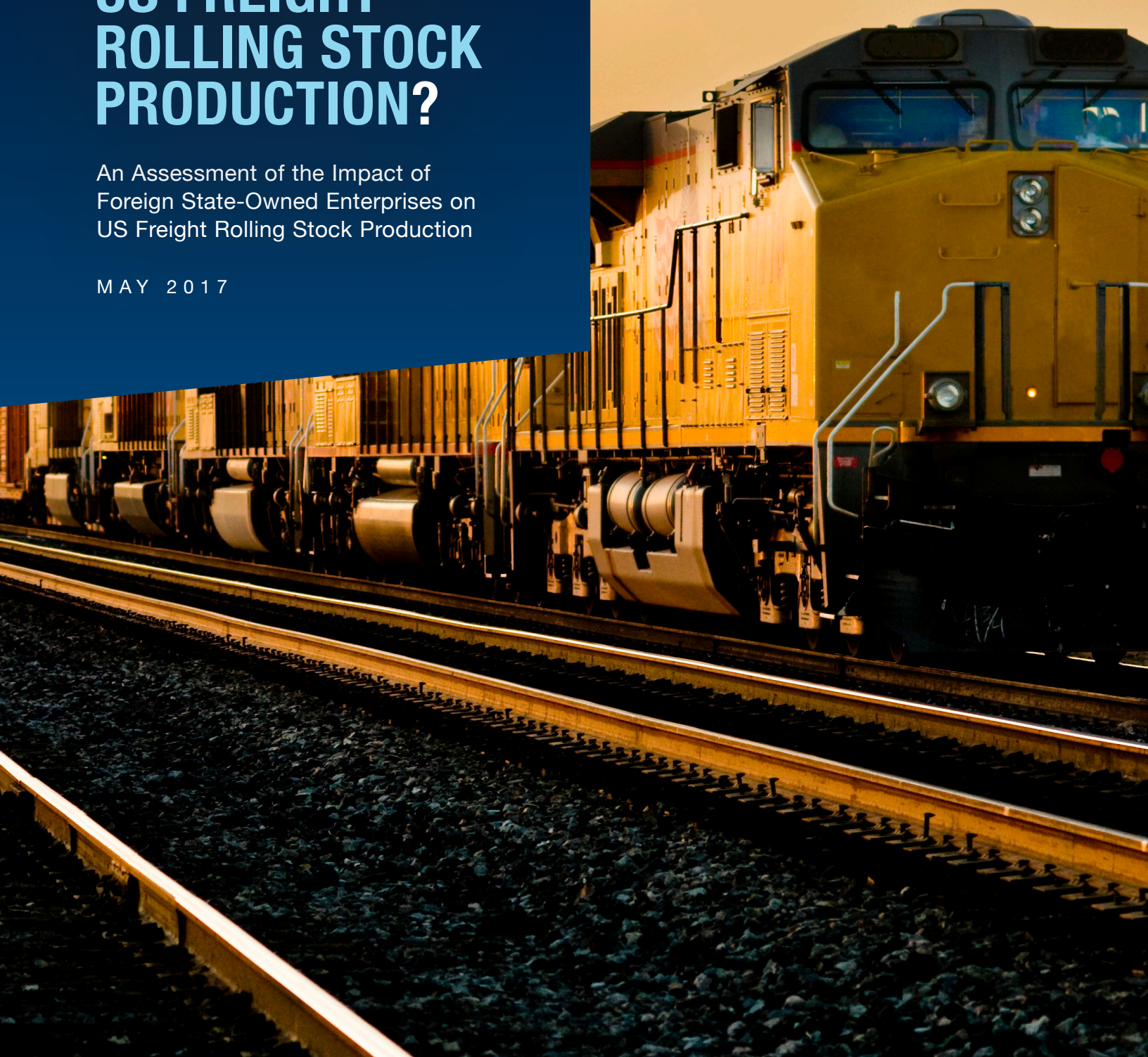


WILL WE DERAIL US FREIGHT ROLLING STOCK PRODUCTION?

An Assessment of the Impact of
Foreign State-Owned Enterprises on
US Freight Rolling Stock Production

MAY 2017



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April 28, 2017

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EXECUTIVE SUMMARY

Up to 65,000 jobs at risk

In the US if foreign state-owned enterprises collapse domestic freight rolling stock manufacturing

Estimate based on foreign SOEs capturing the \$5 Billion freight rail manufacturing market

Up to \$6.5 billion lost in US GDP

Includes \$5 Billion lost in freight rail market, plus loss productivity in domestic supply chains and lost domestic wages and spending

Estimate based on foreign SOEs capturing the entirety of the freight rail manufacturing market

The North American Freight Rail system is one of the most dynamic in the world and has been a key driver of US prosperity. To support the development, growth, and operations of the US rail system, a vast network of suppliers and producers has been established. The future of these long-established producers and suppliers is now potentially at risk because of alleged anti-competitive practices—such as state-supported financing—carried out by foreign state-owned enterprises, predominately from China. Findings from original research and modeling describe the potential losses to the US economy should foreign SOEs achieve dominance over the US freight rail market.

Manufacturers in the US have been producing railcars and rolling stock for more than 170 years. Over time this has had a transformative impact on parts of the US economy, and to this day, American companies still produce the majority of freight railcars seen on tracks across the country. However, the pace of globalization and the arrival of entrants from countries such as China into the US market, are threatening domestic competitiveness. In passenger rail manufacturing, the fallout is already being felt nationwide, from Boston to Chicago and Los Angeles.

Serious concerns are being raised about the aims and impact of state-owned enterprises, especially from China, on domestic producers—ranging from steel products to washing machines. Well-functioning capitalist markets, of course, thrive on fair and open competition to promote efficiency, reduce costs and improve innovation. However, this can be undermined by the activities of state-owned enterprises (SOEs), which are advantaged by the subsidies and support they receive from their home country at the expense of other companies that do not receive such benefits.

In the passenger rail market, the arrival of foreign SOEs is already threatening the ability of domestic US manufacturers to compete.

Concerns have been raised regarding unfair practices—such as subsidized financing from the Chinese government—which may have played a key part in the ability of one SOE to underbid the next lowest competitor by more than \$150 million for a recent project with Boston’s MBTA as well as winning other projects in Chicago, L.A. and Philadelphia. In 2015, a Chinese SOE publicly stated its goal of doubling its export sales, particularly targeting the North American passenger and transit car market.¹

The experience of Australia suggests that the end result could be the collapse and/or offshoring of railcar manufacturing in the US. Over the past roughly 15 years, Australia experienced a rapid decline of domestic railcar production and increased reliance on foreign-produced railcars from Chinese SOEs and other SE Asian countries. This experience is discussed in detail in Section 3 of the report.

In the US freight railcar market, the potential for disruption and loss to the US economy may be even more acute than in Australia, especially given the larger size of US freight railcar demand. The recent expansion of Chinese SOE passenger and transit railcar production in the US, therefore, justifies an examination of the possible implications for US jobs and output as Chinese SOEs seek to expand their presence in the North American freight car market. Through a joint venture, one SOE has already established a beachhead for Chinese railcar manufacturing in the North America freight market. Importantly, the analysis in this paper quantifies how the economic implications of such a shift would extend beyond railcar producers themselves, with wider, knock-on ramifications for US-based supply chain manufacturers as well.

The analysis in this report captures multiple scenarios of potential SOE disruption. The outcome of each scenario results in a loss of jobs and productivity to the US economy through the allocation of some or all of the supply-chain to the SOE’s home country. However, the degree of loss varies depending on the course of action and US expansion taken by an SOE.

As many as 12,860 U.S. jobs are at risk for every \$1 billion in market output that China’s SOE takes from U.S. manufacturers. **Since freight railcar production in the US constitutes roughly a \$5 billion market, the implication of a full loss of domestic freight car production would represent a loss of almost 65,000 jobs in the US.**

1 Cao, Bonnie. China Trainmaker CRRP Plans to Double its Overseas Sales. Bloomberg. September 11, 2015. Retrieved at <https://www.bloomberg.com/news/articles/2015-09-10/china-trainmaker-crrc-plans-to-double-overseas-sales-in-5-years>

The magnitude of impact will depend on the production and export approaches of any SOE entrants. If US freight railcar production collapsed and is completely off-shored, then the job loss effects would be most heavily felt in the following sectors:

- Manufacturing: up to 22,050 jobs
- Business Services: up to 10,020 jobs
- Trade, Transportation, and Utilities: up to 9,980 jobs
- Leisure and Hospitality: up to 5,420 jobs
- Financial Activities: up to 5,220 jobs

In terms of GDP, the impact could be as high as a \$6.5 billion loss, which reflects the direct, indirect (supply chain), and induced (from spending out of employee wages) impacts of the \$5 billion freight manufacturing industry. The industry sectors that can be expected to feel these effects most keenly include rail: car manufacturers, rail parts manufacturers, a range of iron & steel product manufacturers and companies involved in business services and financial activities, such as financing and leasing.

1. INTRODUCTION

THE IMPACT OF SOEs ON GLOBAL COMPETITION

Well-functioning capitalist markets thrive on fair and open competition to promote efficiency, reduce costs and improve innovation. In this context, traditional state-owned enterprises (SOEs) are regarded by many as anti-capitalist in Western countries because of their government-controlled operations, the benefits they may receive from state subsidies and the preferential treatment they are afforded.² State-owned enterprises are seen to stifle efficiencies and innovation in the market, suppress competition and incur losses for the public.³ When governments play the triple role of regulator, regulation enforcer, and owner of business assets, the potential for favorable treatment of SOEs arises—whether through direct subsidies, concessionary financing, state-backed guarantees, and/or exemptions from antitrust enforcement or bankruptcy rules. These all affect fair and open competition.⁴

Nevertheless, SOEs, which are diverse in their corporate structures, comprise a large share of global production and economic activity. Moreover, in the domestic context, such organizations can create vital public value. For example, where markets fail to provide goods and services to the public, or where governments wish to allocate national resources and capital to promote economic development or improve the livelihoods of their citizens, SOEs can play a pivotal role. National governments may subsidize production locally to help ensure that domestic social goals and outcomes are achieved. In the US, public utility companies such as Tennessee Valley Authority, as well as rail operators such as Amtrak are examples of SOEs.

Even in a wholly domestic context, having a large part of output being either

2 Blanding, Michael. Not Your Father's State-Run Capitalism. Harvard Business School, Working Knowledge. 22 October, 2012.

3 Geddes, Richard R et. al. Competing with the Government: Anticompetitive Behavior and Public Enterprises. Hoover Institution Press Publication No. 523. Stanford University. 1994.

4 Buge, Max, et. al. State-owned enterprises in the global economy: Reason for concern? Center for Economic Policy Research. 02 May 2013. Accessed: 04/10/2017. <http://voxeu.org/article/state-owned-enterprises-global-economy-reason-concern>

wholly or partially state-owned can lead to inefficiencies.⁵ From international perspective, however, the more pressing issue arises when SOEs seek to expand their activities outside of their home countries and seek to compete in the global marketplace. In an international trading landscape, unbalanced or unfair business practices from companies based abroad can undermine the performance of competitive, private-sector businesses at home. Domestic subsidies that are turned outward into the global market disrupt fair competition in target countries since SOEs may seek to undercut competitive prices by completing the bulk of production in the SOEs' home country. They may thereby take advantage of explicit and implicit government subsidies, and then export finished or near finished products to the target market. Such concerns are increasingly being raised in regards to the arrival of Chinese SOEs in US and other international markets.

THE ECONOMIC IMPACT FOR DOMESTIC MANUFACTURERS

The impact of SOEs on target market manufacturers is felt in terms of jobs and (taxable) economic activity throughout the manufacturers' supply chain. The channels of impact vary by industry sector; however, in general, domestic supply chains, which support the manufacture of final products, are particularly at risk of such moves. In addition to parts manufacturers, this includes domestic transportation and logistics services, as well as financial services. Rather than support the established supply chain in a new market, Chinese SOEs have been observed to rely on their pre-existing supply chain, joint venture or sub-contractor relationships—often located in China. A specific example of this is increasing vertical integration of the entire railcar, including cast bogie, forged wheel, and forged axle production. Therefore, several tiers of value-added production are controlled by very few SOEs.⁶

In some cases, measures have already been put in place to protect US domestic production. For example, under the Buy America Act (BAA) and other programs, certain government-funded investments or purchases must comply with specific minimum requirements for locally-produced inputs (e.g. concrete, steel/iron, labor, etc.). Understanding the potential impact on domestic markets as Chinese SOEs seek to widen their market share in the US and elsewhere will, however, require further investigation.

5 Yu, Fan. Chinese Bond Defaults Could Accelerate in 2017. Epoch Times. January 1, 2017. Accessed March 17, 2017. Source: <http://www.theepochtimes.com/n3/2205130-chinese-bond-defaults-could-accelerate-in-2017/>

6 China Railroad Rolling Stock Corp (CRRC). 24 April 2017. Products & Services – Castings & Forging. Retrieved: <http://www.crrcgc.cc/g6653.aspx>

PURPOSE AND STRUCTURE OF THE REPORT

In the context set out above, this paper conducts original research into the rail and rolling stock sector within the US and the changing landscape of domestic production—specifically, within freight rolling stock and with an emphasis on Chinese SOEs. The recent emergence and growth of SOEs in passenger rolling stock, as well as the establishment of a joint venture partnership in the US to produce freight rolling stock, provides a good foundation for analysis of potential disruption in the US freight railcar sector.^{7,8}

The fundamental components of this analysis include:

- formulating reasonable assumptions regarding potential adjustments to domestic supply chains emanating from domestic freight railcar displacement by foreign SOEs;
- detailing the adjustments' effects on productivity within domestic supply chains;
- quantifying the effects on domestic jobs, output, and taxes; and
- contextualizing the disruptions across affected industry sectors.

The report contains five sections detailing assumptions, rationales, and modeling outcomes. Section 2 explores the evolution of SOEs in China, followed by an examination of the Australian experience of Chinese SOEs in the country's domestic freight rolling stock industry—found in Section 3. This section documents shifts in the Australian rail rolling stock supply chain and its increased reliance on imported components. This provided motivation for assumptions relating to potential impacts of similar shifts in the United States. Section 4 presents original modeling results of potential impacts on US jobs, GDP, labor income, and taxes associated with Chinese SOE entry into the freight railcar manufacturing sector as well as its ripple effects within the US economy through the use of an input-output model. Lastly, Section 5 summarizes the findings and provides concluding remarks.

7 We assume there is compatibility in the production between freight and passenger rolling stock, which could enable ease of entrance into the freight rolling stock sector with marginal capital investment.

8 Metzger, Andy. US urged to probe Chinese company building MBTA subway cars. *Boston Globe*. July 19, 2016 accessed at <https://www.bostonglobe.com/metro/2016/07/19/urged-probe-chinese-company-building-mbta-subway-cars/wRTd80Hlyx3oDxT1o2KheK/story.html>

2. THE INTERNATIONAL EXPANSION OF CHINESE SOEs

Spurred by an overcapacity in the production of commodities and goods such as steel, the last several years have witnessed a push toward the increased globalization of Chinese SOEs. This has resulted in prices being driven down, and in increased disruption of certain goods-producing sectors elsewhere in the world. This in turn has raised concerns from businesses regarding their ability to effectively and fairly compete over the long-term.⁹ These practices have drawn criticism from foreign manufacturers and policymakers as being anti-competitive and an example of dumping tactics, which are in violation of anti-dumping agreements such as the General Agreement on Tariffs and Trade (GATT).¹⁰ A specific example is allegations of steel dumping into the North American market by Chinese producers. The US International Trade Commission specifically cites cold rolled steel flat products from China and Japan as injurious to U.S. industry, amongst dumping of other steel-related products.¹¹ Tariffs were enacted to discourage such behavior. However, the effects of the tariffs may not curb this behavior, as foreign SOEs will likely seek to circumvent the tariffs by: a) re-routing products illicitly through other countries (referred to as “country hopping”);¹² b) moving up the value chain of produced products from inputs such as steel to products such as steel wheels;¹³ and/or c) establishing

9 Kowalski, Przemyslaw, et. al. “State-owned enterprises: Trade effects and policy implications.” OECD Trade Policy Papers No. 147. OECD. 2013.

10 Dumping is the act of charging a price for comparable goods in a foreign market that is less than the price for the same good in a domestic market—or selling a good at less than “normal value” on the same level of trade that would occur during the ordinary course of trade. Source: Van den Bossche, Peter (2005). “The Law and Policy of the World Trade Organization.” Cambridge, UK: Cambridge University Press. p. 42. ISBN 978-0-511-12392-4

11 Williamson, Irving A (Chairman). Cold-Rolled Steel Flat Products from China and Japan. US ITC Investigation Nos. 701-TA-541 and 731-TA-1284. Publication 4619. July 2016.

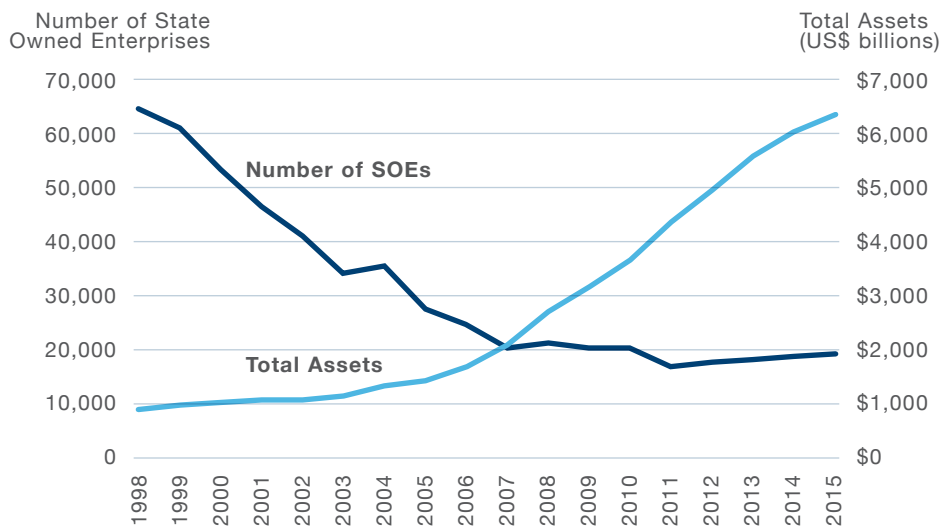
12 Liu, Xuepeng, et. al. “Anti-dumping Duty Circumvention through Trade Re-routing: Evidence from Chinese Exporters.” Remin University of China. August 2016.

13 Anti-dumping tariffs generally apply to a specific country and product—though sometimes they may pertain to a specific company. By changing the product through value-added production, countries can circumvent the tariff.

final assembly facilities in the target market to mitigate fair trade protectionist measures.¹⁴

The number of SOEs in China has been declining since the late 1990s, through closure, privatization, and more recently, consolidation or reform toward less state ownership. This reduction in the number of SOEs has broadly not diminished the capacity for production. Instead, the reduction of SOEs combined with the expansion of total SOE assets has concentrated production activity into the hands of fewer SOEs. Fig. 1 displays the decreasing number of SOEs in China, relative to the increasing value of total assets of SOEs.

Fig. 1: Number of SOEs in China, 1998 to 2015



Source: National Bureau of Statistics, CEIC

An example specific to rolling stock manufacturing is the merger of two Chinese SOEs, CSR (China Southern Rwy Co) and CNR (China Northern Rwy Co), in 2015 to become CRRC. CRRC is now the largest rolling stock producer in the world and employs over 183,000.¹⁵ Ironically, the two firms were initially one firm but were spun off in 2000 and 2002 by China’s State-Owned Assets Supervision and Administrations Commissions (SASAC) with the goal of introducing competition into the market.¹⁶

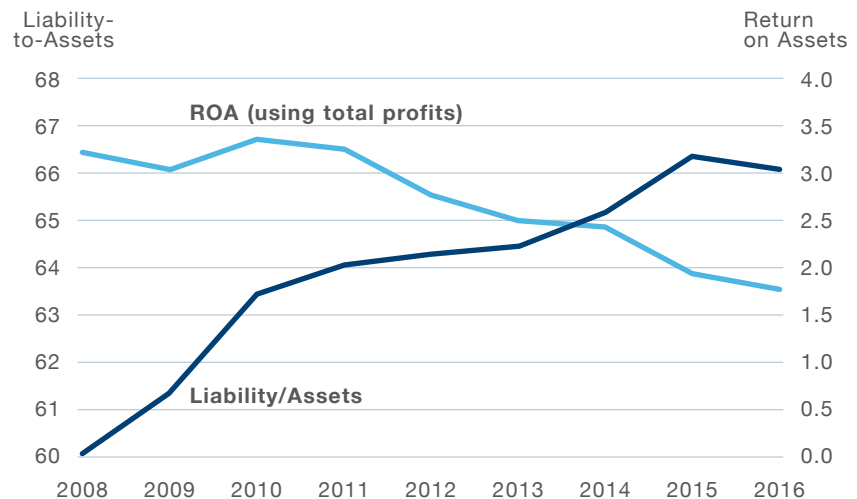
14 This method is evident in the rail rolling stock sector wherein SOEs have established final assembly plants for transit railcar production to meet local content requirements.

15 CRRC Corporation Limited. 2016 Annual Results Announcement. 29 March 2017. P. 48

16 Hong’e, Mo. “Regulator approves CNR, CSR merger deal.” ECNS Wire. 29 April 2015. Accessed 04/20/2017: <http://www.ecns.cn/cns-wire/2015/04-29/163624.shtml>

Moreover, Chinese SOEs still ultimately comprise a significant share of the output and assets in the Chinese economy and more importantly, are increasing their international influence.¹⁷ This is particularly significant in the context of their heightened financial riskiness. Fig. 2 shows that the liability to asset ratio for these SOEs crept up from 60 percent in 2008 to 66 percent in 2016. By comparison, the liability to asset ratio for private-owned enterprises has dropped to about 53 percent in 2016 from about 58 percent in 2007. This indicates that the majority of SOEs' assets are financed through implicitly government-supported debt (not equity), which increases the risk of default in the long-term. Simultaneously, the return on assets (a measure of profitability) has been decreasing, again leading to a higher risk of default. However, in the short-run, this structure enables SOEs to price their products at lower-than-competitive-market costs, absorb any losses and drive out competition—both domestically and abroad.

Fig. 2: Chinese SOE liability/assets and ROA, 2008 to 2016



Source: National Bureau of Statistics, CEIC

Additionally, the low profitability of Chinese SOEs places a further economic burden on the owning government. Compared to the average Chinese private industrial enterprise, whose profitability is around 10 percent return on assets, the low return on SOE assets—at about 1.8 percent—places implicit pressure

17 Xu, Gao. State-owned enterprises in China. How big are they? The World Bank. January 19, 2010. Accessed 4-7-2017. <http://blogs.worldbank.org/eastasiapacific/state-owned-enterprises-in-china-how-big-are-they>

on the government—as the owner of the state-owned enterprise as well as the agent of monetary policy—to lower interest rates in order to allow their SOEs to maintain their low-return investments.¹⁸ A 2013 study by the Center for Strategic and International Studies found that Chinese SOEs obtained loans at rates as low as 1.6 percent from state banks, while private banks typically offered loans at 4.7 percent.¹⁹ As Chinese SOEs turn outward into the international marketplace, their high levels of debt financing and low rates of returns add further credibility to claims of anti-competitive pricing behavior. This consequently adds further risk to competing privately owned enterprises in target countries—including the US.

Unfair competition from SOEs runs the risk that SOEs end up creating monopolies or near monopolies in foreign markets once they've squeezed out domestic competition. This squeezing out of competition ultimately results in one of two outcomes (or potentially both, in sequence). The first is that consumers are subjected to prices that are higher than competitive prices in the long run. The second is that a target country's displaced sectors face large capital start-up costs to revive the displaced sectors if the SOE folds.

The rail rolling stock sector has experienced the impact of Chinese SOEs first hand, both recently in the US, as well as over a longer period in other countries. The experience in Australia serves as a good case study of how domestic industries risks displacement due to SOE business practices and is explored in more detail in the following section.

18 Wildau, Gabriel. China deploys state enterprises to economic stimulus effort. Financial Times. June 21, 2016. Accessed 3-31-2017. <https://www.ft.com/content/3d10e5cc-3754-11e6-a780-b48ed7b6126f>

19 Aburaki, Kiyooki. China's Competitiveness: Myth, Reality, and Lessons for the United States and Japan. Center for Strategic and International Studies. January 2013.

3. AUSTRALIA'S RAIL ROLLING STOCK EXPERIENCE

THE TRADING RELATIONSHIP BETWEEN CHINA AND AUSTRALIA

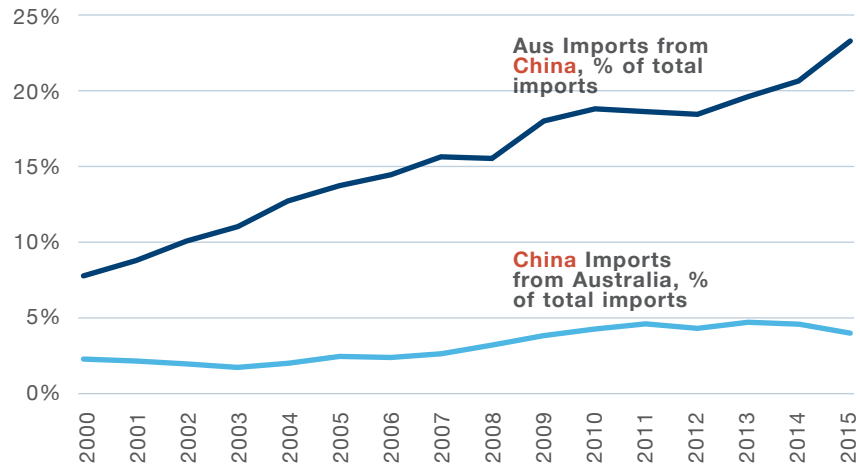
Australia's economy has long been dependent on its relationship with China. Over the past 15 years, however, this dependency has significantly deepened. Since 2000, Australia has increasingly relied on China to buy its goods. In 2000, just six percent of Australian exports went to China; by 2015 this increased to 34 percent (see Fig. 3). China's economic dependence on Australia is comparatively smaller. While China relies heavily on raw minerals, materials, and agriculture products from Australia, over the past 15 years, Chinese imports of Australian goods have grown only modestly, from 2 percent in 2000 to 4 percent in 2015 (see Fig. 4).

Fig. 3: Australia and China exports to each other, 2000 to 2015



Source: Oxford Economics

Fig. 4: Australia and China imports from each other, 2000 to 2015



Source: Oxford Economics

In terms of overall outcomes, both countries have benefitted from increased trade.²⁰ However, specific sectors in Australia appear to have suffered significantly in the wake of trade with China. This is explored further in the next section.

THE IMPACT OF CHINESE SOES ON THE AUSTRALIAN RAIL ROLLING STOCK SECTOR

In response to pressures from low-cost foreign competition, many domestic Australian manufacturers responded by offshoring key aspects of their production, consolidating businesses through mergers and acquisitions (M&A), or closing down altogether. The rail rolling stock sector is a prime example of this pattern.

In 2010, Bradken, one of the largest domestic Australian producers of freight railcars, moved some of its manufacturing operations to China. The company cited its inability to compete with Chinese manufacturers as the reason for the move, ultimately opting to produce in China to more effectively compete.²¹ By 2014 Bradken moved all of its freight railcar production to China.²² A recent Australian press article reflects on the decline and demise of the Australian manufacturing sector, commenting that in “the rail industry, the crunch was

20 See, e.g., Myers, Joe. 5 Things to know about China and Australia's economic ties. World Economic Forum. April 11, 2016. Accessed: April 3, 2017 <https://www.weforum.org/agenda/2016/04/5-things-to-know-about-china-and-australia-s-economic-ties/>

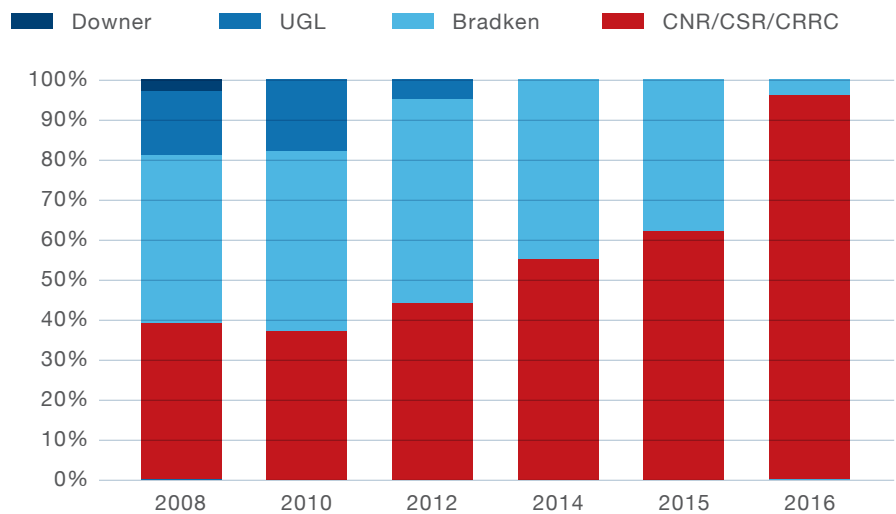
21 Smail, Stephanie. “More Rail Manufacturing Could move to China.” ABC Radio National. 9 August 2010.

22 Bradken Limited. Annual Report. 2014

even more sudden [than in the rest of the manufacturing sector]. As recently as 10 years ago [c. 2004], most rail vehicles were designed and made by Australian-owned companies. The rail operators began buying more wagons from China, and most of the hopper wagons used in the recent expansion of coal and iron ore mining were imported. Local production ceased.”²³

Fig. 5 illustrates the rapid decrease in Australia’s freight railcar manufacturing, in the wake of Chinese SOE growth. In under 10 years, all Australian manufacturers have largely ceased production or have gone out of business. The remaining producer, Bradken, has largely exited the Australian market.

Fig. 5. Australia/Pacific’s freight railcar delivery by manufacturer (units)



Source: SCI Verkehr²⁴

Further explanation was given by two bodies—German Industry and Commerce (GIC) and German Chamber of Commerce, Hong Kong (GCC):²⁵

China’s SOEs are known for a state-supported market access strategy in the course of huge package deals that involves multiple industry sectors. In the case that a Chinese SOE like Sinopec is interested in the raw material deposits of say an African country, they would offer in exchange

23 Szanto, Frank. “The End of Australian Manufacturing.” ABC Radio National. 26 May 2014. Accessed 4/1/2017: <http://www.abc.net.au/radionational/programs/ockhamsrazor/the-end-of-australian-manufacturing/5478190>

24 Special data compilation by SCI Verkehr.

25 German Industry and Commerce Ltd./GCC. China’s Locomotive and Rolling Stock Industry. Issue III. 2014. Accessed 3/12/2017: http://china.ahk.de/fileadmin/ahk_china/pub_bilder/hk_GCcomm201406_full_web.pdf

for access to the resource a comprehensive package of favorable credit terms by a Chinese state-owned bank and infrastructure development carried out by Chinese construction SOEs (the so-called 'Angola mode').²⁶ Those construction enterprises usually buy their equipment from fellow Chinese companies, for example in March, CNR exported three locomotives to Ethiopia, which will be used in railway construction by a Chinese SOE. Furthermore, once such new rails are finished a demand for trains to operate on the rails will be created - with Chinese train makers having a competitive edge, due to their lower cost products and their existing local contacts...

Nevertheless, Chinese train manufacturers do not solely deliver their trains to the usual suspect markets in developing countries. For instance CNR claims to have sold more than 12,000 freight wagons to Australia since 2000.

The message of these comments is that the structuring of international trade and business development largely served to undermine fair competition for Australian domestic producers. The undermining of fair competition stems in part from subsidized financing from state-owned banks, as discussed in Section 2 above, wherein SOEs received loan rates as low as 1.6 percent, compared to privately owned enterprises receiving loans that averaged closer to 5 percent. This finding serves as a key assumption in the impact analysis in Section 4.

EXPLANATIONS FOR RAPID DECLINE OF AUSTRALIAN INDUSTRIAL MANUFACTURING

As Fig. 4 and Fig. 3 show in Section 3.1, trade between Australia and China increased during the global financial crisis, as Australia exported resources such as energy and mining products, while trade with other countries stagnated. This helped Australia to weather the global financial crisis.

After 2007, as the global economic downturn was starting to percolate through foreign economies, Chinese SOEs began to invest more extensively in many of Australia's industrial sectors—including the rail rolling stock sector. It has been estimated that Chinese SOEs accounted for approximately 80 percent by volume and 94 percent by transaction value of all Chinese investment into Australia between September 2006 and December 2012.²⁷

²⁶ Angola-mode: The Chinese strategy of swapping infrastructure projects for mineral resources. Predominantly in resource rich African countries.

²⁷ KPMG and University of Sydney 2013, 'Demystifying Chinese Investment in Australia: Update March 2013', Report, University of Sydney China Studies Centre and KPMG, March 2014, pp 1, 15

Three specific factors at play in Australia have led to a reduction in domestic manufacturing and an increased reliance on manufactured imports from other countries such as China. First, as noted by the Parliament of Australia, the high value of the Australian dollar since 2002 reduced the country's long-term competitiveness in manufacturing.²⁸ Second, the China-Australia free trade agreement (ChAFTA) changed the market landscape for the manufacturing sector. As Australia sought to purchase cheaper imports, China, in turn, gained greater access to Australia's minerals, such as iron ore, and energy.²⁹ Third, along with the impact of the ChAFTA agreement, in 2006 Australia recognized China as a full market economy.³⁰ This designation effectively changed the trade relationship between the two countries (before the finalization of ChAFTA), through legal acknowledgment of fair business and trade practices within China—including state-owned enterprises. However, Australia still imposed import duties on certain types of Chinese steel to protect domestic steelmakers from surplus steel being exported from China—as evidenced from The Anti-Dumping Commission in 2016.³¹ In other words, the Australian government found that China's trading behavior in Australia unfairly threatened Australia's manufacturing sector to such an extent that it was forced to step in on behalf of its domestic steel producers. This is counter to the market economy status Australia recognized in 2006.

With respect to the US market, the economic context is partially similar to the Australian experience, specifically with a high relative value of the US domestic currency to China's yuan and an expanding trade relationship with China. This situation has helped provide the framework for the baseline assumptions of Chinese SOE activities in the US described in Section 4.

For foreign enterprises from a number of countries (including state-owned ones), free trade agreements³² have resulted in increased market access to Australian consumers. These foreign enterprises have benefitted from lower barriers to entry (e.g. lower tariffs and higher thresholds to trigger government oversight review of FDI), as well as increased capital investment in and ownership of Australian operations—most prominently in energy, mining and basic manufacturing. In the Chinese case, there have been a number of major

28 Priestley, Michael. Australia, China and the Global Financial Crisis. Parliament of Australia. Research Publications. 12 October, 2010

29 Ibid

30 Full market economy is a designated status that a country operates on market principles and does not compete unfairly in a global marketplace, such as receiving government subsidies to undercut competitor prices.

31 Westbrook, Tom and Hogue, Tom. Australia imposes dumping duties on Chinese steel. Reuters. April 23, 2016.

32 E.g., AANZFTA (ASEAN-Australia-New Zealand), ChAFTA (China-Australia).

new investment projects by Chinese enterprises, such as the Citic Pacific's Sino Iron mining operation.³³

While the overall macroeconomic effects appear to have benefitted all trading partners involved, notable negative repercussions have emerged in specific sectors—especially in manufacturing.³⁴ Australian manufacturers have argued that, within ChAFTA, they were not afforded a level playing field and the same tariff reductions afforded to Chinese manufacturers.³⁵ Other Australian manufacturing-related industry groups expressed similar concerns at the onset of the free trade negotiations with China going as far back as 2005. For example, the Australian Manufacturing Workers' Union (AMWU) heavily questioned the fairness of the proposed trade deal, outlining risks including China's dumping of goods, lax labor standards, a growing deficit with China and the risk of offshoring of domestic Australian production to China, among many other concerns.³⁶

A retrospective analysis of manufacturing output in Australia supports some of the concern articulated by the AMWU and other industry groups—especially as it pertains to iron and steel, a key input for rail rolling stock manufacturing and other significant industrial and consumer goods manufacturing. Fig. 6 shows the import and export share of iron and steel in Australia. Around approximately 2004, Australia moved from being a net exporter of iron and steel to China to a net importer of iron and steel from China. During this period, the value-added production of iron and steel in Australia dropped significantly—see Fig. 7. Consequently, Australia's output of crude steel dropped from about 7.1 million tons in 2000 to approximately 4.9 million tons in 2015—a 28 percent decline in output. Value-added production of iron and steel also experienced a near 94 percent decline between 2000 and 2016, dropping from \$6.2 billion in 2000 to \$400 million in 2016. This largely reflects increasing costs of inputs as well as decreasing prices in the high-surplus world steel market.

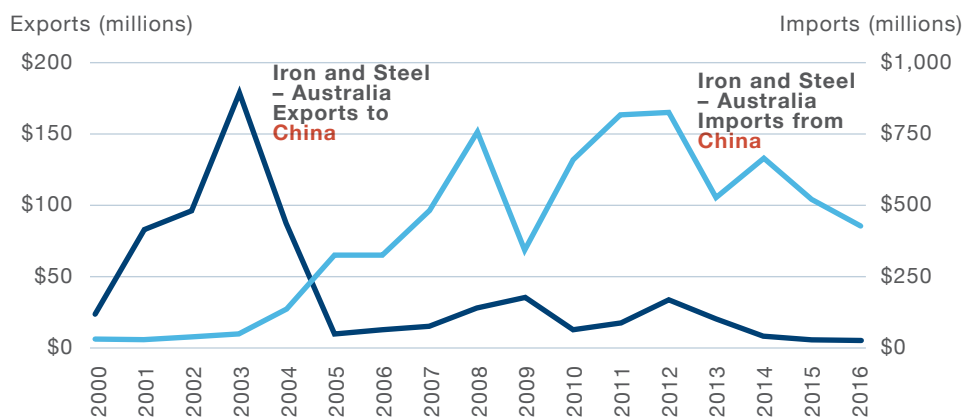
33 Sackur, Stephen. Australia leases out mineral-rich land as China's hunger for resources grows. *The Guardian*. 12 April 2011. Accessed 4/7/2017. <https://www.theguardian.com/world/2011/apr/12/china-australia-mining-iron-coal> (Note that since this investment, the iron ore project has amassed significant losses, leading to a multi-billion write down of Citic's asset, which is at risk of closure.)

34 Manufacturing experienced declines before the ChAFTA. However, value-added manufacturing production began declining significantly in 2007—during the global financial crisis, as well as just after Australia's recognition of China as a market economy.

35 See, e.g., Willox, Innes. "The Australian Industry Group letter to the Joint Standing Committee on Treaties." Submission 86. 17 June 2015. Accessed 4/7/2017. [https://www.cfmeu.org.au/sites/cfmeu-7-x.com.au/files/uploads/Sub%2080%20-%20REVISED%20-%20CFMEU%20JSCOT%20ChAFTA%20-%2017%20August%202015%20\(1\).pdf](https://www.cfmeu.org.au/sites/cfmeu-7-x.com.au/files/uploads/Sub%2080%20-%20REVISED%20-%20CFMEU%20JSCOT%20ChAFTA%20-%2017%20August%202015%20(1).pdf)

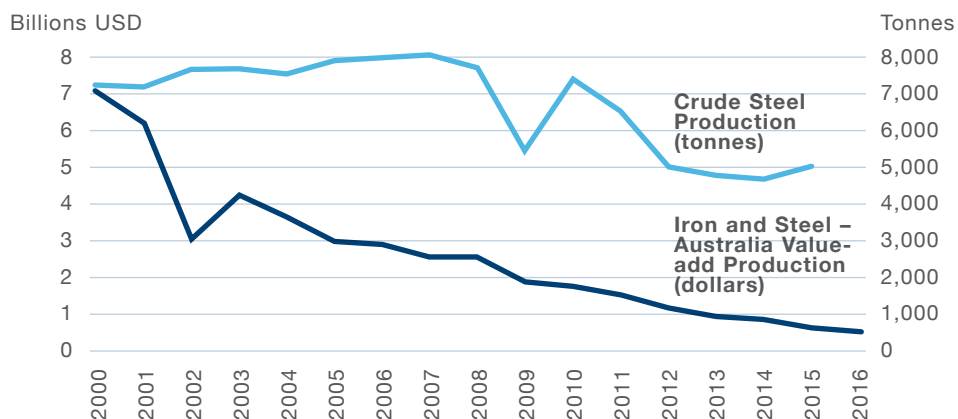
36 Australian Manufacturing Workers' Union. Submission to the Department of Foreign Affairs and Trade Concerning a Possible China-Australia Free Trade Agreement. June 2005

Fig. 6: Australia's iron and steel trade with China, 2000 to 2016



Source: Oxford Economics

Fig. 7: Australia's iron and steel production, 2000 to 2016



Source: Oxford Economics and World Steel Association

THE IMPACT ON THE RAILROAD ROLLING STOCK SUPPLY CHAIN

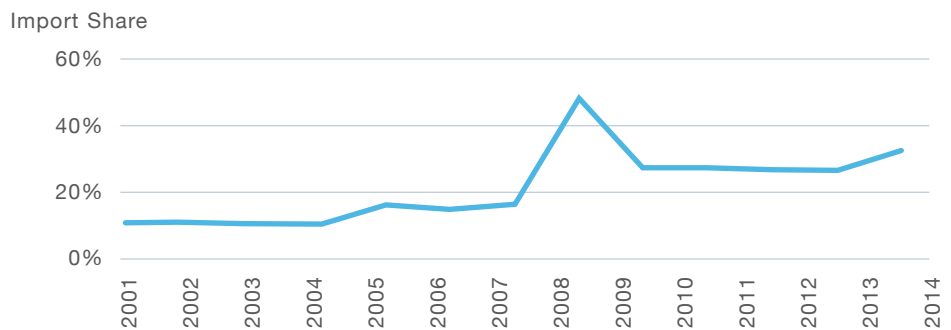
To help to explain the economic effect of the trade agreements on the manufacturing sector in Australia, Oxford Economics has undertaken an independent analysis of the flows of goods and services between Australia and the rest of the world. Specifically, we have evaluated inter-industry purchases within the rail rolling stock manufacturing sector, to better understand fundamental shifts in international supply chains.³⁷ The goal of this analysis is twofold:

³⁷ In addition to freight car manufacturing, the railroad rolling stock industry includes engine manufacturing, passenger car manufacturing, certain industry-specific parts manufacturing, and repair and rebuilding services for existing rolling stock

- to describe the transition from domestic-produced supply chains and final goods to foreign produced supply-chains and final goods, and
- to use this analysis as a starting point to characterize how the US rail rolling stock sector might be affected by the entrance of foreign SOE competitors into the US market.

Australia has always historically imported some elements of rail rolling stock production from overseas. However, between 2007 and 2014, a noticeable shift in the type of imports occurred. Specifically, the use of foreign steel, and components made from iron and steel increased. This was coupled with an increase in the number of imported railcars. Between 2004-05 and 2013-14, the most recent year for which Australian macroeconomic (input-output) data are available, the imports of finished rolling stock jumped from 10 percent of Australia’s rolling stock purchases to 33 percent.³⁸

Fig. 8: Share of railroad rolling stock that is imported to Australia, 2001-2014



Source: Australian Bureau of Statistics / Oxford Economics analysis

Explanations for this aggregate trend differ depending on whether the purchaser of particular final products is a private company or government agency. In the case of private companies, an increase in purchases of Chinese rolling stock presumably reflects its lower cost compared to domestically produced rolling stock. For government agencies, by contrast, there will often be some regard taken of domestic production.³⁹ Provisions might, for example, dictate the percentage of local content required in any final rolling stock product purchased by a public organization. In order to comply with these types of provisions, however, foreign producers use mechanisms such as working with different partners, suppliers and conglomerate partnerships to enable them to achieve local content goals.

³⁸ See <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/5209.0.55.001Main+Features12013-14>.

³⁹ Note: This is not always the case. Queensland does not generally have this provision for rail rolling stock, whereas New South Wales has a local content provision when public funds are used to purchase goods.

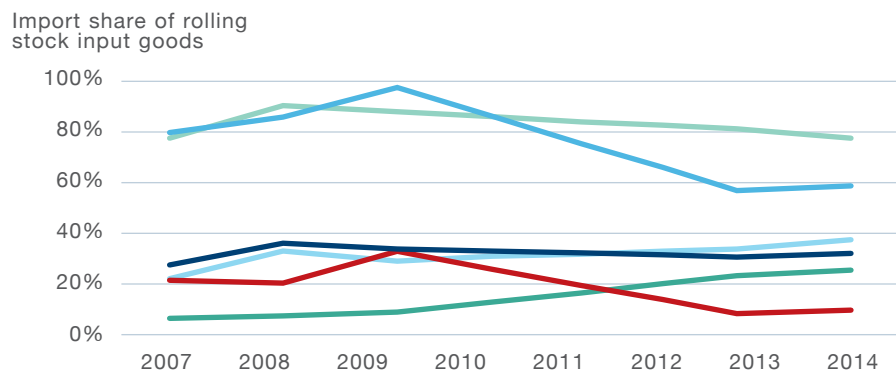
In the case of Australia, freight railcars (purchased by the private sector) were increasingly produced in China and other low-cost countries and shipped to Australia, resulting in the closure, or exit of local producers.⁴⁰ In the passenger rail market—where local content provisions were enacted (note: the purchasers were generally state/local government bodies), many of the components and overall structure for railcars are still produced in the SOE home country (usually China), but final assembly and maintenance/support are completed in Australia.

In addition to an increase in imports of final railroad rolling stock, there was also a shift in the use of imported intermediate inputs into domestic rolling stock production over this period. A look at Australian economic data reveals that although the overall import share of all intermediate inputs used in rolling stock production only increased from 24 percent in 2007-08 to 28 percent in 2013-14, this obscures increases in the imports of some goods, decreases in others, and changes in production patterns. For example, imports of structural metal product manufactured goods increased from 5 percent in 2007-08 to 23 percent by 2013-14. Similarly, imports of iron and steel manufacturing increased from 19 percent to 33 percent in the same time period (see Fig. 8).⁴¹ Overall, this supply chain adjustment resulted in reduced demand for Australian-produced iron and steel inputs—especially in iron, steel, and other metal manufacturing, which tend to have higher job multipliers associated with production. Instead, production of iron and steel has increasingly shifted to China, resulting in lost jobs and GVA in the Australian economy.

Fig. 9: Import shares of top railroad rolling stock input goods, 2007-2014

(mean share of input goods in parentheses)

- All intermediate imports (26%)
- Specialised machinery (11%)
- Forged iron and steel products (9%)
- Structural Metal Products (26%)
- Electrical equipment (12%)
- Iron and steel (8%)



Source: Oxford Economics

40 Szanto, Frank. The End of Australian Manufacturing. ABC Radio National. 26 May 2014. Accessed 4/1/2017: <http://www.abc.net.au/radionational/programs/ockhamsrazor/the-end-of-australian-manufacturing/5478190>

41 Oxford Economics data

4. THE IMPACT OF SOEs IN THE US FREIGHT ROLLING STOCK SECTOR

The Australian experience provides a platform from which to better understand the potential consequences of increased competition from foreign SOEs in the US economy. Similar adjustments in the supply chain structure could be expected, for example, in situations with comparable local content provision requirements—e.g. where government agencies are the purchasers and owners of rolling stock. However, notable differences between the Australian experience and the US experience merit discussion.

The case of Australia is not completely comparable to the US due to the unique nature of the economic relationship between Australia and China, e.g. the importance of natural resources trade. However, the strategy undertaken by SOEs in their interaction with the Australian market may help to predict how SOEs might seek to operate within the US. Especially comparable to the Australian experience and relevant to the context of this research is the high relative price of production in the US compared to China—caused in part by SOEs’ access to low-cost financing and state subsidies—and the increasing trade relationship that the US has with China.

In the absence of key provisions regarding trade and production such as local content provisions (which are typically not applicable to freight railcar purchases), the Australian experience suggests SOEs will seek to minimize costs by leveraging low-cost production in their home country. The impact of these shifts can be modeled in the US economy. In order to quantify the supply-chain effects associated with these changes, we used an input-output model, specifically an impact modeling software produced by IMPLAN.⁴² Using

⁴² IMPLAN is an economic impact software that uses Input-Output tables showing the relationships between industries to evaluate the full economic contribution of one industry throughout the economy. IMPLAN is an industry standard for assessing economic impacts.

this, we were able to calculate the economic impact of the freight rolling stock sector currently, and model the impact of changing trade structures—in GDP, jobs, labor income, and taxes (see box below for a discussion of economic impact analysis).

KEY ASSUMPTIONS AND LIMITATIONS OF THE IMPACT MODEL

Since this report focuses on freight railcars, we assume the following:

- purchasers of freight railcars are private companies or rail operators;
- absent local content provisions, SOEs will ship completed freight railcars for minimal assembly to private companies in the US;
- in the presence of local content provisions, SOEs will produce and ship the large majority of iron and steel inputs and complete final assembly in the US; and
- through state-supported subsidies, SOEs will consistently undercut US producers of freight rolling stock.

With these key assumptions in place, we evaluate two scenarios of potential disruptive effects to the US freight rail rolling stock sector. In one, fully finished, or nearly finished, railcars are shipped to the US by a foreign SOE. Thus in this scenario, we calculate the economic loss of \$1 billion in US freight railcar output to a foreign SOE. This can be easily scaled to evaluate the collapse of the entire (roughly \$5 billion) US freight railcar production sector. In the second scenario, we evaluate a situation in which final production is completed in the US, though an increased share of key iron and steel parts (as well as certain business services) are sourced from the SOE's home country.

MODELING INPUT ASSUMPTIONS

The railroad rolling stock industry in the United States, which includes freight, passenger, and locomotive manufacturing, as well as certain rail-specific parts manufacturing and repair activities, produced about \$22 billion of output in 2015.⁴³ According to the Railway Supply Institute, the North American output specifically of railroad freight was about \$9 billion in 2015, up from \$7 billion in

⁴³ Annual Survey of Manufactures.

AN INTRODUCTION TO ECONOMIC IMPACT ANALYSIS

A standard economic impact assessment identifies three channels of impact that stem from an activity:

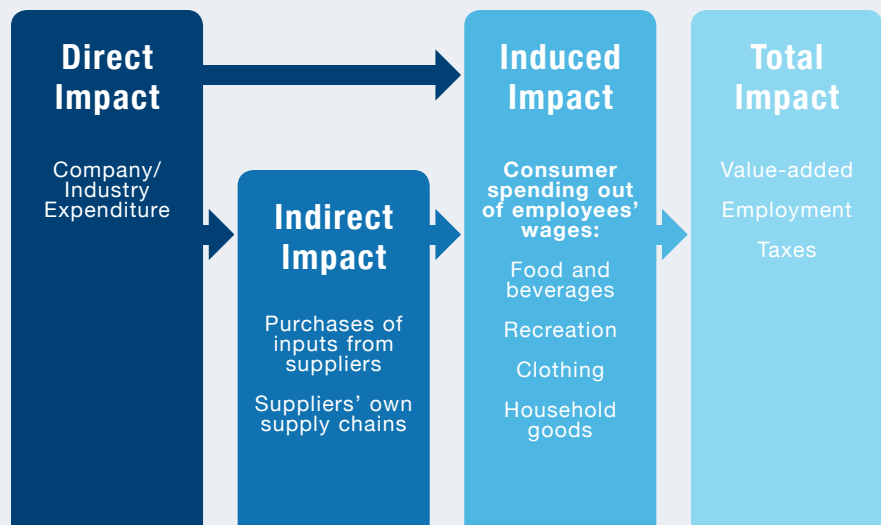
- **Direct effect**, which measures the economic benefit of industrial manufacturing operations and activities in the US.
- **Indirect effect**, which encapsulates the activity driven by the supply chain as a result of the procurement of goods and services from other businesses.
- **Induced effect**, which captures the impact of workers spending their wages on locally produced goods and services. This supports activity across the spectrum of consumer goods and services and their supply chains. An example of this is the purchases a worker makes using his wages, including groceries, clothing, transportation, and utilities.

In accordance with standard economic impact assessments, the scale of the impact of freight railcar manufacturers is measured using four key metrics:

- **GVA**—the gross value added (GVA) contribution to GDP.
- **Employment**—employment is measured in terms of headcount of workers.
- **Wages**—the compensation paid to workers within the industry, the industry's supply chain and induced wages paid to workers in consumer industries.
- **Taxes**—gross tax receipts paid at federal, state and local levels.

All monetary impacts in this report are presented in current 2015 (i.e. non-inflation adjusted) US\$.

Fig. 9: The channels of economic impact



2014 and \$6 billion in 2013 and 2012. Oxford Economics estimates US freight railcar output at roughly \$5 billion per year on average.⁴⁴

In order to produce this output, the freight rolling stock manufacturing industry incurs four broad categories of costs: compensation paid to labor, profits and other payments (e.g. interest) paid to capital, direct taxes paid to government (this does not include indirect taxes on wages, profits, or inputs), and intermediate inputs into the production of rolling stock. Fig. 11 presents three production patterns, which breaks out the cost of production among these four groups:

- real data on the railroad rolling stock industry as a whole;⁴⁵
- assumptions for current US production of freight based on the railroad rolling stock industry as well as interviews with and surveys of freight manufacturers; and
- assumptions about hypothetical future Chinese production in the US.

The assumptions on current US production are based primarily on a survey of five major US freight railcar manufacturers. The Chinese assumptions are based on expert opinion and analysis of Australian rolling stock production.⁴⁶

Fig. 11. Spending patterns for the railroad rolling stock industry, and assumptions for US freight rolling stock production and hypothetical Chinese production

	Rail Rolling stock industry	Current US freight production	Hypothetical future Chinese freight production in US
US capital income	3.3%	5.0%	0.0%
Labor income	10.8%	20.0%	10.0%
Direct taxes	0.6%	0.5%	0.5%
Intermediate inputs	85.3%	74.5%	84.5%

Source: IMPLAN, Oxford Economics based on industry survey

44 Based on the above statistics, expert opinion, survey responses, and published financial data from major producers. As demonstrated by the RSI figures, annual freight output is volatile, and orders frequently extend over multiple years of production.

45 These data are taken from IMPLAN economic impact software and are based on Bureau of Economic Analysis data.

46 US freight producers consistently reported spending more on labor than the rolling stock industry as a whole. Chinese production is expected to use less US-based labor, and instead to import more fully assembled inputs.

The intermediate inputs into production (i.e., the last row of Fig. 11) can be further divided into major categories of inputs as shown in Fig. 12. As before, assumptions are made about current US freight railcar production and hypothetical future Chinese production based on data on the broader industry, industry surveys, expert opinion, and the Australian experience.⁴⁷

Fig. 12. Intermediate inputs for the railroad rolling stock industry and assumptions for US freight rolling stock production and hypothetical Chinese production

Inputs	Rail Rolling stock industry		Current US freight production		Hypothetical future Chinese freight production in US	
	Input share	% US	Input share	% US	Input share	% US
Metallic parts	34.5%	78%	40.0%	90%	35.0%	45%
Electrical parts	7.4%	55%	3.0%	80%	3.0%	40%
Other parts	5.4%	69%	3.0%	80%	3.0%	40%
Rolling stock	19.0%	94%	15.0%	100%	30.0%	30%
Business services	17.4%	97%	12.0%	100%	12.0%	75%
Utilities	1.6%	99%	1.5%	100%	1.5%	100%
Total	85.3%	83%	74.5%	93%	84.5%	45%

Source: IMPLAN, Oxford Economics based on industry survey

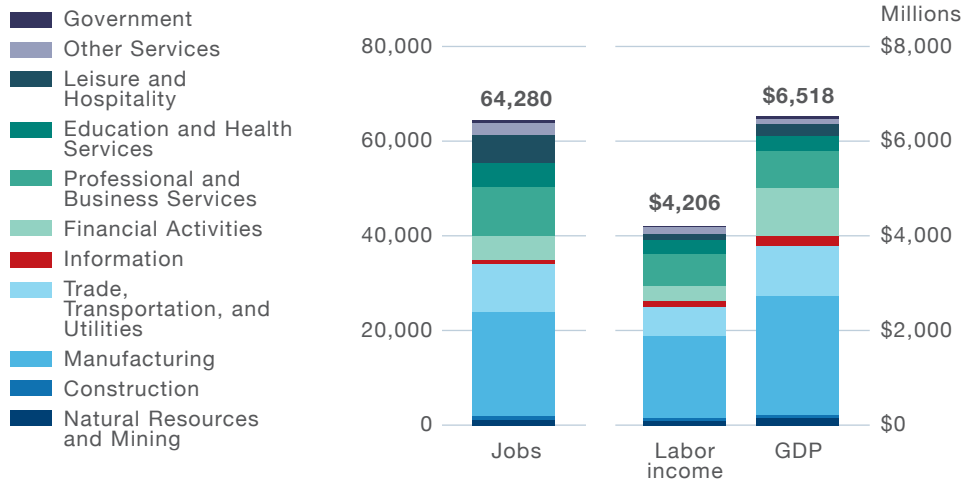
THE IMPORTANCE OF FREIGHT ROLLING STOCK PRODUCTION TO THE US ECONOMY

As shown in Fig. 13, we estimate the total economic impact of the current \$5 billion freight railcar manufacturing industry in the US at approximately \$6.5 billion and 64,280 jobs, with a total labor income of \$4.2 billion. This impact generates \$813 million in federal and \$446 million in state and local taxes. If US

⁴⁷ Surveys of major freight manufacturers generally showed a greater use of metallic versus other parts, lower use of business services, and a higher share of US-made products relative to the railroad rolling stock industry as a whole. Chinese production is assumed to use more imports, and to rely more heavily on railroad rolling stock as an input, i.e. on inputs that have already been processed to the point of being distinctly rail products rather than more general metallic and non-metallic intermediate goods. Note that the import share is only applicable to the goods themselves; US-based trade and transport margins are still included on imported goods.

freight railcar production were to cease, then we would expect the economic loss to the US to reflect these results.

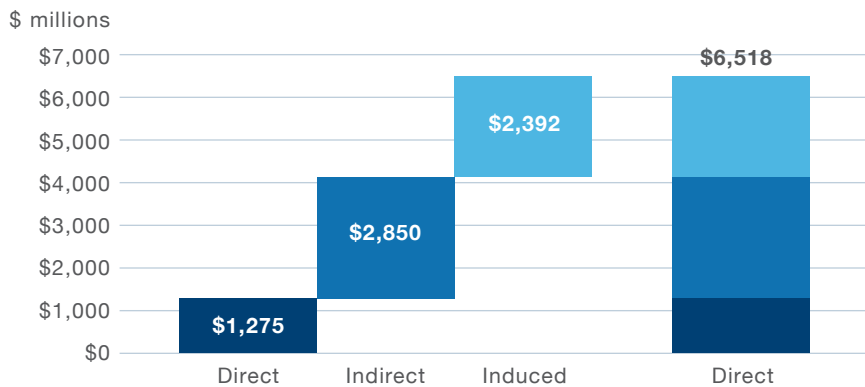
Fig. 13. Economic impact of US freight rolling stock manufacturing industry in 2016



Source: Oxford Economics, IMPLAN

This impact includes the direct impact of freight industry itself, the indirect impact of the industry’s supply chain, and an induced impact that occurs as those employed in the industry and its supply chain spend their wages in the wider consumer economy. This breakout is shown in Fig. 14. Detailed results are presented in Appendix A.

Fig. 14. Direct, indirect, and induced GDP impact of US freight rolling stock manufacturing



Source: Oxford Economics, IMPLAN

THE IMPACT ON THE US ECONOMY FROM INCREASED CHINESE SOE FREIGHT RAILCAR PRODUCTION

This section considers the impact of China absorbing \$1 billion of the US freight railcar production market, roughly one-fifth of current production. Because the model is linear, the effect of shifting all \$5 billion of production overseas would increase the impacts by five times. The time frame of the scenario is unspecified, but all results are presented in 2015\$.

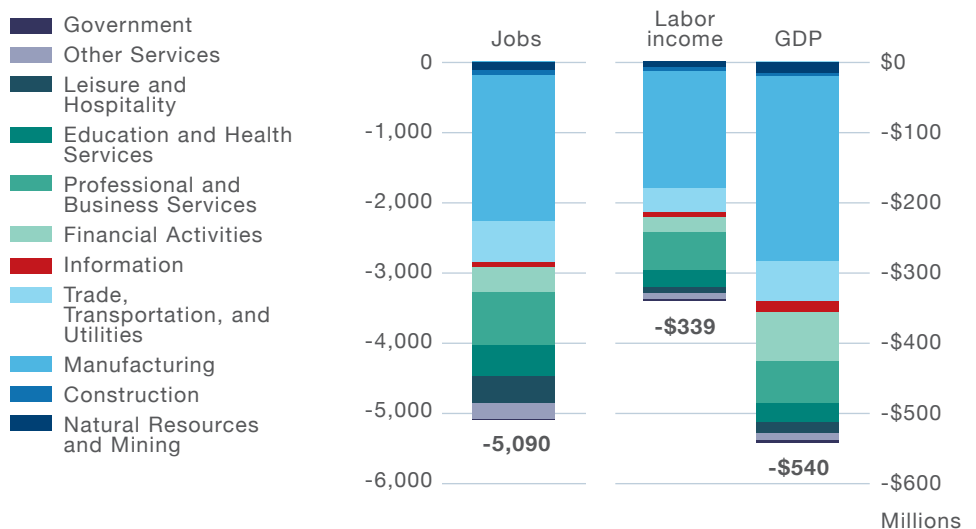
Two scenarios are considered below:

- In scenario 1, Chinese-owned SOEs assemble freight rolling stock in the United States, but with more of the value-add being done in China than is currently the case. Specifically, the production pattern is as described in Fig. 10 and Fig. 12 above.
- In scenario 2, fully Chinese-made freight rolling stock is imported into the US, displacing \$1 billion worth of the existing freight railcar industry.

SCENARIO 1: Increased freight railcar imports from China but final assembly in the US

The modeling shows that a \$1 billion shift from current US production to increased percentage of key supply-chain inputs that are imported from China (or elsewhere) would be associated with a reduction of 5,090 US jobs and \$540 million.

Fig. 15. Impacts of a \$1 billion shift to Chinese SOE freight railcar final assembly in the US



Source: Oxford Economics, IMPLAN

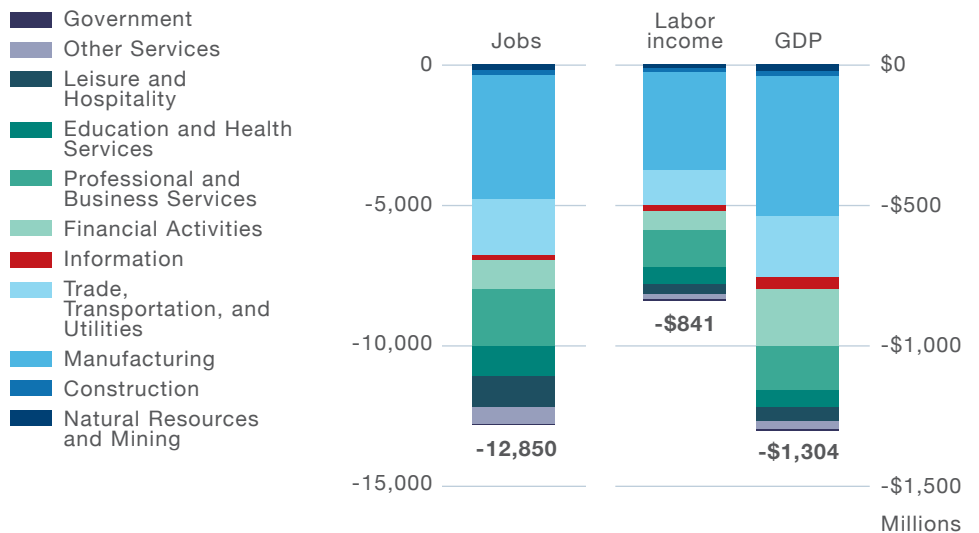
million of US GDP.⁴⁸ Some of the production and final assembly of the rolling stock would still be maintained in the US, while other portions of the supply-chain would be offshored.

SCENARIO 2: Imported Chinese-made freight railcars

In the event that US production is replaced by imports of finished, or nearly finished Chinese freight car products, rather than retaining the final assembly stage in the US, the economic impact of these Chinese imports on the US economy would be effectively nil. Therefore, the freight railcar economic impact presented in Fig. 13 above would be reduced proportionally. That is, the results presented here for the loss to the US economy are exactly one-fifth the results shown in Section 4.3 above, and reflect the full loss of \$1 billion of freight railcar production.⁴⁹

These values are shown in Fig. 16 below. This includes a loss of 12,850 jobs and \$1.3 billion in US GDP.

Fig. 16. Impacts of \$1 billion shift to Chinese imported freight railcars



Source: Oxford Economics, IMPLAN

48 Note: given the right macroeconomic conditions, these workers could be absorbed into other areas of the labor market, though skills training may be required.

49 Production in China may rely on a small amount of US exports to China; those impacts are believed to be small and are not modeled.

IMPACT TO THE US SUPPLY CHAIN

The loss of freight manufacturing may impact key supply chain industries by reducing scale economies in those industries and therefore hurt other downstream users of these same products. Understanding the key inter-industry relationships between industry sectors is, ultimately, critical in understanding the potential ramifications of significant disruption and loss in key purchasers of manufactured inputs—even those who do not produce freight railcars yet require some of the same inputs as freight railcar producers.

Fig. 17 presents the top five supply chain goods used in the production of railroad rolling stock, along with the top other industries using these products. Freight’s share of the output of these goods serves as a measure of the extent to which the loss of the freight market might hurt that industry. For example, at 3.8 percent, freight railcar producers consume a significant share of the US plate manufacturing production, and the loss of this market has the potential to significantly harm the domestic US plate manufacturing industry. This could raise the price of domestic plates, which would hurt industries that rely heavily on this industry, such as the printing machinery and equipment manufacturing industry, whose use of plates is equal to 11.1 percent of industry output.

Fig. 17. Top intermediate input goods and other industries relying on same

Top freight intermediate input goods	Freight purchases (\$ millions)	Input's share of freight output	Freight's share of domestic production	Top using industries	Input's share of industry output
Plates	\$375	7.5%	3.8%	Printing machinery and equipment manufacturing	11.1%
				Machine shops	4.6%
				Motor vehicle gasoline engine manufacturing	4.2%
Spring and wire products	\$97	1.9%	1.1%	Mattress manufacturing	9.6%
				Rolled steel shape manufacturing	4.5%
				Beef cattle ranching and farming	2.1%
Ferrous metals	\$228	4.6%	1.0%	Motor vehicle steering, suspension, and brake mfg.	6.2%
				Motor vehicle transmission and power train parts mfg.	5.9%
				Turbine and turbine generator set units manufacturing	5.4%
Iron and steel forgings	\$49	1.0%	0.5%	Speed changer, industrial high-speed drive, and gear mfg.	4.1%
				Mechanical power transmission equipment mfg.	2.4%
				Motor and generator manufacturing	2.4%
Balls and roller bearings	\$62	1.2%	0.6%	Tire manufacturing	7.6%
				Cut and sew apparel contractors	2.6%
				Apparel accessories and other apparel manufacturing	1.9%

Source: IMPLAN and Oxford Economics

5. CONCLUSION

State-owned enterprises clearly have an important role to play in a country's national economy. However, as SOEs reach outwards in search of growth opportunities in foreign markets, domestic producers in those markets face significant risks. The findings of this study suggest that much of the impact to the US freight rolling stock production sector will depend on how an SOE conducts business. If an SOE opts to build manufacturing facilities in the US and source the majority of input materials through US supply chains, then the overall downside economic effects on the US will be moderate.⁵⁰ If, however, an SOE opts to produce freight railcars in their home country—through state-owned supply chains—and then ship whole or nearly completed railcars to the US, then the impact to the US economy will be more significant across manufacturing and service sectors.

The Australian experience with China's rail rolling stock manufacturing SOEs suggests that the second of these is the more likely outcome, and serves as a cautionary tale for US manufacturing as a whole, as well as freight railcar production in particular. However, even a more "middle ground" approach by foreign SOEs (i.e., the first outcome above) would still threaten US jobs and productivity. For example, an SOE's construction of final assembly facilities in the US, while providing US-based jobs in assembly, would still risk US jobs elsewhere in the existing US railroad rolling stock supply chain. This would occur because key elements of product design, development and parts assembly would likely take place in China, before the resulting parts were shipped to the US for final assembly. Local content provisions in contracts with mass transit/commuter rail authorities are in the realm of 60 percent, meaning 40 percent of the value of the railcar can be satisfied through non-US production. In the case of freight rail production, such provisions are generally non-pertinent as most purchasers are private companies not relying on government funding.

50 Note: the SOE may nevertheless receive preferential finance options from state-owned banks, which may still enable them to undercut competition. This could force a consolidation within the freight car manufacturing market, which may result in increased prices as competition is diminished. Therefore, careful monitoring of fair competitive business practices would still be warranted.

The results and descriptions provided in this analysis are designed to offer key perspectives on potential outcomes and risks to freight railcar manufacturers and other domestic industries resulting from unfair trade practices by SOEs. This analysis is intended to provide contextual understanding of the broader issues and challenges associated with SOEs, international trade, and potential effects on the US economy. Different assumptions regarding SOE behavior, or the sources of key supply chain inputs would lead to different results.

APPENDIX A: DETAILED TABLES

IMPACT OF US FREIGHT MANUFACTURING

Fig. 18. GDP impact (\$ million) of US freight manufacturing industry

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	\$94	\$53	\$148
Construction	\$0	\$31	\$24	\$55
Manufacturing	\$1,275	\$1,020	\$205	\$2,501
Trade, Transportation, and Utilities	\$0	\$631	\$447	\$1,077
Information	\$0	\$94	\$118	\$212
Financial Activities	\$0	\$322	\$679	\$1,001
Professional and Business Services	\$0	\$542	\$250	\$792
Education and Health Services	\$0	\$0	\$333	\$333
Leisure and Hospitality	\$0	\$61	\$156	\$217
Other Services	\$0	\$38	\$103	\$141
Government	\$0	\$19	\$23	\$42
Total	\$1,275	\$2,850	\$2,392	\$6,518

Source: Oxford Economics, IMPLAN

Fig. 19. Jobs impact of US freight manufacturing industry

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	0	460	630	1,090
Construction	0	420	330	740
Manufacturing	11,700	9,060	1,290	22,050
Trade, Transportation, and Utilities	0	4,530	5,450	9,980
Information	0	440	460	890
Financial Activities	0	2,020	3,200	5,220
Professional and Business Services	0	6,660	3,360	10,020
Education and Health Services	0	10	5,460	5,470
Leisure and Hospitality	0	1,520	3,900	5,420
Other Services	0	490	2,510	2,990
Government	0	170	220	390
Total	11,700	25,760	26,810	64,280

Source: Oxford Economics, IMPLAN

Fig. 20. Labor income (\$ million) impact of US freight manufacturing industry

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	\$43	\$36	\$79
Construction	\$0	\$24	\$19	\$42
Manufacturing	\$1,000	\$661	\$94	\$1,755
Trade, Transportation, and Utilities	\$0	\$354	\$261	\$615
Information	\$0	\$52	\$52	\$104
Financial Activities	\$0	\$153	\$184	\$337
Professional and Business Services	\$0	\$467	\$205	\$673
Education and Health Services	\$0	\$0	\$306	\$306
Leisure and Hospitality	\$0	\$38	\$100	\$139
Other Services	\$0	\$28	\$94	\$122
Government	\$0	\$15	\$19	\$34
Total	\$1,000	\$1,837	\$1,369	\$4,206

Source: Oxford Economics, IMPLAN

IMPACT OF SCENARIO 1 – US FINAL ASSEMBLY

Fig. 21. GDP (\$ million) impact of \$ 1 billion shift to Chinese production in the US

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	-\$10	-\$4	-\$14
Construction	\$0	-\$2	-\$2	-\$3
Manufacturing	-\$150	-\$97	-\$17	-\$263
Trade, Transportation, and Utilities	\$0	-\$23	-\$36	-\$59
Information	\$0	-\$5	-\$10	-\$14
Financial Activities	\$0	-\$15	-\$55	-\$70
Professional and Business Services	\$0	-\$41	-\$20	-\$61
Education and Health Services	\$0	\$0	-\$27	-\$27
Leisure and Hospitality	\$0	-\$3	-\$13	-\$15
Other Services	\$0	-\$2	-\$8	-\$10
Government	\$0	-\$1	-\$2	-\$3
Total	-\$150	-\$197	-\$193	-\$540

Source: Oxford Economics, IMPLAN

Fig. 22. Jobs impact of \$ 1 billion shift to Chinese production in the US

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	0	-40	-50	-90
Construction	0	-20	-30	-50
Manufacturing	-1,170	-830	-100	-2,100
Trade, Transportation, and Utilities	0	-160	-440	-600
Information	0	-20	-40	-60
Financial Activities	0	-90	-260	-350
Professional and Business Services	0	-500	-270	-770
Education and Health Services	0	0	-440	-440
Leisure and Hospitality	0	-70	-310	-380
Other Services	0	-30	-200	-230
Government	0	-10	-20	-20
Total	-1,170	-1,770	-2,160	-5,100

Source: Oxford Economics, IMPLAN

Fig. 23. Labor income (\$ million) impact of \$1 billion shift to Chinese production in the US

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	-\$4	-\$3	-\$7
Construction	\$0	-\$1	-\$2	-\$3
Manufacturing	-\$100	-\$61	-\$8	-\$168
Trade, Transportation, and Utilities	\$0	-\$12	-\$21	-\$34
Information	\$0	-\$3	-\$4	-\$7
Financial Activities	\$0	-\$7	-\$15	-\$22
Professional and Business Services	\$0	-\$37	-\$17	-\$53
Education and Health Services	\$0	\$0	-\$25	-\$25
Leisure and Hospitality	\$0	-\$2	-\$8	-\$10
Other Services	\$0	-\$2	-\$8	-\$9
Government	\$0	-\$1	-\$2	-\$2
Total	-\$100	-\$129	-\$111	-\$339

Source: Oxford Economics, IMPLAN

IMPACT OF SCENARIO 2—FULL IMPORT

Fig. 24. GDP (\$ million) impact of \$ 1 billion shift to Chinese imports

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	-\$19	-\$11	-\$30
Construction	\$0	-\$6	-\$5	-\$11
Manufacturing	-\$255	-\$204	-\$41	-\$500
Trade, Transportation, and Utilities	\$0	-\$126	-\$89	-\$215
Information	\$0	-\$19	-\$24	-\$42
Financial Activities	\$0	-\$64	-\$136	-\$200
Professional and Business Services	\$0	-\$108	-\$50	-\$158
Education and Health Services	\$0	\$0	-\$67	-\$67
Leisure and Hospitality	\$0	-\$12	-\$31	-\$43
Other Services	\$0	-\$8	-\$21	-\$28
Government	\$0	-\$4	-\$5	-\$8
Total	-\$255	-\$570	-\$478	-\$1,304

Source: Oxford Economics, IMPLAN

Fig. 25. Jobs impact of \$ 1 billion shift to Chinese imports

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	0	-90	-130	-220
Construction	0	-80	-70	-150
Manufacturing	-2,340	-1,810	-260	-4,410
Trade, Transportation, and Utilities	0	-910	-1,090	-2,000
Information	0	-90	-90	-180
Financial Activities	0	-400	-640	-1,040
Professional and Business Services	0	-1,330	-670	-2,000
Education and Health Services	0	0	-1,090	-1,090
Leisure and Hospitality	0	-300	-780	-1,080
Other Services	0	-100	-500	-600
Government	0	-30	-40	-80
Total	-2,340	-5,150	-5,360	-12,860

Source: Oxford Economics, IMPLAN

Fig. 26. Labor income (\$ million) impact of \$1 billion shift to imports

Sector	Direct	Indirect	Induced	Total
Natural Resources and Mining	\$0	-\$9	-\$7	-\$16
Construction	\$0	-\$5	-\$4	-\$8
Manufacturing	-\$200	-\$132	-\$19	-\$351
Trade, Transportation, and Utilities	\$0	-\$71	-\$52	-\$123
Information	\$0	-\$10	-\$10	-\$21
Financial Activities	\$0	-\$31	-\$37	-\$67
Professional and Business Services	\$0	-\$93	-\$41	-\$135
Education and Health Services	\$0	\$0	-\$61	-\$61
Leisure and Hospitality	\$0	-\$8	-\$20	-\$28
Other Services	\$0	-\$6	-\$19	-\$24
Government	\$0	-\$3	-\$4	-\$7
Total	-\$200	-\$367	-\$274	-\$841

Source: Oxford Economics, IMPLAN

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