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Industrial Policy and Downstream Export Performance^{*}

(Running Head: Industrial policy and downstream exports)

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Abstract: Industrial policies (IPs) are commonly used by countries to promote targeted sectors, but may have significant impacts on downstream sectors. Using a new hand-collected database of steel-sector IP use in major steel-producing countries, I find that IP use is quite harmful to downstream sectors. A one-standard-deviation increase in steel IP presence leads to a 1.2% decline in export competitiveness for the average downstream manufacturing sector in the first few years of its application, and a 6% decline for downstream sectors that use steel most intensively. These results are largely driven by the less-developed countries in my sample.

Keywords: Export subsidies; Import protection; Steel; Non-tariff barriers; Cartels. **JEL Codes:** F13, H81

1. Introduction

Industrial policies (IPs) to nurture an industry may be motivated by a number of reasons.

The first may be an infant industry argument that the country will have a comparative advantage in

the sector once firms in the sector are provided help to overcome entry barriers, particularly in an

industry where economies of scale or learning-by-doing effects are important.¹ Second, an industry

may be seen as a gateway industry, where its development brings crucial knowledge and

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¹ Melitz (2005) provides a formal model with learning-by-doing effects and shows how quotas can be more likely to be welfare-enhancing in such circumstances than tariffs or production subsidies.

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technologies that provide easier entry into the production of more complex and skill-intensive manufactured goods, spurring economic development. Finally, a domestic industry may be protected from import competition because a country feels the domestic industry can better provide specialized products and service to local downstream industries than import sources.

On the other hand, IPs to encourage domestic production often involve practices, such as protection from imports, which can substantially raise the domestic price of an industry's goods. This raises input costs to downstream sectors and can significantly hinder their development and hurt economic growth. While such effects may be seen as the short-run cost to protect an infant industry, Miyagiwa and Ohno (1999) show that sectors can become dependent on IPs and remain uncompetitive, unless the government has quite a bit of information and can credibly commit to discontinue the IPs after an appropriate time period. This can lead to long-run competitive issues for the downstream industries as well, as seen in this quote from a media article on South Africa, a long-run user of extensive IPs in the steel sector:

"South Africa's manufacturing sector... has performed poorly over the past 10 years ... One of the reasons for this is monopolistic provision and pricing of key inputs into manufacturing, including steel. Almost 80% of steel sales in South Africa are directed at the manufacturing and construction sectors. In addition, basic iron and steel are significant inputs into one of the chosen sectors of the second Industrial Policy Action Plan (IPAP2) — metals fabrication, capital and transport equipment. Government thus has a strong interest in ensuring South Africa gets iron and steel at competitive prices." (Financial Mail, March 12, 2010, http://www.fm.co.za/Article.aspx?id=103522)

Using a new hand-collected database of steel-sector IP use in major steel-producing countries, this paper examines whether steel-sector IPs have a significant impact on the export competitiveness of the country's other manufacturing sectors, particularly those that are significant downstream users of steel. Steel products are a significant input to many sectors of the economy, particularly the manufacturing and construction sectors, and are particularly important in the production of investment goods and infrastructure. Thus, availability and quality of steel products can play a major role in the productivity and growth of a country. This is likely a major reason why

the steel sector has been a significant focus of industrial policy in both developed and developing economies throughout the history of the industry.

The paper's empirical strategy is to use the combination of cross-country variation in steelsector IPs and cross-sectoral variation in the importance of steel as inputs to identify the effect of such policies on a sector's export growth. I examine the effect on exports, versus other performance measures of downstream sectors, such as output growth, because of the wide availability and consistent measurement of export data across countries and sectors. In addition, export activity is also seen as an important indicator of growth and development. Unlike studies of input tariffs, there is a wide range of different IPs that countries may employ. These include nontariff barriers (such as quantitative restrictions on imports like quotas) that should have similar effects to input tariffs of raising domestic prices on the inputs and hurting downstream export competitiveness. But they also include domestic production subsidies and grants that could lower prices of steel and help export competitiveness of downstream sectors. This makes the issue of the general effect of IPs on downstream competitiveness an important empirical one.

Across a sample of 22 steel-producing countries from 1975 through 2000, I find evidence that steel-sector IPs have a significant negative impact on the export-performance of downstream industries. My estimates indicate that a one-standard-deviation increase in IP presence leads to a 1.2% decline in export competitiveness for an average downstream manufacturing sector in the first few years of its application where steel accounts for about 3% of its inputs. This effect is 5 times higher (or roughly 6%) for major steel-using downstream sectors, such as fabricated metals and machinery. Long-difference estimates suggest that the cumulative effect of steel IPs can be four to five times larger than this.

My results also suggest that these IP effects on downstream export performance are largely driven by less-developed countries (LDCs) in my sample, though country-by-country regressions show a negative and significant effects of steel IPs on downstream competitiveness in a few

developed countries as well. In general, the negative effect of IPs on downstream export values operates through lowered export quantities, but I do find evidence that export prices increase (or do not fall as much) in differentiated-goods sectors from higher input prices from the steel IPs, most likely due to market power effects. Exploring the heterogeneous effects of different types of IP policies, I find that export subsidies and government ownership have the most harmful effects on downstream export competitiveness.

The paper proceeds first with a review of a prior literature that has focused almost exclusively on the effects of import tariff protection on downstream industries, not the broader range of IPs that this paper will examine. Prior studies are also invariably single-country level studies, unlike this one, which analyzes the extent to which these effects vary across different types of countries. The literature review is followed by section 3, which provides a discussion of expected effects of steel IPs on downstream industries. Section 4 presents an empirical strategy for identifying of the effect of IPs on downstream export competitiveness and section 5 details the data used for analysis. Section 6 provides econometric estimates and section 7 concludes.

2. Literature Review

Despite an immense literature on the effects of trade protection policies, there are relatively iew studies that have examined the effects of protection on downstream sectors. Hoekman and Leidy (1992) and Sleuwaegen *et al.* (1998) introduce a theory of cascading protection, whereby trade protection in an upstream sector induces a greater likelihood of trade protection in downstream sectors, and detail conditions under which cascading protection is more likely. Feinberg and Kaplan (1993) empirically examines this hypothesis directly and finds evidence that U.S. antidumping (AD) and countervailing duty (CVD) cases are more likely in an industry when an upstream industry has been successful in garnering AD and CVD protection. A couple other papers have examined whether AD or safeguard protection leads to significant downstream effects. Krupp

and Skeath (2002) look at downstream effects from U.S. AD investigations as well, and find that such import protection has significant negative impacts on production in the downstream industries. Liebman and Tomlin (2007) conduct an event study of stock market reactions to U.S. steel safeguard events on both steel producers and major steel consumers, including firms in transportation, metal fabrication, and construction. They find there were significant negative effects on downstream-users of steel from the U.S. steel safeguard actions, though secondary regressions do not find a link between the cost share of steel in these sectors and these downstream effects.

Computable general equilibrium (CGE) models often model input-output linkages and then provide estimates of economic impacts across many sectors from trade liberalization in a particular sector. For example, de Melo and Tarr (1990) estimate the welfare effects of quotas in the U.S. steel, auto and apparel and textile sectors with a CGE model. Among their findings is that the simultaneous removal of quotas in these three sectors actually leads to employment and output gains in the automobile sector, which they explain as due to the lower steel prices enjoyed by autos after quota removal in steel. Francois et al. (1996) is another example of a CGE exercise where input-output linkages are important to the analysis. The study examines the effects of the Jones Act, which restricts the provision of domestic cabotage services (transport of goods between domestic ports) in the U.S. to domestic carriers only. Since cabotage is an important upstream sector for so many other sectors in the economy, their analysis provides not only an overall welfare estimate from removing the Jones Act restrictions, but also the output, employment, export, and import effects for the many downstream sectors in the economy. A final example is USITC (1989), which explores the effects of U.S. steel VRAs on downstream users of steel. With an estimated tariff equivalent of the VRAs around 4% for their focus years, they find only modest effects on downstream output, employment, and exports.

A limitation of CGE models is that one has to come up with an estimate of the market distortion that relies to some extent on information outside of the model. While this is not as problematic with explicit tariffs, it is more difficult for non-tariff distortions.² For example, the Francois *et al.* (1996) study found that outside estimates of the price wedge due to the Jones Act distortion ranged from 100% to 300%, and thus present the reader with three scenarios of possible effects. This contrasts with the empirical regression analysis I use in this paper to estimate an average effect of various non-tariff IPs in my data sample through variables simply indicating the presence of such policies.

More recently, a number of studies have used micro-level data to examine the impact of lower input prices from tariff liberalization on firm- or plant-level productivity. Using Indonesian data, Amiti and Konings (2007) finds that lower input tariffs leads to productivity gains of downstream firms (not just better competitiveness from lower input costs), and that these productivity gains from input liberalization are greater than those from liberalization of the output market. Topalova and Khandelwal (2011) finds similar results using Indian data. Goldberg *et al.* (2010) focuses on how lower input tariffs lead to the introduction of new input varieties, which proves to also be an important source of downstream productivity gains in the sample of Indian plants they examine. Chavassus-Lozza *et al.* (2013) uses firm-level data of French food processing firms and examines the impact of input tariff liberalization on downstream export firm behavior. They develop a model that suggests that input liberalization may help the high-productivity exporting firms at the expense of the lower-productivity exporters, and their empirical analysis finds that input liberalization leads to significant exit of the lowest productivity exporters.

Relative to this previous literature, this study has two main contributions. First, unlike previous studies, I examine the effects of an entire array of IPs, not just tariffs, on the economic performance of downstream industries. Thus, I analyze a much fuller set of policies that distort

² Of course, estimation of tariff effects still requires estimates (outside the model) of key elasticities and related parameters, which is another common critique of CGE model analysis.

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market outcomes, as well as examine heterogeneity in the effects of these various IPs. Second, I do this in the context of a panel of countries, not just a single country. Previous studies have been single-country studies of firm- or plant-level data, which focus almost exclusively on less-developed countries, such as Chile, India, and Indonesia. I make the trade-off of exploring more aggregate product-level data, but across a variety of countries – both developed and less-developed. The steel sector has been subject to significant and changing IP policies across many countries, allowing analysis of heterogeneous effects across different types of countries in a consistent framework.

3. Expected Effects of Steel IPs on Downstream Export Competitiveness

The general hypothesis underlying this paper's analysis is that IPs targeted at an upstream industry (here, the steel industry) will affect exporting behavior in the downstream sectors using these inputs. The expected effects depend on 1) how the IP directly affects the targeted upstream sector in various dimensions, particularly price and quality; and 2) the nature of market competition in the downstream industries, as this will affect how firms in those industries respond to changes in input prices and quality.

3.1. IP Effects on Targeted Steel Sector

IPs can have differing and sometimes opposing effects on prices in the targeted (upstream) industry. IPs that limit competition in a substantial way will lead to higher prices. This includes IPs that limit imports in the target sector (e.g., quotas and AD protection) or government sponsored cartel activities, such as coordinated efforts to limit quantities in the market and/or set prices above competitive levels. It is also well known that export subsidies will raise domestic prices in the targeted sector, as firms will require a higher price to sell domestically to cover the export subsidy they forego. On the other hand, there are IPs that may lower prices in the targeted sector. The most prominent example is production subsidies, which effectively lower the private costs of

production for the targeted domestic firms. Governments can also choose to use direct price controls to keep prices below market prices. Though this policy also may lead to the well-known consequence of production shortages in the economy.

A complicating factor is that governments often apply a combination of IPs in practice, which can make it difficult to hypothesize the net effect of a combination of policies. For example, if governments use production subsidies to keep inefficient domestic firms in operation while simultaneously limiting imports, the net effect may very well be higher prices than would be observed in a free market, despite the presence of large production subsidies. A second example may be IPs to limit import competition in a target sector coupled with price controls meant to not let prices go above some set maximum. Here, the net effect of this combination depends on where the maximum price is relative to the market price. This is an important issue as the data show that countries average nearly four (out of eight) different types of IPs in place in their steel sector in any given year in our sample. As a result, our initial focus will be to estimate the net effect of the total number of steel IPs in place in our empirical analysis below.

Another dimension in which IPs targeted at an upstream sector can affect production and supply of that good to other (downstream) industries, is through quality. For example, the quality of imported and domestic varieties may vary. If imports are a source of high-quality products that domestic firms cannot match, IPs limiting imports will reduce the average quality of inputs available to the downstream firms and likely affect the quality of their products. It is also possible that IPs could be targeted to increase the quality of products in the targeted sector: for example, through R&D subsidies. However, there is no evidence of IPs targeted in this way in the steel IP database I have collected. On the other hand, there is significant anecdotal evidence that IPs limiting imported steel have harmed the availability of high quality steel products.³ In addition, if

³ For example, the 2001 U.S. steel safeguards led to thousands of "exclusion requests" by users of steel to exclude certain imported steel products that were not available locally from domestic U.S. steel producers. (Bown, 2013)

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lower competition leads to less incentives for domestic firms to innovate and invest in quality, IPs limiting domestic competition may also lead to lower quality inputs.

3.2. IP Effects on Downstream Industries

To understand the expected effects of upstream IPs on the downstream exporting behavior, let us start with the simplest case: Downstream firms are price takers on the export market, imported and domestic inputs are perfect substitutes for each other, and the industrial policies will lead to a rise in input prices (e.g., the case of import protection).⁴ In this case, the higher input prices will cause the downstream price-taking firms to reduce their export quantity with no change in export prices due to the assumed price-taking behavior of the firm. Thus, export value will go down as well.

Now relax the assumption of perfection competition in the downstream export markets. It is a well-established theoretical result that higher input costs will cause firms to supply less quantity, ceteris paribus, for any reasonably plausible market structure and well-behaved cost and demand conditions. Thus, our predictions on export quantity are invariant to market structure. However, the effect of upstream IPs on the export prices of downstream firms is ambiguous when downstream firms have some degree of market power in their export markets. For example, a higher input price on a downstream monopolist firm could lead to an increase or decrease in the export price depending on the convexity of demand. (Feenstra, 2004, pp. 221-223) Game theoretic models of oligopoly markets likewise generate ambiguous predictions on the effect of an input tax on (export) prices, depending on the nature of the strategic interaction.

Relaxing the assumption of perfect substitutability between domestic and imported steel is important to consider as well. Less substitutability means that it is more costly for downstream

⁴ For simplicity, we assume that either the downstream firms only serve export markets or, if they serve the domestic market as well, that demand and production costs between the domestic and export markets are independent of each other.

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sectors to adjust to an IP policy that affects one of these sources of steel. For example, limitations on imported steel will be more costly to downstream firms if they cannot easily substitute domestic steel for the imported steel.⁵ This also connects to the issue of product quality. Consider the case where imported varieties of the imported sector are higher quality than domestic varieties and IPs limit imports and, therefore, lead to declines in the average quality of inputs for the domestic industry.⁶ Making the natural assumption that lower-quality inputs also lower the quality of the downstream firms' products and that consumers prefer higher quality products, ceteris paribus, we expect lower demand for the downstream industry's products. And lower demand leads to lower quantities, lower prices, and lower total export value for the downstream firms.

In summary, most IPs we see in the steel sector (as described in section 5) are ones we expect to raise the price of domestic steel. This means higher input prices for downstream sectors, which should then translate into lower export quantities. Export price effects are ambiguous depending on the market power of the downstream firms, and this makes the net effect on export values ambiguous as well. And product substitutability and quality issues contribute additional ambiguity, especially to the magnitude of effects we will observe to downstream export performance. These theoretical ambiguities make empirical evidence on the net effect of upstream IPs on downstream industries even more important. As we will see below, our empirical evidence indicates that IPs generally lead to significantly lower export values due to lower quantities and unaffected prices. This is consistent with the simple case where exporting firms generally have little to no market power in their export markets.

⁵ Of course, less substitutability between imported and domestic producers of steel, lessens direct competition and then means that IPs to limit imports would be less effective at having an impact on the domestic steel firms' pricing and quantity decisions.

⁶ It is not clear that IPs would lower quality. Most IPs are likely to distort competition in some fashion and Aghion *et al.* (2005) shows that the effect of competition on innovation could be either positive or negative, following an inverted-U shape. Relatedly, Amiti and Khandelwal (2013) find that import competition could either spur greater or lesser quality upgrading by domestic firms, depending on how close to the frontier are the domestic firms' products. Other literatures suggest that import protection could spur quality upgrading by import sources depending on the type of import protection (see e.g., Feenstra, 1988) and that the response of domestic innovative activities to an IP depend on the credible commitment of governments to limit the period of the IP (see Ohno and Miyagiwa, 1999).

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4. Empirical Specification

To identify the effects of steel sector IPs on downstream export performance, I use a specification that is analogous to that used by Rajan and Zingales (1998) and, more recently, Manova (2008). In their settings, they use heterogeneity in external financial dependence across sectors to identify the effects of financial policies and events at the national level on growth. Here, I use heterogeneity in sectors' requirements of steel inputs to examine the impact of national-level IPs on downstream export competitiveness. In particular, one can estimate the impact of IPs on downstream export performance with the following empirical specification:

 $T_{cit} = \beta_1 IP_{ct} + \beta_2 StSh_{ci} + \beta_3 (IP_{ct} \times StSh_{ci}) + \beta_4 GDP_{ct} + \rho_c + \gamma_i + \tau_t + \varepsilon_{cit}$ (1) where T_{cit} is the log of the value of country *c*'s exports in year *t* in sector *i*, IP_{ct} is a country-time measure of steel sector IPs, $StSh_{ci}$ is the share of steel in sector *i*'s output in country *c* in time *t*, GDP_{ct} is a country-time measure of GDP, the ρ , γ , and τ terms are country-, sector-, and time-fixed effects, and e_{cit} is a mean-zero error term. The focus is on the third term on the right-hand side and the sign and significance of b_3 , with a positive sign suggesting that IPs improve export competitiveness and a negative sign indicating that they have a deleterious effect.

I choose to estimate a specification that is simpler, but even more demanding on the data than equation (1), for identification:

$$T_{cit} = \beta_1 (IP_{ct} \times StSh_{ci}) + \eta_{ci} + \theta_{ct} + \varepsilon_{cit}$$
(2)

In equation (2), I replace the country-, sector, and time-fixed effects with country-sector and country-time fixed effects, η_{ci} and θ_{ct} , respectively. The country-time fixed effects (θ_{ct}) subsume the independent effects of the IP and GDP terms on exports, as well as any other observed or unobserved country-time effects on exports, such as exchange rate movements. The country-sector fixed effects (η_{ci}) subsumes the independent effect of the steel share term ($StSh_{ci}$), as well as any other observed country-sector effects on exports, such as country-specific

endowments that determine the underlying long-run comparative advantage of a country's sector. I first-difference the data by country-sector to control for unobserved country-sector fixed effects, as well as to mitigate time-series issues.

I also cluster at the country-sector level, which effectively adjusts the standard errors for any remaining autocorrelation.

Endogeneity concerns seem fairly minimal with this specification. The steel-share is an input-output relationship, which is related to technological requirements of production. The use of these input-output relationships from the final year of sample (2000), when IP presence was lowest for most countries, further ensures the likely exogeneity of this variable across the many years in the sample. The decision on IPs in the steel sector are also likely reasonably exogenous to exporting behavior in other sectors. As the quote in the introduction from South Africa suggests, policymakers are unlikely to consider extra-sectoral consequences very much when making sectoral policy decisions. It's possible that IPs in the steel sector lead policymakers to consider effects on the sectors that use steel most heavily and possibly employ IPs in these downstream sectors to mitigate the effects of IPs in the steel sector. This would make it less likely that I find any effects of steel IPs on downstream sectors. Third factors, such as GDP growth of the economy or exchange rate movements could induce spurious correlation from omitted variable bias, but these will be controlled for with the use of country-sector and country-time fixed effects.

5. Data

There are three important sources of information that I use to implement estimation of the empirical specification in equation (2): industrial policy measures, export data, and data on the importance of steel in the manufacture of various downstream sectors.

The dependent variable is the value of country *c*'s exports in year *t* in sector *i*. These data come from the United Nation's COMTRADE database (retrieved via the World Bank's World

Integrated Trade Solution (WITS) database) at the 5-digit Standard International Trade Classification (SITC), Revision 1, level for the years 1975 through 2000. I drop the steel sector from my sample, as my focus is on the effect of steel IPs on downstream sector competitiveness, which should have the opposite effect as that on the steel sector itself.⁷ As discussed below, the sample of countries is determined by the availability of IP data. Given the skewness of the data, I take the natural log of the export variable.

The key independent variable is the interaction of the IP measure and the input share of steel in a sector. I begin by describing my measure of IPs (IP_{ct}), as it was the most difficult to collect, and limitations in its availability put tighter constraints on the data sample than the other data necessary for estimation. Simply put, there is no common source of data on various countries' IPs in various sectors. And this is typically true even when searching at an individual country level. I was able to overcome this with respect to steel sector IPs by relying on two main sources of information. The first is Howell et al. (1988), which is a rich source of information with well-documented case-study information on steel-sector IPs for the major steel-producing countries going back through the decades prior to the late 1980s. The second main source was *Trade Policy Reviews* that the General Agreement on Tariffs and Trade (GATT) began to publish in the late 1980s for its major member countries every 3-5 years.⁸ These provide general overviews of government policies affecting the country as whole, as well as at sectoral levels.

I also relied on other sources for additional detail, when needed, and corroboration of my primary sources. The first supplemental source comes from a European Commission publication, *European Commission Report on Competition Policy*, which provides information on IPs across sectors for the member European countries, many of which are important world steel producers. A second supplemental source of information comes from the detailed reports on foreign government

 ⁷ I do not include observations from any country-sector pair where there was no trade over the entire sample as my identification relies on variation within country-product time series.
 ⁸ These reports are available online back to 1995 at the WTO webpage:

http://www.wto.org/english/tratop_e/tpr_e/tpr_e.htm

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subsidization programs published in the U.S. *Federal Register* by the International Trade Administration (ITA) of the U.S. Department of Commerce in their notices of their U.S. CVD investigations. The U.S. steel industry has been a major user of AD and CVD investigations since 1980 against virtually all countries exporting steel to the United States. In a CVD investigation, the ITA investigates any and all government programs, policies, and other interventions that may constitute government subsidization of an industry. Their reports document their findings on these programs, including a short history of the policy going back in time, including the initiation of the program.

A critical feature of the history of U.S. steel CVD investigations is that the steel industry has been very comprehensive in filing these CVD cases across virtually all import sources, particularly in three distinct time periods. The first time period was the early 1980s, when hundreds of AD and CVD cases were filed and ultimately led to the imposition of comprehensive VRAs on U.S. imports of steel. The second time period was after the VRAs were allowed to expire in 1992, which was quickly followed by (again) hundreds of AD and CVD cases. A final period was in the late 1990s, after the Asian Financial Crisis led to a significant import surge of "cheap" steel, sending many U.S. steel firms into bankruptcy by 2000. This period also saw scores of AD and CVD cases filed by the U.S. steel industry. These three events then give us a fairly comprehensive snapshot of non-U.S. government IPs through the ITA CVD reports accompanying the investigations. Blonigen and Wilson (2010) provide more detail on U.S. CVD activity in the steel sector and similarly use the ITA reports to construct measures of foreign government subsidization, which they then use to estimate the impacts of such foreign subsidization on the U.S. steel industry.⁹

A final supplemental source was newspaper articles searched through Lexis-Nexis. This was particularly important for determining exact timelines for instances where governments finally privatized the majority of their national steel firms.

⁹ The reader can access the detailed timelines I was able to put together for all U.S. CVD cases in steel at: http://pages.uoregon.edu/bruceb/Steel Subsidy Programs Detailed in U.S. CVD Cases.xls.

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I use these sources of information to categorize the annual presence of various steel-sector IPs in 22 major steel-producing countries from 1975 through 2000.¹⁰ In particular, I create indicator variables for the presence of the following IPs in a country's steel sector in a given year: 1) export subsidies, 2) government production subsidies (typically in the form of grants, funds for capacity expansion, or favorable loans), 3) government ownership, 4) national or regional cartel arrangements, 5) price controls, 6) quotas and other quantitative restrictions on imports, 7) AD/CVD measures¹¹, and 8) import licensing. While there is sometimes information that relates to the magnitude of the IP (e.g., whether government ownership is full or partial), it is not reported in a consistent or frequent enough fashion to employ in my sample of countries and years. An appendix describing and documenting how I coded these IP measures, as well as data sources, is available online at http://pages.uoregon.edu/bruceb/Steel IP Database Appendix.pdf. As mentioned in section 3, IPs can have various (and sometimes opposing) effects on the targeted sector and, in turn, the downstream sectors. Five of the eight IPs are expected to increase domestic steel prices – export subsidies, cartels, quotas, AD/CVD, and import licensing. Import licensing, however, can range significantly from automatic licensing, which only imposes some paperwork but no threat of denial, to licensing programs that severely curtail imports. My sources had little information on the type of import licensing program. One program, production subsidies, is expected to lead to *lower* steel prices and, hence, help downstream export performance. Finally, government ownership and price controls, are ambiguous in their expected effects on steel prices.

Price controls could be used to either set minimum or maximum steel prices, which would have opposite effects when binding. My sources did not have consistent information on whether

¹⁰ The countries are Argentina, Austria, Belgium, Brazil, Canada, Finland, France, Germany, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, South Africa, South Korea, Spain, Sweden, Taiwan (1989-2000 only), Turkey, the United Kingdom, and the United States. I end the sample at 2000 because there have not been major comprehensive CVD filings in steel since then, but also because the steel industry went through a massive worldwide restructuring in the early 2000s. This was characterized by major bankruptcies and cross-border mergers.

¹¹ A country had to not only have AD/CVD laws, but also AD/CVD activity against steel products before I coded AD/CVD measures as "present."

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governments were using prices controls to prop up steel prices or keep them from getting too expensive for downstream sectors. With respect to government ownership, there is substantial anecdotal evidence that government ownership leads to inefficient management and higher output costs. On the other hand, government ownership may come with implicit subsidization of production that I do not otherwise pick up in my production subsidy IP measure. For my base empirical specifications below, I use a measure of total IP presence that adds up these eight IP indicator variables in order to understand the net effect of the multiple IPs that governments typically apply to their steel sectors. But I then examine whether there are differences in the effects across these various types of IPs.

Table 1 provides descriptive statistics of these eight IP indicator variables. As one can see, IP usage is quite high for this sample of countries. Each type of IP is present in at least 28% of my sample's observations, with import licensing (68%), production subsidies (72%), quotas (57%) and government ownership (52%) each present in over half of the observations. The average number of IPs present for a country at any given time in my samples is nearly four, indicating that substantial layering of multiple IPs at once is common.

Figure 1 displays the substantial variation in the presence of IPs across countries during the sample years. On one side is Canada, New Zealand and the United States, which each average two or fewer annual steel IPs. In contrast are Taiwan and a number of European countries (Belgium, France, Italy, and Spain), which average around five or more annual steel IP types during the sample years.

The sample also displays rich variation in IP presence over time and across countries. The solid line in Figure 2 displays the pattern of the average number of steel IP types present in all countries in my sample over time. There is a general pattern over the sample years of rising IP presence from just over three IPs at the beginning of the sample to over 4.5 by the mid-1980s. This is followed with significant decreases in IP in the late 1980s and continuing to the end of the

sample, when the average number of IPs is around three again. As seen in Figure 2, the pattern in IPs over time for less-developed countries (LDCs) is very similar to that of the full sample, though the average IP presence is significantly higher in LDCs for most of the sample. Because of the well-publicized general use of IP by these Asian countries to promote manufacturing and exports, I also show in Figure 2 the pattern of IPs in the Asian countries in my sample, which is admittedly only three countries (Japan, South Korea, and Taiwan). IP use in the steel sector varies little over time for these Asian countries, though the average number of IPs is roughly the same as for the full sample.

In addition to a measure of IP use, I also require data on the input share of steel in a sector ($StSh_{ci}$). These data come from country-level input-output tables available from the OECD Structural Analysis (STAN) database and are reported on an infrequent basis, with the most recent data coming from the year 2000 for most of the countries in my sample. Importantly, the STAN database provides these data at a consistent level of detail (48 sectors) for each country. Given the limited data availability, I apply the steel share of input usage for each sector taken from these country-specific input-output tables from the year 2000 to all the years in my sample, making the common assumption that these input-output ratios are fixed within a country. Across my sample the input share of steel in a sector ranges from 0.00 to 0.43, with a mean of 0.03 and a standard deviation of 0.06.

I create the main independent variable by multiplying the total IP measure with the input share of steel ($IP_{ct} \ StSh_{ci}$). Greater IPs in steel should decrease export competitiveness, particularly for sectors that use steel more intensively. Table 2 provides descriptive statistics for this independent variable, as well as my dependent variable.

On a final note, the Trade Analysis and Information System (TRAINS) database, available through the WITS database of the World Bank, has country- and sectoral-level data on import tariffs and non-tariff measures (NTMs) which could be of potential use as measures of IPs. Unfortunately,

the years of coverage of the NTM measures was of much too limited availability to useful for this sample of countries and years. There is also a question of controlling for input tariffs. Tariff protection is ubiquitous amongst the countries during this time period, so an indicator variable will not have any necessary variation for identification. The TRAINS dataset has steel-sector tariff data for only about

1/8 of my sample's observations, which covers primarily developed countries in the latter third of my sample. Inclusion of an input tariff variable interacted with the input share of steel in a sector has virtually no impact the estimated IP effect, though this is not a representative portion of my sample.

6. Results

Column 1 of Table 3 provides results when I estimate equation (2) using the full sample of 364,350 annual observations across 22 countries from 1975 through 2000. An F-statistic easily rejects the hypothesis that the coefficients, including the set of country-time fixed effects, are jointly zero at the 1% significance level. My focus variable, the interaction of the IP measure with the input share of steel in the sector is estimated to be -0.075, but with a p-value that is 0.155 and outside of standard levels of statistical significance.

An average IP effect, however, can mask significant heterogeneity across various dimensions, and I next explore whether there is systematic heterogeneity in these IP effects across different types of countries. A common distinction is between developed countries versus LDCs, which may also be pertinent to this setting. For example, one might expect that governments of LDCs have fewer resources to analyze the effects of policies, and therefore may apply IPs in such a way that they are more likely to create harmful effects for downstream industries. Another distinction that is potentially important in this context is the effect for Asian countries. A popular notion is that Asian countries were particularly effective and intelligent in their use of IPs with

respect to their manufacturing sector or, alternatively, implicitly subsidized most manufacturing sectors in their economy. Either alternative would make it less likely that I find that steel IPs are harmful to downstream export competitiveness.

In columns 2 and 3 of Table 3, I separately estimate the IP effects for developed countries and LDCs and find evidence consistent with the hypothesis that IPs are more likely to be harmful in LDCs.¹² Greater IP presence is negatively correlated and statistically significant at the 10% significance level (p-value of 0.065) for the LDC sample, but has a highly-insignificant positive coefficient for the developed country sample. Estimates for the Asian countries in column 4 of Table 3 are likewise positive, but statistically insignificant.

In summary, this evidence suggests that while IPs are not harming export competitiveness in downstream sectors in developed and Asian countries, their application in LDCs has harmful effects. The marginal effect of this result for LDCs is reasonably large.

Given a specification with only the dependent variable in logarithms, 100 times the coefficient indicates the percentage change in the dependent variable for a one-unit change in the regressor. In other words, a one-unit change in the regressor leads to a 13.6% decline in export value. More realistically, a standard deviation change in the IP measure (1.6) is associated with a -0.65% decline in export value for an average downstream sector, where steel is 3% of their inputs. (This is calculated as $100 \times 1.6 \times 0.03 \times (-0.136)$ percent, or -0.65%). This is a reasonably large magnitude for an average sector where steel accounts for just 3% of its inputs. However, steel accounts for a much higher percentage of inputs in the main steel-using industries, which include machinery, electronics and electrical equipment, transportation equipment, and fabricated metal products. In fact, the application of one additional steel IP in these industries is associated with an average

¹² Countries I define as developed in my sample are Argentina, Brazil, Mexico, South Africa, Spain, and Turkey. The developed countries in my sample are Canada, New Zealand, the United States, and the European countries in my sample. The Asian countries in my sample are Japan, South Korea, and Taiwan.

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decline in downstream export value of over 3.3% for the high steel-using sectors of machinery and fabricated metals, where steel accounts for approximately 15% of inputs on average.

6.1. Beyond Contemporaneous Effects

The estimates in Table 3 only provide contemporaneous effects of IP changes on downstream export competitiveness, but it may take time for such effects to systematically affect export competitiveness in downstream sectors. In this section, I provide evidence that there is evidence of lagged and longer-run effects of IPs. Column 1 of Table 4 provides full-sample estimates when I include three annual lagged terms of my focus regressor. There is substantial evidence that lagged effects are important. Most obviously, both the first- and second-year terms have negative coefficients and the two-year lagged term has a relatively large and statisticallysignificant coefficient. When the coefficients are summed (reported in column 1 below the coefficients) the cumulated impact of IPs over the four years (contemporaneous and three lags) on the export value of downstream sectors is

-0.240 and statistically significant at the 1% level. This suggests that the application of a standard deviation change in the IP measure lowers export values for an average downstream sector by over 1.2% in the following 3-4 years. For a high steel-using sector, where steel accounts for 15% of its inputs, this effect is a 6.0% decline in downstream exports.

Columns 2 through 4 in Table 4 provide results when applying this same regression with lagged terms separately for developed countries, LDCs, and Asian countries. As with the previous results, we again find that the average negative effect of IPs on the exports of downstream sectors in the full sample is being driven by the IP effects in LDCs. The four-year moving-average effect of IPs in LDCs is estimated to be -0.400 and is significant at the 1% level. This indicates that a standard deviation increase in the IP measure lowers export values for an average downstream sector in an LDC by approximately 1.9% in the following three years, and over 9.6% for high steel-using sectors. Unlike the effect for LDCs, the average effect of IPs on downstream exports are

insignificant for both the developed and Asian countries in the sample even when accounting for three annual lagged terms.

As a final examination of the potentially dynamic effects of IPs, I estimate a long difference of the data from the end year of my sample (2000) to the first year of the sample (1975). This is not only a quite demanding specification that collapses my sample down from over 350,000 observations to less than 15,000, but it also provides an estimate of the long-run effect of steel IPs on downstream export performance. Table 5 provides these empirical results for the full sample (column 1), as well as for the different country groupings. There is strong evidence for even larger effects of IPs over this long horizon that, consistent with the prior results, are primarily driven by effects in the LDCs. The coefficients are substantially larger than when I estimate the IP effect using annual changes or even a four-year moving average, suggesting a large cumulative impact of steel IPs. The effect of steel IPs is estimated to be negative and statistically significant for the full sample and the LDC sample at the 1% level. In fact, the magnitude suggests 5.6% lower export value growth in the average downstream sector (and 28% for high steel-using sectors) over the sample period (1975 to 2000) for LDC countries.¹³ The estimated IP effect is also negative for developed countries in the sample with a magnitude that is a bit more than half that for the LDC sample, but not quite statistically significant at standard confidence levels (p-value of 0.11).

In summary, there is substantial evidence that steel IP effects on downstream sectors' exports are varied across different types of countries and have particularly deleterious effects in LDC countries. These IP effects in LDC countries take some time to fully affect downstream export competitiveness and are substantial. The average net effect of steel IPs is insignificant for developed and Asian countries, though there is evidence for significant IP effects in a few select developed countries.

¹³ This is calculated at -1.162 times 1.6 times 0.03 times 100.

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To further examine heterogeneity across countries and address any worry that one or two countries may be driving results for any of these sets of countries, Table 6 provides three-year moving average estimates of the IP effect when I run my specification for each country's observations separately.¹⁴ I focus on three-year moving averages (contemporaneous plus the first two lags) because of the evidence above that the third-year lag is rarely (if ever) significant. Of the 21 countries, 13 show a negative coefficient for the estimated effect of steel IPs on downstream sectors' export competitiveness, with 6 of these statistically significant at standard confidence levels, despite relatively small numbers of observations. As expected, virtually all of the LDCs display large negative coefficients, though estimates suggest that IPs have had significant harmful effects on downstream export competitiveness in developed countries such as Belgium, Germany, and the Netherlands as well.

6.2. Heterogeneity Across IP Types

While the estimates discussed above suggest significant heterogeneity in steel IP effects on downstream export competitiveness, another important dimension over which to explore for heterogeneous effects is by type of IP. As discussed in section 5 above, there are eight different types of IP policies that I have categorized. While most of these are expected to increase domestic steel prices, there are some for which the expected effect is ambiguous (government ownership, import licensing, and price controls) and one which is expected to lower domestic steel prices and, thus, have an opposite effect on downstream steel industries (production subsidies).

Table 7 provides the separate three-year moving average estimates of these eight types of IP programs for the full sample and for LDCs in my sample, respectively. Results are quite consistent across the full sample and that of the LDCs. Export subsidies and government ownership are the two IPs with the largest and statistically significant negative impacts on downstream

¹⁴ We cannot identify this coefficient for Canada as its measure of steel IP was constant (at 2 out of 8 types of IPs) throughout the sample years.

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sectors' export values. As one would expect, the magnitude of their effects are larger than the average net effect of IPs estimated in Table 3. For example, the presence of government ownership is associated with around a 4% decrease in the export value in the full sample and the LDC sample for the average downstream sector where steel is 3% of its input costs.

The estimated effects of other IPs are not statistically significant in either the full or the lessdeveloped country samples. All are expected signs with the exception of quotas. With respect to import licensing, there is a wide range of practices, so it is not surprising that the estimated effect is insignificant. Anecdotal evidence from narratives in the WTO *Trade Policy Reviews* suggests that countries sometimes instituted import licensing to monitor activity as they liberalized import protection, which could explain the unexpected sign on import licensing. The insignificance and unexpected sign on production subsidies may be connected with the fact that these were typically applied in times when the domestic steel firms were facing large losses and even bankruptcy. In other words, they appear to have been provided to prop up inefficient firms, rather than a consistent program to subsidize production though both good and bad times. A couple other IPs, price controls and antidumping, are negative and statistically significant in the LDC sample, though not in the full sample. The negative effect of price controls in LDCs suggests that these countries may use them to establish high price floors on steel, which would help the steel sector at the expense of the downstream sectors.

6.3. Steel IP Effects on Export Prices and Quantities

Our dependent variable, export value, is the product of price and quantity. Section 3 provides a discussion about the possible effects of steel IPs on downstream prices and quantities, depending on a number of factors, including market structure, input substitutability, and product quality changes. For example, one would expect that higher input costs would affect downstream sectors' quantities much more than prices if these downstream sectors face highly competitive

export sectors. If this is true, then the effect of IPs on downstream export values is primarily the effect of IPs on downstream export quantities. However, if firms in the export sector have market power, they may adjust prices, as well as quantities, in response to higher input costs. Raising prices in response to higher input costs could mean that export value does not fall (in percentage terms) as much as export quantity. Another possibility is that higher steel input costs cause adjustments in the downstream sector (such as substitution to lower-quality substitute inputs for steel) that may affect prices more than quantities. In this case, export value may fall (as prices are lowered) more than export quantity.

By substituting export price and export quantity measures for export value in our specification we can decompose how much price and quantity effects contribute to the average negative effect of steel IPs on downstream export values. The COMTRADE database provides export quantity data and one can then also calculate unit values (i.e., prices) by dividing export value by export quantity. There are more data reliability issues with these data than the export value data, as countries may not report quantity in comparable measures (number versus weight) or may not report the data at all. This requires estimation of missing values and conversion exercises by the United Nations in constructing the export quantity data.¹⁵ As a result of this increased measurement error, one would expect less precision in our estimates. Following the discussion in section 3, I focus on the IPs where theory clearly indicates the IP will increase domestic prices of steel; namely, import protection measures (quantitative restrictions and antidumping), export subsidies, and cartel arrangements.¹⁶

Columns 1 and 3 of Table 8 provide the contemporaneous estimated effects of these steel IPs on export price and export quantity for the full sample. The results are consistent with the hypothesis that downstream sectors are generally facing highly competitive export markets, as the

¹⁵ See United Nations (2009) and Berthou and Emlinger (2011) for further details.

¹⁶ I get estimates that are qualitatively identical, but weaker in significance (as one would expect), when I include all IPs.

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steel IP effect is estimated to be a small positive, but insignificant, increase in export price, and a statistically significant decline in export quantity. Columns 5 and 7 show the three-year moving average effects. The export quantity regression displays a similar-sized coefficient on the IP effects as with the contemporaneous effects, but is less precisely estimated. The price regression continues to show an insignificant average effect of steel IPs on downstream sectors' export prices.

As a robustness test to explore the validity of these results and to provide further information, I interact the IP regressor with a variable indicating when a product is classified as a differentiated goods sector by Rauch (1999) and display these results in columns 2, 4, 6, and 8 of Table 6. Differentiated-goods sectors should have more market power and we should therefore estimate a stronger direct impact of steel IPs on export prices in these sectors. This comes through in the data. For both the contemporaneous and three-year moving average estimates, there is evidence of a significant and large positive difference for export prices for the differentiated-goods sectors versus export prices for other (homogenous-goods and reference-price) sectors, consistent with the notion of market power effects for differentiated-goods sectors.

6.4. Further Robustness Checks

I undertake a number of additional robustness tests, which are reported in Table 9. Columns 1-4 provide three-year moving average estimates when I do not log the dependent variable. The estimated effect of IPs is negative and statistically significant, consistent with the estimates when I log the dependent variable. With an average export value of \$43,200 (in thousands) across the full sample, the implied magnitude is about a 0.8% decline in export value for a standard deviation increase in IP usage for the average downstream sector where steel is 3% of its input costs.¹⁷ In fact, the effect in the developed country sample is now negative and statistically significant as well, unlike the results when the dependent variable is logged. Consistent with

¹⁷ This is calculated as $(-7431.78 \times 1.6 \times 0.03)/43,200) \times 100$, where 1.6 is a standard deviation change in the IP measure, 0.03 represents a 3% steel input share, and 43,200 is the average value of exports (in thousands).

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previous results, the LDC estimates are negative and significant, while the Asian sample estimates are insignificant. The magnitude of the IP effect for both the LDC and developed countries' samples as a percent of average export values is actually quite similar, given much higher average export values in the developed country sample, and relatively high. For both the developed country and LDC samples, a standard deviation increase in the IP measure is associated with a 1.5% decline in export value for the average downstream sector where steel is 3% of its input costs. While these results provide stronger evidence of a negative IP effect, especially for the developed countries, the magnitude of the IP effect is likely more representative when the dependent variable is logged because of the skewness of the export data.¹⁸ Consistent with this, the R² statistics for these regressions are an order of magnitude smaller than when the dependent variable is logged.

Finally, steel IP usage increases on average across countries over the first half of my sample and then declines over the second half. It would be concerning if my main results are being driven by this switch in IP usage over time. In columns 5 and 6 of Table 9, I provide three-year moving average estimates of the average effect of steel IPs on downstream export values separately for sample years prior to 1990 and for the sample years of 1990 and after. I find an average effect that is very close across these different samples.

7. Conclusion

Throughout history, governments have used IPs to guide the development of key sectors in their economies and spur general economic development. However, many of the IPs typically used will raise prices of the protected sector in the country, potentially hurting the competitiveness and development of the downstream sectors that use the protected sectors' products as inputs. Nevertheless, governments often make extensive use of IPs on sectors that are key inputs in the

¹⁸ The skewness measure reports in Stata is over 11, where a normal distribution has a skewness of 0. This article is protected by copyright. All rights reserved.

economy, presumably because the IPs will lead to a highly competitive sector in the long-run that no longer needs IPs and deliver low-cost inputs to the rest of the economy.

Despite the large stakes involved we don't know very much about how IPs affect other sectors, particularly the downstream sectors that rely on their products for inputs. The prior literature has focused almost exclusively on tariffs. In contrast, this paper examines a full range of IP programs that were used by various steel-producing countries during my sample period from 1975-2000. The evidence I find suggests that IPs have a statistically and economically harmful net effect on the export competitiveness of downstream sectors after controlling for both countrysector and country-time fixed effects, particularly for LDCs. The most harmful IPs are export subsidies and government ownership.

The differences across countries indicate avenues for further study. The harmful effects of steel IPs on downstream industries in LDCs may suggest that these countries are much more focused on using the IPs to benefit their steel industry, whereas developed and Asian countries may just as likely to apply steel IPs to benefit steel-using industries as they do to benefit the steel industry itself. Relatedly, developed and Asian country policymakers may be more conscious of the potentially harmful effects to downstream industries when they apply IPs to benefit their steel industry and therefore layer on additional IPs (such as price controls that set price ceilings) to mitigate any harmful effects to downstream steel-using industries. In the end, more work can be done to understand whether these differences in IP effects are intentional on the part of policymakers, or due to poor information or forethought.

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		Standard		
	Mean	deviation	Minimum	Maximum
Export subsidies	0.33	0.47	0	1
Production subsidies	0.71	0.45	0	1
Government ownership	0.54	0.50	0	1
Cartel arrangements	0.28	0.45	0	1
Import licensing	0.68	0.47	0	1
Price controls	0.31	0.46	0	1
AD/CVD	0.45	0.50	0	1
Quotas	0.51	0.50	0	1
Total IPs	3.81	1.60	0	7

Table 1

Notes: Statistics based on the full sample of 364,150 observations. The total IPs variable is a sum of the eight indicator IP variables for each observation.

Table 2 Descriptive statistics for dependent variable and main independent variable in levels									
		Standard							
Mean deviation Minimum Maximu									
Log of export value	6.47	3.97	0	17.21					
Steel industrial policies × Steel									
input share	0.12	0.29	0	2.99					
Notes: Statistics based on the full sample of 364,150 observations.									

	Less-				
	Full sample	Developed countries	developed countries	Asian countries	
Steel industrial policies × Steel	-0.075	0.015	-0.136	0.041	
input share	(0.053)	(0.086)	(0.073)	(0.115)	
Country-year fixed effects	Yes	Yes	Yes	Yes	
R ²	0.20	0.16	0.18	0.36	
F-statistic	167.77	127.43	147.87	391.70	
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	
Observations	364150	211900	100400	51850	

Table 3

Notes: Dependent variable is the log of one plus the value of a sector's exports. Variables are first differenced by country-industry pair. Standard errors, clustered by country-industry pair, are in parentheses. The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are jointly zero.

	0		Less-	
	Full sample	Developed countries	developed countries	Asian countries
Steel industrial policies	-0.081	0.006	-0.145	0.046
× Steel input share	(0.057)	(0.098)	(0.079)	(0.128)
(Steel industrial policies	-0.024	-0.008	-0.032	-0.011
× Steel input share) t-1	(0.063)	(0.094)	(0.084)	(0.174)
(Steel industrial policies	-0.165	0.001	-0.261	0.113
× Steel input share) t-2	(0.066)	(0.104)	(0.088)	(0.175)
(Steel industrial policies	0.031	0.081	0.037	-0.211
× Steel input share) t-3	(0.056)	(0.104)	(0.073)	(0.168)
SUM of the coefficients for all the (Steel industrial policies × Steel input share) terms	-0.240 (0.089)	0.080 (0.147)	-0.400 (0.118)	-0.063 (0.250)
Country-year fixed effects	Yes	Yes	Yes	Yes

 Table 4

 Effects of steel industrial policies on downstream sectors' EXPORT VALUES – lags and moving average terms

R ²	0.23	0.19	0.20	0.39
F-statistic	193.08	151.38	160.68	425.10
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	320452	186472	88352	45628

Notes: Dependent variable is the log of one plus the value of a sector's exports. Variables are first differenced by country-industry pair. Standard errors, clustered by country-industry pair, are in parentheses. The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are jointly zero.

Table 5

Effects of steel industrial policies on downstream sectors' EXPORT VALUES - Long differences

		~	Less-	
	Full sample	Developed countries	developed countries	Asian countries
Steel industrial policies × Steel input share	-0.929 (0.173)	-0.688 (0.437)	-1.162 (0.204)	0.159 (0.496)
Country fixed-effects	Yes	Yes	Yes	Yes
R ²	0.34	0.34	0.07	0.40
F-statistic	342.89	338.46	49.08	454.50
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	14566	8476	4016	2074

Notes: Dependent variable is the log of one plus the value of a sector's exports. Variables are long differenced by country-industry pair over the entire sample. Standard errors, clustered by country-industry pair, are in parentheses. The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are jointly zero.

361101	s export competitiveness	
	Estimated 3- year moving average IP effect	Number of observations
Argentina	-2.056 (1.122)	15847
Austria	-0.937 (1.174)	14904
Belgium	-1.045 (0.426)	14835
Brazil	0.130 (0.249)	16054
Canada	NA	
Finland	0.356 (0.270)	14927
France	0.854 (0.560)	14927
Germany	-0.727 (0.604)	15939
Italy	0.048 (0.336)	14950
lapan	0.161 (0.294)	16100
Luxembourg	-0.324 (0.283)	14904
Mexico	-1.340 (0.644)	14789
Netherlands	-1.111 (0.556)	14950
	0.035	14352

Table 6Country-by-country effect of steel IPs on downstreamsectors' export competitiveness

New Zealand (0.525)South Africa -0.519 15847 (0.178)South Korea 0.197 16123 (0.141)Spain -0.326 14950 (0.173)Sweden 1.691 14927 (0.620)Taiwan -0.056 15479 (0.296)Turkey -0.353 14881 (0.477)United Kingdom -0.472 14904 (0.327)**United States** -0.257 14766 (0.183)

Notes: The table reports the coefficient on the three-year moving average of the variable, Steel industrial policies × Steel input share, when estimating equation (2) for a particular country's observations. Canada is not estimated because it did not see any change in its industrial policy measure over the sample years.

Table 7Effects of steel specific industrial policies on downstream sectors' EXPORTVALUES

	Full sample	Less-developed countries
EXPORT SUBSIDIES × Steel input share	-0.367 (0.221)	-0.722 (0.286)
GOVERNMENT PRODUCTION SUBSIDIES × Steel input share	0.174 (0.236)	-0.155 (0.315)
GOVERNMENT OWNERSHIP \times Steel input share	-0.922 (0.252)	-0.798 (0.328)

CARTELS $ imes$ Steel input share	-0.038	-0.169
-	(0.264)	(0.381)
	0.000	0.650
IMPORT LICENSING × Steel input share	-0.298	-0.652
	(0.373)	(0.459)
DDICE CONTROLS y Steel input share	0.207	0654
FRICE CONTROLS × Steel input share	-0.297	-0.034
	(0.233)	(0.359)
AD/CVD × Steel input share	-0.271	-2.261
	(0.262)	(0.904)
	(0.303)	(0.804)
QUOTA \times Steel input share	0.212	0.592
	(0.193)	(0.396)
Country-year fixed effects	Ves	Ves
	105	105
R ²	0.21	0.19
F-statistic	170.74	135.88
(p-value)	(0.000)	(0.000)
Observations	335018	92368

Notes: Dependent variable is the log of one plus the value of a sector's exports. Variables are first differenced by country-industry pair. Standard errors, clustered by country-industry pair, are in parentheses. The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are jointly zero.

Table 8: EXPORT PRICE and QUANTITY effects of IPs on downstream sectors

		One-year effect			Thr	Three-year moving average effect		
	Price	Price	Quant ity	Quant ity	Price	Price	Quant ity	Quanti ty
		-					-	
Steel industrial policies	0.081	0.35 9	-0.370	-0.167	- 0.110	-0.505	0.28 3	-0.352
× Steel input share	(0.063)	(0.17 7)	(0.162)	(0.424)	(0.08 6)	(0.288)	(0.25 0)	(0.667)
Steel industrial policies		0.50 9		-0.234		0.455		0.080
× Steel input share × Differentiated		(0.18 2)		(0.440)		(0.293)		(0.698)

	F-statistic
	(p-value)
	Observations
	<i>Notes:</i> The depe Variables are fin industry pair, an (including the c
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+	Steel industrial Steel input shar
	Country-year fi
	R ²
	F-statistic
	(p-value)
	Observations
	Notes: The depe first differenced The F-statistic i
	This article is p

Country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.02	0.02	0.18	0.18	0.02	0.02	0.19	0.19
F-statistic	12.61	12.6 0	142.8 4	142.5 8	12.99	12.94	150. 04	149.16
(p-value)	(0.000)	(0.00 0)	(0.000)	(0.000)	(0.00 0)	(0.000)	(0.00 0)	(0.000)
Observations	26831 5	2683 15	36406 0	36406 0	2489 58	24895 8	3349 28	334928

Notes: The dependent variable is the log of the quantity or unit value (price) of a sector's exports. Variables are first differenced by country-industry pair. Standard errors, clustered by countryindustry pair, are in parentheses. The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are jointly zero.

Table 9: Further ROBUSTNESS checks

	Dependent variable in levels (not logs)				Sample split	
	Full sample	Develop ed countrie s	Less- develop ed countrie s	Asian countrie s	Before 1990	1990 and after
Steel industrial policies × Steel input share	-7431.78	- 20979.6 9	-3881.65	2232.34	-0.201	-0.322
	(2032.61)	(5554.51)	(1735.17)	(10834.9 4)	(0.106)	(0.137)
Country-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.01	0.02	0.003	0.02	0.22	0.20
F-statistic	9.56	10.93	2.10	11.43	183.63	165.71
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	335018	194948	92368	47702	174792	160226

Notes: The dependent variable is the log of the quantity or unit value (price) of a sector's exports. Vari first differenced by country-industry pair. Standard errors, clustered by country-industry pair, are in <u>p</u> The F-statistic is for the null hypothesis that all the coefficients (including the country-year effects) are



