

Using safeguard protection to raise domestic rivals' costs

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Abstract

The primary impact of import protection is to raise foreign firms' costs. We show that poorly designed protection also raises domestic rivals' costs. We find that simultaneously taxing both the upstream and downstream import markets results in a very small expansion in industry-wide downstream production. We use the US' recent steel safeguard action as a case study. Our analysis sheds new light on the controversial steel slab restrictions. We show that the primary effect of the steel tariffs is distributional. In particular, the steel tariffs will mainly benefit minimills and will provide relatively small benefits to traditional mills.

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1. Introduction

The idea of “raising rivals' costs” is widely accepted by antitrust authorities as an important threat to competition (Salop and Scheffman, 1983, 1987; Brennan, 1988). The concept is easy to explain. A dominant firm executes some type of strategy to shift the supply curve of its rivals. This, in turn, shifts out the residual demand curve for the dominant firm's product and results in increased profits for the dominant firm. Crucially, shifting upward the the rivals' supply curve requires increasing the rivals' costs at the margin.

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Although not discussed in Salop and Scheffman's original papers, import restrictions are arguably the most widely used (and abused) example of raising rivals' costs. For instance, Baumol and Ordover (1985) argue that the protection discourages firms from adopting technological improvements and instead encourages the firms to litigate against foreign firms who have innovated. In effect, trade protection, most notably antidumping, is a form of raising rivals' costs whereby foreign firms' efforts to lower their costs are "undone" by higher tariffs.¹

In this paper, we argue that Baumol and Ordover's critique addresses only half of the problem. In particular, Baumol and Ordover's entire focus is on the impact of trade protection on *foreign* firms' costs. Policymakers sympathetic with antidumping protection discount such concerns as outside the intent of the law. Their view is that Congress has made a decision that low-cost imports are to be discouraged, regardless of their benefits.² Simply put, their view is that if foreign firms' costs are raised, so be it—it was Congress' intent that the ITC raise foreign rivals' costs.

We argue, however, that the cost-raising impact of administered protection is not solely limited to foreign firms. In fact, for vertically integrated industries, we believe that the cost-raising concerns of protection are more insidious, more widespread, and more anticompetitive than previously discussed. We argue that poorly designed, over-reaching protection will serve to raise not only foreign rivals' costs, but also *domestic* rivals' costs. Therefore, our findings are much more difficult for policymakers to ignore. Even the most ardent protectionists cannot argue that it was Congress' intent to harm one domestic firm so that another domestic firm will gain. But this is precisely what we find.

Our results are not merely a theoretical curiosity. Rather, the findings directly bear on the US's recent Section 201 investigation involving steel.³ In truth, the steel safeguard case served as the motivation for this paper. In the 201 dispute almost all steel products were investigated in an attempt to determine whether imports were causing serious injury to the domestic steel industry. Steel is perhaps the archetypal example of a vertically related industry, where product A is the input for product B, which in turn is the input for product C, and so on.

The complicating factor is that different steel firms rely on different sources for their inputs. For instance, some firms like US Steel (USX) internally produce virtually all of their input needs. Other firms, like AK Steel and California Steel must purchase some (or all) of certain inputs on the open-market. In the 201 dispute, due to strong lobbying by the firms who are wholly internalized, the US government levied huge tariffs on the entire vertical chain of products. The huge tariffs were even levied on a vital input like steel slab. What makes this decision particularly troubling is that slab is not available domestically. At

¹ As articulated by Salop and Scheffman, the concept of raising rivals' costs can be interpreted a form of nonprice predation carried out by altering the rivals' supply curve, rather than the traditional (and prohibitively expensive) predatory tactic of reducing the market price by flooding the market. It is therefore more than a bit ironic that antidumping—a law originally intended to discourage predatory behavior—is the primary weapon used to raise foreign rivals' costs.

² For instance, ITC Commissioner Lynn Bragg wrote, "As a nation . . . we have made the judgment that unfairly traded imports are to be discouraged, regardless of their 'benefits,' if they cause harm to competing domestic industries and workers" (USITC, 1995).

³ Section 201 actions are also known as safeguard protection.

its core, our paper shows that firms who generally do not need (or use) imported slab—namely Nucor and US Steel—used the government to raise their rivals' costs.

As Salop and Scheffman note in their original article, a strategy of raising rivals' costs is most viable when the strategy increases rival costs more than those of the incumbent firms.⁴ This condition is met in the present case, as the tariffs on slab increase the costs of rollers more than of the integrated firms and particularly the minimills. This asymmetry is what drives the strategy and makes it more likely to succeed than, for example, a typical predatory pricing strategy.

We will also show that cutting off the import market for upstream products does very little real good for the overall industry. We show that protecting the upstream product results in a very small increase in total industry production. The primary effect is distributional. Some firms (like Nucor) will expand their output while others (like many traditional integrated mills) will decrease their output. Ironically, given that the firms who benefit have very low unit labor requirements, we find that taxing the upstream product may actual lower domestic employment. All in all, given the technological characteristics of modern steel production, the decision to impose restrictions on upstream products is not only perplexing but also counterproductive to the objective of increasing steel industry employment.

The remainder of the paper proceeds as follows. In [Section 2](#), we will describe the current state of the US Steel industry. In [Section 3](#), we will give an overview of the Section 201 proceedings. In [Section 4](#), we will report on the stated positions of the various domestic firms. In [Section 5](#), we will US a stylized model of the competition with the steel industry. We then solve the model and show that the primary effect of the government's decision is to choose winners and losers. We make a few concluding comments in [Section 6](#).

2. The steel industry: the emergence of new competitive pressures

To understand the current competitive dynamics of the steel industry, it is important to realize that not all steel firms are alike. Within the domestic flat-rolled steel industry, there are at least three distinct business models: the traditional integrated mills; the new low cost minimills; and the new lower cost rollers. The emergence of these two new lower cost segments has intensified the intra-industry competition in the domestic steel industry.

2.1. Traditional BF/BOF mills

The traditional business model for the domestic steel industry involved firms manufacturing steel by combining basic raw materials.⁵ These “integrated mills” combine iron ore, coke, and other fuel sources in a large blast furnace (BF) to make pig iron and then refine that pig iron into raw steel in a basic oxygen furnace (BOF). Slabs and billets are then cast from the liquid steel (see [Fig. 1](#)). These two products are referred to as semi-finished

⁴ According to Salop and Scheffman, “a sufficient condition for an (RRC) strategy to be profitable is for it to shift up the dominant firms' residual demand curve by more than it shifts up its average cost curve at the original output.”

⁵ For a useful historical overview, see [Barnett and Crandall \(1998\)](#).

Two Technologies for Making Steel

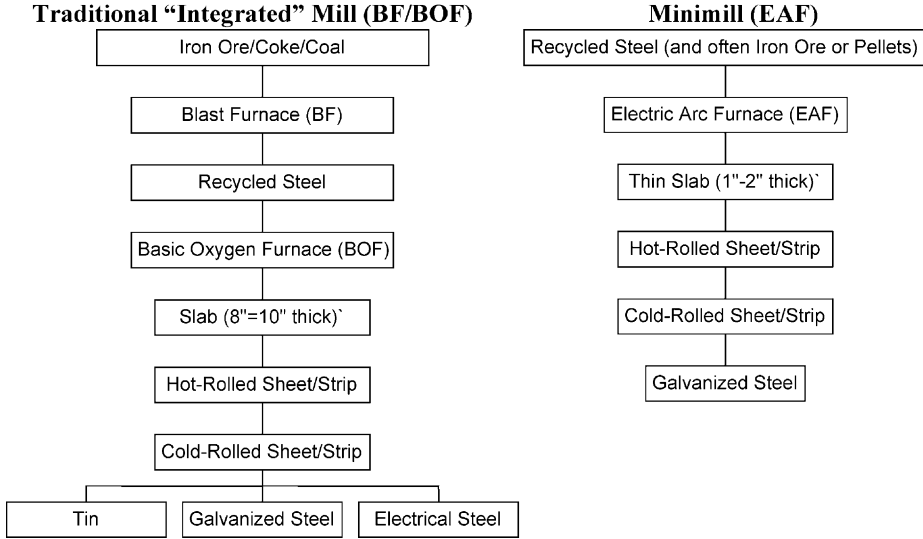


Fig. 1. Two technologies for making steel.

steel since these early stage products have not been sufficiently processed to have any real commercial use. The slabs and billets are then rolled or shaped into various finished steel end products. For example, a typical production flow would be to start by making steel slab, which is then processed into “hot-rolled steel” (steel rolled to less than 0.20 in. thick while still in a hot state), or further processed into “cold-rolled steel” (steel that is allowed to cool, and is then rolled even thinner and smoother) or even further processed with various coatings such as zinc or tin to create corrosion resistant steel and other specialized products.

In order for blast furnace technology to be economically efficient, the furnaces need to be large, by which analysts mean capable of producing at least 2–3 million tonnes per year. A BF/BOF mill of this scale requires substantial capital investments—according to study done by the US International Trade Commission (Yost, 1996) the cost of a new BF/BOF mill of efficient scale is on the order of US\$ 3.5–5 billion.⁶ A BF/BOF’s high fixed costs create a particularly strong incentive to maximize output, so as to lower the average cost of the steel produced.

2.2. EAF minimills

The first major change to the traditional steel-making model is principally a technological phenomenon—the emergence of electric arc furnace (“EAF”) steel mills. Rather

⁶ Donald Barnett, a leading industry analyst, estimates the cost of a new blast furnace is approximately US\$ 2 billion (Ghemawat and Stander, 1992). The cost is so high relative to likely profits, no new greenfield BF/BOF has been built in the US in more than 20 years.

than making raw steel in a blast furnace, these so-called “minimills” use electricity to melt scrap steel and virgin iron units in an EAF (see Fig. 1). The recycled steel is then used to make various downstream products. By avoiding the time consuming and expensive process of making raw steel, the minimills can make downstream products faster and with substantially lower costs than integrated mills. Moreover, an EAF’s minimum efficient scale is about 1/10 that of an integrated mill, which means that successful minimills can set up EAF furnaces in geographically diverse locations, allowing them to be near customers and therefore minimize transportation costs.⁷ An EAF’s smaller scale also means that the capital costs are a fraction of a BOF.⁸ After accounting for all of these factors, minimill costs are widely estimated to be 25–30 percent lower than even the most efficiently operated US integrated mills (Barnett, 2000).

Although US minimills have produced substantial quantities of steel using EAF technology since the 1960s, their output was traditionally confined to less technically complex steel products such as wire rod, bar, and rebar. And while the minimills’ substantial cost advantages have resulted in the exit of traditional mills in the structural and long product segments, most traditional mills survived by specializing their operations in the one product segment that minimills were traditionally unable to produce: flat-rolled steel. Flat-rolled steel products, such as automobile panels, the exterior metal on home appliances, construction sheet metal, HVAC ducting, tin, etc., now accounts for more than 95 percent of traditional integrated mills’ output. Flat-rolled steel also accounts for about 70 percent of all US steel consumption.

By 1989, however, EAF technology had evolved to the extent that minimills were finally able to produce flat-rolled products. In a technological breakthrough, Nucor pioneered the commercial application of thin slab casting. In contrast with integrated mills which produce thick slab (8–10 in. thick) minimills go from molten steel directly to 1–2 in. steel slab, skipping entirely the traditional thick slab stage. Moreover, not only do mini-mills using thin slab caster produce 1–2 in. slabs, the slabs are immediately hot-rolled in a continuous process. That is, they are not taken off-line and placed in inventory. This saves the cost of re-heating a cold slab.⁹ As was easily predictable, the minimills’ cost advantage has led to rapid market share growth in the flat-rolled segment. As of 2002, minimills are projected to account for 27 percent of domestic flat-rolled production (Barnett, 2000).

2.3. *Rollers*

The second major change in the US steel industry is not primarily technological (as is the case with minimills) but rather philosophical—namely, the use of imported slab to augment internal production or to overcome fundamental mill shortcomings. But in order to appreciate this new business model, a bit more background is needed.

⁷ A typical EAF has an output of 1–1.5 million tonnes per year.

⁸ Yost (1996) estimates the costs of a greenfield EAF minimill are US\$ 460–500 million.

⁹ This also means that Nucor does not produce slabs for inventory and does not purchase slabs. Thus, its production process precludes it from either buying or selling slabs. In addition, thin slabs cannot be transported because they are too long and thin.

Table 1
International cost comparison—thick slab (1999)

| Country | Cost per tonne (US\$) | Costs relative US (percent) |
|---------|-----------------------|-----------------------------|
| US | 247 | NA |
| Canada | 205 | –17 |
| Japan | 198.75 | –20 |
| EU | 184 | –26 |
| Korea | 166.25 | –33 |
| Brazil | 141 | –43 |

Source: Barnett (2000).

Over the past 20 years it has become increasingly clear that: (i) other countries can produce slab at far lower cost than the US;¹⁰ and (ii) wholly self-contained (i.e. fully integrated) production limits a firm's ability to fully utilize its best assets.

Table 1 illuminates the first point. As one can see, world-class slab production has a cost advantage of more than US\$ 100 per tonne (40 percent) even relative to efficient US production. Foreign producers' cost advantage stems from their proximity to high-quality, low-cost raw materials, their more modern facilities, and also their larger scale.

With respect to the second point, the rapid growth of minimills has accelerated what is often referred to as a “deverticalization” in the steel industry. That is, the minimills' success is not entirely technological, but rather is also heavily influenced by their belief in maximizing output per manhour. Accordingly, minimills sell a far greater fraction of their output on the open-market than the traditional integrated mills who prefer to handle most of the downstream processing themselves. In other words, primarily due to the success of Nucor, many now realize that there is neither a technological nor economic reason why a steel mill has to be a “one stop shop.” Rather, profitability is driven by being the lowest cost producer in those product segments where you do participate. As a result, there are dozens of new steel firms who only produce cold-rolled steel, or only make pipe, or only produce galvanized steel. Rather than produce the upstream input required, these new firms simply purchase the input, usually from a US minimill or foreign suppliers.

This movement toward slab importing is simply the next step in this process. Given the substantial investment needed to construct and operate an integrated mill, the competitive advantages that other countries have at the slab stage, and the relatively more attractive operating margins on higher value-added downstream products, a number of firms have invested in downstream rolling capacity without any concomitant creation or expansion in their upstream blast furnace capacity. To the extent that these mills' new rolling facilities imply that they have a slab deficit, the firms can simply turn to the open-market and purchase slab.

There are two substantial costs savings associated with buying slab. First, the slab buyer (often referred to as a roller) has significantly lower fixed costs of investment. This is especially important during periods of slack demand when slab buyer can simply cut their purchases without worrying about the ongoing costs of maintaining and owning a BF/BOF.

¹⁰Put another way, the US has lost comparative and absolute advantage in slab production.

Indeed, in the early 1990s when AK Steel made the choice of where to invest money in their steel operations, they chose to invest in state-of-the-art rolling mills rather than their furnaces.

Second, as demonstrated in [Table 1](#) the cost of buying slab is lower than the cost of making slab. Blast furnaces in Brazil and other countries—large, modern, efficient mills near sources of high quality iron ore and substantial transportation infrastructure—produce high quality slabs at a lower cost than any American blast furnace. Importing slab thus gives the rollers significant cost savings.

Mills have adopted this new approach to steel making in two ways. Firms such as AK Steel, Oregon Steel and Ispat Inland buy imported slab to *supplement* their own steel slab production. Other firms such as California Steel and Duferco-Farrell rescued the rolling operations of shuttered mills, but did not purchase the highly inefficient melting operations. Without *any* ability to produce raw steel, these two firms became pure rollers.

This new business model has exerted competitive pressure on both the high- and low-ends of the steel market. Let's first think about the implications for the high-end. Given that minimills use scrap steel, and the difficulty of controlling the purity and consistency of the scrap, some types of steel—particularly higher quality grades of cold-rolled and coated steels—still need to be produced by the BF/BOF method. At this point minimills simply cannot profitably make these high-end types of steel.¹¹ As a result, minimill market share gains have been primarily confined to commodity-grade products. Not surprisingly, BF/BOF mills who compete in that part of the market are struggling to stay in business.

However, BF/BOF mills who compete in the high-quality part of the market have done much better. The slab roller business model threatens this safe haven.¹² Depending on the quality of slab imported and the quality of the rolling lines, slab rollers can compete quite successfully at the high-end of the steel market. AK Steel is the preeminent example of a slab buyer competing at the highest end of the market. AK Steel invested more than US\$ 1 billion to build a large capacity, state-of-the-art rolling mill and is now the most profitable US steel producer (on a per tonne basis). But, these new rolling lines mean that AK Steel must augment its own internally produced slab with open-market purchases.

What are the implications of the rollers on the low-end of the market. Simply put, if roller mills purchase commodity grade slab, they can compete quite successfully at the low-end or commodity-grade part of the market. But this is precisely the market segment where the Nucor and the rest of the minimills dominate. As a result, roller mills like California Steel and Duferco-Farrell pose a serious competitive challenge to the minimills' dominance.

2.4. *The risk of vertical foreclosure*

The rollers have proven that it is no longer necessary for a successful steel firm to make all of its own raw steel; the feedstock can be purchased. The only caveat, of course, is that there needs to be firms willing to supply the slab. This seemingly obvious stipulation is the

¹¹ Although there are public reports that the best minimills are very close to making and selling higher quality grades.

¹² We note that the many firms merely augment their own internal slab production and are not really rollers. In order to keep the terminology simple, we will use the term roller to refer to both types of firms.

huge risk associated with this new business model. Why? Domestic integrated mills never offer commercial quantities of slab on a regular basis—they would rather roll the slab into higher value-added products before selling the steel.¹³ Besides, domestic integrated firms have no incentive to enable their rivals to compete for downstream higher margin sales. In addition, all of the new roller firms' operations require thick slab which means that minimills are not potential suppliers. In other words, if left to their own devices, domestic mills can and do choke off the supply of slab and thus can largely eliminate the competition from these new firms.

This business situation means that rollers depend almost entirely on imported slab.¹⁴ Large-scale internationally competitive mills in other countries—most notably Brazil and Mexico—are willing and able to supply large quantities of slab on a regular basis.¹⁵ Over the past few years, slab imports have increased to meet the growing demand by rollers.

In summary, these new segments—both the minimills and the rollers—have fueled competitive pressures in the market. The integrated mills for years experienced only limited rivalry, mostly from other integrated mills. This industry spent decades expecting annual price increases. Yet in the past two decades, minimills have captured larger and larger shares of more and more product segments. Now in the past decade, the rollers have begun to capture a larger portion of even the higher valued-added segments. The competitive rivalry within the domestic industry has intensified. Even more troubling for traditional integrated mills, both the minimills and the rollers have significant cost advantages, and thus have more flexibility to adjust prices. The problem posed by the rollers could be solved, of course, if the traditional mills and minimills could find a way to eliminate the supply of imported slab.

3. The Section 201 proceeding: targeting competitive rivals

Under international trade rules, countries may impose so-called “safeguard” measures. Under WTO rules, countries normally should not raise tariffs¹⁶ or impose quantitative restrictions. Under Article XIX of the GATT and the Agreement on Safeguards, however, countries can impose such restrictions in exceptional situations if a domestic industry is suffering serious injury substantially caused by rapidly increasing imports. The importing country is allowed to take a temporary break from its trade obligations to allow its domestic industry time to restructure.

¹³ Domestic mills do make “courtesy” shipments to each other, say, when a blast furnace needs to shut down for relining. But such shipments are sporadic at best, often of undesirable chemistries, and almost always for relatively small volumes.

¹⁴ It should be noted that the unavailability of domestic slab means that *all* BOF mills purchase at least some imported slab. There is simply no other source.

¹⁵ In contrast to the situation in the US, many other countries can produce more slab than they can roll. Thus, selling slab to other markets is a viable option for mills in other countries. The supplies of slabs will remain available in the long-run and are not contingent upon a downturn in the demand for finished steels in foreign countries.

¹⁶ Technically, countries may not raise tariffs beyond the legally “bound rate;” in practice, most countries set actual duty rates at the bound rate.

Under US law, the Senate, the President, or a domestic industry can request safeguard measures under Section 201. The Trade Act of 1974 allows the imposition of safeguard measures if certain statutory factors are met. The first stage of a Section 201 proceeding involves an investigation by the International Trade Commission (“ITC”), an independent regulatory agency, of whether the domestic industry is suffering serious injury caused by increasing imports. The second stage is for the ITC to consider the alternative remedy options, and to make a recommendation to the President. The third and final stage consists of the President’s decision, who can accept, reject, or modify the ITC recommendations. In many cases, the President exercises the statutory right to consider the broader national interest and not impose restrictions.

The domestic steel industry has a long history of obtaining trade protection, going back to the 1970s. This history includes prior safeguard proceedings. In 1984, the steel industry filed a Section 201 case. Although President Reagan technically rejected the recommended import relief, he then proceeded to negotiate a series of voluntary export restraint agreements with all the US trading partners. These quantitative restrictions protected the steel industry from 1984 to 1992.¹⁷

In the summer of 2001, the US began its second major safeguards investigation of steel imports. The domestic industry had been pushing for such an investigation for some time as a way to limit imports. The campaign for a Section 201 case began in 1998. In the early stages, the industry chose not to file a formal request and instead pushed for President Clinton to self-initiate a case. The Clinton Administration, however, felt that the domestic industry had sufficient protection from the hundreds of antidumping cases and that additional protection was neither necessary nor appropriate. To the very end, even in the election year, President Clinton rebuffed calls for a self-initiated case.

With the election of President Bush, the dynamics would soon change. In theory, the Bush Administration should have been even more committed to resisting calls for protection. But when Senator Jeffords of Vermont changed parties and gave control of the Senate to the Democrats, the political dynamic changed dramatically. The Senate Finance Committee was posed to initiate the Section 201 case that the Republicans on the committee had blocked for so long. Under these circumstances, President Bush decided to initiate the case himself. Like all politicians, President Bush wanted to be able to take credit for an action that was now inevitable.

This proceeding was unique in several respects. First, the position of the minimills had changed over the years. In trade disputes in the 1980s, minimills had consistently opposed trade protection. In the 1984 safeguards case, for example, the leading minimill Nucor testified in opposition to any special protection for the steel industry.¹⁸ By the late 1990s, however, management changes and new competitive realities (and rivalries) changed the minimill position. Now minimills joined the domestic industry crusade to seek protection.

Second, the competitive dynamics surrounding trade in slab had changed. The emergence of rollers had created larger and growing demand for slab imports. Unlike the 1984 safeguards case, in which slab imports were only 3–4 percent of total imports under

¹⁷ For this history of protection, see [Barringer and Pierce \(2000\)](#) and [Moore \(1996\)](#).

¹⁸ Ken Iverson, then CEO of Nucor, published an article in *The Wall Street Journal* on 21 August 1986 with the subtitle “Protection ensures stagnation.”

investigation, in the 2001 safeguards case, slab imports accounted for more than 9 percent of the total imports under investigation.¹⁹ Moreover, the rate of growth in slab imports was one of the highest of all the steel products being investigated. In fact, while most products were showing declining imports, slab imports were still increasing.

Third, the slab import issue split the domestic industry. Although the industry largely agreed on the demand for protection on finished goods, the industry was sharply split over semi-finished goods. The most extreme position—take by the United Steelworkers—called for an investigation of all semi-finished products, including both “pig iron” (an early stage material) and slab. The minimills wanted to exclude pig iron—a product that could be used in some EAF technologies—but include everything else. The economic rationale for the minimills’ position is that high quality pig iron allows them to produce cleaner steel and higher value downstream products which ultimately makes them even more competitive with integrated mills. The rollers, in contrast, fought hard to exclude slabs from the Section 201 case. The minimills’s position prevailed on both counts—pig iron was excluded; slab was included.

In the end, the ITC found serious injury caused by imports. The ITC grouped together into one “like product” most flat carbon steel—including slab, plate, hot-, cold-rolled, and corrosion resistant steel into a single category. The plurality remedy recommendation from the ITC was for 20 percent tariffs on all finished flat-rolled steel, and a tariff rate quota on slab that allowed the first 7 million tonnes to enter duty free with a 20 percent tariff applying to imports in excess of the quota. The President ultimately imposed a 30 percent tariffs on all finished flat-rolled steel, and a tariff rate quota on slab that allowed the first 5.4 million tonnes to enter duty free with a 30 percent tariff applying to imports in excess of the quota.²⁰

4. Using government regulation to vertically foreclose domestic rivals

Despite early assurances from minimill producers that historical levels of slab imports would be allowed, once the case proceeded to the ITC, the minimills pressed hard to have large tariffs imposed on slab.

For instance, shortly before the initiation of the 201 investigation (June 2001) *New Steel* magazine published the following exchange between the CEO of Nucor and the CEO of California Steel (emphasis added):

New Steel: What is the impact of President Bush’s decision to initiate a Section 201 investigation? What are the implications for the US industry and for steelmakers around the world?

Gonçalves (CEO, California Steel): The 201 is not supposed to create losers, especially here among US steel companies. ‘If restrictions are applied to slabs, of course, California Steel would be a loser’.

New Steel: People are wondering if semi-finished steel might be included. You [Gonçalves] must have quite an interest in this issue. Slabs are your bread and butter.

¹⁹ See [USITC \(1984\)](#) and [\(USITC, 2001\)](#).

²⁰ The slab TRQ was not designed to merely stop a surge of slab imports. Rather the TRQ was set at an amount less than the average 1998–2000 level.

Gonçalves: Absolutely. It's my raw material . . . Even if the slabs are included, we have . . . to teach the ITC what slabs mean, the importance of slabs for companies such as California Steel.

DiMicco (CEO, Nucor): Slabs will be allowed in at certain levels that will grandfather companies like CSI, AK, and other people who have been using slabs regularly for running their businesses . . . The industry is fairly unanimous on that.

Mr. DiMicco's statement warrants two comments. First, his statement that "the industry is fairly unanimous" on restricting slab is demonstrably false. The slab issue was arguably the most hotly contested aspect of the 201 case. We surmise that he means the Steel Manufacturers Association, a trade association of EAF steel makers and perhaps a few integrated producers who import little slab.

Second, the statement demonstrates that Mr. DiMicco is well versed in the politics of protectionism. Early on in the case Mr. DiMicco did not want to publicly reveal his anticompetitive intent. However, once the case proceeded to the remedy phase, there was no longer any talk of allowing slab imports at "certain levels" and instead Mr. DiMicco and his allies pushed for uniform, across-the-board 40 percent tariffs on all products.

For instance, in *Metal Center News* (December 2001), Thomas J. Usher, CEO of USX Corporation stated

We urge the President to act quickly to adopt 40 percent tariffs on all flat-rolled imports, including slabs.

In February 2002, Mr. Thomas J. Usher pursued this argument further; testifying before the US Senate Finance Committee he stated:

Relief on slab is critical . . . The only fair remedy is to put everyone on an even footing—including slab re-rollers, hot band re-rollers, integrated mills, etc.—and insure that any imported feedstock is subject to a consistent remedy.

At the same hearing Mr. DiMicco testified and stated:

It is crucial that the same tariff be applied to all product categories, from semi-finished slab to rebar.

Thus, at the end of the process, the minimills were revealing their true intentions—namely, the foreclosure of their most threatening competitors.

5. A modelling framework

5.1. General description

Minimills neither produce nor consume traditional "thick" slab. Nevertheless, the minimills, most notably Nucor, lobbied long and hard to have prohibitive tariffs levied on all slab imports.²¹

²¹ Integrated mills like US Steel that source their feedstock internally also lobbied hard to restrict slab imports. These mills sell very little, if any, slab in the open-market.

Vertically Related Production

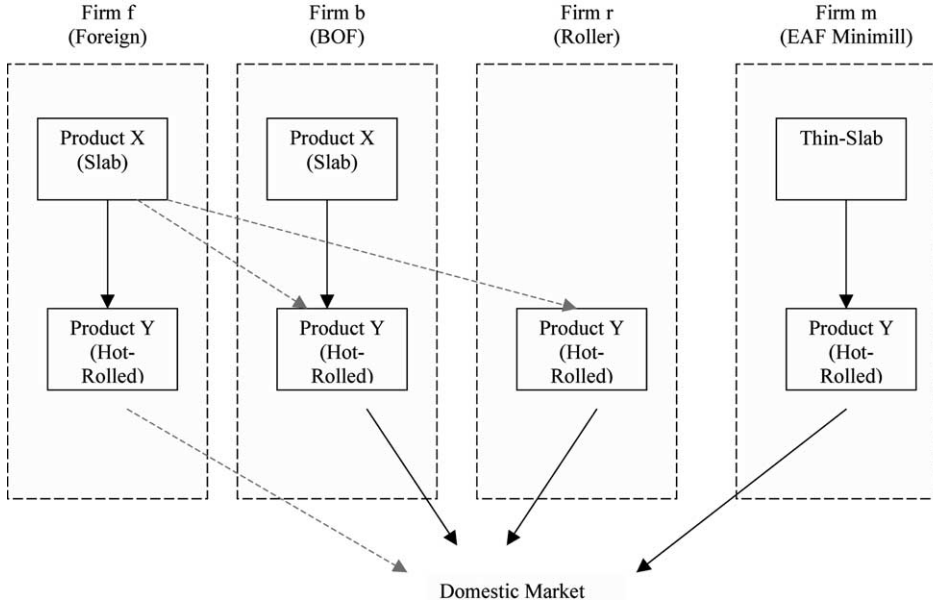


Fig. 2. Vertically related production.

Was their position only an attempt to project industry solidarity to the President? Or, were the minimills’ motivated in the 201 case by a desire to raise their rivals’ costs? If their lobbying efforts were successful, for all intents and purposes they would have induced the government to foreclose input supply from their domestic rivals.

In order to formally discuss this issue, we will now setup and analyze an oligopoly model with vertically related production.²² The model setup is illustrated in Fig. 2. There are four firms in the market: (i) a domestic integrated BF/BOF mill (firm *b*); (ii) a domestic EAF minimill (firm *m*); (iii) a domestic roller mill (firm *r*); and (iv) a foreign integrated BF/BOF mill (firm *f*). The outer dotted lines indicate vertical integration.

For simplicity, we will confine our analysis to only the first two stages of flat-rolled steel production: slab and hot-rolled steel. In our model, we will simply refer the products as upstream (*X*) and downstream (*Y*) products. The model can be easily, if somewhat tediously, extended to additional downstream product lines. Also, throughout our exposition, we focus exclusively on the domestic market.²³

In our model, the vertically integrated foreign firm, denoted as firm *f*, controls the exports of both products. That is, firm *f* can export both *X* and *Y* to the domestic market. In keeping with actual practice in the domestic steel industry, we will assume that the foreign firm is the *only* source for buying the upstream product on the open-market. Once firm *f*

²²The structure of the model is similar to that in Spencer and Jones (1992) and Rodrik and Yoon (1995).

²³More precisely, we are assuming that the domestic and foreign market are segmented. Given our assumptions on the foreign firm’s costs, this has little impact on the analysis.

sets a price for the upstream product, the integrated BF/BOF mill (firm b) and the roller (firm r) can then choose a volume to import.²⁴ We will assume firm m uses an alternative technology and thus will not purchase the upstream product from firm f .

We will assume that 1 tonne of the upstream product is required to produce 1 tonne of the downstream product.²⁵ We will also assume that a fixed number of laborers are required to produce 1 tonne of the upstream product. We will use the parameter α_i to denote the unit labor requirement at firm i .²⁶ We denote the unit labor requirement of downstream production as β_i .²⁷ We now turn to the issue of capturing costs of upstream production. As we discussed above, the US integrated mills operate at substantially higher costs than either minimills or their foreign rivals. In addition, we want to capture the incentive for firm b to purchase at least some of its upstream product from the open-market. To capture both issues, we will assume that firm b is characterized by increasing marginal costs. In contrast, the three other firms have constant marginal costs. With increasing marginal costs, firm b may both import and internally produce the upstream product.²⁸

The subgame perfect equilibrium between the firms involves two stages of decision. At stage 1, the foreign firm (f) announces a price for the upstream product. At stage 2, the output of each of the four firms is determined by Cournot competition. At this second state, firm b will choose the cost minimizing combination of imports and internal production and firm r will choose how many tonnes of X to import. In setting the upstream product price at stage 1, firm f takes into account the effect of the price on the second stage Cournot quantity competition.

Finally, we will allow the home government to levy a tariff on the upstream product, t^X , and also on the downstream product, t^Y .

Before discussing the solution to the model, it seems appropriate at this point to make a couple of comments on our modelling approach. First, our goal is to show how different steel firms had different economic stakes in the design of the Section 201 restraints. We believe that an oligopoly approach is a useful tool for highlighting the differing incentives. Toward this end, our model assumes that only a single firm sells the upstream product on the open-market. While it is true that a few domestic firms occasionally participate in the slab market, in reality there are dozens of firms from many countries who sell slab on the open-market. The ITC's recommendations subjected all foreign slab producers to the same

²⁴ Since the price and the export quantity of the upstream product are related, it does not really matter whether we model the foreign firm setting the price or quantity of upstream product. The presentation is a bit more straightforward if we assume the foreign firm sets the price of the upstream product.

²⁵ This is consistent with actual steel industry technology, where about 1.05 tonnes of slab is required to produce 1 tonne of hot-rolled steel.

²⁶ According to Barnett (2000), minimills require about 1 man-hour to produce 1 tonne of steel and integrated mills require about 4 man-hours.

²⁷ Following industry wisdom we assume that the minimills have the lowest unit labor requirement for downstream production, followed by rollers (predominantly non-union operations), and then integrated (mostly union mills).

²⁸ We note that in circumstances where demand for steel is weak, integrated mills can expand production with decreasing marginal costs. However, US BF/BOFs are small which means that at normal demand levels integrated mills operate at or near practical capacity, particularly with respect to many grades of steel. At this point the firms have increasing costs—substantial capacity investments—unless they augment their needs with slab imports. For simplicity, we model this alternative as increasing marginal costs. In related work we examine alternative cost technologies.

tariff treatment. Loosely speaking, lumping all the foreign suppliers into a single firm captures the notion that all of the foreign suppliers would be subject to the same tariff. In practice, however, the various foreign slab suppliers cannot coordinate their actions. Hence, our model gives substantially more market power to firm *f* than any slab seller has.

A similar stipulation applies to the downstream market, namely we assume that there are only four firms. Just as in the upstream market, this likely means that we are endowing each firm with more market power than any one firm has in practice. Of the two markets, however, our sense is that the model’s “deviation” from actual market behavior is more serious for the slab market. We are endowing firm *f* with monopoly power in the slab market. As a result, we believe that our model more severely overstates the extent of firm *f*’s strategic behavior.²⁹

Second, we have deliberately abstracted away from any capacity constraint issues. In practice, capacity constraints—especially at the upstream product level—can have an important impact on market behavior. For simplicity we model integrated firms as importing slab when the marginal cost of internal production exceeds the open-market price of slab. In practice, fixed capacity also explains the open-market purchases of slab. Ignoring the capacity constraint means that our model understates the true cost of tariffs on the upstream product. Our modelling approach allows domestic firms to expand their output. A high tariff simply induces firm *b* to expand its internal production but at a higher marginal cost. In reality, it is impossible to expand beyond a BF/BOF’s maximum capacity regardless of cost. The fixed capacity will mean that a high tariff has a bigger impact than our model captures.

Despite these caveats, we believe our model captures important economic forces in the steel market. What we take from these limitations is that although the model may overstate/understate the impact of the tariff policy, the sign or direction of the impact (i.e. which firm’s output expands) is accurate. Said differently, we feel strongly that the economic intuition and lessons from the analysis are accurate, but the quantitative estimates are more illustrative than precise predictions.

5.2. Formal description

5.2.1. The downstream (hot-rolled) market

As is customary in two-stage models, we setup and solve the model backwards, first characterizing the downstream market and then the upstream market.

Thus, we begin by looking at the downstream market. We will assume that the downstream products are perfectly substitutes, so we can write the price as the inverse demand curve $P^Y = P^Y(Q_b^Y + Q_m^Y + Q_r^Y + Q_f^Y)$. Letting w (w_f) denote the exogenous cost of home (foreign) country labor, we can write the firm *b*’s profit from producing *Y* as

$$\Pi_b = \begin{cases} R_b(Q_b^Y, Q_m^Y, Q_r^Y, Q_f^Y) - P^X(Q_b^Y - Q_{bi}^X) - C_b(Q_{bi}^X) - \beta_b w Q_b^Y - \alpha_b w Q_{bi}^X, & \text{if augment,} \\ R_b(Q_b^Y, Q_m^Y, Q_r^Y, Q_f^Y; t^Y) - C_b(Q_b^Y) - (\beta_b + \alpha_b) w Q_b^Y, & \text{otherwise,} \end{cases} \tag{1}$$

²⁹ While not an absolute monopoly, Brazil has about 50 percent of the non-NAFTA slab market. The degree of concentration in slab far exceeds other flat steel markets. To keep the exposition simple, we model the upstream market as a monopoly.

where $R_b(\cdot)$ denotes the revenue from selling Q_b^Y . $C_b(Q_{bi}^X)$ is the total cost of internally producing Q_{bi}^X tonnes of X . The firm will choose to augment when $P^X = C'_b(\cdot)\alpha_b w$.³⁰

Firm m 's profit from producing Y is

$$\Pi_m = R_m(Q_b^Y, Q_m^Y, Q_r^Y, Q_f^Y) - (\beta_m w + \alpha_m w + c_m)Q_m^Y, \tag{2}$$

where c_m denotes the constant marginal cost of producing 1 tonne of the alternative upstream product (i.e. thin-slab).

Firm r 's profit from producing Y is

$$\Pi_r = R_r(Q_b^Y, Q_m^Y, Q_r^Y, Q_f^Y) - (\beta_r w + P^X)Q_r^Y, \tag{3}$$

and firm f 's profit from producing Y is

$$\Pi_f = R_f(Q_b^Y, Q_m^Y, Q_r^Y, Q_f^Y; t^Y) - (\beta_f w_f + \alpha_f w_f + c_f)Q_f^Y. \tag{4}$$

The first-order conditions can be written as

$$\frac{\partial R_b}{\partial Q_b^Y} = \begin{cases} P^X + \beta_b w, & \text{if augment,} \\ C'_b(\cdot) + \beta_b w + \alpha_b w, & \text{otherwise.} \end{cases} \tag{5}$$

$$\frac{\partial R_m}{\partial Q_m^Y} = \beta_m w + \alpha_m w + c_m \tag{6}$$

$$\frac{\partial R_r}{\partial Q_r^Y} = P^X + \beta_r w \tag{7}$$

$$\frac{\partial R_f}{\partial Q_f^Y} = \beta_f w_f + \alpha_f w_f + c_f. \tag{8}$$

The second stage Cournot equilibrium can be characterized by the equilibrium output levels $\{\tilde{Q}_b^Y(P^X, t^Y), \tilde{Q}_m^Y(P^X, t^Y), \tilde{Q}_r^Y(P^X, t^Y), \tilde{Q}_f^Y(P^X, t^Y)\}$, which simultaneously solve the four first-order conditions, (5)–(8). We will assume that the parameters are such that there is a unique Cournot equilibrium wherein the integrated firm imports some X and that the relevant second order conditions are satisfied. Substituting the Cournot equilibrium quantities into (1)–(4), we denote the second stage equilibrium profits as³¹

$$\{\tilde{\Pi}_b^Y(P^X, t^Y), \tilde{\Pi}_m^Y(P^X, t^Y), \tilde{\Pi}_r^Y(P^X, t^Y), \tilde{\Pi}_f^Y(P^X, t^Y)\}.$$

5.2.2. Workers' objective

It will be useful to also discuss the impact of the various policies on workers. Our sense is the workers' objective function (or at least as articulated by the union leaders) can be roughly stated as "maximize jobs." It is unclear, however, how broadly the employment objective is defined. Most of the minimills and even some of the rollers have little/no union

³⁰ We note that there are substantial sunk cost of BF/BOF operations. Without these sunk costs in practice some integrated mills would find it optimal to purchase all their slab on the open-market. The sunk costs, however, mandate that the BF/BOFs stay in operation. We abstract from these issues.

³¹ For notational convenience, we suppress the exogenously given wage levels w , w_f , and technology parameters, c_j , α_j , β_j , $j = b, m, r, f$.

representation. It seems reasonable to believe that union leaders only care about union jobs. Moreover, given that the disproportionate share of steel-making jobs are at the upstream stage, it is arguable that the union only cares about upstream employment.

Hence, we will consider several potential objective functions for the workers:

$$\begin{aligned}
 \text{firm } B \text{—all jobs :} & \quad \beta_b Q_b^Y + \alpha_b Q_{bi}^X \\
 \text{firm } B \text{—upstream jobs :} & \quad \alpha_b Q_{bi}^X \\
 \text{all firms—all jobs :} & \quad \beta_b Q_b^Y + \alpha_b Q_{bi}^X + (\beta_m + \alpha_m) Q_m^Y + \beta_r Q_r^Y \\
 \text{all firms—upstream jobs :} & \quad \alpha_b Q_{bi}^X + \alpha_m Q_m^Y
 \end{aligned}$$

5.2.3. The upstream (slab) market

We now turn to the stage 1 decision of the establishing the open-market price of X . Given the strategic interaction between the markets, firm f will choose the price of X incorporating its impact on both the upstream and downstream markets.

Firm f 's total profits can be written

$$\Pi_f^{\text{tot}}(P^X) = (P^X - t^X - c_f - \alpha_f w_f)(Q_b^Y - Q_{bi}^X + Q_f^Y) + \tilde{\Pi}_f(P^X, t^Y). \quad (9)$$

Maximizing total profits with respect to P^X gives rise to the first-order condition $d\Pi_f^{\text{tot}}/dP^X = 0$. The solution to which we will denote as $\tilde{P}^X(t^X, t^Y)$.

5.3. Simulating the impact of trade restrictions

In order to quantify the strategic incentives for firms to lobby for tariffs on the upstream and downstream products we will numerically solve the model described above. Parametric details are provided in the [Appendix A](#).³² Most of the computational details are relatively unimportant, but one key simplification should be noted. In our simulations we assume that demand is linear, $P^Y = \theta - \lambda(Q_b^Y + Q_m^Y + Q_r^Y + Q_r^Y)$.

[Table 2](#) summarizes our findings. We consider two scenarios which differ in the extent to which firm b augments its internal production with imports. In the first scenario we study a situation where firm b imports a large quantity of its total requirements of X (more than half in free trade). In the second scenario firm b imports a small quantity of its total requirements of X (about 10 percent).

5.3.1. High import volume/high tariff scenario

In the high import scenario, we analyze a policy where very high specific tariffs are imposed (equivalent to about a 30 percent ad valorem tariff) on one or both of the products. In each of the columns we report the impact relative to the free trade benchmark. Hence, positive (negative) numbers mean the variable of interest expands (contracts) relative to its free trade level.

5.3.1.1. Tariff on upstream imports (slab). Lets begin by looking at column 1. Here we consider a tariff on product X (slab) alone. In this case, firm f absorbs about a half of the

³²Maple code is available upon request.

Table 2

Summary: impact of tariffs relative to free trade

| | Slab tariff only (percent) | Hot-rolled tariff only (percent) | Tariff on slab and hot-rolled (percent) |
|--|-------------------------------|-------------------------------------|--|
| BOF High import volume scenario, high tariff scenario (30 percent ad valorem equivalent) | | | |
| Price slab | 17.5 | -4.5 | 13.0 |
| Price hot-rolled | 6.0 | 5.1 | 11.2 |
| Firm <i>b</i> —slab imports | -97.4 | 96.7 | -0.7 |
| Firm <i>r</i> —slab imports | -86.0 | 85.5 | -0.5 |
| Total slab imports | -91.4 | 90.8 | -0.6 |
| Firm <i>b</i> —slab internal | 12.7 | -3.4 | 9.5 |
| Firm <i>b</i> —hot-rolled production | -96.7 | 96.1 | -0.6 |
| Firm <i>m</i> —hot-rolled production | 7.3 | 6.2 | 13.6 |
| Firm <i>r</i> —hot-rolled production | -86.0 | 85.5 | -0.5 |
| Firm <i>f</i> —hot-rolled exports | 6.9 | -32.1 | -25.3 |
| Total hot-rolled sales | -3.2 | -2.7 | -5.9 |
| Firm <i>b</i> —profit | -95.7 | 275.5 | -0.4 |
| Firm <i>m</i> —profit | 15.2 | 12.9 | 28.9 |
| Firm <i>r</i> —profit | -98.0 | 244.1 | -1.1 |
| Firm <i>f</i> —profit | -3.0 | -32.2 | -40.3 |
| Workers—firm <i>B</i> , all jobs | -95.3 | 94.8 | -0.5 |
| Workers—firm <i>B</i> , upstream jobs only | 12.7 | -3.4 | 9.5 |
| Workers—all firms, all jobs | -9.8 | 20.9 | 11.1 |
| Workers—all firms, upstream jobs only | 7.3 | 6.2 | 13.5 |
| BOF low import volume scenario, low tariff scenario (10 percent ad valorem equivalent) | | | |
| Price slab | 5.8 | -1.3 | 4.5 |
| Price hot-rolled | 1.9 | 1.6 | 3.5 |
| Firm <i>b</i> —slab imports | -49.8 | 42.8 | -7.0 |
| Firm <i>r</i> —slab imports | -20.5 | 19.1 | -1.4 |
| Total slab imports | -29.7 | 26.6 | -3.1 |
| Firm <i>b</i> —slab internal | 5.2 | -1.2 | 4.0 |
| Firm <i>b</i> —hot-rolled production | -22.4 | 20.9 | -1.5 |
| Firm <i>m</i> —hot-rolled production | 2.3 | 1.9 | 4.3 |
| Firm <i>r</i> —hot-rolled production | -20.5 | 19.1 | -1.4 |
| Firm <i>f</i> —hot-rolled exports | 2.2 | -9.7 | -7.5 |
| Total hot-rolled sales | -1.0 | -0.8 | -1.8 |
| Firm <i>b</i> —profit | -8.0 | 16.2 | 4.5 |
| Firm <i>m</i> —profit | 4.7 | 3.9 | 8.7 |
| Firm <i>r</i> —profit | -36.8 | 41.9 | -2.7 |
| Firm <i>f</i> —profit | -1.6 | -11.6 | -13.7 |
| Workers—firm <i>B</i> , all jobs | -8.6 | 9.9 | 1.2 |
| Workers—firm <i>B</i> , upstream jobs only | 5.2 | -1.2 | 4.0 |
| Workers—all firms, all jobs | -2.1 | 5.2 | 3.1 |
| Workers—all firms, upstream jobs only | 3.0 | 1.2 | 4.2 |

tariff and passes the rest through to the buyers. This tariff dramatically reduces trade in product *X*. Specifically, firm *b* reduces its purchases by 97 percent. Firm *r* reduces its purchases by 86 percent. Overall, the imports of the upstream product fall by 91 percent.

Not surprisingly, the large tariff on the upstream product has an impact on downstream production. In particular, total (foreign + domestic) downstream production falls by about 3 percent. This modest fall masks a huge change in fortunes among domestic mills. Both firm *b* and *r*'s output falls dramatically. Firm *m*'s output, on the other hand, expands by 7 percent. In other words, the main impact of a tariff on the upstream product is its effect on the *distribution* of production, not total output. Given the vertical nature of production, taxing the upstream product is nothing short of having the government pick winners and losers. Taxing the upstream product puts firms *b* and *r* at a competitive disadvantage and firm *m* in a favorable position.

The output changes correspond to observed profit changes—namely, firm *b* and *r*'s profit falls while firm *m*'s profit increases.

Interestingly, protecting the upstream product is not a panacea for workers. We find protecting *X* may well hurt workers.³³ Whether a high tariff on *X* makes workers worse off depends on the relative unit labor requirements and on what jobs the union focuses. Protecting *X* does increase upstream jobs, but total industry employment falls. This seemingly paradoxical result is driven by the fact that minimills have such low unit labor requirements. Protecting *X* raises firm *b* and *r* costs and thus indirectly encourages firm *m* to expand its output. And, since firm *m* has a relatively low unit labor requirement relative to the rest of the industry, then even though firm *b* increases its internal production and firm *m* grows, total jobs will be lost in the industry. Put another way, taxing *X* encourages an expansion of the firm who has the smallest unit labor requirement. And, as firm *m* expands, firm *b* and *r* strategically respond by reducing their output (and employment). Overall, there are two reasons why taxing upstream imports lowers domestic employment: (i) raising input costs results in a reduction in total domestic production; and (ii) the firm with low unit labor requirement (firm *m*) expands its production at the expense of the firm with a high unit labor requirement (firm *b*).

5.3.1.2. Tariff on downstream imports (hot-rolled). Let's look next at column 2. Here we consider a tariff on product *Y* (hot-rolled) alone. In this case firm *f* absorbs about four-fifths of the tariff. Relative to the above scenario, competition from the other three firms significantly restricts the extent to which firm *f* can pass through the tariff. Importantly, protection in the downstream market has an impact on upstream input prices; in this case, lowering the price of *X* by about 4 percent. The tariff on *Y* reduces firm *f*'s exports by about 32 percent.

As one would expect, reducing firm *f*'s presence in the market results in expanded production by the three domestic firms. This in turn leads to greater trade in product *X*. Specifically, in order for both firm *b* and *r* to efficiently expand output they need to import more *X*. As a result, firm *m* is only able to expand its production by about 6 percent.

³³ We also modelled the objective as jobs at both the upstream and downstream product level, i.e. depending on total output. Our results are the unaffected—namely, workers can be made worse off by reducing upstream imports.

However, in comparison with firm *b* and *r*, firm *m* loses market share. Overall, all three domestic firms production and profits increase as a result of the tariff on *Y*. Thus, these results suggest that firm *m* would prefer not to have only downstream protection because relatively speaking, its rivals do better.

Finally, protecting *Y* benefits workers (i.e. raises domestic employment). Not only does overall industry output expand, but the output of each firm grows. While there is a small distributional impact, it favors the firms with higher unit labor requirement, which further bolsters workers.

5.3.1.3. Tariff on both upstream and downstream imports. We now turn to column 3. Here we consider a large tariff on both product *X* (slab) and product *Y* (hot-rolled). This is the scenario that most closely matches the policy recommendation of Nucor, the minimill coalition, and the United Steelworkers. In this case, firm *f* absorbs most of the upstream and downstream tariff. The large tariffs reduce trade both products, but has an especially big impact on product *Y*, lowering import volume trade by more than 25 percent. The impact on upstream sales is muted because the price increase on the downstream product.

Relative to a tariff on the downstream product alone (column 2), the addition of restrictions on the upstream product harms firm *b* and *r*. Specifically, when the tariff is levied on the downstream product alone, both firm *b* and *r*'s output expands significantly; when the tariff is levied on both the upstream and downstream products, both firm *b* and *r*'s output falls by about 1 percent. In terms of profitability, firm *b* and *r* both prefer a policy involving a tariff on *Y* only.³⁴

The fact that restrictions on the upstream product hurt domestic firms is not entirely unexpected. After all, the policy essentially raises the costs of production for firms *b* and *r*. What might be surprising, however, is that workers are also worse off when the tariff is levied on the upstream product. When comparing all three policies, the most preferred policy for the workers is simply the policy where a tariff is levied on the downstream product alone. Perhaps to the surprise of the workers, taxing upstream trade hurts their cause. Why? Because it tilts the playing field in favor of firms who have low unit labor requirements.

Well, if firm *b* and *r* are worse off, and the workers are worse off, who benefits from taxing both upstream and downstream products? The firm with the alternative technology—firm *m*. Taxing upstream imports results in firm *m* looking relatively more efficient than it is under free trade. The tax on product *X* has no impact on firm *m*'s costs, but raises the costs of its rivals. Intuitively, this means that the best response function of the other three firms (*f*, *b* and *r*) all shift in, and induce an expansion in firm *m*'s output. As a result, firm *m*'s output and profit increase relative to a policy where only the downstream product is taxed.

In summary, the model suggests that only one domestic constituent is unambiguously better off when the government taxes both upstream and downstream trade—firm *m*. All other interested parties are worse off, either relative to free trade (firm *r*) or relative to a policy where only downstream trade is taxed (firm *b* and workers).

³⁴ This result reflects the fact that both *b* and *r* import a high volume of slab. If firm *b* imports no slab, it would prefer protection on both *X* and *Y*.

5.3.2. *Low import volume/low tariffs scenario*

In the preceding analysis the benchmark free trade equilibrium involved a substantial quantity of X imports. As an alternative we now simulate a situation where in free trade imports augment only about 10 percent of firm b 's production. We believe this scenario is interesting since in recent years the US imports about 10 percent of its slab requirements. However, given the relatively low volume of the upstream product imported, a 30 percent tariff is prohibitive. In fact, any tariff much larger than 10 percent ad valorem results in firm b ceasing to purchase any imports. Because we believe that technological restrictions and capacity limitations imply that BF/BOF firms must import slab, we restrict ourselves to studying the impact of tariffs of only about 10 percent ad valorem.

As it turns out, the qualitative results are remarkably similar to those presented above. Generally speaking, all of the key results continue hold. Namely, taxing the upstream product benefits firm m at the expense of firms b and r . In fact, adding upstream tariffs to a policy with tariffs on the downstream product essentially leaves firms b and r output unchanged relative to the “no tariff” scenario. Their profits are higher due to the downstream price distortion, but these means consumers are being taxed with no real production benefit to a large set of the domestic industry. On the other hand, adding upstream tariffs to a policy with tariffs on the downstream product doubles the impact on firm m . Both the high and low tariff simulations make it clear that taxing the upstream product serves primarily to raise the costs of domestic firms in order to benefit another part of the domestic industry.

As we saw in the above scenario, taxing upstream production has an ambiguous impact on steelworkers. Specifically, taxing upstream imports only benefits steelworkers if their objective is simply to maximize upstream jobs.

More precisely, not all sectors of the domestic industry use the same upstream inputs which implies that, in taxing imports of finished steels and imports of slab, the government is taxing all downstream trade but only *some* kinds of upstream trade. So perhaps more accurately, the problem in the steel 201 case is in large part due to the selective protection of upstream trade. Relative to free trade, taxing X lowers overall steel employment but does result in gain at the upstream stage. Relative to only taxing Y imports, taxing X reduces overall employment.

6. Conclusions

In this paper, we have examined that a decision made even before the steel 201 case was initiated—to include slab as part of the investigation—has led to a remedy that likely poses serious competition/antitrust policy concerns. Our results suggest that the Justice Department should carefully scrutinize the conduct of such investigations.³⁵ Whereas Congress may have intended to disadvantage to foreign rivals, it is far less clear that Congress intended the trade authorities to pick winners and losers among domestic firms.

The results in this paper suggests that the industry definition used in the investigation was overly broad and inevitably forced the President to make a choice over what set of

³⁵Note that the problems are from an economic perspective. We realize that from a legal perspective, efforts to petition the government (i.e. seek protection) are largely protected under the Noerr–Pennington doctrine.

firms he wanted to favor. If he excluded slab from the remedy, he would allow capacity constrained BF/BOF mills and rollers to continue to operate profitably. If he included slab in the remedy, he would put those mills at jeopardy and encourage the expansion of the minimill sector.

In contrast with the rhetoric, our analysis indicates that there was really no “fair” remedy. In deciding whether or not to include slab the President was in effect making a decision whether or not to hurt one set of firms. As it turned out, the President chose to favor the minimills at the expense of the mills that rely on imported slab.

Our analysis also indicates that the restricting slab is not a panacea for workers. Raising the costs of slab puts all integrated mills at a competitive disadvantage, not just the rollers. Even mills like US Steel who import relatively small quantities of slab will be faced with higher marginal costs of production. As a result, the minimills will expand their production. While bolstering domestic production sounds good to the steelworkers, the firms experiencing the greatest gains are mills who use the fewest workers. And, as the minimills expand, the BF/BOF mills will lose sales. On net, we show that levying tariffs on slab may well reduce the number of steelworkers jobs.

The findings of this paper should not be viewed as only applying to the recent US steel safeguard case or safeguard cases more generally. Rather, the message is equally applicable to antidumping protection. When cases are selectively filed on upstream and downstream products the government ends up picking winners and losers instead of promoting overall industry health.

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Appendix A

We make the following assumptions:

- (Inverse) demand for downstream product

$$P^Y = \theta - \lambda(Q_b^Y + Q_m^Y + Q_r^Y + Q_r^Y),$$

where $\theta = 5000$, $\lambda = 1/100$.

- Firm b cost function $C_b(Q_{bi}^X) = \rho(Q_{bi}^X)^\eta$, where we will set
 - Cost function-high volume scenario $\rho = 0.5, \eta = 2.5$
 - Cost function-low volume scenario $\rho = 0.005, \eta = 2.25$.
- Constant marginal costs $c_f = 140, c_m = 225$.
- Wages $w = 40, w_f = 10$.

- Unit labor requirement—upstream product $\alpha_m = 1, \alpha_b = 4, \alpha_f = 5$.
- Unit labor requirement—downstream product $\beta_m = 1, \beta_r = 1.5, \beta_b = 2, \beta_f = 2$.

References

- Barnett, D.F., 2000. Seizing the competitive advantage. *World Steel Dynamics*.
- Barnett, D.F., Crandall, R.W., 1998. Steel: decline and renewal. In: Deutsch, L.I. (Ed.), *Industry Studies*. M.G. Sharpe, Armonk, NY.
- Barringer, W.H., Pierce, K.J., 2000. Paying the Price for Big Steel: \$100 Billion in Trade Restraints and Corporate Welfare. American Institute for International Steel, Washington, DC (available online at <http://www.aiis.org>).
- Baumol, W.J., Ordover, J.A., 1985. Use of antitrust to subvert competition. *Journal of Law and Economics* 28, 247–265.
- Brennan, T.J., 1988. Understanding ‘raising rivals’ costs. *Antitrust Bulletin* 33, 95–113.
- Ghemawat, P., Stander, H.J., 1992. Nucor at a Crossroads. Harvard Business School Case Study No. 9-793-039 (revised 1998).
- US International Trade Commission, 1984. Carbon and Certain Alloy Steel Products—Investigation No. TA-201-51. USITC Publication, 1553.
- US International Trade Commission, 1995. Economic Effects of Antidumping and Countervailing Duty Orders and Suspension Agreements. USITC Publication, 2900.
- US International Trade Commission, 2001. Steel—Investigation No. TA-201-73. USITC Publication, 3479.
- Moore, M.O., 1996. Steel protection in the 1980s: the waning influence of big steel? In: Krueger, A.O. (Ed.), *The Political Economy of American Trade Policy*. University of Chicago Press, Chicago, pp. 73–125.
- Rodrik, D., Yoon, C.H., 1995. Strategic trade policy with potential for import substitution. *Journal of Economic Development* 20, 37–56.
- Salop, S.C., Scheffman, D.T., 1983. Raising rivals’ costs. *American Economic Review* 73, 267–271.
- Salop, S.C., Scheffman, D.T., 1987. Cost-raising strategies. *Journal of Industrial Economics* 36, 19–34.
- Spencer, B.J., Jones, R.W., 1992. Trade and protection in vertically related markets. *Journal of International Economics* 32, 31–55.
- Yost, C., 1996. Thin-Slab Casting/Flat-Rolling: New Technology to Benefit US Steel Industry. USITC Industry, Trade, and Technology Review.