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The Effects of U.S. Section 232 Steel Tariffs on Steel Producers and Consumers

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The Effects of U.S. Section 232 Steel Tariffs on Steel Producers and Consumers

by

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The Effects of U.S. Section 232 Steel Tariffs on Steel Producers and Consumers

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Abstract

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Having capacity to produce sufficient steel is often forming the basis for industrialization and economic progress. To produce more steel, numerous countries have contributed to excess capacity through diverse types of government subsidies. As a result, even before China joined the World Trade Organization, massive excess capacity on steel outpaced the optimal level of global steel output. In the United States, imported steel price has always been lower than domestic steel price. Against the cheap foreign steel, domestic producers have struggled in terms of survival and profitability. Maintaining the profitability of steel producers is important in terms of supply chain management and economic security. Therefore, various statutory authorities have addressed steel import restrictions using tariffs or quotas. This precedent was followed by the Trump administration, imposing 25 percent tariffs on certain types of steel products. Biden Administration embraces the Trump's initiative, and further oversees all 50 critical minerals for securing the supply chain through the Defense Production Act. This study employs Interrupted Time Series and Vector Auto-Regression model to evaluate the effects of steel tariffs on domestic producers and consumers in terms of price, profitability, production and employment.

Keyword : Steel industry, Trade war, Steel employment, Trade protection policies
Student Number : 2018-25345

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Chapter 1. Introduction

1.1. Study Background

The United States steel industry which is capital intensive and intensely political has long been protected from import competition by both Republican and Democratic parties. Historically, politicians are stirred to protect steel because largest steel companies locate in politically important states such as Ohio (Cleveland-Cliffs Inc & AK Steel), Pennsylvania (US Steel Corporation)[1], and West Virginia (ArcelorMittal USA). These views about protecting the steel industry change as more and more integrated mills become mini-mills and more plants are relocated to California, Indiana, and Michigan. [2] Overflowing steel production that had been unfairly sponsored by the foreign government flooded the American steel market during this transition, and forced many small production companies to shut down.

Starting from the President Lyndon B. Johnson in 1969, various statutory authorities have used tariffs or quotas or voluntary restraint agreements to address steel imports. Negotiations through World Trade Organization and opening up forums through Organisation for Economic Co-operation and Development did not stall abundance of steel produced by illegally subsidies circumvent international rules. Therefore, American Iron and Steel Institute, Steel Manufacturer Association, USTR investigations, and Congressional consensus argue that the long-term viability of domestic steel industry to critical to national security. Then, in 2018 March, the

[1] Prechel, Harland. "Steel and the State: Industry Politics and Business Policy Formation, 1940-1989." *American Sociological Review* 55, no. 5 (1990): 648–68

[2] Soergel, Andrew, "These States Are Most Affected by Steel, Aluminum Tariffs" *U.S. News & World Report,* Sept. 16, 2019. Northwest Indiana and California lead the mini mill plant allocations (the sum of two states' steel production accounts for 40 percent of the nation's total steel and ore production)

Trump Administration imposed the tariff on import steel from nearly all countries under the Department of Commerce's section 232 investigation reports that illustrates the cheap foreign steels are not stoppable, and foreign steel have been found to harm national security.

The Effects of three years of the trade barriers enable domestic production capacity of steel to reach to eighty percent, which is a profitable level of production that sustain steelmakers to carry on. Despite the risks to infrastructure renovation plan which requires huge amounts of steel, Biden Administration embraces the Trump's initiative and accepts market distortions against cheap foreign steel, as Commerce Secretary Gina Raimond mentioned that tariffs on steel "helped save American jobs in the steel industry…"[3]. In 2022, President Biden invokes Defense Production Act to shore up supply chains of raw materials, including steel.

1.2. Literature Review

The Effects of the tariffs on import steel are not straightforward, but rather controversial. Diverse studies focus on gains of different players in the market such as domestic consumer and producer on the different period of time. For example, Francois (2002) argues that steel tariffs trigger shortages of imported products and put steel consuming domestic manufacturers at a disadvantage relative to foreign rivalry with access to lower-cost steel inputs, emphasizing consumers' economic loss from limited choices[4]. For this reason, the domestic price for steel products increases to 30 percent when safeguard tariffs on steel products are imposed by the Bush administration. Various studies based on data from 2018 indicate that the price

[3] Stein, Jeff "U.S. announces deal with European Union to ease steel and aluminum tariffs enacted under Trump" *Washington Post*, Oct. 30, 2021

[4] Francois, Joseph, The Unintended Consequences of U.S. Steel Import Tariffs: A Quantification of the Impact During 2002

burden from imposed tariffs has been again passed on to importers and consumers, even though trade theory has long emphasized that tariffs applied by large countries should drive down prices abroad. Similarly, Flaaen and Pierce (2019) shows and further predicts that manufacturing industry in the U.S. is negatively affected by steel tariffs. [5]

However, other studies rather emphasize on benefits of the U.S Steel producers derived from increased price. Empirical results show that as Johnson's Voluntary Restraint Agreement increased the domestic steel price (Crandall, 1981), and reduced the price gap between the domestic and imported steel (Canto, 1984). Other studies discuss irrelevant interactions between the steel tariffs and domestic price of steel. Although domestic price increases during the period of imposed tariff, the paper states that the price has returned to the healthy level of price due to dominating influences of business cycle fluctuations, not by government protection. Similarly, according to Hufbauer and Goodrich (2003), consolidation within mining iron-ore and steel production through merger and acquisition are the main driver of the price increase during the safeguard period.

1.3. Significance of Research

Steel is one of the most essential engineering and construction materials because the steel industry provides the basis of wide industrial value chains. Contribution to social development in its many forms, such as infrastructure development (52%), mechanical machinery (16%), automobiles (12%), other metal products (10%)[6], military platforms, weapon systems, and aerospace industries, the steel industry encourages circular economy practices and nation's welfare. Therefore,

[5] Flaaen and Pierce, Disentangling the Effects of the 2018-2019 Tariffs on a Globally Connected U.S. Manufacturing Sector

[6] Worldsteel Association: World Steel in Figures 2020 summarizes the global crude steel production and its industrial use

steel industry is regarded as an indicator of economic development, the price of steel products has been a crucial issue for policymakers. several previous literatures highlighted the close relation between steel sector and economy through GDP dynamics. Huh (2011) and Evans (2011) offers a positive statistical trend between economic activity and steel consumption. Likewise, Wårell (2014) finds how the consumption of steel changes regarding the level of economic progress. Crompton (2015) explains the correlation between 26 OECD countries' GDP per capita and steel consumption for the period of 1970-2012, concluding that the steel demand growth slows as the economy develops. In other words, steel consumption gradually decreases as GDP per capita reaches to a certain level of economic progress.

With respect to supply chain sustainability, Azimifard paper (2018) provides components to select supplier countries of steel industry. Measuring methods for selection suppliers includes the size of employees, carbon dioxide emissions, number of employees, and distances in terms of economic, and environmental sustainability. Moreover, Pan at el. (2016) argues that the use of nonrenewable inputs and high pollutant emissions in China's steel production have generated its unsustainability in a long run, concluding that it is urgent to promote market reform and pollution control to enhance economic and environmental benefits. This aligns with "2030 United Nations Agenda for Sustainable Development", and the growing attention on sustainable development. In addition, EU policy makers have set competitiveness, stability, and efficiency of steel industry as strategic priorities through the creation of "European Coal and Steel Community" for economic expansion, and employment growth (ECSC).

Furthermore, in an era of economic statecraft, there have been clear changing dynamics on partnering among likeminded countries over conventional international trade remedies. In terms of national security and economic security along with pursuing foreign policy goals, diverse risks and uncertainties related to

supply chains are considered more costly than benefits obtained from fair trades. Particularly, destructive competitions and unfair trades in steel industry pursued by many government subsidies for decades intensify the need for friend-shoring. The new highlights on establishing supply chains including raw materials are likely to lead a future paradigm of economy along with national security, which puts more values on securing the sustainability of supply chains, rather than the mere result of cost-benefit analysis. Therefore, understanding the steel production protection provides insight into the transitions of the invisible hand of free market toward the hand the states.

2. U.S. Steel Industry

2.1. Overview of Steel Production.

The steel industry involves both fixed and variable costs. When firms incur variable costs depending on the quantity they produce, fixed costs must be incurred regardless of production levels. For the steel-making process, basic input components are iron- ore, scrap metal, and coke. Kim and Ghosh's analysis on casual effects and connection between iron price and other commodity prices illustrate that "the iron-ore price has bi-directional influence on oil, copper, and Australian coal prices and vice versa"[7]

In addition, variable costs include labor and electricity. Aforementioned essential inputs and variable costs are consumed in exact proportions during the production process. Based on the panel data of integrated steel mills with the generalized Leontief cost function, Crompton and Lesourd(2008) analyze economies of scale in iron-making industry, indicating which is appropriate for technologies

[7] Kim, Y., Ghosh, A., Topal, E. et al. Relationship of iron ore price with other major commodity prices. Miner Econ (2022).

with a fixed proportion of inputs used in production. This study observes a significant scale effect with the linear relationship between cost function and production[8]. The labor costs of steel production play a relatively small role in reducing costs compare to costs of capital and mastering ore fundamentally reflects the viability of steel industry relies on a scale of productions and costs of input commodities, which means that steel industry is capital intensive.

Capital-intensive industries such as steel are burdened with huge fixed costs for equipment and production facilities, which dominate their total costs. This characteristic of steel production business contradicts textbook economic models of production and competition for following reason. Firstly, due to the capital-intensive feature with huge economies of scale and scope, producers must contend with increasing returns to scale. Producing more steel means increased efficiency of production - which reflects industrywide capacity increases in a nontrivial way (Crotty, 2002). For steelmakers to remain sustainable, they should maintain a large production capacity, and when expanding production capacity, they have to increase the capital in large phases. Therefore, it is reasonable for manufacturers to maximize its production volume to the level of full capacity to reduce production costs since fixed costs is much higher than variable costs[9]. As a result, in many countries, producers make more than they can consume in their domestic markets, and they export the surplus.

Secondly, the fixed assets owned by steel companies are very specific and are not easily redeployed to other industry uses. Therefore, firms that are not financially viable are rather purchased by firms that are in a better financial position.

[8] The breakeven scale of a simple linear cost function is roughly equal to 4.5 million tons of steels annually, where costs equal revenue, illustrating that the cost of essential inputs also plays a role in the effectiveness of the production process.

[9] Unlike Say's law that states "supply creates its own demand", government policy that encourage production distorted the steel market for decades.

Combined features of steel industry provide producers with incentives to build big and manufacture more, regardless of their competitors' actions. In aggregate, chronic overinvestment in productive capacity results from producers that follow this logic. In response, the steel industry interpreted a slow growth in demand as increased competition, which resulted in inadequate profits, excess capacity, and reinvestment into mergers and acquisitions.

The global steel sector is highly profitable when growth demand is adequate. Therefore, large corporations from advanced industrialized economies seek to remain dominant in the industry. When intense competitions that leads the price to fall close to marginal cost, firms suffer large losses due to their large fixed costs per unit. A high excess capacity exacerbates this danger, which again increases fixed cost per unit. Joseph Schumpeter's assumptions on perfect competition and the notion of "creative destruction" are not sustainable in the capital intensity industry, especially, the steel industry (Crotty, 2020). Hence, when steel firms deal with steel excess supply, market mechanisms of price competition which essentially provides adequate environments for promoting incessant innovation do not lead the producers to self-regulate[10]. Without concerning the sustainable market condition, steel producers' sole purpose is to produce as much as possible, beyond optimal output levels.

2.2. Global Excess Capacity Crisis

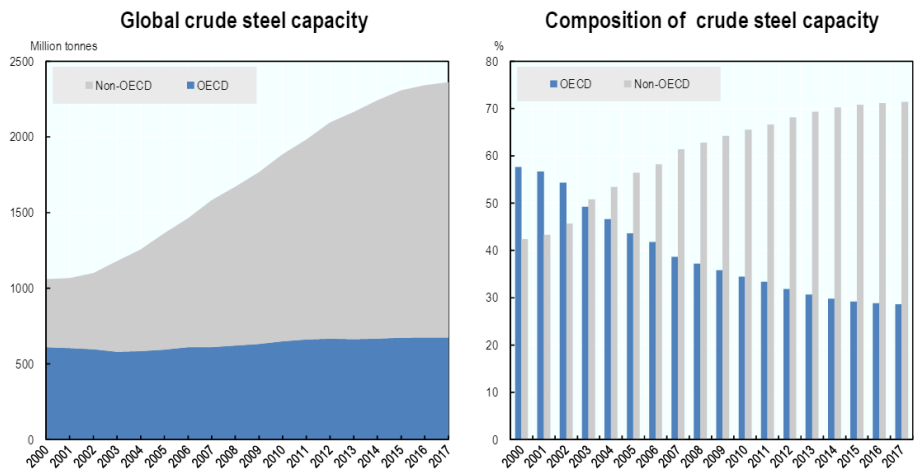
Global steel excess capacity has grown considerably since 1997 financial crisis. Despite of sluggish global demand growth of steel, there are still new investment projects happening all over the globe because the trend of steel industry shifted from a long-term supply contract system to a direct market network

[10] Schumpeter argues that there is no possibility of resource wastage in the economic system since output and its use are at their maximum levels.

expansion with consolidation and partnership.

Steelmakers are experiencing a decline in their financial situations due to the gap between global steelmaking capacity and demand, raising concerns about the industry's efficiency, and longer-term economic viability (OECD, 2015). [11] Furthermore, as figure 1. Shows, developing countries that wished to progress to higher levels of technology, productivity, and value-added entered the steel industry. Adding new players to the market increased the possibility of overcrowding, making sustaining cooperative relations between companies increasingly difficult (Crotty, 2002).

Figure.1 Global Crude Steel Capacity and Composition of Crude Steel Capacity[12]



The surplus of steel capacity causes the global price of steel to fall. Consequently, producers' profit margins shrink so much that they cannot service their debts properly enough to keep workers' jobs and as well as to stay financially

[11] OECD, 78th Session of the Steel Committee, Paris, 11-12 May 2015

[12] OECD (2015), "Excess Capacity in the Global Steel Industry and the Implications of New Investment Projects", *OECD Science, Technology and Industry Policy Papers*, No. 18, OECD Publishing, Paris

solvent.

In a fair competition, companies usually decide when to open and close steel mills. However, over several decades, government interventions that encourage more steel production additions or the maintenance of incompetent plants have been detrimental to the economic conditions of steel producers. Therefore, excess capacity predicament is an outcome of anti-competitive practices in numerous countries with negative consequences for steel producers throughout the world. Dumping and subsides policies of third countries are main threats to competitiveness in the market in terms of trade flows and prices due to increasing arbitrage opportunities. Moreover, policies that encourage efficient restructuring or aid workers that are relocated by the closure of incompetent plants can be effective in redressing the problem and promoting higher levels of stability in the global steel markets. Excess capacity is a chronic problem in global steel markets and government interventions have led to accumulations of superfluous steel productions.

Since China has been one of the largest steel producers, the global excess production crisis is often mislabeled as a mere problem induced by China[13]. This preconceived notion turns out to be wrong because before a year before China joined the WTO, excess capacity was already 283 million metric tons greater than production (840 Million Metric Tons) by one-third of global output. From 2000 to 2015, capacity growth continued to outpace steel production growth with surplus capacity already at considerable levels. In 2015, the global production quantity increased again by 90%, as excess capacity grew by 165%.

Many countries contributed to global overcapacity. Forbidding state interventions for fair trades by WTO rules were not properly regulated, which

[13] American Iron and Steel Institute and the Steel Manufacturers Association, *Examples of Policies and Practices Contributing to the Global Excess Capacity Crisis*, 2021

forestall the exit of inefficient capacity. Types of government intervention include followings: "the state-led low-cost inputs, subsidized loans and equity , grants, tax reductions, provision on acquiring of foreign raw materials, export ". American Iron and Steel Institute[14] pointed out key contributors to the steel overcapacity crisis, which are “the Russian federation, South Korea, Japan, Vietnam, Indonesia, the Netherlands, Brazil, Italy, Canada Germany, the United Kingdom, and Mexico”. By comparison, the United States relies on import steel products as domestic production is less than the domestic consumption. The economics of scale and operations is essentially determinantal process point to steel industry which enable firms to maintain eighty-percent level of production capability.

2.1. Efforts to Resolve Global Excess Capacity

A dispute over steel capacity and attempts to resolve the excess capacity on a multilateral basis are not new. A foundation for the European Union was laid by the European Coal and Steel Community, which was established to ease the complex tensions over steel production. In 2014, the OECD Steel Committee decided to add capacity development monitoring to elaborate the issue of excess capacity. Reaching for common understandings of which policies promote better functioning markets and a more efficient global steel industry, and which policies worsen excess capacity by destructive competition in domestic and global markets, OECD Committee examines government policies and their effects on global excess capacity.

With market-distorting cross-border unfair subsidies and market-destructive practices, the domestic steel sales fell below fair market value, which triggered injury to the U.S. industry. For these reasons, U.S. steelmakers and unions have urged the United States government to ensure the trade remedy and to

[14] American Iron and Steel Institute. 2020. Comments Regarding Foreign Trade Barriers to U.S. Exports for 2021 Reporting.

repeatedly restrict steel imports over the past 50 years. George H.W. Bush put efforts in order to accomplish an international arrangement to prohibit illegal subsidies of states on steel production in 1989. Afterward, the Clinton Administration issued a Steel Action Program that included three main sections: (1) expedited investigations (2) efforts to devise a plan to deal with Korea and Japan, and Russia to limit steel imports (3) improved mechanisms for detecting potential import surges. Also, in August 1999, the U.S. Congress conceded the "Emergency Steel Loan Guarantee Act" to assist steel companies in financial difficulty in obtaining reasonable commercial loans[15].

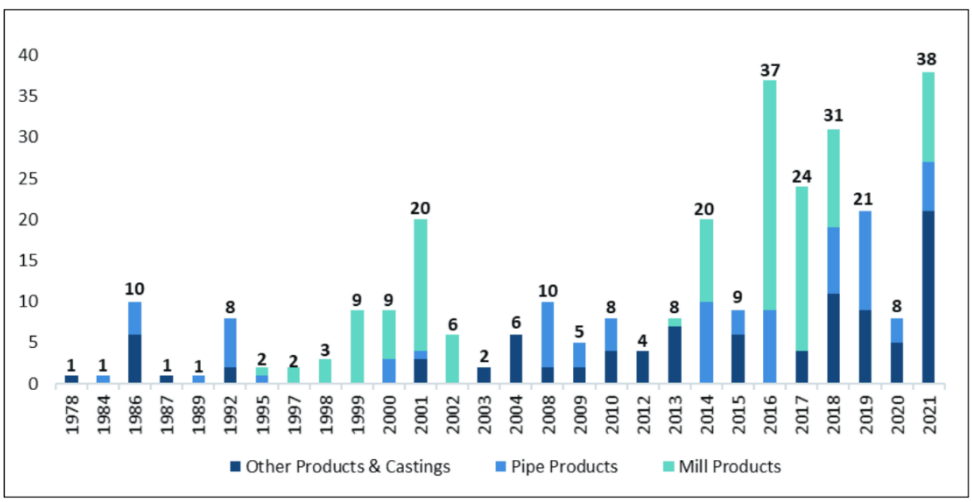
Nonetheless, by mid-1998, the United States was losing significant market share to lower-cost foreign steel imports and the income and profit of many previously profitable domestic steel companies declined. Consequently, more than 40 steel companies filed for bankruptcy due to lack of access to capital and liquidity problems by 2003. Furthermore, over the years, President Obama pressed China on steel capacity issues in the Strategic and Economic Dialogue. For example, at the G20 summit in 2016, President Obama helped launch the Global Steel Forum with multilateral partners through OECD Steel Committee.

As Trump's Administration also recognized that the high import penetration of the steel played the crucial role in national security, and critical infrastructure needs, the President imposed 25-percent tariffs on various types of steel products including but not limited to imports from China. In early 2022, President Biden has only replaced the tariffs on steel products of Japan, Ukraine, and the United Kingdoms with a tariff-rate quota system and has maintained the tariffs for most other countries.

[15] Cooper, William. "U.S-Japan Economic Ties: Status and Outlook Issue," Brief for Congress, Foreign Affairs, Defense, and Trade Dvision IB97015. May 29, 2002

Despite this effort, OECD Steel Committee discovers that many governments preserve protective policies that are designed to prevent steel production capacity from reducing during economic downturns (OECD, 2020). For example, in 2009, WISCO of China and Century Iron of Quebec, Canada signed an agreement to mine iron-ore. In 2010, China's state-owned Chinalco partnered with Australia's Rio Tinto to develop iron-ore mine in Guinea. Their goal is to become one of the biggest steel manufacturers in the world (Park, 2011).

Figure 2. The U.S. Antidumping and Countervailing Duty Orders on Iron and Steel[16]



Despite tariffs in forms of voluntary restraint agreement, safeguard, countervailing, and anti-dumping measures on imported steel to spur the U.S. steel industry for economic competitiveness reasons, there have been numerous allegations of transshipment of steel from other countries like Canada, Japan, Mexico, and Vietnam to the United States because through consolidation within the raw material industry in third parties, such as Chinese companies operating with an

[16] Watson Christopher, "Domestic Steel Manufacturing: Overview and Prospects," Congressional Research Service R47107, May 17, 2022. Figure created based on import injury investigation data from USTR Commission.

independent system to turn them into new separate firms. Under One Belt One Road initiative, outbound investment of state-owned Chinese steel companies expanded production capacity and obtained market share by the strategy of circumventing Anti-Dumping or countervailing duty orders in third party countries such as Europe, Austrailia, Canada, Indonesia, Vietnam, and Brazil. For example, Jingye Group, which was founded by Li Ganpo, a former Communist party official, completed the acquisition of British Steel in 2020. Jianye acquired £1.2 billion of British Steel's assets including UK Mills at Scunthorpe, Teesside Beam Mill and Skinningrove, and FN Steel in the Netherlands. (British Steel) Continuous efforts to avoid international trade rules and enforcement actions, China is investing in expanding capacity overseas.

In the globalization of the industry, foreign producers open themselves to the U.S. market, and U.S. domestic producers also expanded abroad. For example, among the largest steel producers in the United States, US STEEL has an integrated steel mill in Slovakia, and Nucor Corporation has a reduced iron plant in Trinidad and Tobago, and several plants in North America. “Competition from imports and domestic mini-mills have forced steel firms into bankruptcies… integrated producers jointly may hold tighter control over raw materials, participate in growing numbers of horizontal joint ventures, and engage in numerous cooperative enterprises with foreign competitors”(Scheuerman, 1990). The global and domestic steel industry has been restructured through joint ventures.

More consolidations occurred through the merger of NKK and Kawasaki Steel in 2003, and the merger of Nippon Steel and Sumimoto Metal in 2011. Examples of entrepreneurial strategies on geographical expansion and expansion of product scope include Russian company, Severstal’s acquisition of Rouge Steel of the USA in 2004, and the Indian steel tycoon Lakshmi and Tata Corus buyout in 2007.

2.3. U.S. Steel Production and Income

The Trump Administration has announced aforementioned section 232 steel tariffs as U.S. Trade Laws "*allows the President to adjust imports if the Department of Commerce finds certain products are imported in such quantities or under such circumstances as to threaten to impair U.S. national security*". [17] The objective was to reduce import volumes so that domestic industry can achieve at least 80% of rated production capacity to remain financially viable over the context of the business cycle, according to the department Commerce (BIS 2018). [18] Section 232 influenced the downward trends of import penetration for steel mill products and volume import changes on trading partners. Surging imports into U.S. markets. global steel surpluses essentially have caused the domestic steel prices, productions, and investments to decline for decades. In terms of 2018 OECD calculations, global excess capacity is 5.8 times greater than U.S. steel industry capacity.

Chart 1. Section 232 Steel Tariff on value of affecting U.S imports[19]

Tariff (Effective Date)	Tariff Rate	2017	2018	2019	2020	2021	sum
Section 232 Steel (March 2018)	25%	$15.90	$15.50	$11.40	$7.20	$13.70	$63.70
Section 232 Derivative Steel Articles (February 2020)	25%	$0.40	$0.50	$0.50	$0.40	$0.40	$2.20

[17] Through Section 232 of the Trade Expansion Act of 1962 (19 U.S.C.§1862, as amended), the President can request the Department of Commerce to investigate and determine whether certain foreign import products threaten "national security"

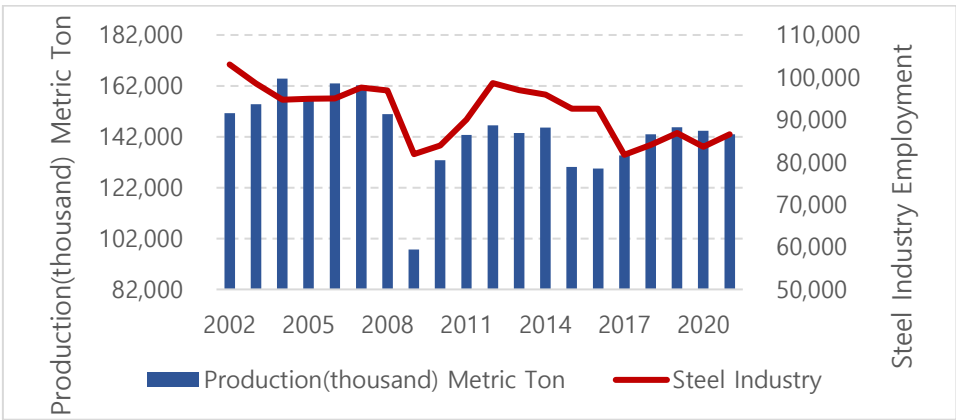
[18] Bureau of Industry and Security (BIS). 2018. The Effect of Imports of Steel on the National Security: An Investigation Conducted Under Section 232 of the Trade Expansion Act of 1962, as Amended. January 2018.

[19] Source: Federal Register; Tom Lee and Jacqueline Varas (2022); author' calculations

(USD billions)

U.S. steel producers' capacity utilization rate rose from 72% in 2017 to 80% in 2019[20] (OECD 2020) and import penetration on steel dropped to a five-year low of 23.2 percent of U.S demands in 2020, from 33.5 percent in 2015[21] (U.S. Department of Commerce, 2021). Tariffs and quotas enacted under Section 232 have created breathing space for U.S. steel producers to increase production domestically as well as to recover market share. According to the World Supply and Demand Assessment (WSA 2020), there was a production capacity overflow of 40% in Brazil, 42% in Japan, 29% in South Korea, and 140% in Belgium in 2019.

Figure 3. The United States Steel Production and Employment[22]

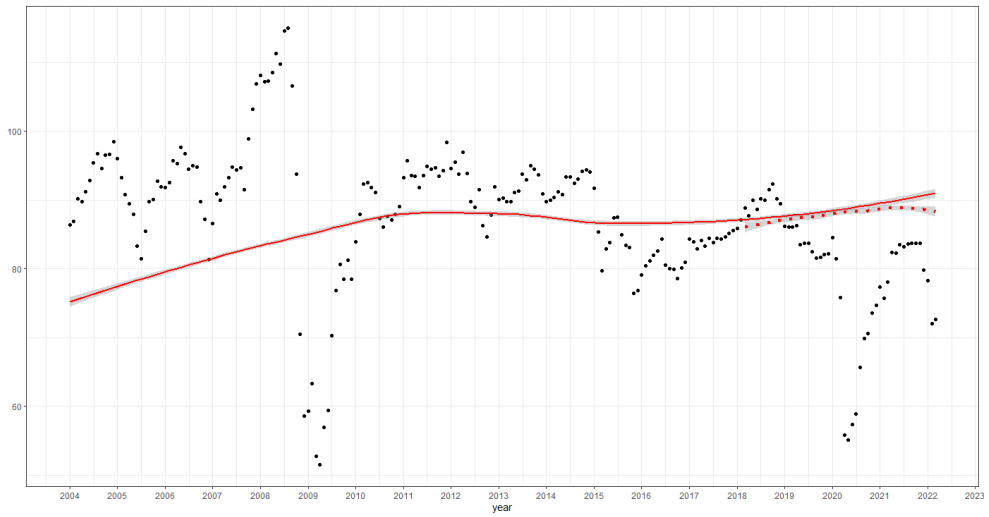


[20] Organisation for Economic Co-operation and Development (OECD) Short Range Outlook 2020-2021, OECD Steel Committee meeting, September 24-29, 2020

[21] U.S. Department of Commerce. Section 232 Steel and Aluminum Published Exclusion Requests. Accessed February 5, 2021.

[22] (Source: FRED, 3011 3012, BLS 2021, All Employees in Private NAICS 3311 Iron and steel mills and ferroalloy. All Employees in Private NAICS 3312 Steel product manufacturing from purchased steel; author's graphic)

Figure 4. Trend of “Fitted value” and “Counterfactual” in steel production index



Note: Steel production index is equal to 100 at 1982; Seasonally adjusted

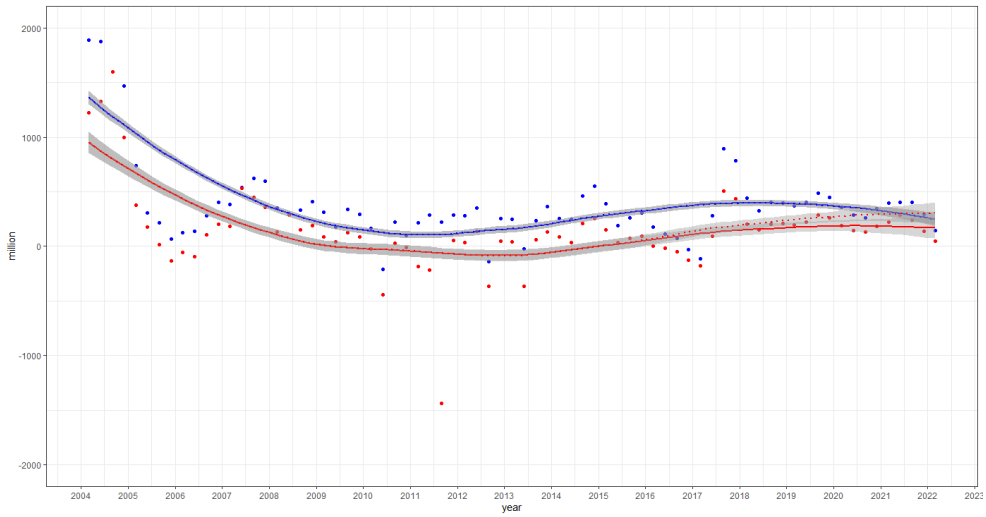
Table. Interrupted time series analysis in steel production industry

Variables	β
Intercept	113.17
date	148.39
Tariff	-0.002
Tariff * date	-0.01

Note: Autocorrelations are set to 0.9. To improve robustness, variables are applied to seasonality

According to Interrupted time series analysis result, (Figure.4) shows the trend line of steel production index. Steel production index trend is drawn through the period of before and after tariff. The counterfactual value, the dotted line indicates that the U.S. domestic steel production would have been decreased (worsened) dramatically starting from mid-2021, if the steel tariff had not been implemented.

Figure 5. Comparison of "Fitted values" and "Counterfactual" in trend of EBIDTA[23] and net income (average of four U.S steel companies)[24]



Significant differences in the values of the Fitted and Counterfactual before and after the imposition of tariffs in EBITDTA were not observed. Counterintuitively, however, in net income of the Fitted values was lower than the Counterfactual value. If we assume section 232 was not imposed, the net income would have been higher than now.

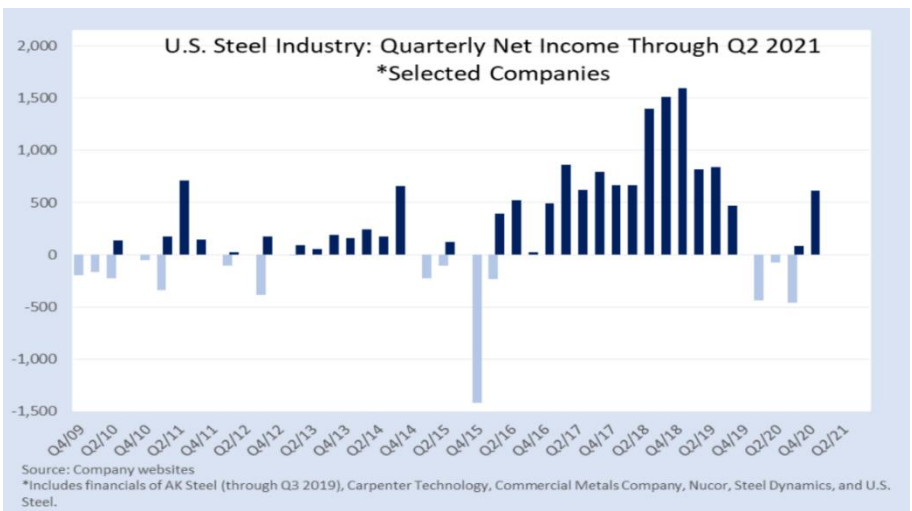
This result shows completely opposing trend to my prediction. The author of this paper predicted that tariff would generate higher EBIDTA of the US steelmakers, and that earnings would be presumably used to invest more on capitals and acquisition because of the high capital-intensive nature of the industry, mentioned in Chapter 2.1. Overview of Steel Industry. That numerous M&A actives occurred (nearly $6 billion) in the United State steel market between 2018 and 2021 also supports the prediction of this paper.

23 EBITDA Formula= Net Income + Interest Expense + Tax Expense + Depreciation Expense + Amortization Expense

24 Average of five selected publicly trade steel companies' quarterly income and EBIDTA of Nucor Corp, US Steel Corp, Steel Dynamics Inc, Cleveland-Cliffs Inc, and ArcelorMittal SA

Imported steel's price has generally been lower than domestic steel since the late 1950s. Steelworkers and producers have continued to worry about this issue, fearing that imports would lead to the closure of many domestic steel mills. At first glance, the concerns of steel producers and their employees seem well founded in economic theory: Different products can't sell at different prices; either the more expensive product will fall in price or production will cease. Despite price differences between domestic and imported steel, domestic steel retained most of the market. Jondrow (1982) estimates that import costs were forced to be priced at 8.3% below domestic mill prices due to supply uncertainty and that a further 10.6% discount was necessary due to a longer lead time. Jondrow author argues that the price differential results from consumers' difficulties in approximating quoted domestic prices with actual foreign transaction prices. Results from this literature accompanied by a hedonic regression model support that the difference in price is real, indicating that the import steel must be priced below domestic steel due to unfavorable service attributes such as insecurity of supply and longer transportation lead times.

Figure 6. U.S Steel Industry Net Income[25]



25 Steel Industry Executive Summary: September 2021, U.S Department of Commerce, International Trade Administration

Despite the counterfactual result of EBIDTA, the steel industry's net income reaches its highest level since the period before the 2008 Recession, when real estate construction boomed. US steel producers struggled to achieve profitability after the recession of 2007-2009. U.S. steel companies averaged just $73 million in net income from 2009 to 2016. An indicator of profitability, net income as a percentage of sales, was 0% during the same period.

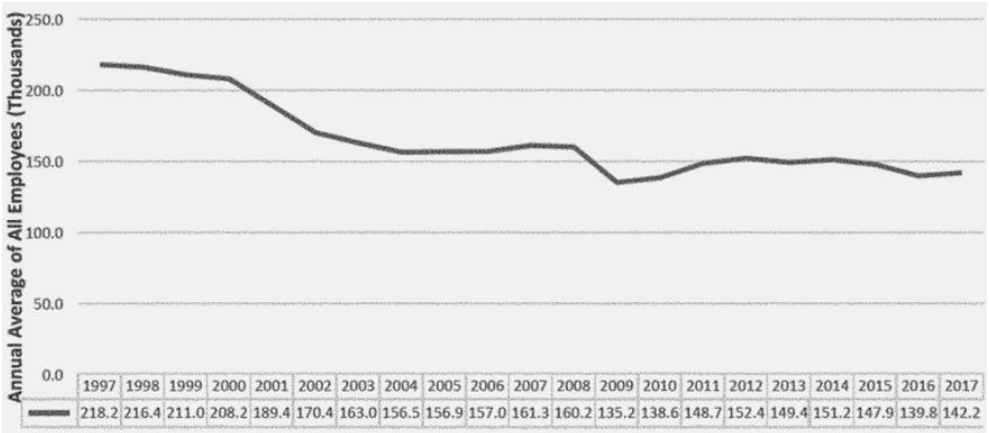
Tariffs and quotas enacted under Section 232 have created breathing space for U.S. steel producers to increase production domestically as well as to recover market share. As a result, the US domestic steel companies have been able to recover to a level of profitability. However, the recovery has been quickly challenged by the COVID-19 recession from pandemic's 2020 lockdowns. Moreover, exemption from Section 232 measures allows the leakage of uncovered imports. According to the Department of Commerce, by 2021 approximately 198,000 exclusion requests for steel imports was received. Bureau of Industry and Security (BIS) administered the section 232 product exclusion process. To limit potential adverse domestic effects on consumers and businesses, the Department of Commerce issued an interim rule on how U.S. suppliers can request exclusions for products that are not "produced in a sufficient and reasonably available amount or of satisfactory quality."

2.4. Employment of U.S. Steel Industry

Over the period year of 1963 -2005, technological progress has played an important role in displacing workers. Entry of a new technology called the mini-mill which reallocates resources from productive plants to more efficient producers, substantially increased the industry productive. As a result, over the 40-year period, the US steel industry' workforce reduced from 500,000 to 100,000. Loecker and Wexler (2016) finds that output per worker quintupled, steel employment declined

sharply fell by a factor of five. The empirical results show that rapid productivity growth is not associated with the emergence of globalization or the steady decrease in steel consumption. The steel industry employment continued to decline until 2016. (216,400 in 1998 to 139,800 in 2016 by 35 percent).

Figure 8. History of U.S. Steel Industry Employment[26]



Grossman (1986) tests whether imports of cheap foreign steel products caused significant injury to the U.S steel industry, estimating steel industry employment by equating a function of the price of imported steel, energy, iron-ore, a time trend, real income and the wage rate for the period from 1976 to 1983. Grossman (1986) estimating "the elasticity of steel employment with respect to industrial production to be 1.40", indicates that imports are not direct source for industry restructuring processed through job shedding and employment decline.

Yet, Bureau of Industry and Security still worries that such declining industry employment and incompetence to rapidly grow skilled workers to industry

[26] Bureau of Labor Statistic, annual average of adjusted employee, NAICS Code: 3311 and 3312

is “problematic in the event of a major production surge or mobilization” (2018)[27], because unstable outlook for the industry discourages young workers to join in the future U.S steel industry and create negative impacts on manufacturing capabilities. Thus steel industry employment is put in the list concerning with the national security[28]as Commerce’s Section 232 deem small steel companies’ employment as necessary to sustain, since financial distress caused by layoffs, permanent closures, and bankruptcies mainly had negative impacts on small steel companies and their employments.

Chart 2. U.S. Steel Industry Employment

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Iron and steel mills	92,600	90,900	91,000	87,000	87,000	80600	82100	85700	83200	86000
Steel product manufacturing	70,500	69,400	67,600	66,000	66,000	54300	56700	57800	54900	57000
Total employment	163100	160300	158600	153000	153000	134900	138800	143500	138100	143000

Chart 2 shows that from 2015 to 2020, steel manufacturing jobs again decreased 12,500 job due to industrial automation technologies[29]. Therefore, comparing the protective measures and changes on employment in steel is not a precise barometer that effectively shows the level of viability or suffering of the industry. As Crandall (1981), and Scott and Blecker (1997) shows that prices are sensitive to trade barriers in past protective regime, and the purpose of protectional policy is to reconstruct the industry by improving efficiency and productivity level with higher profits, rather than employment. The objective of section 232 steel tariffs is to help the domestic steel producers to operate at their competitive production capacity. Therefore, although trade protections on the steel lead the price of steel and domestic production to rise, increase capital investment and sustain adequate profitability, the employment growth in the steel industry is unlikely to occur.

[27] Bureau of Industry and Security The Effects of imports of steel on the national security with redaction January, 2018

[28] Section 232 Investigation:Overview and Issues for Congrress, updated May 18, 2021

[29] Bureau of Labor Statistics (BLS), Employment and Output by Industry, 2021

Figure 9. The Trend of "Fitted value" and "Counterfactual" in steel industry employment

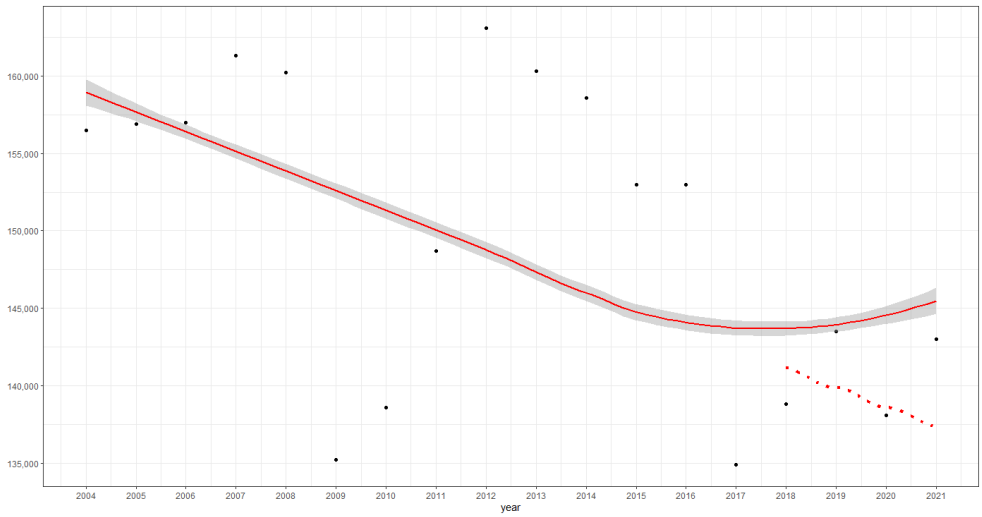


Table.1 Interrupted time series analysis in employment

Variables	β
Intercept	2,704,503
Year	-1,270.25
Tariff	3,017,070
Tariff * year	1496.666

Note: Autocorrelations are set at 0.9.

This generated the counterfactual simulation provides assess to effects of import tariffs on employment of steel producing companies, which enables us to compare the changes in employment during the period before and after the government intervention. Interrupted time series result shows that throughout the observed period from 2004 to 20221, steel industry has experienced downward trend on employment. However, after the tariff was implemented on foreign steel products in 2018, the employment on steel industry started to increase. Without the import barriers, the steel labor market industry would have experienced continuous

downward trend as the red dotted line shows..

Chapter 3. Empirical Framework and Data

3.1. Data and Methodology

In response to the uncomplying economic behaviors to on-rule based international trading order which created high excess capacity crisis, the United States government-imposed tariffs on imported steels for spurring the long-term viability of domestic steel producers. However, various studies based on data from 2018 indicate that the price burden from imposed tariffs has been passed on to importers and consumers. In evaluating the effects of steel tariffs, the asymmetry between the weights of the gains of the steel sector compared to consumers who had enjoyed low of steel can determine which interests are represented in decision-making processes.

I employ the Interrupted Time Series regression analysis method to evaluate the effectiveness of changes in trading policy "that was implemented at a clearly defined point in time" (Bernal, Cummins, Gasparrini, 2017), which means that the ITS model is a constant sequence of observations in economic features of steel industry over time. In exploring how the section 232 steel tariff changes the U.S. steel industry, a time series of a specific outcome is employed to present and verify the underlying trend. March of 2018 is a point in time that interruption, implementation of steel tariff occurred. The following explanation shows how the counterfactual comparison trend line is formed: *"the hypothetical scenario under which the intervention had not taken place and the trend continues unchanged (that is: the 'expected' trend, in the absence of the intervention, given the pre-existing trend) is referred to as the 'counterfactual'. This counterfactual scenario provides a comparison for the evaluation of the impact of the intervention by examining any*

change occurring in the post-intervention period" (McDowall, D., et al, 2019).[30] Therefore the factual condition considers the all yearly employment data and variables throughout the period from 2004 to 2021, while the counterfactual condition shows the extension of the coefficient outcome before 2018 March.

The following regression model is used:

$$Y_t = \beta_0 + \beta_1 Tariff + \beta_2 T_t + \beta_3 * Tariff * T_t$$

T_t: the time elapsed from the intervention of the steel tariff policy initiation.

Tariff: a dummy variable representing periods of before or after intervention, 0 or1.

Y_t: the outcome at time t

Counter factual: column all 1.

Factual: column all 0.

To increase the robustness of the analysis in this study, seasonality test is addressed on production and profitability of steels because the raw material producing industry, steel has seasonal patterns. Statistical test for seasonality on data types may produce two problems. "First, if there is an uneven distribution of months before and after intervention, such as a higher proportion of winter months, seasonality could derive biased the results, especially in the analysis of short series. Second, outcomes in one month tend to be more similar to those in neighboring months within the same time of year, which leads to autocorrelations (Bernal, Cummins, Gasparrini, 2017)." Since serial measures of data and outcome is accessible both before and after the interruption which is implementation of 232 steel tariff, and aforementioned problems caused by seasonality test is unlikely to occur,

[30] McDonald, E. G., Wu, P. E., Rashidi, B., Forster, A. J., Huang, A., Pilote, L., et al. (2019). The MedSafer Study: A Controlled Trial of an Electronic Decision Support Tool for Deprescribing in Acute Care. J. Am. Geriatr. Soc. 67, 1843–1850.

this paper uses the interrupted time series design to show clear the differentiation of pre and post intervention period. Quarterly EBIDTA and net income data is adjusted for seasonality. Monthly production data is adjusted for seasonality. However, Annual employment data is not adjusted for seasonality

After Bush's section 301 steel tariff, time series statistical analysis shows how Trump's section 232 tariff affects the average of EBIDTA and net income of 4 publicly traded steel companies, employment (NAISC3011,3012), and U.S. domestic steel production. This methodology does not show how employment of US steel industry changes relative to overall employment, all manufacturing, constructing, auto vehicle after the section 232 steel tariff.

Moreover, through the reduced version of Vector Auto-Regression model with Granger's causal analysis, this paper delivers the assess to link between changes of the domestic price of four types of steel with annual effective annual interest rate[31] and five types of prices of final-goods. This paper is meant to focus on Trump's 232 Steel Tariff. The author picked the duration from January 2004 to 2021, the latest period so the reader can exclude the impacts of Bush's tariffs on the U.S steel industry. St. Louis's FRED Economic data are collected yearly from the Federal Reserve Bank.[32]

[31](FEDFUNDS) Effective Annual Interest Rate

[32] Data of the price of index of end-use products and primary steel inputs.
CUSR0000SAD, Consumer Price Index for All Urban Consumers: Durables in U.S. City Average, Index 1982-1984=100, Annual, Seasonally Adjusted

CUUR0000SETA01, Consumer Price Index for All Urban Consumers: New Vehicles in U.S. City Average, Index 1982-1984=100, Annual, Not Seasonally Adjusted

WPU1412, Producer Price Index by Commodity: Transportation Equipment: Motor Vehicles Parts, Index 1982=100, Annual, Not Seasonally Adjusted

PCU333120333120, Producer Price Index by Industry: Construction Machinery Manufacturing, Index Dec 1980=100, Annual, Not Seasonally Adjusted

If the burdens or harms were passed on to industries that uses primary steel as in-puts, Vector Auto-Regression will demonstrate that increased in-put costs have statistically significant effects on price of final-goods. I employ this methodological approach because Vector Auto-Regression model provides the flexible method for analysis of causality in evaluating relationships on changes on mining industry with commodity prices. The VAR model has been broadly used in econometric analysis especially in steel industry.

The VAR model has following reduced forms of

$$\begin{bmatrix} \Delta p_t^1 \\ \Delta p_t^2 \\ \Delta i_t \end{bmatrix} = \alpha_0 + A_1 \begin{bmatrix} \Delta p_{t-1}^1 \\ \Delta p_{t-1}^2 \\ \Delta i_{t-1} \end{bmatrix} + \cdots + A_k \begin{bmatrix} \Delta p_{t-k}^1 \\ \Delta p_{t-k}^2 \\ \Delta i_{t-k} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \end{bmatrix}$$

p_t^1 : the price of the primary steel input (natural log) at time t.

p_t^2 : the price index of the final products (natural log) at time t.

i_t : the Effective Annual Interest Rate (natural log) at time t.

The Vector Auto Regression calculates parameters $\alpha_0, A_1 \, to \, A_k$ and ε_t by estimation to constant vector terms of n x n "matrices of coefficients relating the current dependent variable to past values of the independent variables, and a vector of randomly distributed residual with mean zero and uncorrelated across time" (Hersh and Scott 2021). The result shows that the increased price of steel does not affect the price of steel consuming end-goods.

WPU101, Producer Price Index by Commodity: Metals and Metal Products: Iron and Steel, Index 1982=100, Annual, Not Seasonally Adjusted

WPU101707, Producer Price Index by Commodity: Metals and Metal Products: Cold Rolled Steel Sheet and Strip, Index Jun 1982=100, Annual, Not Seasonally Adjusted

WPU101704, Producer Price Index by Commodity: Metals and Metal Products: Hot Rolled Steel Bars, Plates, and Structural Shapes, Index Jun 1982=100, Annual, Not Seasonally Adjusted.

WPU101705, Producer Price Index by Commodity: Metals and Metal Products: Steel Wire, Index Jun 1982=100, Annual, Not Seasonally Adjusted

3.2. Result of the VAR Model

Table 2. Augmented Dickey-Fuller Test

Variables	Dickey-Fuller	Lag order	p-value
Durable Goods Consumer Price Index	-0.67	2	0.96
Construction Machinery Producer Price index	-2.85	2	0.25
Motor Vehicles Parts Producer Price Index	-2.26	2	0.47
New Vehicle Consumer Price Index	-1.77	2	0.66
Cold-Rolled Steel Sheet and Strip	-1.91	2	0.61
Hot-Rolled Steel Bars, Plates, and Structural Shapes	-2.62	2	0.34
Effective Annual Interest Rate	-2.87	2	0.24

Augmented Dickey-Fuller Test did not reject the null hypothesis of a unit root for individual variables, which means each variable are not stationary. With this non-stationarity, the procedure test of Johnsen shows there is no relationship or cointegration between variables. Thus, this data and variables can be employed and modeled by the Vector Auto-Regression.

Table 3. The effects of steel tariffs on end-use products

Final products	**Primary steel inputs**	**Casual effect on final product**
Durable Goods (consumer price index).	Hot-Rolled Steel. Cold-Rolled Steel.	Statistically detectible. The coefficient is not economically dispositive, but it is rather negligible.
Construction Machinery Manufacturing (producer price index).	Hot-Rolled Steel. Structural Shapes.	Not statistically reliable
Motor Vehicles Parts (producer price index)	Hot-Rolled Steel.	Not statistically reliable
New Vehicle (producer price index)	Cold-Rolled Steel.	Not statistically reliable

Note: price index is adjusted seasonally and equals to 100 at 1982

Figure 10. Durable goods Consumer Price Index Response to Cold-Rolled Steel and Hot Rolled Steel.

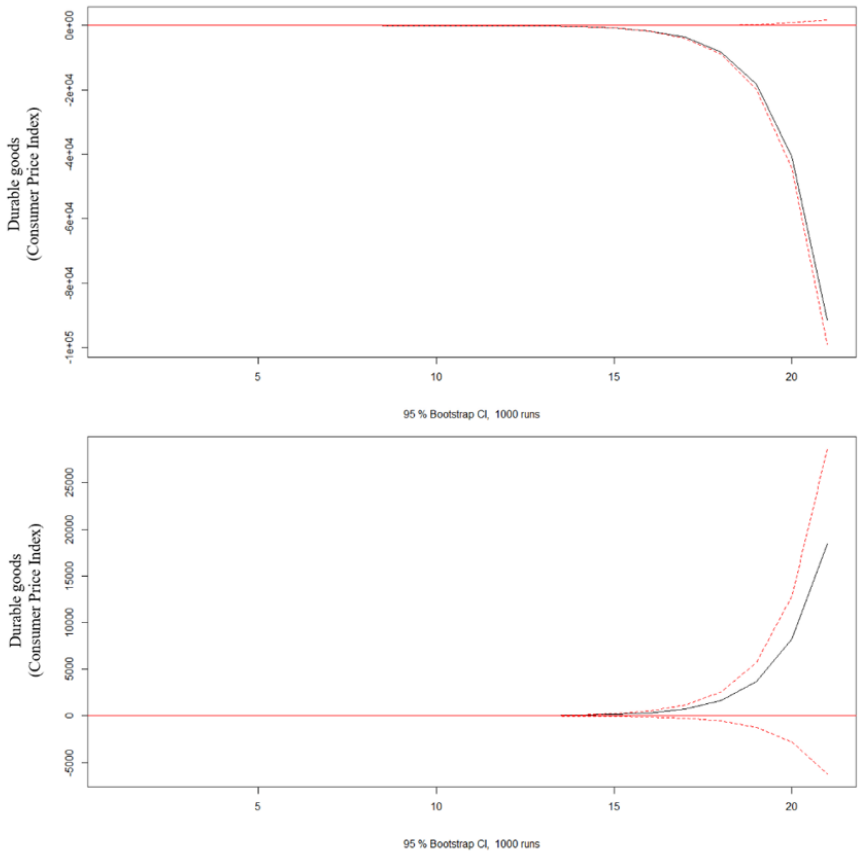


Figure 10 presents1000 runs of 95% bootstrap which shows how price of durable goods respond to two variables which are, Hot rolled steel shock, and Effective Annual Rate shocks. The red lines are Confidence Intervals. The result above shows that the sample of durable goods reacts positively toward Hot rolled steel. However, durable goods respond to interest rate in a negative direction. Combined in early step, two variables are not influenced accordingly. Nonetheless, as time passes, the responses of variances suddenly increase rapidly. (Bootstrapping and confidence interval uses the middle 95% of values of distribution.)

Table 4. Results of VAR (durables, cold rolled steel, hot rolled steel, interest rate)

	Dependent variable:			
	durables, t	cold rolled steel, t	hot rolled steel, t	interest rate, t
durables, t-1	3.458***	24.247**	5.761	1.74
	(0.714)	(7.427)	(3.083)	(26.678)
cold rolled steel, t-1	0.078	1.283	2.235**	6.371
	(0.156)	(1.627)	(0.675)	(5.844)
hot rolled steel, t-1	**-0.260***	-3.370**	-2.295***	-10.475*
	(0.119)	(1.242)	(0.516)	(4.462)
interest rate, t-1	-0.022**	-0.142	-0.091**	0.623*
	(0.007)	(0.073)	(0.030)	(0.264)
durables, t-2	**-2.461***	-23.151*	-5.560	-43.690
	(1.105)	(11.486)	(4.768)	(41.254)
cold rolled steel, t-2	0.346	3.140	0.641	0.792
	(0.175)	(1.824)	(0.757)	(6.552)
hot rolled steel, t-2	**-0.370****	-2.997*	-0.488	3.453
	(0.139)	(1.441)	(0.598)	(5.177)
interest rate, t-2	**0.024***	0.233*	0.050	-0.050
	(0.011)	(0.114)	(0.047)	(0.410)
durables, t-3	0.137	1.130	0.726	45.874*
	(0.590)	(6.136)	(2.547)	(22.038)

cold rolled steel, t-3	0.056	-0.448	-0.141	-6.875
	(0.140)	(1.453)	(0.603)	(5.218)
hot rolled steel, t-3	0.027	1.393	0.180	3.003
	(0.149)	(1.550)	(0.644)	(5.568)
effective rate, t-3	-0.001	-0.068	0.055	-0.238
	(0.010)	(0.101)	(0.042)	(0.364)
Observations	17	17	17	17
R2	1.000	1.000	1.000	0.973
Adjusted	R2	1.000	0.999	0.907
Residual Std. Error (df = 5)	0.013	0.140	0.058	0.504
F Statistic (df = 12; 5)	172,002.300***	2,106.607***	11,610.810***	14.797***

Note: *p<0.1; **p<0.05; ***p<0.01

As a result of the VAR model, each model (all columns) was found to be statistically significant in the model F-test of VAR. The F Test determines whether the difference in variance between the two samples is statistically significant

The result shows that (hot-rolled steel, t-1), (hot-rolled steel, t-2), and (interest rate, t-1), (interest rate, t-2) variables have statistically significant effects on (durable goods, t) although the coefficients are economically negligible.

In order words, when interest rate, t-1 increases by 1%, the price of durable goods, t decreases by 0.022%, and when interest rate, t-2 increases by 1%, price of durable goods, t increases by 0.024%. When the price of hot rolled steel, t-1 increases by 1%, the price durable goods, t decreased by 0.26%. When price hot rolled steel, t-2 increases by 1%, the price of durable goods, t decreases by 0.37%.

Relative to t-3 of each variables, any statistically significant effects were

not shown.

The author of this paper supposes the price of hot rolled steel, t-1 and t-2's negative statistically significant effect on price of durable goods, t is derived from external shock such as COVID-19.

Table 5. Results of Granger Causality Test

End-use product	Steel product	k-lags	F statistics	Causality	Average effect of 1% price increase
Durable Goods	Cold-Rolled	3	5.71	Y	0.19
	Hot-Rolled	3	6.07	Y	-0.20
Construction Machinery Manufacturing	Cold-Rolled	3	8.96	Y	-0.01
Motor Vehicles Parts	Hot-Rolled	3	4.45	Y	-0.01
New Vehicle	Cold-Rolled	3	1.76	N	0.00

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5 presents Granger causality test results. Granger-cause exists between price of in-put steels and price of final-goods except for the case of New Vehicle and Cold-roll sheet and strip. Coefficient of Cold-rolled steel is statistically not significant. Although the price shock on end-product has relations to price of in-put, the effect is negligible. Granger analysis indicates that when end good experiences a 1% change, the related steel price is also affected.

Durable Goods has different relations with Cold-rolled steel and Hot-rolled steel, which means when the price of this final goods is experiencing changes, the price of two in-put steel moves in a different direction.

Construction Machinery Manufacturing shows that there is Grander-causality with Cold-Rolled steel, but the effect is just -0.01% Likewise, Motor Vehicles Parts relates with hot-rolled steel, but the effect again less than -0.01%. In case of Hot-rolled steel give negative correlations with durable goods, Durable Goods' Granger-cause average effect is 0.19% and -0.20%. The author of this paper presumes this negative interaction is caused by an external shock such as Covid-19.

Figure 12. Construction Machinery Manufacturing price index response to Cold rolled steel and Effective Rate shock

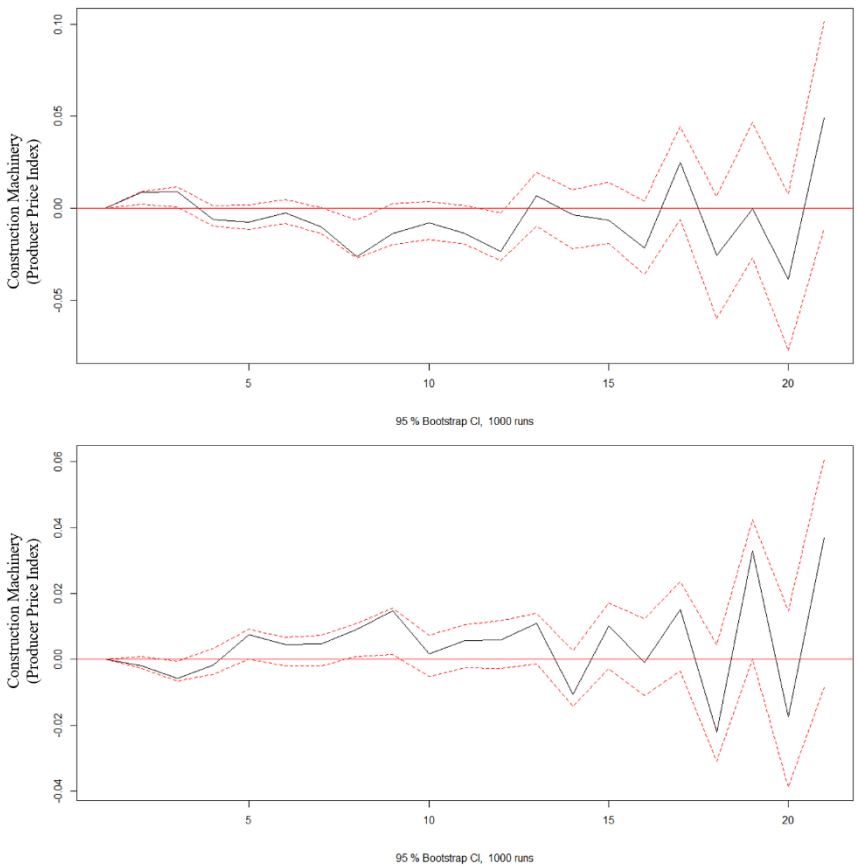


Figure 12 shows how construction machinery manufacturing responses to Cold rolled steel shock and interest rate shock. The red line indicates Confidence Intervals; both Cold rolled steel and Interest rate oscillates toward zero. Therefore the effect on price of construction machinery is not clear. In case of Cold rolled steel, in the beginning stage, it seems that there is a positive effect, but in mid-term it returns to have negative effects and in long- term, the effect is both positive and negative.

Figure 13. Motor Vehicles Parts price index response to Hot rolled steel and Effective Rate Shock

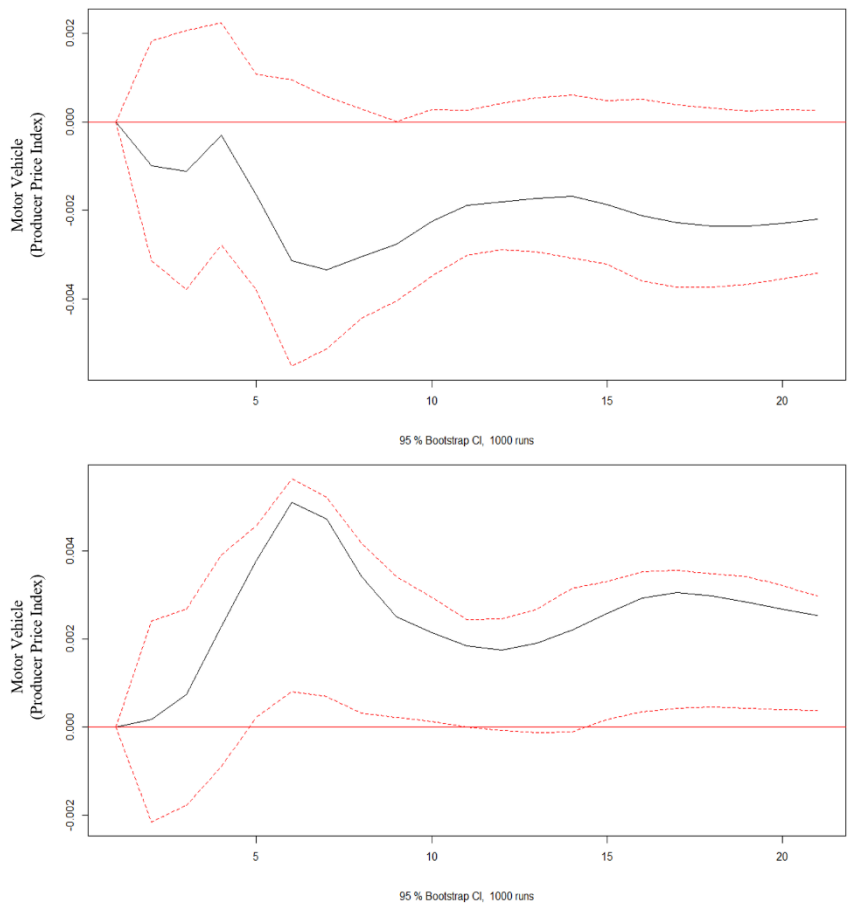


Figure 13 also presents aforementioned response of Motor Vehicle Parts to Hot rolled steel shock and Annual Effective Interest rate shock. Hot rolled steel in short-term respond negatively. Interest rate in short term and a long term, there are both negative and positive effects, but overall respond seems positive.

Figure 14. New vehicle price index response to Cold rolled steel and Effective Rate shock

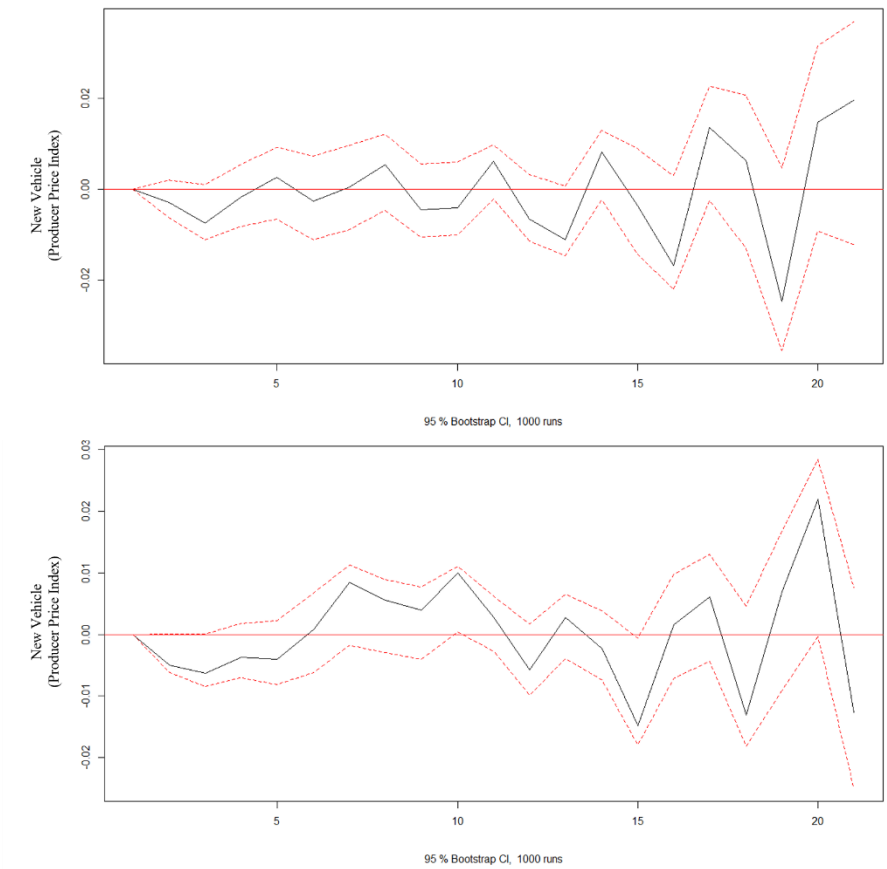


Figure 14 elaborates New Vehicle's response to Cold Rolled Steel shock and Annual Effective Interest Rate shock. Both Cold rolled steel and Interest Rate in short term and long term is fluctuating positively and negatively. Due to this noncoinciding changes, the effect is not clear.

Chapter 4. Implication and Conclusion

4.1. Implication

To evaluate whether Trump's section 232 steel tariffs are successful policy for steel industry without hurting steel consumers, as Francois (2002) "suggest that

the effects across the full industrial spectrum should be considered," the author of this paper looks into diverse aspects of steel industry. This results of the study address that adequate protective policies and government intervention help domestic producers to regain viability regarding the nature of steel production in global excess capacity crisis. Chapter 2 presents what have happened with section 232 steel tariffs, and predicts what would have happened without trump's tariffs. Production and employment of domestic steel industry would have worsened off without the import barriers. Chapter 3 of this paper explores casual relations between changes of the domestic price of four types of steel and five types of price of final-goods, and the result shows that increased domestic steel price do not affect the price of selected steel consuming end-goods while recent studies rather indicate the commodity price of steel is driven by the input price of Australian Ore and Iron.

In the past, studies have shown that George W. Bush's attempt to save the steel industry was a failure. Job losses outweighed job gains. His intended beneficiaries suffered. It was ultimately overturned that the tariffs were imposed. Bush's tariffs were shown to be more harmful than beneficial. Similarly, the conventional theorists predicted that Trump would also fail. Concerns were raised because the granting U.S firms strategic benefits over foreign competitors by protecting certain sectors and encouraging production on a more efficient scale is conceived as dangerous. Media and scholars worry that section 232 measures may lead to inflation because the increased domestic price of steel may affect end-product prices to rise.

However, in case of Trump, as this paper illustrates, "the lessons of the impact of higher steel costs should counsel a good deal of caution… are [in fact] considered," and bring more benefits than harms. Furthermore, Trump administration advocated for trade protectionism with quite a bit more force and breadth to re-negotiate existing free trade agreements such as the US-Korea Free

Trade Agreement and the North American Free Trade Agreement with Mexico and Canada. Furthermore, the Trump administration pulled out of the Trans-Pacific Partnership negotiations, which were renamed as Completion and Progressive Agreement for Trans-Pacific Partnership, now in effect for the eleven countries still participating.

Moreover, from the early stage of Trump's trade war, tariffs that are applied on imports from countries that are not like-minded have continue to decline. Congressional Research Service data in 2018 and in 2022 show that the U.S. imports that were subject to newly imposed tariffs (retaliatory) accounted for twelve percent of yearly imports. In contrast, the "exports that were subject to retaliatory tariffs accounted for 5 percent of annual exports". From 2017 to 2019, while the trade deficits with Vietnam and Mexico, which are regarded as like-minded countries increased by 45%. Over the same period, the trade deficits with China declined about 8% the same period. Similarly, after the steel trading barriers, the steel import per volume from Russian Federation and China decreased more than 55%, but the steel import per volume from Canada and Mexico increased by 20%[33].

Moreover, some noticeable changes are made between China and the United States as they signed the phase one agreement in 2020 January, addressing amends on technology transfer including "intellectual property protection… and new access to financial services, exchange rates, and transparency". Such new enforcement mechanism "could lead to unilateral trade sanctions if one side did not comply with the agreement". Furthermore, in 2020, after the agreement, both China and the United States reduced tariffs by half from the tariff escalation imposed in 2019. All other tariffs, however, remain in effect, and phase one agreement does not mention any tariffs. China paid $8.3 billion to the United States in 2017 in royalties for its intellectual property (Santacreu and Peake, 2019).

[33] Department of Commerce Steel Import Monitor

4.2. Conclusion

Results of this paper show that increased prices of steels were not direct source of changes in price of steel-consuming products. The result of the reduced version of Vector Auto-Regression observes a statistically detectible effect between Hot rolled steel price and consumer price index of durable goods. However, the observable relative percentage changes are negligible and negative. This reflects that increased input price of that type of steel trivially decrease the price of durable goods, but other types of steel price do not influence the price of final-goods price index.

Yet, after section 232 steel import barriers, the steel producers in the United States increased domestic production, and steel industry employment increased. This evidence supports that when properly handled, government's intervention may help the producing side of certain sector's viability without tradeoffs that instead harms the consuming side. Due to many uncertainties related to global supply chain after Covid-19, networks to allies and friendly counties are getting restructured. For securing a sustainable supply of raw materials among likeminded countries that are USTR investigation reckons with government intervention in related sectors. With protective tradeolicy as a risk managing method that reduces the vulnerabilities of supply chain, the new paradigm of global economy and trades has already moved toward the hand the states from the invisible hand of free market.

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국문초록

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경제 발전의 기반이 되는 철강 생산은 주요 경제지표로 간주된다. 다양한 유형의 정부 보조가 글로벌 철강 과잉 생산 사태를 초래했다. 철강 최대 생산국인 중국이 세계무역기구(WTO)에 가입하기 전 이미 막대한 과잉 생산이 이뤄졌고 미국 철강 생산자들은 생존과 수익성 측면에서 고군분투했다. 철강 생산자들의 수익성을 유지하는 것은 공급망 관리와 경제 안보 측면에서도 중요하다. 예로부터 수입 철강 가격이 미국 내 철강 가격보다 낮았고, 과거 미국 대통령이 관세 또는 수입할당량 정책을 통해 값싼 수입 철강으로부터 철강 산업을 보호하고자 노력했다. 이 선례에 따라 트럼프 행정부는 특정 철강 수입품에 25% 관세를 부과했다. 정권이 교체되었지만 바이든 행정부는 철강산업 보호정책 발의를 수용하고 방위생산물법을 통해 핵심 광물 생산 공급망을 더욱 강화하고 있다. 모니터링되는 50개의 주요 광물 중 9개의 광물은 철강 생산의 재료로 활용되기 때문에 미국 철강산업의 변화를 살핌으로써 보호무역 확산과 코로나 이후 공급망 혼란을 동맹과 우방국을 통해 생산을 해결하는 프렌드 쇼어링의 의미를 분석한다. 미국 정부 개입의 효과를 평가하기 위해 단절적 시계역 분석 방법을 사용하였고, 철강 관세가 인플레이션을 부추겼는지 알아보기 위해 다변량 시계열 분석을 사용하였다.

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