

Exporters in Developing Countries: Adjustment to Foreign Market Access after a Trade Policy Shock

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Abstract

This paper estimates the short-run impact of an unexpected foreign trade liberalization shock on exporting firms and product-level data from a developing country. The economic environment was created when major importers such as the U.S., EU and China imposed new safeguard trade barriers in 2002 on steel imports deriving from developed countries and implicitly provided developing country exporters an unexpected preferential market access shock of up to 30% by exempting them from the barriers. We use firm-level data to estimate the differential impact of this trade liberalization shock on Indian steel firms and the products they produce. We provide evidence that Indian firms with historic export ties to these markets responded more quickly to the changing market conditions in order to increase sales, exports and profits. Furthermore, we present evidence of hysteresis – i.e., exports continue to expand even after the termination of the preferential market access conditions via the removal of the discriminatory import restrictions. In terms of firm-level use of inputs, while the Indian firms that produce these preferred products increased capacity utilization on average, the historic exporters responded more quickly by making new investment to expand existing capacity. Finally, our data also allows us to explore the role of product-switching to examine characteristics and behavior of firms that entered into these new preferred-product categories. Entry into these new products was predominantly undertaken by larger firms that had previous experience exporting other types of steel products, a result with implications for understanding how firms overcome the fixed costs of exporting.

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1 Introduction

Firm-level research in the international trade literature uses increasingly detailed micro-level data to generate insights regarding how firms respond to the challenges and opportunities that globalization presents. The first empirical work on productivity and exporting firms by Bernard and Jensen (1995), Tybout and Roberts (1997), and Clerides, Lach and Tybout (1998) has subsequently resulted in a burgeoning theoretical literature initiated by Melitz (2003) and simultaneous empirical literature on heterogeneous firms that identifies a variety of dimensions along which firms respond to exporting opportunities in different markets via product-switching, learning by exporting, etc.¹ This paper contributes to this firm-level literature but through an empirical approach that focuses more narrowly on how firms differentially respond to a discrete foreign market access shock: the result of a well-defined, but unexpected, change in foreign policy.

In particular, we focus on firms in the Indian steel industry and how they responded to a foreign market access shock in which the U.S., EU and China granted them implicit trade preferences via a WTO-mandated exemption to their joint imposition of steel safeguard import-restricting trade policies in March 2002. Figure 1 provides the most stark representation of how such preferences affected India's exports by illustrating U.S. imports from India over the 1998-2006 period in steel products that fell into one of three different categories associated with the 2002-2003 U.S. safeguard policy. In the products for which India received a U.S. preference of up to 30% via an exemption from the new import restriction, India's exports to the U.S. increased sharply – from less than \$50 million in any of the four years prior to 2002, to over \$250 million in the first year of the preference alone. Interestingly, even once the preference disappeared in 2004 (i.e., when the U.S. removed the safeguard tariffs on other countries and restored MFN treatment to all foreign sources of these products), Indian exports to the U.S. in these previously preferred

¹ A recent survey is Bernard, Jensen, Redding and Schott (2007). For product switching, see Bernard, Redding and Schott (2005, 2006a,b). Goldberg, Khandelwal, Pavcnik and Topalova (2008) examine the issue of product-switching using the Indian firm-level data we use here, but they focus more generally on the response to differences associated with India's unilateral import market access liberalization shock of the 1990s. For research on firm-level patterns to exporting to different markets, see Eaton, Kortum and Kramarz (2004) and Eaton, Eslava, Kugler, and Tybout (2007).

products continued to expand – to over \$600 million in 2004 and \$750 million by 2006. Such evidence is consistent with theories of hysteresis (e.g., Baldwin, 1988; Dixit, 1989) that has long been of interest in the international trade literature.²

The environment created by this policy event allows us to examine the short-run behavioral response of Indian steel firms that have been presented with an unexpected, exogenous external trade liberalization affecting a certain subset of their products. Most of the prior firm-level literature typically characterizes the export behavior of large cross-sections of firms over longer-run time horizons, sometimes relying on inference from highly parameterized structural econometric models.³ Our approach uses the environment created by an exogenous shock of foreign trade liberalization to examine differences in firm-level changes – via sales and exporting and product-switching on the output side, to increased capacity utilization and new investment on the input side – associated with prior exporting experience. This resulting economic environment is particularly interesting and somewhat unique because it is not only a trade *liberalization* shock, it is actually a trade *preference* shock – and one that has resulted in India's steel firms increasing their exports by billions of dollars (relative to its pre-preference level of exports) in a relatively short time period. Furthermore, the firms maintained that export expansion even once the preferences had expired, a result consistent with theories of hysteresis.

Our specific approach is to first trace the information on policy preferences granted by the 2002 U.S. policy, along with those preferences granted by the EU and China in similarly timed and constructed trade policies, to firm and product-level data for Indian steel producers. Our resulting estimates from a

² Roberts and Tybout (1997) use data on firm-level exporting activity in Colombia to provide one of the first structural investigations of the relationship between sunk costs, prior exporting experience, and subsequent participation in export markets.

³ An exception is a study like Lileeva and Trefler (2007) which focuses on exporting firm response to NAFTA. While there is a change in market access associated with the imposition of NAFTA, it was likely not an exogenous event neither in terms of timing (phase in) nor from the perspective of all firms – i.e., those who had been part of lobbying efforts to ensure its passage. Our setting is both a shock in that it was unexpected and immediate. Examples of related research presenting evidence that firms do adjust to new exporting opportunities through investment, technology upgrading or productivity channels include Van Biesebroeck (2005) for African firms, De Loecker (2007) for Slovenian firms, and Bustos (2008) for Argentine firms. Nevertheless, the economic environment in each of these papers is not an unexpected foreign market access shock like the kind we study here.

panel of firm-level and product-level data then documents heterogeneity in the Indian firms' response to the foreign market access shock, thus generating insights into some of the mechanisms through which firms take advantage of new export opportunities. In particular, we study the behavior of Indian firms that produce cold rolled flat (CRF) and clad, plated or coated flat rolled (CPCF) products during this time period, as these were the products facing the largest market access shock via combined (U.S., EU and China) preferences to Indian producers. Rather than estimate a structural model on firm-level productivity which may be better suited to a longer-run analysis, we take a less parameterized approach to examining how Indian firms differentially responded to this particular shock. Our data set also allows us to examine product switching, and in particular, we are able to identify some of the characteristics of firms that successfully enter into producing CRF/CPCF products for foreign markets after the imposition of the shock.

We establish a number of stylized facts for how Indian firms responded to this positive foreign market access shock. First, while there is evidence that the shock had a large positive affect across firms on average – with respect to various measures of sales, exports, profits – invariably the positive response is larger and quicker for the Indian firms known to have historic export ties to these preference-giving markets.⁴ The quicker and larger response for historic exporters for these output measures is complemented by other estimates in which we document that such firms more quickly increased production and invested in new capacity. These results are consistent with the theory that exporting firms may have access to information on changing market conditioners earlier or are better positioned to be targeted by foreign consumers seeking new suppliers once others have been discouraged from that market via new import restrictions.

Finally, we also examine questions related to product-switching in order to learn more about the firms that are new entrants into preference-product production, sales and exports. Our evidence is that

⁴ We obtain this result even by imperfect knowledge of the identity of each firm's product-specific destination for its exports, as our data derives from information relating to their export sales of other (i.e., non-preferenced) steel products.

once again export status matters – i.e., amongst a sample of firms that produce upstream (hot rolled) steel products that did not receive a foreign market access shock, firms with prior exporting experience had larger increases in sales of downstream (preferenced) steel products, even if that prior exporting took place in other product categories.⁵ This result suggests that, at least in the case of a foreign market access shock implemented as a preference, it may be easier to overcome the fixed costs of entering into exporting of a new product if the firm is a historic exporter even if it exports a different product, and thus the firm is already known to the foreign importing consumers.

The approach and results of this paper arguably contribute to two other important literatures in empirical trade. The first empirically examines the importance of the trading system's flagship institutions of first the General Agreement on Tariffs and Trade (GATT) and now the World Trade Organization (WTO). New and evolving research presents evidence that these institutions do create economic incentives that affect policy choices through mechanisms consistent with theory.⁶ First, Broda, Limão and Weinstein (2008) find that countries that are not WTO members systematically set higher tariffs on goods that are supplied inelastically. Second, Bagwell and Staiger (2006) focus on a set of countries newly acceding to the WTO between 1995 and 2005 and find evidence that these countries' WTO accession tariff cut commitments are consistent with negotiating behavior predicted by the theory.⁷ Our approach documents an alternative, complementary, and more micro-oriented approach to addressing the question of how the GATT/WTO affects policy decisions and economic activity. For example, the requirement discussed in the policy section below that safeguard-imposing countries, such as the U.S., EU and China

⁵ The question of the impact of trade policy on product-switching is related to an earlier literature on quality upgrading that has been studied as a response to discrete trade policy shocks, such as the U.S. import quotas on Japanese autos (Feenstra, 1988).

⁶ For a theoretical motivation for the GATT/WTO and its principles, see Bagwell and Staiger (2002). See also Hoekman and Kostecki (2001).

⁷ In empirical work less related to underlying political-economic theory of the role and relevance of the GATT/WTO institutions, Rose (2004a, 2004b) questioned whether they had any impact even on the trade or trade policies of its contracting parties and member countries. Subsequent papers such as Subramanian and Wei (2007) and Goldstein, Rivers and Tomz (2007) have clarified the robustness and limitations of the Rose results in various ways.

in the steel case, must exempt developing countries from application of the measure, can have a sizable affect on developing country trade flows.

The other important literature to which this paper contributes is new empirical research examining the micro-level impact of particular trade policy shocks on economic activity within developing countries. The closest related research is an approach that uses exogenous foreign trade policy shocks to examine the negative impact of trade policy restrictions on household or firm-level behavior (e.g., Brambilla, Porto and Tarozzi, 2008). We provide a complementary estimation strategy that traces how a likely *positive* market access shock from the exogenous granting of a temporary trade preference affects micro-level (firm) decisions and outcomes in a developing country.

The rest of the paper proceeds as follows. Section 2 describes the underlying set of policy events that creates the economic environment we use to examine the impact of a foreign market access shock across steel firm activity in India. Section 3 describes the characteristics of the firm-level data on steel-producing firms in India that forms the basis of our empirical analysis. Section 4 presents our first set of estimation results for a fixed effects panel data regression model on a 1998-2006 sample of Indian firms that produce steel products that potentially received the foreign market access shock beginning in 2002. Section 5 extends the analysis to address the question of product-switching by providing a complementary panel regression analysis on a sample of Indian steel firms that produce hot rolled flat products and which may have switched into producing these preferenced steel goods after the foreign shock. Finally, section 6 concludes.

2 The Steel Safeguard Import Restrictions and the Unexpected Preference

2.1 The policy environment leading to the market access shock

Forming the basis for our empirical analysis is the economic environment created when a number of major steel importing countries imposed new trade barriers in 2002. The wave of new import restrictions was triggered by an unexpected political shock within the United States government which led the U.S. to

initiate a safeguard investigation in June 2001 and impose new trade restrictions in March 2002.⁸ The European Union responded to the U.S. safeguard by almost immediately imposing its own import-restricting safeguard in March 2002, covering imports of many of the same products targeted by the U.S.⁹ Furthermore, China also quickly imposed an expansive safeguard import restriction covering steel products in early 2002, even though it had newly acceded to the WTO only in late 2001 and was in process of lowering its own import restrictions including those on steel products to comply with accession terms.¹⁰

Nevertheless, when the U.S., EU and China imposed the new safeguard import restrictions in 2002, they each chose to *exempt* from the safeguard policy steel exports produced in most *developing*

⁸ See the case study in Devereaux, Lawrence, and Watkins (2006) for a discussion of the party switch (from Republican to an independent) of U.S. Senator Jim Jeffords which led the Bush Administration to self-initiate an investigation. The U.S. domestic steel industry had been claiming that it was suffering injury from increased imports and calling for a new U.S. safeguard import restriction since the East Asian crisis (and contagion which spread it to Russia and Brazil, amongst other places) in 1998. In late 2001, the United States International Trade Commission (USITC) carried out the investigation, as required under U.S. law, and in December 2001 recommended a serious of import-restricting measures be imposed. Nevertheless, because the imposition of safeguard import restrictions in the United States is at the discretion of the U.S. President and not subject to bureaucratic decision-making, until the Bush Administration's decision to impose barriers in March 2002, there was tremendous uncertainty as to whether any trade restrictions at all would be implemented, let alone the size, scope, or their duration.

⁹ The reasoning behind the EU's decision to largely replicate following the U.S. policy lead was clear:

“[w]hilst U.S. imports of steel have fallen by 33% since 1998, EU imports have risen by 18%. Given that worldwide there are 2 major steel markets (EU with 26.6m tonnes of imports in 2001 and U.S. with 27.6m tonnes), this additional protection of the U.S. steel market will inevitably result in gravitation of steel from the rest of the world to the EU. This diversion [“deflection”] is estimated to be as much as 15m tonnes per year (56% of current import levels).” (European Union, 2002)

Thus the response to the U.S. import restriction was other countries following suit was motivated by the fear of “trade deflection” (Bown and Crowley, 2007) – i.e., that there would be resulting surges to third markets and distortions in trading patterns due to steel exporters now being shut out of the U.S. market.

¹⁰ Furthermore, according to data reported to the WTO's Committee on Safeguards (collected in Bown, 2007), investigations were also initiated in Bulgaria, Canada, Chile (2), Czech Republic (3), Hungary, Poland and Venezuela. The results of the investigations were the following: Bulgaria (no measure), Canada (no measure), Chile (unknown), Czech Republic (tariff rate quota), Hungary (tariff rate quota), Poland (tariff rate quota /ad valorem duties), Venezuela (ad valorem duties). From the perspective of India's direct export markets, note that this group is dominated by Canada, but even collectively, these countries are the destination for only 2% (2006) to 4.6% (1999) of India's chapter 72 and 73 exports, so any policy changes imposed by these countries would not have had large direct effects on India.

countries.¹¹ The economic implication is that in March 2002, exporting firms in developing countries suddenly found themselves the potential beneficiaries of an unexpected market access shock through this new trade *preference*. I.e., while steel-exporting firms in major developed economies faced new tariffs (of up to 30% ad valorem) and quantitative restrictions in the U.S., EU and China markets, exporting firms in many developing countries became an attractive alternative source of steel for U.S., EU and China consumers because of the preference margin of up to 30% relative to these other foreign competitors in the developed economies.¹²

The length of the preferences offered by the three importing markets varied. It was not until December 2003 that the U.S., under the threat of WTO-authorized retaliation from steel exporting country governments adversely affected by the safeguard following a formal trade dispute, removed its import-restricting safeguard and eliminated the preference by restoring nondiscriminatory foreign access to the U.S. market.¹³ Once the U.S. removed its safeguard, the EU and China quickly followed suit and

¹¹ While the WTO's Agreement on Safeguards states that such trade restrictions should be applied on an MFN basis, under Article 9.1 WTO members that impose a safeguard import restriction are required to exempt exports deriving from *developing* countries that are de minimus suppliers (i.e., exporters with less than 3% market share individually and 9% cumulatively). For a more general discussion of the discriminatory application of WTO safeguards, see Bown and McCulloch (2003, 2004). Note, however, that there is substantial uncertainty involved in any given safeguard application as to whether this "rule" will be followed. Evidence of this stems from multiple formal WTO trade disputes in which the failure of a safeguard-imposing country to follow Article 9.1 has been challenged. For the case of Indian exports of steel products, the only products not exempted from the various safeguards were *Pipe and Tube Fittings* (U.S., not exempted, though a more refined steel product found in chapter 73 of the HS code) *Electrical Sheet* and *Steel Wire* (EU, not exempted from preliminary safeguard, no definitive safeguard imposed on these products) and *Non-Alloy Plate* (China, not exempted from preliminary safeguard, no definitive safeguard imposed on these products).

¹² For the U.S. market, conservative estimates presented in Bown (2004) put the aggregate trade impact as a 13.5% reduction in the value of U.S. steel imports in the year following the March 2002 safeguard in the product categories targeted by the policy, eliminating close to \$683 million worth of trade relative to the previous year. Bown (2004) estimates that when considering the differential treatment across exporters, countries excluded from the policy saw exports increase from 20% to 63% (depending on the reason for the exclusion), while exporters that were actually targeted with the policy saw their shipments to the U.S. decrease by 30% in the twelve months following the policy imposition.

¹³ After U.S. imposition of the safeguard in March 2002, the European Union and eight other complainant countries almost immediately challenged its legality through a formal trade dispute at the WTO. By the summer of 2003, a WTO Panel had legally ruled against the U.S. policy, judging it to be inconsistent with U.S. obligations under the Agreement. The U.S. appealed the legal decision, and in the fall of 2003 the WTO's Appellate Body confirmed the Panel ruling against the United States policy. The European Union then exercised its legal rights by publicly announcing an intention to retaliate by raising its import tariffs over U.S. exports of citrus products and other politically sensitive products, should the U.S. refuse to comply with the WTO ruling. The U.S. ultimately avoided

eliminated their safeguards in late 2003 or early 2004. In total, the U.S. preferences for steel imports from firms in developing countries stayed in place for almost two years – i.e., from March 2002 until the end of 2003. Our primary focus will be on the set of products for which there was a substantial *overlap* of U.S., EU and Chinese preferences for Indian-produced steel, what we refer to below as the “combined preference” products.¹⁴

2.2 India and the economic environment created by foreign policy changes

The imposition of the U.S., EU, and China steel safeguards in 2002 creates an excellent economic environment in which to examine the impact of an unexpected foreign market access shock on firm behavior in a developing country such as India. In this section we describe in more detail the motivating trade-level evidence on the impact of the shock.

First, evidence from Indian export data suggests that there was a substantial response to the opportunity to export to these markets under the preference. Figure 2 extends the analysis of the trade data beyond the U.S. market (discussed above in reference to figure 1) to illustrate some of the effects of the U.S., EU and China “combined preferences.” The figure breaks out steel products into two categories – the first is defined as products for which there was a substantial *overlap* of U.S., EU and Chinese preferences for Indian-produced steel, and the second category is for all other steel products for which

the retaliation, and the dispute concluded in December 2003 when it complied with the WTO legal ruling by removing the safeguard.

¹⁴ Some of the products given preferences in the EU and Chinese markets also lasted for two years, while other products were preferenced only for 2002, as in late 2002 the EU and China lifted the preliminary safeguard (and preferences to developing countries) on a subset of products and thus imposed a definitive safeguard (and preferences to developing countries) on another subset. Due to data limitations that we describe below in the need to concord the firm-level with the trade policy-level data, we do not attempt to exploit the affect on Indian firms of *differences* in relative preferences across these three markets – either because of differences in time the preferences were available or the size of the preference margin due to differences in applied safeguard tariffs across products as well as the U.S., EU and China markets.

India did *not* receive combined preferences.¹⁵ The products for which there was a substantial overlap in preferences across the three markets are listed in table 1.

The main inference to draw from figure 2 is that the 2002 market access shock is consistent with an affect on Indian steel exports in both absolute and relative terms. Figure 2a illustrates the time path of combined *value* of Indian exports to these three (U.S., EU, China) markets. It is clear that for both categories of products – preferenced and non-preferenced – India’s exports to these markets rose rapidly starting in 2002, though the non-preferenced products had begun from a higher base in the late 1990s (e.g., in 1998 over \$400 million versus less than \$50 million for products that would eventually become "preferenced"). Figure 2b, however, illustrates that while there is relatively little change in the Indian share of the three combined import markets for the non-preferenced products (roughly 2% each year between 1998 and 2006),¹⁶ there is a dramatic increase in the Indian share in the preferenced product categories beginning in 2002. Whereas Indian exporters had less than 1% of these three countries’ combined import market in these products in 2001, this increased to 2.5% in 2002, to nearly 5% by 2003.

While Indian exports to the U.S., EU and Chinese markets in these preferenced product categories documented in figures 2a and 2b grew rapidly beginning in 2002 – from a level (import share) of less than \$100 million (1%) in 2001, to more than \$800 million (4.5%) in 2003 and \$1.2 billion (4.8%) in 2004 – the reason why it is possible to examine the impact that this unexpected foreign market access shock had on Indian *firms* that produce these products is because the U.S., EU and China are important

¹⁵ The figure's panels focus on steel trade for all products in chapter 72 of the HS code, as that is where most of the 2002-2003 safeguards were applied. For the products in which India was not given a preference, the reason is typically that the underlying product itself was not covered by the safeguards. However, in a handful of product codes (e.g., see again figure 1), especially in hot rolled steel products, India did not receive preferences in a product covered by the U.S. or EU safeguard because, while it was technically exempted from application of the safeguard, the U.S. and EU had applied an earlier (2000 or 2001) antidumping import restriction on Indian exports to their market.

¹⁶ The exception is the decline in 2001, and this is associated with trade in hot rolled steel products, the dominant Indian steel export in chapter 72 of the HS code that was not one of the “combined preferenced” products. The 2001 decline is therefore associated with reduced Indian exports of hot rolled steel products to the U.S. and EU markets due to these countries’ imposition of antidumping import restrictions. On the other hand, China’s WTO accession in 2002 led to a substantial increase in Indian hot rolled steel exports to China beginning in 2002, thus effectively restoring the Indian share to the three combined markets to 2% in these products.

markets for Indian exporters in these product categories. Figure 3 illustrates this point by documenting the share of total Indian exports in these “preferenced” product categories that are sent to these three combined export markets. From a 2001 low point of 20%, the share of Indian total exports in these products that are sent to the combined U.S., EU and China markets has ranged between 40% and 70% since the preference went into effect in 2002.¹⁷

The last reason why this economic environment is an excellent setting in which to examine the impact of a foreign market access shock is because the developing country exemption was largely unexpected, and certainly exogenous to Indian firm-level decisions.

3 Steel Production and Data on Firms in the Indian Steel Industry

3.1 The steel industry and steel products

Our empirical investigation will ultimately use a panel of Indian steel-producing firms to estimate the differential impact of the foreign market access shock on a number of measures of their input and output decisions. Before turning to a discussion of the data sources, we provide a brief overview of steel production more generally so as to provide a better context for our approach.

Durling and Prusa (2006) provide an excellent background discussion of the underlying steel production process that is at the heart of our analysis.¹⁸ They describe how an important primitive stage for steel-producing firms is to generate molten steel that is then poured into thick slabs or ingots of semi-finished steel. Many steel-producing firms then have a rolling process by which they reduce the thickness of the slab while it is still hot, generating a steel commodity called “hot rolled flat” (HRF) steel once the thickness of the steel has been reduced to less than 4.75mm. Some firms sell this HRF product on the open market, including to foreign consumers via international trade. Other firms “consume” this HRF product themselves to further process it into other steel products. For example, if the firm takes HRF

¹⁷ Furthermore, as we document in the next section when examining the firm-level data, for the Indian firms that are the major producers of these preferred products, a substantial share of their total sales is destined for export.

¹⁸ See also the discussion in Blonigen, Liebman and Wilson (2007).

(either that it has processed itself or bought on the open market) and further reduces its thickness after it has cooled, the resulting steel is known as a cold rolled flat product. If a firm then continues to process the steel by coating it with zinc, it would be transformed into a “galvanized” or “plated” corrosion-resistant flat product.¹⁹ For reasons related to the policy environment and data matching needs that we describe in more detail below, much of our analysis will be on firms that produce the cold rolled and corrosion-resistant flat products.

3.2 Prowess data on Indian steel firms and products

Before turning to our econometric investigation of interest, we first describe the underlying data. The data on firms in the Indian steel industry draws from information in the *Prowess* database, collected by the Centre for Monitoring the Indian Economy (CMIE), which reports firm-level information from company balance sheets and income statements. In their study on multi-product firms and Indian trade liberalization, Goldberg, Khandelwal, Pavcnik and Topalova (2008) report that the data set covers 60-70% of organized industrial sector activity in India, 75% of corporate taxes and 95% of excise duties collected by the Government of India.²⁰ The firms in the database are not drawn at random and thus the data set can be expected to cover typically the economies’ largest firms. Nevertheless, for a capital-intensive industry such as steel in which economic activity is dominated primarily by large firms, this limitation is not likely to impose problems. Furthermore, while an implication of the focus on large firms more generally is that *Prowess* may not be a good data set for examining questions related to *firm*-level entry and exit, the data can be used to examine questions related to *product*-level entry and exit as well as entry and exit into activities such as *exporting*.

We use information for Indian firms from two separate *Prowess* modules – one firm-level and one firm-product-level – as each contains different, exploitable information. The firm-level module

¹⁹ Of course the process does not stop there, as many steel firms then use these products as intermediate inputs to process them into further downstream products such as bars, wire, etc.

contains information that *Prowess* has aggregated up to the firm level including total firm sales of all products, profits, exports, imports, and expenditures on various input categories (R&D, gross fixed assets, etc.). The firm-product-level module, on the other hand, provides more detailed information on the various products that each firm reports producing. For each reported firm-product combination, the module contains information on production, sales (in values and volumes), capacity, capacity utilization, inventories, and unit values.

While each of the modules contains useful information, each also has its limitations. For example, we can link information from the product module to identify which firms produce which type of steel products so as to be able to identify firms most likely to be affected by the environment created by our market access policy shock. Nevertheless, while the firm-product module contains the firm's total sales at the product level, export sales are only reported at the firm level. Thus we cannot identify what share of a firm's production of a given *product* is exported, and we can only make an indirect inference by linking the firm-level module's data on exports to data on the share of its total sales that are in that particular product category.

Table 2 presents some descriptive information to help identify key elements of the *Prowess* classification scheme so as to understand some of the constraints it imposes on the estimation exercise. Within the broader category of the "iron and steel" industry, *Prowess* allocates firms into production of one of 110 different types of steel product categories. When we match the 110 different product categories to the trade policy actions and preferences documented in table 1, the most relevant product categories for our environment are what *Prowess* calls "cold rolled coils and other flat rolled" (what we refer to as CRF) and "clad, plated, or coated flat rolled" (what we refer to as CPCF) products. Both of

²⁰ *Prowess* is also the source of the data in Topalova's (2004) study on Indian firm-level productivity and import market access liberalization.

these *Prowess* products would fit into the "cold rolled sheet" category that was given the combined preference by the U.S., EU and China policies described in table 1.²¹

However, within a given steel product category such as CRF or CPCF, *Prowess* does not mandate that firms adopt a naming convention for actual varieties of sub-products they may produce. The result is that each firm in the firm-product-level module names its own varieties of products. For example, by extracting all of the data distinctly from each of the 110 different product classifications, we learn and report in table 2 that *Bhushan Steel Ltd.* produces both "semi-finished steel" and "CRF" steel products. However, *Bhushan Steel Ltd.* reports that it produces four *different* varieties of CRF products. Because this is self-reported the varietal differentiation is not necessarily consistent across firms – i.e., one firm may report producing many different varieties of sub-products while a second firm may report only one, even if the two firms produce the same variety mix of sub-products.

Another important limitation of the data evident in table 2 is that there is also no *Prowess*-mandated naming convention for such sub-products, so firms can choose their own names for their varieties. For example, within the CRF product category, *Bhushan Steel Ltd.* reports production of "Cold Rolled Steel Strips Etc.," *JSW Steel Ltd.* reports production of "Cold Rolled Coils/Sheets" and *Shree Precoated Steels Ltd.* reports production of "C.R.Coils." While these are likely to be similar (or even identical) varieties, the lack of consistent naming convention for sub-products within a category such as CRF implies that we cannot sum over varieties of sub-products across firms to a level more disaggregated than one of the 110 different steel product categories such as CRF or CPCF. On the other hand, because the name for each firm's varieties of sub-products is consistent for a particular firm over time, we can use this firm-product combination from the firm-product-level module as a unit of observation in some of our more formal panel regression analysis.²² Finally, there is reason to want to use this level of disaggregation

²¹ Even though there was a substantial overlap in the combined preferences of some other steel products documented in table 1 – e.g., bars, electrical sheet and tin mill products – there was too little data from *Prowess* on Indian firms that self-identify as producing these products to also include them in the analysis.

²² This is one motivation for using firm-product combined fixed effects to control for time invariant, unobserved heterogeneity across products that may arise simply based on how firms have chosen to define them.

as some of the variables that are available in units (e.g., capacity, sales volume, production) can not be aggregated up to a higher level given that a firm may report different units (tonnes versus meters) depending on the particular product.

To summarize, our baseline analysis focuses on a sample of Indian firms that self-report producing at least one CRF or CPCF product over the 1998-2006 period. The first firm-level sample is thus a panel of 58 firms with data extracted from the firm-level module. When we subsequently expand our analysis to examine questions related to the firm-product module, we are able to include data on 80 different firm-product combinations related to these same 58 firms. Also, as table 2 again illustrates, within the set of firms that claim to produce at least one CRF or CPCF product, some firms report information on different varieties of sub-products within these product categories.

Tables 3a and 3b present summary statistics for the firm and firm-product level data samples used in the baseline econometric estimation presented below in section 4.

3.3 Other data

In addition to the data from the firm and firm-product modules in *Prowess*, we rely on two additional sources of data. First, since the *Prowess* data is reported in Rupees, we convert to current U.S. dollars using the IMF's *International Financial Statistics* nominal exchange rate data series.

Second, we rely on the *Global Antidumping Database* (Bown, 2007) to overcome one limitation in the *Prowess* database regarding the lack of information on the identity of the destination markets for India's firm-level exports.²³ The *Global Antidumping Database* reports firm-level information on the targets of many countries' (including the U.S.'s, EU's and China's) antidumping trade policy actions. From this data, we create a list of Indian steel-producing firms revealed to be present as exporters to the U.S., EU and China markets in the pre-2002 period via the necessary condition that, for an Indian firm being the target of a countries' antidumping investigation, it had to have positive level of exports to that

²³ I.e., while we *Prowess* provides data on the size of firm-level exports for firms with positive sales of a particular steel product of interest, *Prowess* does not provide information on the destination foreign markets for those exports.

market. This approach allows us to match 19 Indian steel-producing firms in the *Prowess* data to information that they had been the target of pre-2002 antidumping investigations in at least one of these markets.²⁴

3.4 India’s aggregated product-level data from *Prowess*

Before turning to our more formal regression analysis in sections 4 and 5, we provide a brief discussion of trends in the underlying data once we aggregate over Indian firms that produce these cold rolled flat (CRF) and clad, plated, or coated flat rolled (CPCF) products over the 1998-2006 period.

Consider first figure 4a which presents separate data for Indian firms' total sales of CRF and CPCF products over this time period.²⁵ Recalling that the foreign market access shock took place beginning in 2002, this appears well-timed with the increase in the total sales data – i.e., Indian firms' total sales of both CRF and CPCF almost double between 2001 and 2003 – from roughly \$600,000 million in each product, to almost \$1.2 billion in each. Furthermore, since this figure indicates that sales of both sets of products are growing at a similar pace and we know from our policy analysis that these two products faced the same foreign market access shock via the combined U.S., EU and China preferences, we combine the sales of these two products, refer to them as CRF/CPCF, and focus on firms that produce one or both products.

In figure 4b, we aggregate Indian firms' total sales of CRF and CPCF products together, and we disentangle the source of the growth of the sales between “historic suppliers” (firms that had positive sales of CRF or CPCF products prior to 2001) and “new entrants” (firms that had produced neither of

²⁴ This list of 19 firms derives only from U.S. and EU antidumping investigations as China did not have any investigations against India in steel products during this time period. The U.S. and EU antidumping data on investigations of Indian firms named more the 19 Indian firms in the investigations, but a number of these firms were not in the *Prowess* database – for example, they may have exited the market as some of the investigations took place in the early 1990s before the beginning of our sample for analysis (1998). However, it is important to point out that while some of these investigations were targeting Indian firms in hot rolled steel product categories, none of the investigations were targeting Indian exports of CRF/CPCF products. Thus even this method at identifying whether a particular firm was an exporter of CRF/CPCF to the U.S., EU or China market is imprecise. Furthermore, it is also possible that an Indian steel firm in the *Prowess* data that did export to the U.S. or EU market was not the target of any AD investigations, in which case our approach would also not be completely precise.

these goods before 2002). While the historic suppliers also continued to increase their sales after the 2002 shock, a substantial share of the growth of total sales is via new entrants into these product categories. I.e. by 2006, nearly 25% of CRF/CPCF total sales were by Indian firms that had entered into selling these products only within the five years since the onset of the foreign trade policy shock.

Figure 4c examines the share of sales of these preferenced products in the total sales of all steel products for firms that produce CRF/CPCF. In the data series aggregated over "all firms," the share of sales associated with preferenced products appears to fall dramatically at the time of the 2002 shock as the share plummets from 65% of total sales in 2001 to 38% in 2002. However, this "all firms" series masks an important feature of the data that becomes evident once the share of total sales is broken into historic suppliers versus new entrants. For historic suppliers of CRF/CPCF, sales of these products continue to be a major share of their sales of all steel products over the entire sample, hovering around 60% each year after 2002. For the new entrant firms that begin producing CRF/CPCF only after 2001, the share of their CRF/CPCF sales in total steel sales is initially and understandably much smaller than that of the historic firms, which drags down the aggregated average for all firms. However by 2004, even the new entrants' share of CRF/CPCF sales in their total sales of steel products increased to over 27%, indicating that such firms quickly shifted into substantial production of these preferenced goods as a core element of their operations.

As described in the last section, the *Prowess* data set lacks the ability to match CRF/CPCF product-level sales to product-level exports, as the only export data that it reports is at the firm level. Nevertheless, figure 5 reports information at the firm-level for the share of total firm sales that are exported for all firms that are revealed to produce at least one CRF/CPCF product in a given year. The figure reveals evidence of a clear jump in response to the 2002 foreign market access shock for these firms – i.e., the share of exports in total sales increases from 11% in 2001 to 26% in 2002.

²⁵ As the CRF and CPCF data derive from the firm-product module in which there is no export data, total sales will be a combination of domestic sales + exports.

Thus while we do not have export data at the product level, we draw the following implications from a combined assessment of figures 4 and 5. First, conditional on a firm having positive sales of a CRF/CPCF product, the average share of these preferenced product sales in total sales (figure 4c) is large and relatively time-invariant for historic producers (60%) and growing substantially for new entrants (27% by 2006). Second, conditional on a firm having positive sales of a CRF/CPCF product, the average share of total firm sales of all products that are exported increases substantially in 2002, the year of the foreign market access shock for these preferenced products. These trends from the firm-level data are certainly consistent with the theory that the foreign market access shock led to an increase in India's exports of these preferenced products. The continuation of this export expansion even once the market access shock (trade preference) was eliminated in 2004 is also consistent with theories of hysteresis.

In the next section we examine whether the data trends and the impact of the post-2001 foreign market access shock presented in figures 4 and 5 are significant in the context of a formal panel data regression model estimated at the firm and firm-product level, once we control for other factors. In addition, we also examine how firms may have differentially responded to the questions of whether and when to increase sales and exports in response to the market access opportunities that the foreign policy shock created.

4 Regression Analysis for CRF/CPCF-Producing Firms Response to the Shock

In this section of the paper we estimate fixed effects panel data regression models on two different samples of data. The first is the *Prowess* sample of known producers of CRF/CPCF products that we construct into a quasi-balanced panel of data aggregated to the firm level. The second is the *Prowess* sample of known CRF/CPCF firm-product combinations that we construct into a quasi-balanced panel of data at the disaggregated (combination) firm-product level.

In both instances, the panels are “quasi-balanced” in the sense that firms or products are included in the sample for every year between two points in time in which they have independently reported that they produced a CRF/CPCF product. For example, if a firm reports positive sales in 2001 but then does

not report positive sales of the product again until 2004, we “balance” the panel by filling in zeros for each of the years 2002 and 2003.²⁶

4.1 Estimates from firm-level data

Table 4 presents our first set of estimates on a quasi-balanced sample of 58 firms that produce CRF/CPCF over the 1998-2006 period. We estimate a firm-fixed effects panel regression model in which we have three sets of interacted explanatory variables: yearly indicators, an indicator for whether the firm is a known exporter to the U.S. or EU market pre-2001 (from the *Global Antidumping Database*), and an indicator for whether the firm was a post-2001 entrant – i.e., it first reported sales of CRF/CPCF after 2001. Finally note that the firm-fixed effects control for time-invariant firm characteristics that may be present but which may be difficult to measure precisely (e.g., using size, productivity levels, etc.).

The explanatory variables are identical across each of the regressions in table 4, and thus the only difference between each specification is the dependant variable. In terms of how to interpret the explanatory variables, the parameter estimate associated with a particular year indicator is the average effect for all firms in the sample in that year. The coefficient on the year interacted with the indicator for exporter to the U.S. or EU provides information on the *differential* effect for those firms that were known to export to the U.S. or EU markets. Finally, the year interacted with the new entrant indicator provides the differential effect for those firms who only began producing CRF/CPCF after 2001.

The first dependent variable in specification (1) of table 4 is the firm’s sales of *all* goods, measured in tens of millions of dollars. The estimate of 2.329 for the 2002 indicator implies that total sales in the first year of the foreign shock were \$23.29 million higher than the average, though this estimated increase is not statistically different from zero. However, in addition to that amount, the

²⁶ We do not fill in zeros for all variables – e.g., capacity. Since reporting capacity may be conditional on reporting positive sales, we assume that if the firm reports the same capacity for a product in 2000 and 2005 that it also had that same capacity in the intervening years as well. Furthermore, while this approach does not allow us to estimate the immediate impact of entry and exit at the product level (i.e., within the same year), we do present estimate in which we break out the impact that is generated from historic producers in the sample vis-à-vis new entrants.

differential impact in 2002 for Indian firms that were known exporters to the U.S. or EU is a statistically significant \$195.65 million higher than the average for that year. For each year in 2003-2006, total sales for all firms are larger on average by statistically significant amounts, but the differential is even larger for known exporters to the U.S. and EU markets. In terms of historic suppliers versus new entrants, the only year in which there is a statistically significant difference between the two categories of firms is 2006, when total sales for the new entrants increased by an additional \$201.29 million vis-à-vis the historic firms.

Column (2) presents the same regression specification but changes the dependent variable to be the yearly value of the firms' *exports* of goods, also measured in tens of millions of dollars. The same basic timing and pattern to the results as the sales dependent variable are also present in this export regression. For firms that are known exporters to the U.S. or EU markets, their exports are higher than the average firms' exports by a statistically significant differential of \$98.25 million in 2002, the first year of the foreign market access shock. In each of the years 2003-2006, all firms have (statistically significant) higher levels of exports on average, but the differential is also always larger for known exporters to the U.S. and EU markets. In terms of historic suppliers versus new entrants, again 2006 is the only year in which there is a statistically significant difference between the two categories of firms, when exports for the new entrants are \$81.62 million higher than those of historic suppliers.

In specification (3) we estimate the model on the ratio of export sales to total sales of goods. Here the results indicate a statistically significant and sharp increase above the average for 2002, the first year of the market access shock, as firms exported 9.1% more of their total sales that year than the average. These figures are even higher for years 2004-2006, ranging from 14.5% to 20.6%. Interestingly, there is no statistically significant differential impact from this average effect for firms that are known exporters to the U.S. or EU markets nor for new entrants versus historic suppliers.

Column (4) of table 4 uses an alternative performance measure as the dependent variable, defined as firm-level profits. In years 2002, 2003, 2004 and 2006, known exporters to the U.S. and EU earned higher profits than the average firm in those years, while the estimated profit was only higher than

average for all firms in 2005 and 2006. In no year was there a statistically significant difference in profits for new entrants versus historic suppliers.

Thus far, each of specifications (1) through (4) presents information from firm-level data constructed from the firm-level module in the *Prowess* data set. Nevertheless, while each of the regressions on these variables provides an interesting piece of information, each of the four dependent variables may not precisely capture the phenomenon we are attempting to measure. For example, this may occur if a CRF/CPCF-producing firm produces other (non-CRF/CPFC) products that did not receive a preference, as the data used in the variable construction are the firms' total sales (of all goods), total exports (of all goods) and total profits (in all lines of business).

In specification (5) of table 4, we therefore construct a variable called "preference sales" in which we use the same sample of 58 firms and aggregate up from the *Prowess* firm-product-level module the value of sales of only CRF/CPCF goods for each firm. The qualitative pattern of results between specifications (5) and (1) are quite similar, the only differences being that there is no differential effect for known exporters to the U.S. or EU (in 2005 or 2006) nor differential effect for new entrants versus historic suppliers (in 2006) that were estimated to be statistically significant in specification (1) on the dependent variable of the sales of all goods. Furthermore, the size of the estimated impacts in specification (5) is also predictably smaller since preferred sales are a subset of the firms total sales of all goods.

Finally, as a first attempt to examine the question of whether multi-product steel firms may be substituting toward production of these preferred products over time in response to the 2002 shock, in specification (6) we construct a dependent variable defined to be the ratio of "preference sales" of CRF/CPCF to the firms' total sales of steel products. There is some evidence of this effect on average for all firms in years 2003 and 2005. Of course, the effect is also most pronounced for the differential estimate of the "new entrant" firms which, by construction, had 0% of their total steel sales in the CRF/CPCF preferred product categories prior to 2002 and then only a very small percentage in 2002.

4.2 Estimates from firm-product-level data

Table 5 presents our second set of estimates on a quasi-balanced sample of 80 firm-product combinations deriving from the 58 firms that produce (perhaps multiple varieties of) CRF/CPCF over the 1998-2006 period. Here we use a combined firm-product-level fixed effects panel regression model in which we have the same three sets of interacted explanatory variables as table 4. The firm-product-level fixed effects control for time-invariant firm-product characteristics, including those associated with differences in product variety definition described in section 3.2.

The first dependent variable in specification (7) of table 5 is the value of the firm's sales of a particular CRF/CPCF product, measured in hundreds of thousands of dollars. Unlike specification (1) of table 4, when we define sales at the product level there is no statistically significant immediate effect of the shock in 2002 for known exporters to the U.S. and EU markets. Nevertheless, sales are statistically significant and higher, on average, for each of the years 2003 through 2006, and there is also a statistically significant differential for exporters to the U.S. and EU markets in 2003.

One benefit to estimating the model on data from the firm-product module is the ability to take advantage of information on quantities of steel being sold, which is useful to distinguish between price and volume effects. Thus in specification (8) we redefine the dependent variable to be a firm-product *quantity* of CRF/CPCF sales. Interestingly, when measuring sales by volume, each of the statistically significant effects of specification (7) are also present, but in addition there is evidence that exporters to the U.S. and EU were quicker to respond to the market access shock, as in 2002 they had larger than average sales (by volume). Furthermore, prices appear much slower to respond than volumes – i.e., in specification (9) in which the dependent variable is defined as a unit value, the estimated price is only higher than the average in 2004, 2005 and 2006 – and there is no differential estimates on prices for exporters to the U.S. or EU nor a differential impact for new entrants versus historic suppliers.

Specifications (10) through (12) move beyond sales to examine questions more closely related to production strategies and intensity of input use. In specification (10), for example, the dependent variable is defined as the firm-product capacity utilization rate. The only statistically significant effect takes place

for all firms, on average, in 2003, when the immediate-run response of firms to take advantage of the foreign market access shock appears to have been to increase capacity utilization by 14.51 percent in these preferred products.

One explanation for the result of specification (10) and the lack of persistence of intense capacity utilization after 2003, however, can be found in specification (11) in which the dependent variable is the level for installed capacity for each firm-product combination. Firms increased capacity so that it was above average only slowly, in years 2004, 2005 and 2006. However, there is evidence of a differential effect for exporters to the U.S. and EU market who may have recognized the need for additional capacity to install it quicker, as there is a differential positive estimate for these firms in 2003.

Finally, specification (12) defines the dependent variable as the production of CRF/CPCF goods, in recognition that firms may produce above the level at which they intend to sell in order to further process the goods themselves into other downstream steel products. The qualitative pattern to the estimates is almost identical to what we observed for the sales quantity dependent variable in specification (8) – i.e., the known exporters to the U.S. and EU were the quickest (2002, 2003) to respond by producing more relative to the average firm, but even the estimate for the average firm was that production increased in response to the shock in each of the years 2003, 2004, 2005, and 2006.

5 New Entrants and the Role of Product-Switching

One implication of the regression results from the last section is that there are both important similarities and differences between the “new entrants” in the CRF/CPCF preferred product market – i.e., those firms that first produced one of these products after 2001 – and the “historic firms” producing for the CRF/CPCF market prior to the shock. In this section we focus on the new entrants in CRF/CPCF –how they are similar to and different from the historic suppliers, and where they “come from” in terms of potential product-switching in response to the opportunities created by the changing market access conditions in CRF/CPCF associated with the 2002 shock.

5.1 Underlying motivation from the data

Here we review what we have learned about the new entrants thus far. First, figures 4b and 4c illustrated that the post-2001 entrants into CRF/CPCF quickly increased their sales of these products and made them a sizable fraction of their total sales of all steel products. This is confirmed by the firm-level and product-level regression results presented in tables 4 and 5 – i.e., there is not one negative and statistically significant differential for new entrants when compared to historic suppliers in any of the sales regressions.

Furthermore, figure 5 suggests that the firms that entered into CRF/CPCF sales in 2003 or after may be slightly different from the historic suppliers of CRF/CPCF as they have a larger fraction of total sales that are exported. The research literature comparing the characteristics of exporting versus non-exporting firms in a number of countries (e.g., surveyed in Bernard, Jensen, Redding and Schott, 2007) finds that exporters are typically quite different. To examine a related question in our context, table 6 takes the cross-section of 32 firms that had *both* positive CRF/CPCF sales *and* which exported in 2005 and provides summary statistics on three sub-categories of firms: 1) historic producers of CRF/CPCF that were also *historic* exporters; 2) historic producers of CRF/CPCF that had newly *entered* into *exporting* since 2001; and 3) new *entrants* into *production* of CRF/CPCF since 2001.

Interestingly, table 6 indicates that the new entrants into CRF/CPCF production are larger firms on average – vis-à-vis both the historic exporters and new exporters in the class of historic producers of CRF/CPCF products – along a number of different dimensions of the data. This includes total sales of all goods, total exports of all goods, profits, total purchases of imports, gross fixed assets and even total sales of CRF/CPCF goods. Figure 6 indicates that some of these features of the cross-section of the data for 2005 are not an entirely new phenomenon. This figure reports data on total sales, total exports, and export share of total sales, with data aggregated from firms that entered into CRF/CPCF production after 2001. Even for these firms, there is an increase in their sales and exports and a sharp increase in their export share that is well timed with the 2002 foreign market access shock.

Given that the new entrants into CRF/CPCF production are relatively large firms, many of which enter into CRF/CPCF production with substantial prior experience exporting some other steel products, from where are they switching?²⁷ Figure 7 presents one way to address this question by illustrating a time series of data on sales by steel product for two different categories of firms – figure 7a presents the data for the post-2001 new entrants into CRF/CPCF, while figure 7b presents the data for the historic suppliers of CRF/CPCF. Perhaps not surprisingly from our discussion of section 2.1, new entrants into CRF/CPCF come from a background of major production of hot rolled flat (HRF) products – i.e., the necessary input into creation of a CRF/CPCF product – as that is the only major “other” product worth noting from the figure.²⁸ As figure 7b indicates, even the historic producers of CRF/CPCF also have major, product-level sales of HRF products as well.

Nevertheless, these figures provide motivation for one approach to examining the question of product-switching and entry into CRF/CPCF production. They also then beg the following questions that we address more formally through a panel regression analysis in the next section. For the *Prowess* sample of firms that produce HRF, which appears to be almost necessary condition for a firm to produce CRF/CPCF, what is the response to the incentive created by the 2002 foreign market shock that gave preferences to CRF/CPCF products? Which of these HRF-producing firms dominated expansion into CRF/CPCF? Was it firms with historic experience producing CRF/CPCF goods? Were the sales led by firms entering into this new product domain only after the shock? Is there a link for firms with prior exporting experience?

²⁷ "Switching" may admittedly not be the best term for this context, as we do not examine whether firms are exiting production of one type of steel to enter into CRF/CPCF production. Indeed, as is evidence from figure 7, they likely continue to produce both goods even after they begin producing CRF/CPCF.

²⁸ This information is not trivial as it could have been the case that the data would be dominated by firms producing more refined upstream products could have "entered" CRF/CPCF production from the other direction. That is clearly not the case here.

5.2 Estimates from a panel regression on a sample of hot rolled flat producing firms

Table 8 presents a set of estimates on a quasi-balanced sample from *Prowess* of the 22 firms that produce a HRF product over the 1998-2006 period. While the sample is the set of all firms that produce HRF, the dependent variable is defined as the value of that firms' yearly sales of the preferred CRF/CPCF product. Thus if the HRF-producing firm reports no sales of a CRF/CPCF product, the value for that observation would be zero. The estimates derive from a firm-product fixed effect panel data regression model.

Column (13) estimates the fixed effects model on year indicators only. The first result of interest is that sales of CRF/CPCF products by the sample of HRF-producing firms increase after the 2002 shock, but not until years 2004, 2005, and 2006. So there does appear to be some lag between the CRF/CPCF market access opportunity and the sales expansion reaction by the average HRF-producing firm. Specification (14) introduces a second explanatory variable into the regression, interacting the year indicator with an indicator for whether the HRF-producing firm was also a historic producer of CRF/CPCF products. For example, this regression could reveal whether it is easier to increase CRF/CPCF sales after the shock for HRF firms that were also producers of CRF/CPCF before to the shock vis-à-vis HRF firms that had to enter into CRF/CPCF for the first time. Interestingly, the estimates suggest there is no differential impact between such historic multi-product firms and firms who may have become multi-product (both HRF and CRF/CPCF producers) after the shock.

Nevertheless, specification (15) indicates that the 2004-2006 increase in CRF/CPCF sales by the sample of HRF-producing firms is linked to one important characteristic – exporter status. This is consistent with the theory that Indian producers of HRF that were also exporters would be more likely to realize the attractive market conditions in CRF/CPCF production created by foreign market access shocks. Nevertheless, in specification (16) we add one last explanatory variable into the regression – our indicator for whether a particular firm is a known exporter to the U.S. or EU market. The result from this specification suggests that there no statistically significant differential impact of exporting to the U.S. or EU market for these HRF-producing firms – overall export status dominates.

6 Conclusions

By using a WTO-induced foreign trade policy shock, we examine the impact of external trade liberalization on micro-level economic activity within India. The economic environment was created when major importers such as the U.S., EU and China imposed new safeguard trade barriers in 2002 on steel imports deriving from developed countries and implicitly provided an unexpected preferential market access shock of up to 30% ad valorem to exporters in India and other developing countries by exempting them from the barriers. We use firm-level data to estimate the short-run impact of this trade liberalization shock on Indian steel firms and the products they produce, and we provide evidence that Indian firms with historic export ties to these markets were more quickly able to respond to the changing market conditions presented by the shock to increase sales, exports and profits. Our results also provide evidence of hysteresis, as the Indian firms continued to expand exporting activity even after the termination of the market access shock via the removal of the discriminatory foreign trade barriers on their international competitors in 2004. Furthermore, in terms of input use, while all firms that produce these preferred products increased capacity utilization on average, the historic exporters were quicker to respond to the shock by making new investment to expand existing capacity.

We also explore the role of product-switching in order to examine the characteristics and behavior of steel-producing firms that entered into these new preferred-product categories to take advantage of the market conditions created by the shock. From a sample of hot rolled steel producing firms, we learn that entry into these new products was predominantly undertaken by larger firms that had previous experience exporting other steel products, a result that has implications for our understanding of the fixed costs of exporting.

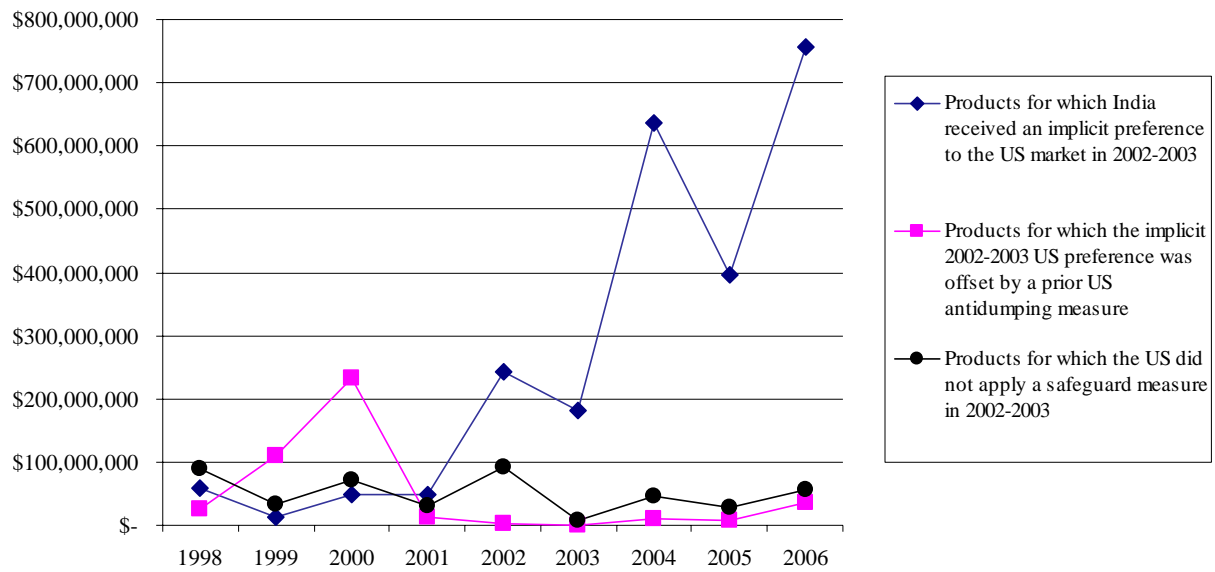
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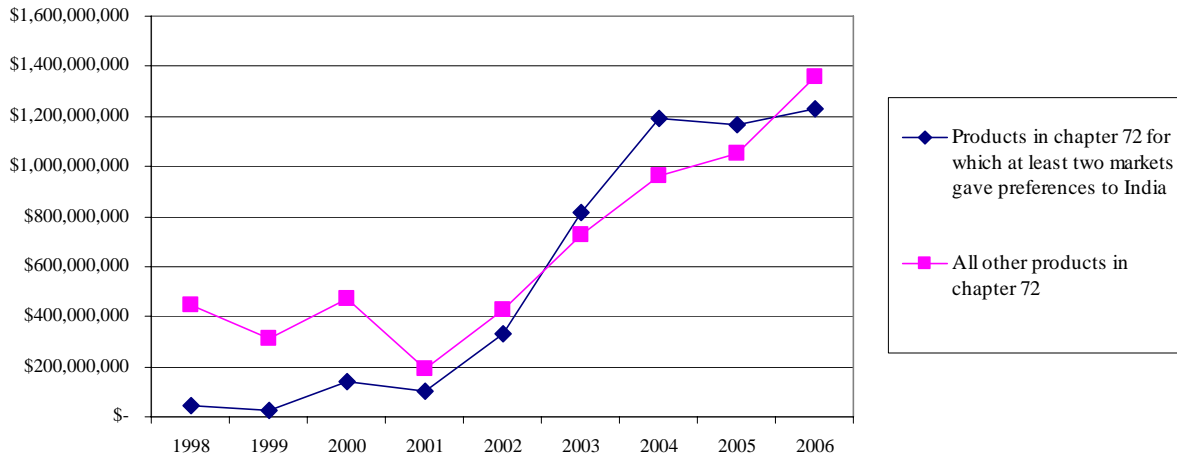
**Figure 1. U.S. Steel Imports from India, 1998-2006,
Various Product Categories Associated with the U.S. 2002-2003 Safeguard Policy**



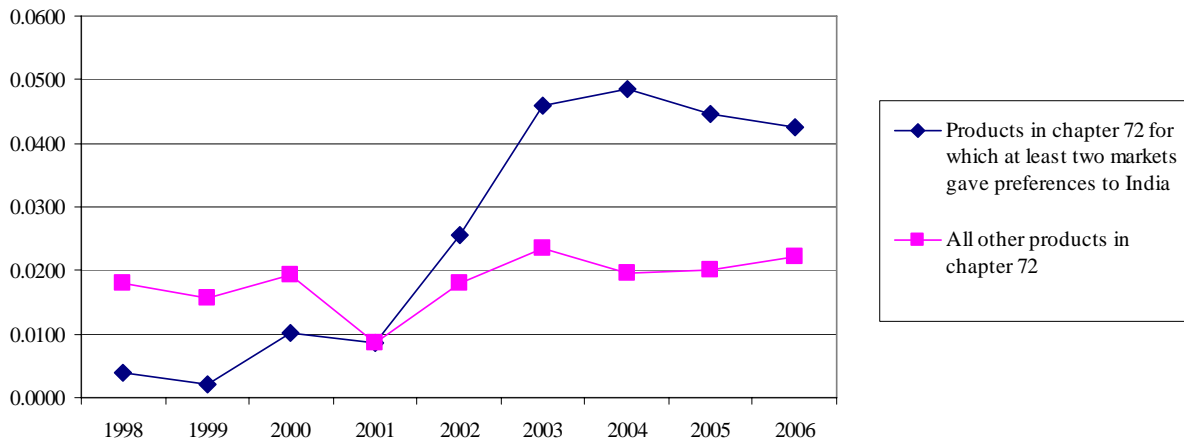
Source: 10-digit USHTS import data from USITC's *Dataweb*.

Figure 2. Combined U.S., EU and China Imports in Selected Steel Products, 1998-2006

a. Value of imports from India

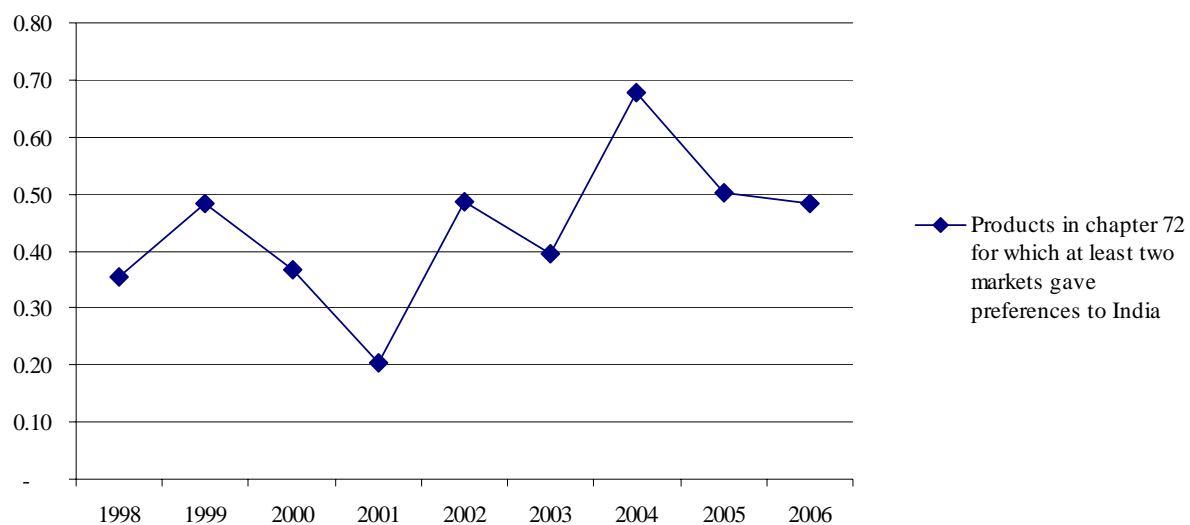


b. Share of combined import markets deriving from Indian exporters



Note: U.S., EU and China import data from WITS. The 44 different 6-digit HS products are included in the "at least two countries gave preferences to India" category, which implies products for which two out of the U.S., EU or China provided exemptions from preliminary safeguard measures (and if only two, the other country gave the product from India at least MFN treatment).

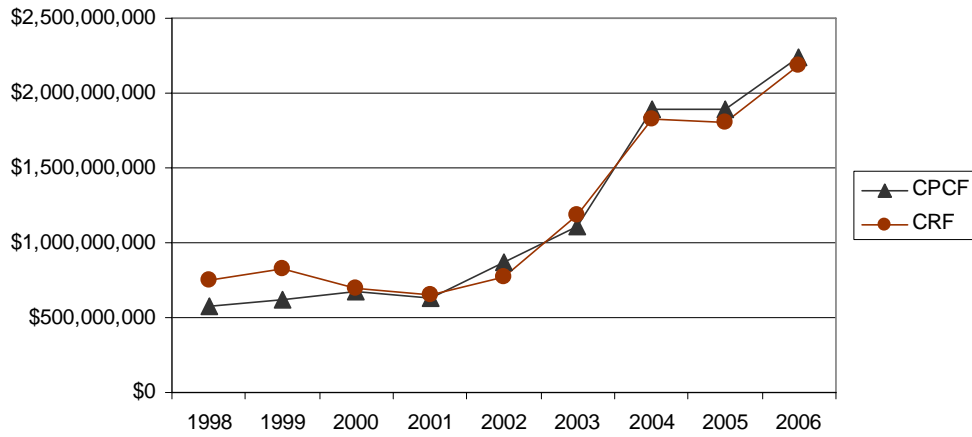
Figure 3. Share of India's Total Exports Sent to U.S., EU and China in These Preferred Product Categories, 1998-2006



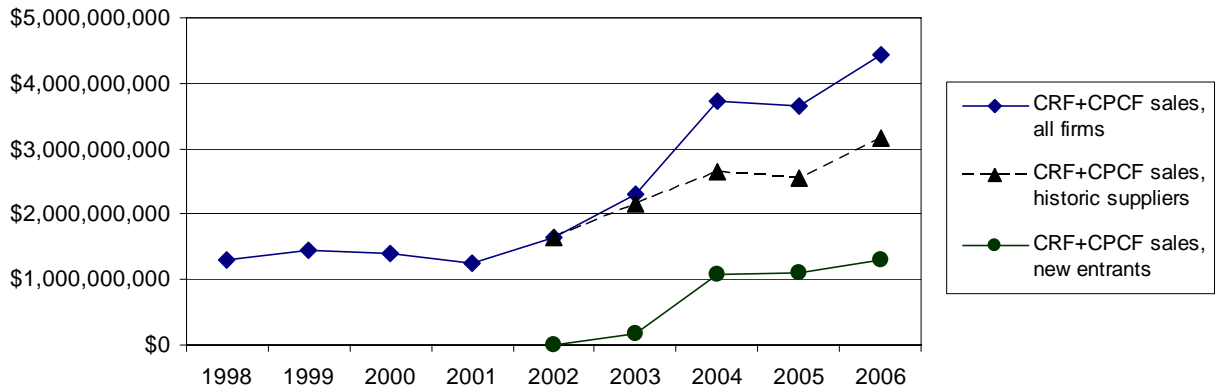
Source: India export data in WITS.

Figure 4. Total Indian Firm Sales of CRF and CPCF, 1998-2006

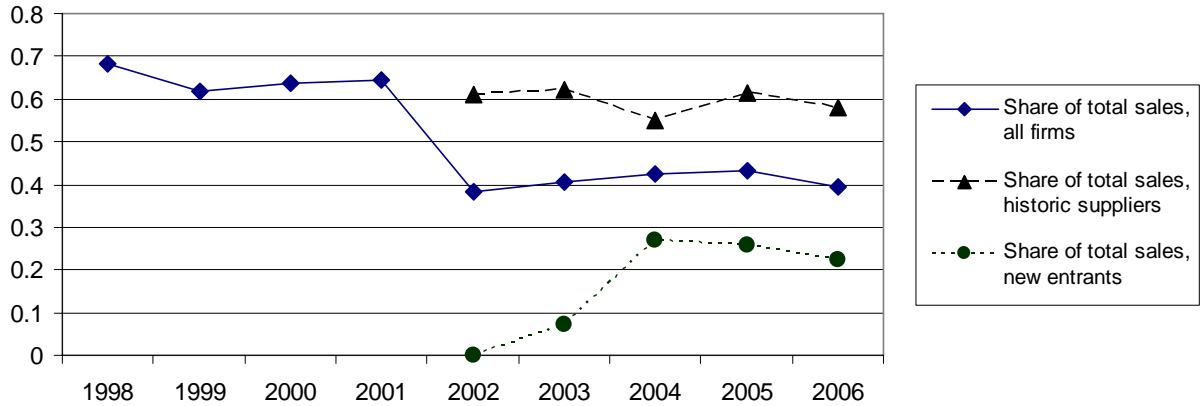
a. Total Sales by product



b. Total CRF+CPCF sales, historic suppliers and post-2001 entrants

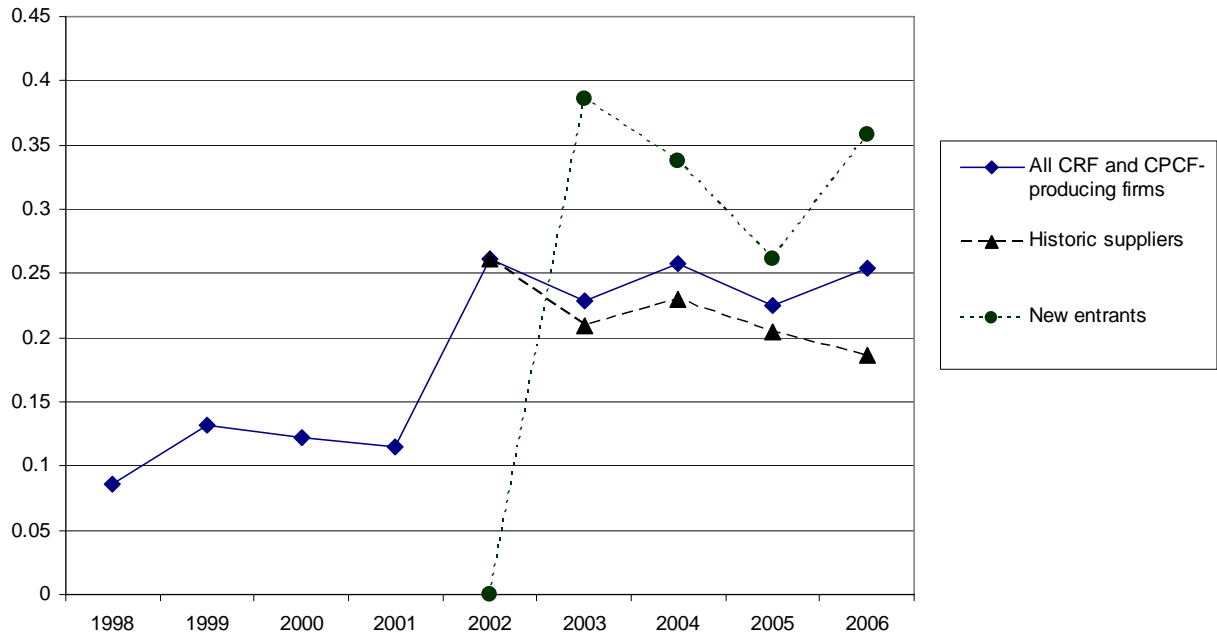


c. Total CRF+CPCF sales as a share of total firm sales



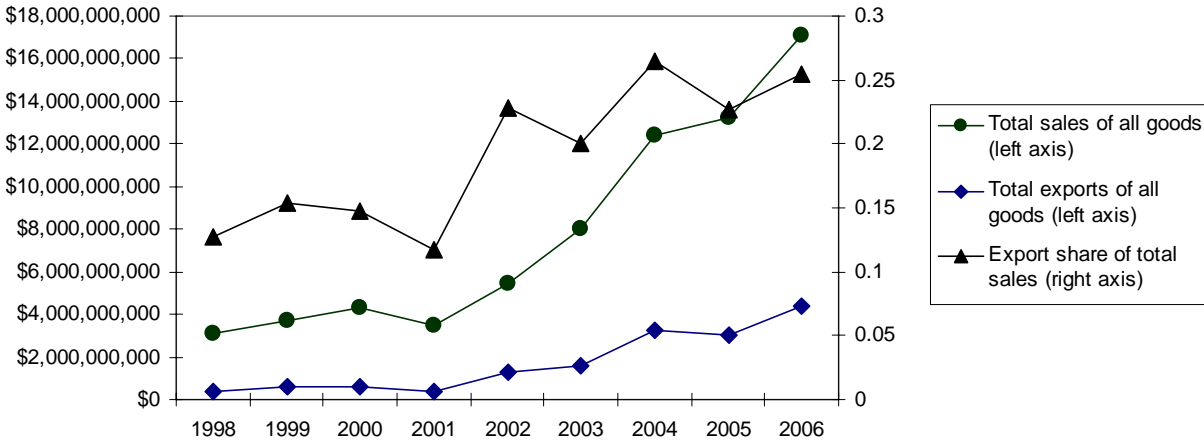
Source: CRF refers to “cold rolled coils and other flat rolled” and CPCF refers to “clad, plated, or coated flat rolled,” data collected by the authors from *Prowess*.

**Figure 5. Export Share of Total Sales,
Aggregated from Firms that Produce CRF or CPCF, 1998-2006**



Source: CRF refers to “cold rolled coils and other flat rolled” and CPCF refers to “clad, plated, or coated flat rolled,” data collected by the authors from *Prowess*.

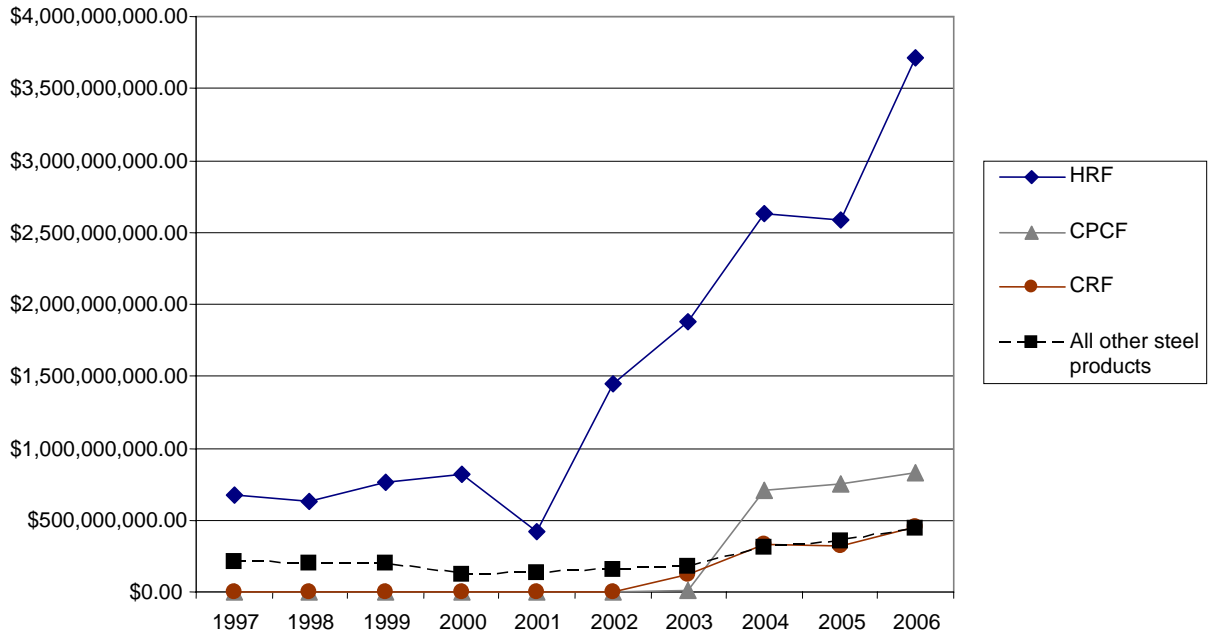
Figure 6. Total Sales, Total Exports, and Export Share of Total Sales, Aggregated from Firms that Entered into CRF or CPCF Production After 2001



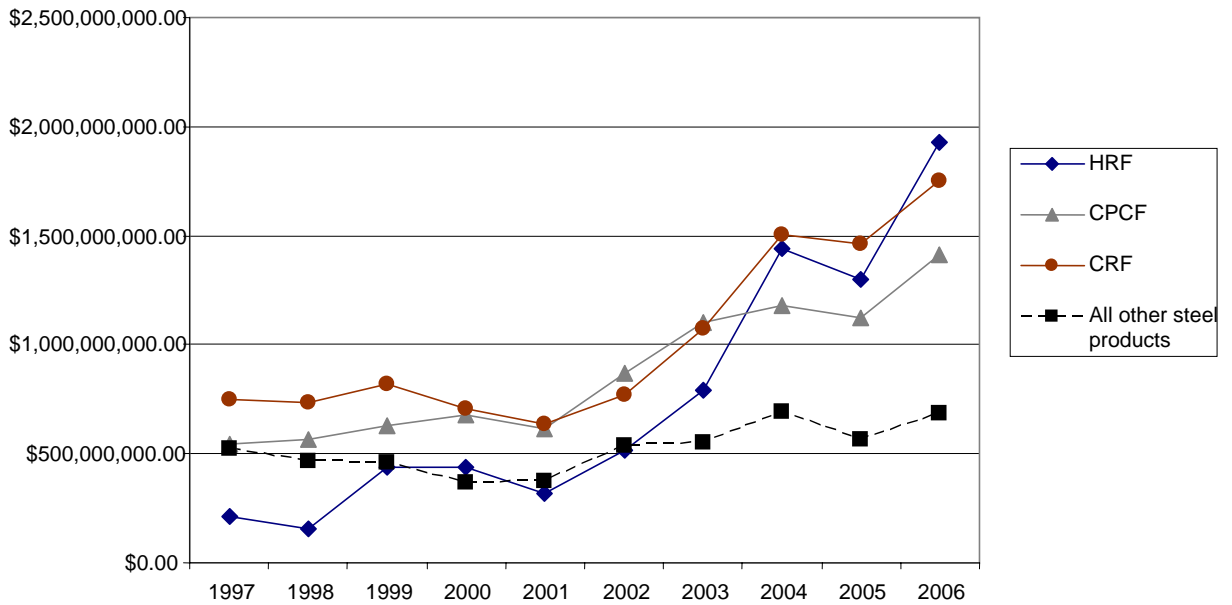
Source: CRF refers to “cold rolled coils and other flat rolled” and CPCF refers to “clad, plated, or coated flat rolled,” data collected by the authors from *Prowess*.

Figure 7. Total Sales by Steel Product for CRF/CPCF-Producing Firms

a. New entrants into CRF/CPCF



b. Historic suppliers of CRF/CPCF



Source: HRF refers to "hot rolled flat," CRF refers to "cold rolled coils and other flat rolled," and CPCF refers to "clad, plated, or coated flat rolled," data collected by the authors from *Prowess*.

Table 1. India Steel Products with “Combined Preferences” under Safeguard (SG) imposed by U.S., EU and China, 2002-2003

Steel Product	U.S. Policy Treatment	EU Policy Treatment	China Policy Treatment
Cold Rolled Sheet	2002-2003 preference via exemption from SG	2002-2003 preference via exemption from preliminary and final SG	2002-2003 preference via exemption from preliminary and final SG
Hot Rolled Bar	2002-2003 preference via exemption from SG	2002 preference via exemption from preliminary SG, no final SG imposed on this product	2002 preference via exemption from preliminary SG, no final SG imposed on this product
Cold Rolled Bar	2002-2003 preference via exemption from SG	2002 preference via exemption from preliminary SG, no final SG imposed on this product	2002 preference via exemption from preliminary SG, no final SG imposed on this product
Reinforced Bar	2002-2003 preference via exemption from SG	2002 preference via exemption from preliminary SG, no final SG imposed on this product	2002 preference via exemption from preliminary SG, no final SG imposed on this product
Tin Mill Products	2002-2003 preference via exemption from SG	2002 preference via exemption from preliminary SG, no final SG imposed on this product	2002 preference via exemption from preliminary SG, no final SG imposed on this product
Electrical Sheets	No preference as some products not subject to safeguard	2002-2003 preference via exemption from preliminary and final SG	2002-2003 preference via exemption from preliminary and final SG

Source: collected by the authors from information in WTO (2002, 2003, 2004).

Table 2. Prowess Data Classification for Iron and Steel Industry Products

Examples of Product Categories (110 Total)	Examples of Firms	Examples of Firm Names for Products
Steel, Semi-finished	<i>Bhushan Steel Ltd.</i>	Billets
Hot Rolled Coils and Other Flat Rolled Products (“HRF”)	<i>J S W Steel Ltd.</i>	Hot Rolled Coils Hot Rolled Steel Plates
Cold Rolled Coils and Other Flat Rolled Products (“CRF”)	<i>Bhushan Steel Ltd.</i>	Cold Rolled Steel Strips Etc. Cold Rolled/Galvanised Steel Strips Etc. Colour Coated Galvanised Steel Strips/Sheet Hardened & Tempered Cold Rolled Steel Strips
	<i>J S W Steel Ltd.</i>	Cold Rolled Coils/Sheets
	<i>Shree Precoated Steels Ltd.</i>	C.R.Coils
Clad, Plated, or Coated Flat Rolled Products (“CPCF”)	<i>J S W Steel Ltd.</i>	Galvanized Coils/Sheets
	<i>Shree Precoated Steels Ltd.</i>	Continuous Galvanising Line G.P.Colour Coated Coils/Sheets/Trapezoidal Sheets Profiling Line/Cut To Length Line Profiling Line/Cut To Length Line -Sq.Mt

Source: collected by the authors from *Prowess*.

Table 3. Summary Statistics for CRF and CPCF Regressions**a. Firm-level regressions**

	Mean	Standard Deviation	Minimum	Maximum
Total sales of goods	18.510	45.352	0.000	429.641
Total exports of goods	4.171	10.106	0.000	74.943
Share of exports in total sales	0.152	0.219	0.000	1.912
Profits	2.832	12.966	-5.649	147.208
Total sales of CRF+CPCF	6.205	11.597	0.000	80.407
Share of CRF+CPCF sales in total steel sales	0.766	0.325	0.000	1.000
Total imports	3.361	9.151	0.000	70.179
Expenditures on R&D	0.013	0.069	0.000	0.751
Gross fixed assets	20.700	58.200	0.005	416.000

Note: Based on 290 observations. All sales, profits, and expenditure figures are reported in \$10,000,000.

b. Firm-product-level regressions for CRF/CPCF goods

	Mean	Standard Deviation	Minimum	Maximum
Total value of sales	448.951	808.669	0.000	6196.768
Total quantity of sales	67.032	106.999	0.000	761.960
Unit value of sales	7.416	6.348	0.000	84.87536
Capacity utilization	71.164	42.105	0.000	446.050
Capacity	145.364	181.608	0.000	1000
Production	107.353	152.450	0.000	912.860

Note: Based on 442 observations. All sales, profits, and expenditure figures are reported in \$100,000.

Table 4. Firm-Level Fixed Effects Regressions of CRF and CPCF-Producers

Explanatory variables	Firm-level fixed effects regression with dependent variable being...					
	Sales of goods	Exports of goods	Export share	Profits	Preference sales	Preference Share
	(1)	(2)	(3)	(4)	(5)	(6)
Year 2000	1.459 (1.669)	1.113 (0.835)	0.044 (0.036)	0.119 (0.454)	1.226 (1.079)	-0.016 (0.029)
...x known exporter to U.S. or EU	8.596 (5.737)	-0.612 (2.868)	-0.101 (0.122)	-1.579 (1.562)	0.223 (3.700)	0.036 (0.101)
Year 2001	1.197 (1.625)	0.799 (0.813)	0.044 (0.035)	0.168 (0.442)	0.820 (1.051)	0.027 (0.029)
...x known exporter to U.S. or EU	3.966 (5.724)	-0.794 (2.862)	-0.057 (0.122)	-2.334 (1.558)	-1.358 (3.692)	0.024 (0.101)
Year 2002	2.329 (1.675)	1.330 (0.838)	0.091^b (0.036)	0.334 (0.456)	1.535 (1.088)	0.010 (0.030)
...x known exporter to U.S. or EU	19.565^a (6.555)	9.825^a (3.277)	0.074 (0.139)	4.247^b (1.785)	5.613 (4.229)	0.063 (0.115)
Year 2003	3.879^b (1.796)	1.537^c (0.898)	0.094^b (0.039)	0.476 (0.489)	2.350^b (1.178)	0.064^c (0.033)
...x known exporter to U.S. or EU	33.775^a (6.587)	15.316^a (3.293)	0.082 (0.140)	5.994^a (1.793)	10.522^b (4.253)	-0.016 (0.116)
...x post-2001 entrant	-0.342 (8.601)	1.582 (4.300)	0.053 (0.183)	0.251 (2.341)	-0.887 (5.553)	0.266^c (0.152)
Year 2004	7.671^a (1.768)	3.092^a (0.884)	0.145^a (0.038)	0.702 (0.481)	4.720^a (1.149)	0.047 (0.032)
...x known exporter to U.S. or EU	83.791^a (7.439)	28.117^a (3.719)	-0.052 (0.158)	20.841^a (2.025)	9.152^c (4.799)	-0.110 (0.131)
...x post-2001 entrant	-7.206 (8.331)	-1.624 (4.165)	-0.056 (0.177)	-0.144 (2.268)	-3.577 (5.376)	0.382^a (0.147)
Year 2005	9.084^a (1.826)	3.995^a (0.913)	0.157^a (0.039)	0.884^c (0.497)	5.634^a (1.177)	0.055^c (0.033)
...x known exporter to U.S. or EU	82.036^a (7.453)	14.507^a (3.726)	-0.140 (0.158)	-2.844 (2.029)	4.461 (4.806)	-0.134 (0.131)
...x post-2001 entrant	-2.781 (8.423)	-4.592 (4.211)	-0.121 (0.179)	-1.048 (2.293)	-1.922 (5.433)	0.396^a (0.148)
Year 2006	14.885^a (1.940)	5.827^a (0.970)	0.206^a (0.041)	2.190^a (0.528)	9.081^a (1.251)	0.025 (0.034)
...x known exporter to U.S. or EU	139.696^a (7.482)	19.744^a (3.741)	-0.183 (0.159)	23.826^a (2.037)	4.464 (4.824)	-0.115 (0.132)
...x post-2001 entrant	20.129^b (8.921)	8.162^c (4.460)	-0.085 (0.189)	3.064 (2.428)	-0.950 (5.754)	0.355^b (0.157)
Constant	10.351 ^a (1.334)	1.340 ^b (0.667)	0.069 ^b (0.028)	1.965 ^a (0.363)	3.266 ^a (0.862)	0.721 ^a (0.024)
Observations	290	290	286	290	286	282
Number of firm fixed effects	58	58	58	58	58	58
R-squared	0.9845	0.9201	0.6921	0.9879	0.8986	0.8987

Standard errors in parentheses. c significant at 10%; b significant at 5%; a significant at 1%

Table 5. Firm-Product Fixed Effects Regressions for CRF and CPCF-Products

Explanatory variables	Firm-product fixed effects regression with dependent variable being...					
	Sales value (7)	Sales quantity (8)	Unit values (9)	Capacity utilization (10)	Capacity (11)	Production (12)
Year 2000	-13.763 (55.665)	-6.507 (6.503)	-0.127 (0.900)	-0.517 (6.765)	1.790 (11.374)	-0.091 (9.177)
...x known exporter to U.S. or EU	75.839 (157.347)	21.832 (18.210)	0.183 (2.590)	7.020 (17.611)	-1.790 (30.403)	24.848 (25.224)
Year 2001	-7.831 (57.004)	1.684 (6.624)	-0.906 (0.910)	4.802 (6.852)	7.179 (11.475)	5.630 (9.288)
...x known exporter to U.S. or EU	-15.230 (157.826)	16.812 (18.254)	-0.119 (2.594)	-0.046 (17.644)	-7.179 (30.441)	16.828 (25.265)
Year 2002	47.576 (57.255)	9.265 (6.692)	-0.469 (0.939)	7.268 (6.874)	11.245 (11.407)	9.788 (9.456)
...x known exporter to U.S. or EU	193.603 (165.361)	34.595^c (19.138)	0.158 (2.751)	-9.889 (18.467)	47.089 (31.835)	44.181^c (26.510)
Year 2003	110.664^c (60.208)	15.382^b (7.081)	0.666 (1.007)	14.510^b (7.100)	15.595 (11.881)	18.645^c (9.857)
...x known exporter to U.S. or EU	321.281^c (166.407)	46.085^b (19.277)	0.178 (2.774)	-11.966 (18.552)	126.905^a (32.008)	96.681^a (26.656)
...x post-2001 entrant	-244.662 (342.651)	-10.508 (39.625)	-0.395 (5.251)	2.721 (40.508)	-41.597 (70.113)	-16.628 (54.753)
Year 2004	313.697^a (60.752)	26.565^a (7.109)	2.725^a (0.976)	10.289 (7.073)	37.046^a (11.803)	47.304^a (9.896)
...x known exporter to U.S. or EU	105.083 (187.984)	9.159 (21.755)	-0.311 (3.235)	2.454 (20.888)	29.121 (36.068)	35.138 (30.075)
...x post-2001 entrant	-174.552 (334.325)	-15.233 (38.655)	-0.543 (5.118)	23.547 (37.880)	-51.539 (65.128)	-44.929 (53.409)
Year 2005	315.434^a (61.337)	31.234^a (7.180)	2.397^b (0.998)	3.379 (7.117)	69.852^a (11.982)	61.098^a (9.993)
...x known exporter to U.S. or EU	-68.276 (183.069)	-12.796 (21.189)	-0.615 (3.242)	5.570 (20.342)	-4.025 (34.438)	-9.168 (29.294)
...x post-2001 entrant	-6.681 (335.970)	12.633 (38.845)	-0.590 (5.144)	48.419 (38.565)	-85.623 (65.974)	-10.484 (53.669)
Year 2006	531.163^a (64.717)	37.682^a (7.588)	5.920^a (1.039)	1.547 (7.469)	91.659^a (12.539)	80.451^a (10.551)
...x known exporter to U.S. or EU	-146.003 (184.229)	-14.967 (21.330)	-2.705 (3.255)	17.766 (20.468)	-25.153 (34.607)	-13.871 (29.489)
...x post-2001 entrant	59.182 (347.923)	-1.676 (40.231)	-1.819 (5.326)	44.202 (41.522)	-89.700 (68.931)	-40.026 (56.008)
Constant	289.759 ^a (46.128)	51.672 ^a (5.398)	6.297 ^a (0.764)	64.068 ^a (5.003)	119.963 ^a (8.780)	79.416 ^a (7.532)
Observations	442	434	395	392	425	426
Number of firm-product fixed effects	76	75	74	71	80	79
R-squared	0.9101	0.9316	0.6646	0.5955	0.9424	0.9356

Standard errors in parentheses. c significant at 10%; b significant at 5%; a significant at 1%

Table 6. Characteristics of Historic and New Entrant for CRF and CPCF-Producers for Firms Exporting in 2005

Variable (mean values)	Historic Firms in CRF+CPCF		New Entrants in CRF+CPCF
	<i>Historic Exporters</i>	<i>New Exporters</i>	<i>All</i>
Total sales of goods	38.128	16.681	53.099
Total exports of goods	7.580	4.724	14.317
Share of exports in total sales	0.264	0.180	0.177
Profits	6.851	1.210	8.699
Total sales of CRF+CPCF	8.584	13.671	17.653
Share of CRF+CPCF sales in total steel sales	0.749	0.901	0.513
Total imports	7.286	6.019	18.478
Expenditures on R&D	0.034	0.000	0.024
Gross fixed assets	42.900	13.000	56.700
Number of firms	20	6	6

Note: based on a sample of firms with positive exports and positive CRF (cold rolled flat) or CPCF (clad, plated or coated flat rolled) sales in 2005. A firm is defined as a new entrant if it first reported positive sales of a CRF or CPCF product after 2001 and is defined as a new exporter if its first exports were reported after 2001. Not reported are the summary statistics are three non-exporting firms with positive sales in 2005: one new entrant firm and two historic firms. All sales, profits, and expenditure figures are reported in \$10,000,000.

Table 7. Summary Statistics for Regressions on Sample of HRF-Producing Firms

	Mean	Standard Deviation	Minimum	Maximum
Total sales of CRF+CPCF	5.816	12.255	0	67.537
Historic producer of CRF/CPCF	0.448	0.499	0	1
Known exporter	0.612	0.489	0	1
Known exporter to U.S. or EU	0.149	0.358	0	1

Note: Based on 134 observations. Sales are reported in \$10,000,000.

Table 8. Firm-Level Fixed Effects Regressions of CRF and CPCF-Sales from the Sample of HRF Producing Firms

Explanatory variables	Dependent variable is the value of sales of CRF+CPCF for a HRF-producing firm			
	Years only (13)	Interact indicator for historic producer (14)	Replace with indicator for exporter (15)	Interact with second indicator of exporter to U.S. or EU (16)
Year 2000	0.244 (2.890)	-0.008 (4.207)	-0.004 (4.510)	-0.028 (4.527)
...x historic producer of CRF/CPCF	--	0.508 (5.907)	--	--
...x known exporter	--	--	0.514 (5.928)	0.204 (6.498)
...x known exporter to U.S. or EU	--	--	--	1.357 (8.297)
Year 2001	-0.321 (3.017)	-0.376 (4.624)	0.030 (4.510)	0.005 (4.527)
...x historic producer of CRF/CPCF	--	0.226 (6.211)	--	--
...x known exporter	--	--	-0.614 (6.160)	0.585 (6.766)
...x known exporter to U.S. or EU	--	--	--	-3.818 (9.250)
Year 2002	0.788 (2.857)	-0.587 (3.998)	0.031 (4.394)	-0.018 (4.413)
...x historic producer of CRF/CPCF	--	3.305 (5.883)	--	--
...x known exporter	--	--	1.547 (5.942)	0.678 (6.573)
...x known exporter to U.S. or EU	--	--	--	4.293 (8.310)
Year 2003	2.359 (2.903)	0.490 (4.105)	0.072 (4.607)	0.046 (4.624)
...x historic producer of CRF/CPCF	--	4.313 (5.956)	--	--
...x known exporter	--	--	3.972 (6.044)	2.628 (6.637)
...x known exporter to U.S. or EU	--	--	--	6.094 (8.310)
Year 2004	6.939^b (3.004)	7.647^c (4.221)	0.154 (4.854)	0.128 (4.872)
...x historic producer of CRF/CPCF	--	-1.974 (6.172)	--	--
...x known exporter	--	--	11.110^c (6.298)	11.746^c (6.812)
...x known exporter to U.S. or EU	--	--	--	-3.083 (9.135)

Year 2005	7.936^b	8.659^b	0.224	0.198
	(3.179)	(4.325)	(5.052)	(5.071)
...x historic producer of CRF/CPCF	--	-2.276	--	--
		(6.644)		
...x known exporter	--	--	12.633^c	15.053^b
			(6.576)	(7.150)
...x known exporter to U.S. or EU	--	--	--	-10.238
				(9.287)
Year 2006	11.552^a	13.067^a	0.242	0.217
	(3.327)	(4.633)	(5.994)	(6.016)
...x historic producer of CRF/CPCF	--	-3.758	--	--
		(6.849)		
...x known exporter	--	--	16.316^b	18.807^b
			(7.323)	(7.846)
...x known exporter to U.S. or EU	--	--	--	-10.560
				(9.287)
Constant	2.625	2.659	2.712	2.722
	(2.077)	(2.140)	(3.845)	(3.950)
Observations	134	134	134	134
Number of firm-product fixed effects	22	22	22	22
R-squared	0.6105	0.6205	0.6561	0.6787

Standard errors in parentheses. c significant at 10%; b significant at 5%; a significant at 1%