
Oregon	-507	-1,564	-2,071
Pennsylvania	-2,163	-6,239	-8,402
Rhode Island	-148	-384	-532
South Carolina	-774	-2,677	-3,451
South Dakota	-170	-300	-470
Tennessee	-1,389	-3,474	-4,863
Texas	-2,937	-12,889	-15,826
Utah	-338	-1,396	-1,734
Vermont	-92	-261	-353
Virginia	-789	-4,250	-5,038
Washington	-1,269	-2,761	-4,030
West Virginia	-138	-839	-977
Wisconsin	-1,910	-3,062	-4,971
Wyoming	-20	-351	-371
TOTAL	-49,753	-147,401	-197,153

Starting basis is statewide employment levels as reported by U.S. Bureau of Labor Statistics.

Conclusion

Clearly, higher steel costs hit American manufacturers of products using steel quickly after the tariffs were imposed, and with force. Because *their*

customers for the most part have sufficient market power to refuse to accept price increases from steel-consuming manufacturers, steel-consumers had to look for other ways to pay for higher-priced steel. Some absorbed the higher costs out of profit margins; others had insufficient profits to fund the higher costs. Some simply lost customers to foreign competitors. Many had to lay off workers.

Unfortunately, insufficient data exist at this time to measure the precise role steel tariffs played in causing such significant price increases, relative to the other factors that pushed steel prices up. But this much is certain: tariffs clearly played a leading role. As noted, steel tariffs caused shortages of imported product and put U.S. manufacturers of steel-containing products at a disadvantage relative to their foreign competitors. In the absence of the tariffs, the damage to steel consuming employment would have been significantly less than it was in 2002.

Annex A: The Employment Models

Overview

We estimated the impact of steel price increases using a combination of producer price and employment data. Obviously, the remedies have not been in place long, and relevant data are quite limited in availability. Even so, some simple relationships are apparent in the data. Using a simple log-linear regression model, we have explored the apparent reduced-form linkages between employment in two definitions of steel consuming industries, general conditions in the manufacturing sector, and steel price changes.

Data

Price data are taken directly from the U.S. Bureau of Labor Statistics published producer price index (PPI) price series for steel. We constructed an average of the PPI for cold-rolled steel (series: PCU3316#71) and hot-rolled steel (series: PCU3312#311). Employment data, on an SIC basis for the total number of workers, not seasonally adjusted, are also from the U.S. Bureau of Labor Statistics. Our narrow definition of steel consuming industries includes SIC 34, 35, and 37 (metal fabrication, machinery, and transport equipment). Our broader definition includes SIC 15 (less 152), 16, 17, 28, 291, 301, 34, 35, 361, 362, 363, 364, and 37. We use monthly data from January 2000 through December 2002.

Method

For both our narrow and broad steel-consuming employment series, we regressed the log of employment on the log of overall manufacturing employment and the log of steel prices.

(1) $$\ln(E) = \alpha_o + \alpha_1 \cdot \ln(M) + \alpha_2 \ln(PPI) + \varepsilon$$

In equation (1), *E* is downstream employment, *M* is our indicator of overall manufacturing employment (less the most steel-intensive sectors), and *PPI* is our steel price index. Manufacturing employment *M* serves to capture combined effects related to the general health and related trends of the overall manufacturing sector. The α_2 term measures the reduced-form sensitivity (elasticity) of employment to changes in the price for steel.

Results

We estimated equation (1) using ordinary least squares (OLS). The overall fit is actually quite good, as summarized in Charts A-1 and A-2 and also in Tables A-1 and A-2 below. For the narrow definition of steel-consuming industries (metal manufacturing, machinery and equipment and transportation equipment and parts), 98 percent of total variation in employment over the 2000-

2002 period (measured by the model R-squared) is accounted for. For the broader definition, 82 percent of the variation in employment is accounted for over the same 2000-2002 period covered by our data. (Seasonal dummies are also included, though not shown in the table.)

In our narrow downstream sector, a 10 percent increase in steel prices yields a 0.41 percent drop in employment. For the broader sector, a 10 percent increase in steel prices yields a 0.64 percent drop in employment. To estimate employment effects of recent price increases, we use the α_2 coefficients to calculate the implied difference in employment if steel prices had stayed at December 2001 levels throughout 2002. Once we have an estimate of the change on *ln(E)* due to steel price changes, we estimated a notional level of employment $\tilde{E}$ which equals actual employment plus any notional change in employment following from restoring steel prices to December 2001 levels.

For example, formally, we calculate the change in employment from price increases between December 2001 and December 2002 in natural logs, $\Delta \ln(\tilde{E})$, as follows:

(2) $$\Delta \ln(\tilde{E}) = \alpha_2[\ln(PPI_{Dec2001}) - \ln(PPI_{Dec2002})]$$

Chart A-1

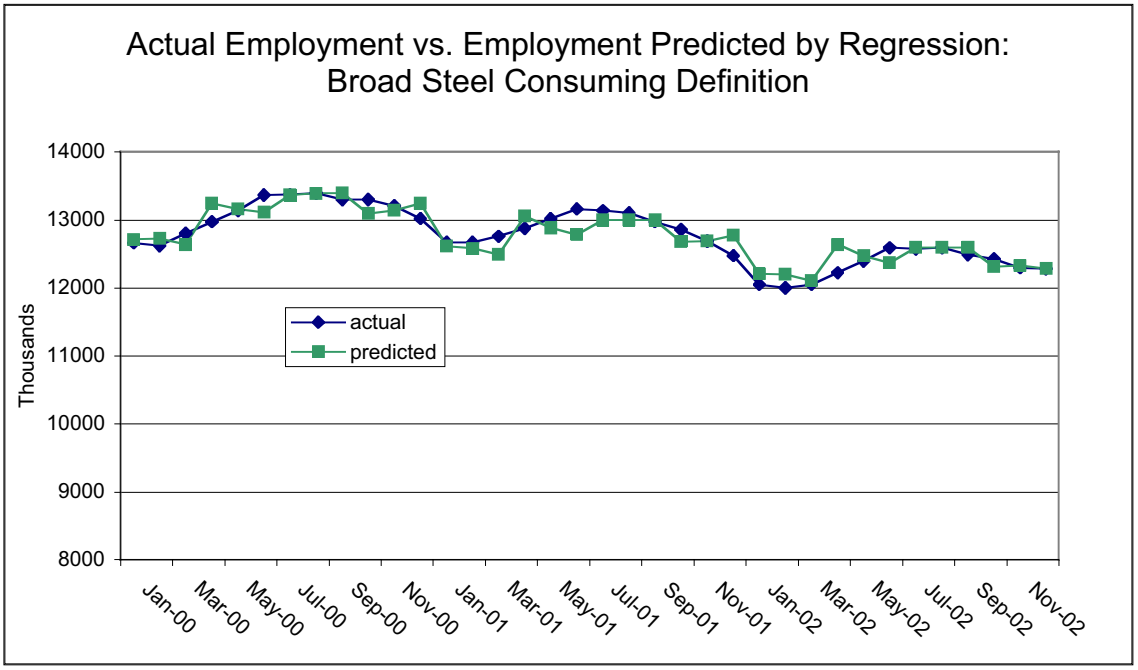


Chart A-2

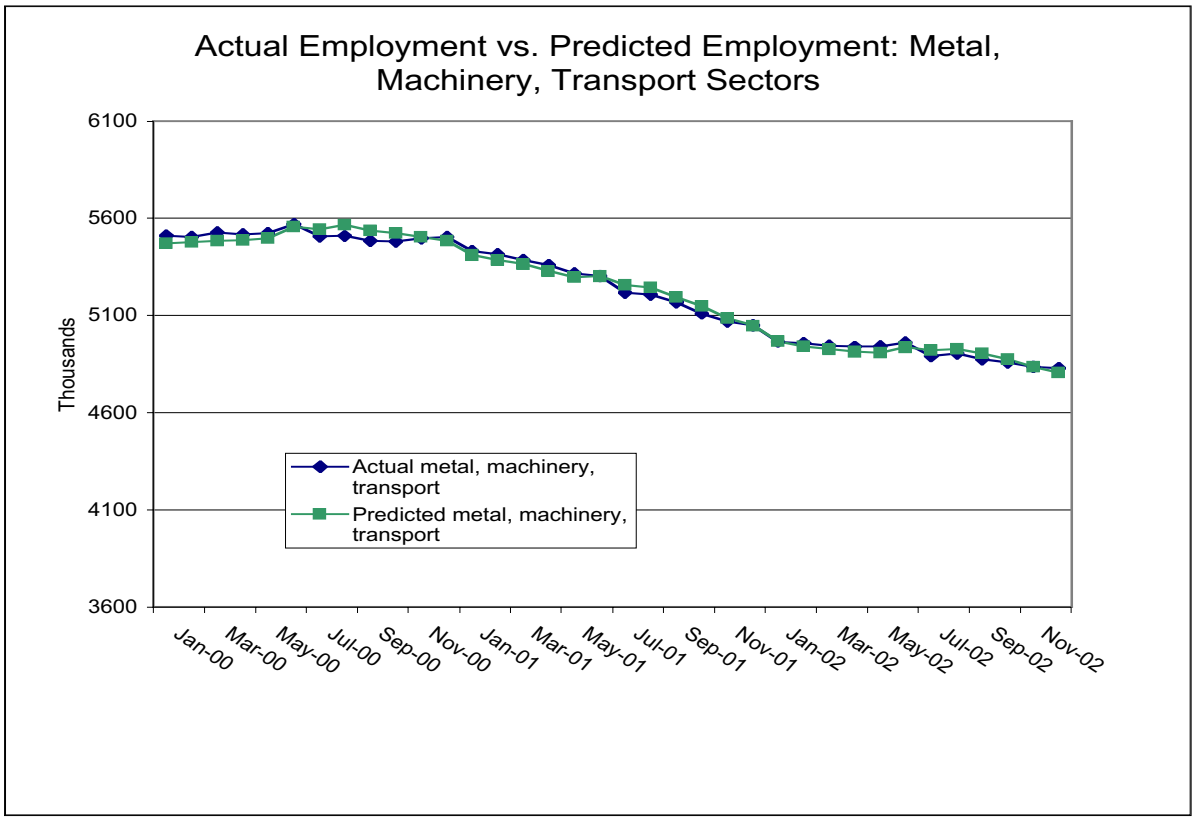


Table A-1
Narrow Definition of Steel-Consuming Industries

Independent Variable	Coefficients	Standard Error	t-statistic	Significance*
α_0 : Constant	-2.8806	0.2722	-10.583	3.8E-12
α_1 : Change in General Conditions Index	1.2337	0.0259	47.506	5.8E-32
α_2 : Change in Steel Prices Index	-0.0414	0.0138	-2.998	2.5E-03

Number of observations: 36
Adjusted R^2: 0.98
F-statistic: 1328.6
F-significance: 2.9E-32
Durbin-Watson statistic: 2.11
*based on one-tailed test for price index

Table A-2
Broad Definition of Steel-Consuming Industries

Independent Variable	Coefficients	Standard Error	t-statistic	Significance*
α_0 : Constant	7.5674	0.3325	22.759	1.8E-20
α_1 : Change in General Conditions Index	0.2577	0.0295	8.737	9.6E-10
α_2 : Change in Steel Prices Index	-0.0643	0.0356	-1.807	4.0E-02

Number of observations: 36
Adjusted R^2: 0.79
F-statistic: 26.7
F-significance: 3.3E-10
Durbin-Watson statistic: 1.82
*based on one-tailed test for price index

Table A-3
The Monthly Impact of Price increases: Relative to December 2001, Not Adjusted for Seasonal Variations

	Broad Definition of Steel-Consuming Industries (Thousands)			Narrow Definition of Steel-Consuming Industries (Thousands)		
	A	B	C	D	E	F
	Actual Employment	Estimated Total Employment without Price Increases	Estimated Impact of Price Increases	Actual Employment	Estimated Total Employment without Price Increases	Estimated Impact of Price Increases
Dec-01	12475	12475	0	5051	5051	0
Jan-02	12053	12050	3	4965	4965	1
Feb-02	11997	12009	-12	4957	4960	-3
Mar-02	12052	12097	-44	4944	4956	-12
Apr-02	12218	12283	-65	4940	4956	-17
May-02	12393	12503	-110	4942	4970	-28
Jun-02	12587	12720	-133	4959	4993	-34
Jul-02	12571	12718	-147	4890	4927	-37
Aug-02	12588	12756	-168	4906	4948	-42
Sep-02	12492	12672	-180	4876	4921	-45
Oct-02	12424	12608	-184	4859	4905	-46
Nov-02	(p) 12292	12494	-202	4837	4888	-51
Dec-02	(p, e) 12281	12478	-197	4827	4876	-50

p = preliminary
e = partly estimated

$$B = \exp\left(\ln(A) + \alpha_2\left(\ln(PPI_{steel,DEC'01}) - \ln(PPI_{steel})\right)\right)$$

$$C = A - B$$

$$E = \exp\left(\ln(D) + \alpha_2\left(\ln(PPI_{steel,DEC'01}) - \ln(PPI_{steel}0)\right)\right)$$

$$F = D - E$$

Note that for column B, the value of α_2 is taken from Table A-1. Note that for column E, the value of α_2 is taken from Table A-2.