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Antidumping Duties and Plant-Level Restructuring

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Abstract This paper examines the effect of antidumping duties on the restructuring activities of protected plants. Using a dataset that contains the full population of U.S. manufacturers, I find that protected plants increase their capital intensities modestly relative to unprotected plants, but only when antidumping duties have been in place for a sufficient duration. I find little effect of antidumping duties on a proxy for the skilled labor intensity of protected plants.

Keywords Antidumping · Temporary protection · Restructuring

JEL Classifications F10 · F13 · L20 · L25

1 Introduction

While a large theoretical literature has considered the effect of temporary trade protection policies on restructuring activities, such as the adoption of new technology, there is little empirical evidence on the subject. This paper examines whether the temporary reduction in competition associated with antidumping duties allows plants to restructure their production processes. Using a plant-level dataset containing the universe of U.S. manufacturers, I examine how plants adjust their capital and skill intensities in response to the imposition of antidumping duties. I find that protected plants increase their capital intensities relative to unprotected plants, but only when antidumping duties have been in place for a sufficient duration. I do not find a robust effect of antidumping protection on a measure of skill intensity. The results suggest that the

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effect of antidumping duties on restructuring activities is not immediate, either because plants take time to assess the effects of the policy on their market, or because they are financially constrained and must generate the cash flow needed for investments.

Studying the effect of temporary tariffs on plant-level restructuring activities offers several important types of insights. First, given the prominent role that antidumping duties have come to play in international trade policy, understanding the reactions of plants to this temporary trade protection is a matter of interest for researchers and policy-makers. For example, it is helpful to understand whether antidumping duties induce firms to purchase new equipment or simply allow them temporarily to increase prices. Second, antidumping duties provide a useful setting for examining the more general question of how government policies that temporarily restrict competition affect firms' timing of irreversible investments.

This paper also provides new empirical evidence that is related to a theoretical literature that examines the effect of temporary trade protection on restructuring activities—particularly the adoption of new technologies. Matsuyama (1990) shows in an infinite-horizon perfect information setting that the government can induce firms to make investments by threatening to liberalize trade in a future period, but that the threat is not renegotiation-proof, and hence may not be credible. Miyagiwa and Ohno (1995) find that under certain conditions—with either permanent tariffs or temporary tariffs with an exogenous end date—trade protection can actually speed the timing of technology adoption. Crowley (2006) examines the effect of variation in the breadth of coverage of temporary tariffs on technology adoption and finds that antidumping duties can speed the timing of adoption while preserving the order of technology adoption across countries. In this paper, I find that antidumping protection is associated with plants increasing their capital intensities, but that the effects are only present as the duration of protection increases.

I measure plant-level restructuring activities in two ways. The first measure is the change in the capital-labor ratio that is observed at protected plants, relative to unprotected plants. This variable measures the extent to which plants reallocate their input usage between capital and labor—potentially as a way to respond to changes in the level of foreign competition. The second measure is the change in the share of non-production employees in total employment. To the extent that non-production workers are higher-skilled employees, an increase in the share of non-production workers represents an increase in the skill intensity of the production process.

As has been noted in the literature that examines the effect of antidumping duties at the micro-level, plants and industries that receive antidumping duties may differ systematically from those that do not receive protection.[1] I construct a control group that is designed to eliminate two potential sources of bias, following the procedure described in Pierce (2011). The first source of bias is a self-selection bias that arises if industries that apply for protection differ from those that do not. I control for this self-selection bias by restricting the control group to industries that applied for protection but were turned down by the government. The second source of bias is a government selection bias that occurs if the industries that the government approves for protection

[1] See Konings and Vandenbussche (2008) and Pierce (2011).

differ from those that do not. I control for the government selection bias by further limiting the control group to industries that are similar to those receiving protection in terms of variables considered by the government.

I compare the restructuring activities of plants in a treatment group that received protection to those in the control group described above. I use a difference-in-difference framework, which controls for time-invariant differences between the treatment and control groups, as well as macro-level shocks that affect the treatment and control groups identically at a particular time.

I find that protected plants increase their capital intensities relative to unprotected plants, but that the effect is only found as the duration of protection increases. More specifically, I estimate that the effect of antidumping protection on capital intensity only turns positive after the duties have been in place for 3–4 years. This relationship holds with either product or plant fixed effects, and also when controlling for the effective rate of the antidumping duty. I do not find a robust effect of antidumping duties on my proxy for the skill intensity of the production process.

While the results indicate that antidumping protection of sufficient duration is associated with capital-deepening, they should not be interpreted as an indication that antidumping duties are welfare-augmenting, or even productivity-augmenting. As discussed in Pierce (2011), antidumping duties are not generally associated with increases in productivity—for the subset of plants that report output data in physical units of quantity in that paper, productivity actually falls. Moreover, because measures of capital are based on deflated nominal values, the capital-labor ratio may spuriously change if industry-level price deflators do not accurately capture changes in the price of capital.

The remainder of the paper is organized as follows: Sect. 2 describes the data. Section 3 presents my empirical strategy and provides detailed definitions of my measures of restructuring activities. In Sect. 4 I report the results of my analysis. Section 5 provides a discussion of the results, and Sect. 6 concludes.

2 Data

The primary source for the plant-level data used in this paper is the U.S. Census Bureau's Census of Manufactures (CM). The CM is a useful data source for this analysis for two reasons: First, its coverage is broad—the CM collects data for every U.S. manufacturing establishment (plant), regardless of size. Second, the data collected in the CM are rich, with information on plants' employment by broad category of employee, book value of capital, and the complete set of products that are produced. These plant-level data allow me to identify the plants that are involved in antidumping investigations and calculate the measures of plant-level restructuring activities that will be used throughout this paper.

The CM is conducted every 5 years in years ending in 2 and 7, and for this analysis I employ data for the years 1987, 1992, and 1997. These years are selected for two reasons: First, the Standard Industrial Classification (SIC) codes that are used to define products in the CM are constant from 1987 to 1997, whereas earlier and later years in the CM were subject to different classifications systems. Second, the level of detail that

is available in the concordance that is needed to match antidumping data to the CM is far better in these years than in later years, which allows substantially more accurate products matches between the two systems.[2] One drawback of consideration of this time period, however, is that changes in the nature of antidumping investigations since the sample period, such as the increasing prevalence of cases against China, could limit the ability to project the effects of current investigations.

Data on antidumping investigations are from the Global Antidumping Database (GAD) that has been compiled by Chad Bown for the World Bank.[3] The GAD collects data on every antidumping investigation that has been initiated in the United States, as well as many other countries. It contains data on the key dates of each investigation, the countries that were targeted, and the products that were involved. I consider antidumping investigations that were completed from 1988 to 1996, which allows me to observe plants both before and after every investigation.

Products in the GAD are defined under the U.S. Harmonized Tariff System (HTS), at various levels of disaggregation, typically from the six-digit to the ten-digit level. In contrast, products in the CM are defined using the SIC. Therefore, to identify plants producing products that are involved in antidumping investigations, I map HTS codes to five-digit SIC codes using the concordance described in Pierce and Schott (2012). This concordance uses data that were obtained from the Census Bureau, allowing HTS codes to be mapped to SIC codes through a bridge code known as a "SIC Base" code.

Antidumping investigations are widespread in the manufacturing sector, with duties imposed in nearly every two-digit SIC manufacturing category over the period from 1988 to 1996. Certain major industries are particularly prolific seekers of antidumping protection, however, especially steel and other basic metals, machinery and parts, and chemicals. See U.S. International Trade Commission (2006) for more detailed information with regard to the product distribution of antidumping investigations over time.

3 Empirical Strategy

3.1 Measures of Plant-Level Restructuring Activities

I employ two variables to examine plant-level restructuring activities: The first variable is the capital-labor ratio, K_{pt}/L_{pt} where K is the book value of capital and L is the total number of employees at plant p, at time t. This variable measures the extent to which plants restructure by changing the mix of labor and capital in their production process. For example, plants may respond to increased competition from low-wage countries by increasing the capital intensity of their production process or switching to more capital-intensive products, as described in Bernard et al. (2006).

The second variable is the share of non-production employees in total employment, NP_{pt}/L_{pt}, where NP is the number of non-production employees and L is the total number of employees at plant p, at time t. In research involving Census data, non-production workers are often interpreted as being higher-skilled than produc-

[2] See Pierce and Schott (2012) for more details.

[3] See Bown (2012).

Table 1 Summary statistics by treatment group, year

Year	Treatment	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Capital-labor ratio		Share of non-production workers in total employment		Duration of AD protection		Effective AD Rate	
		Mean	SD	Mean	SD	Mean	SD	Mean (%)	SD (%)
1987	0	42.30	70.56	0.27	0.15				
1987	1	51.84	116.21	0.32	0.18	0	0	17	14
1992	0	45.90	84.18	0.28	0.16				
1992	1	54.94	105.08	0.34	0.19	0.96	0.80	17	14
1997	0	51.91	93.04	0.27	0.16				
1997	1	70.44	258.07	0.34	0.20	5.67	1.32	16	14

Note This table reports summary statistics (means and standard deviations) for the continuous variables employed in the empirical analysis in this paper. Treatment is an indicator variable that takes the value 1 if a plant is in the treatment group and 0 if the plant is in the control group (see text). Columns (1) and (2) report the mean and standard deviation, respectively, of the capital-labor ratio, where capital is measured as the book value of capital in thousands of 1997 dollars and labor is the total number of employees. Columns (3) and (4) report the mean and standard deviation of the share of non-production workers in total employment. Columns (5)–(8) report summary statistics for the two key independent variables in the analysis–the duration of AD protection (in years) and the Effective AD rate (in percentage points)

tion workers.[4] Even without this interpretation, this variable provides another way of examining restructuring activities by measuring the extent to which plants change the composition of their employment in response to antidumping protection. Summary statistics for each of the measures of plant-level restructuring can be found in Table 1.[5]

3.2 Defining Treatment and Control Groups

To examine the effect of antidumping protection on plant-level restructuring, I compare the behavior of plants in a treatment group that receive antidumping protection to those in a control group that do not. These treatment and control groups are constructed using the approach employed in Pierce (2011). In particular, the treatment group is composed of plants that produce products that receive antidumping protection.[6] The control group includes plants that produce products that applied for antidumping protection, are

[4] See, for example, Berman et al. (1994) and Bernard and Jensen (1997).

[5] The table reports means and standard deviations for all continuous variables that are employed in this paper. The Census Bureau does not permit release of minimum and maximum data, as they represent survey responses of individual establishments. Review of minimum and maximum data by the author did not reveal any anomalous observations.

[6] In the time period examined in this paper, five of the 148 antidumping investigations completed ended with suspension agreements as the only form of protection. Under this arrangement, foreign firms agree to stop dumping, in exchange for suspension of the antidumping investigation. Because data on the effective duty rate—considered later in the paper—are unavailable for these investigations, they have been excluded from this analysis.

similar to those that received protection, but did not receive antidumping protection, as discussed immediately below. Note that for the remainder of the paper, I refer to the set of plants that produce a particular product, g, as "sub-industries."

The control group is constructed in a way that mitigates two potential sources of bias. The first potential bias is a self-selection bias that occurs if sub-industries that apply for protection are different from those that do not apply for protection. I control for this possibility by limiting the control group to plants in sub-industries that applied for protection, but whose petitions were rejected by the government. This means that both the treatment and control groups are composed of plants that are similar in the sense that they are subject to import competition and are able to cooperate in drafting a petition requesting antidumping protection.

The second potential source of bias is a selection bias that occurs if the government bases its decision of whether to provide protection or not based on variables that are correlated with dependent variables in my analysis. I control for this selection bias by further limiting the control group to plants in sub-industries that are similar in terms of the variables considered by the ITC when determining whether an industry has been sufficiently injured by dumping to allow antidumping protection.[7]

I determine similarity in terms of the variables considered by the ITC by estimating the probability that a sub-industry is successful in its antidumping application with a logit specification. The dependent variable is an indicator that takes the value 1 if a sub-industry applies for protection and is awarded antidumping duties, and takes the value 0 if a sub-industry applies for protection but is not awarded antidumping duties. The regressors include a set of variables considered by the ITC in its determinations including import penetration, employment and the rate of change of prices.[8] After obtaining estimates from the logit specification, I estimate a predicted probability of receiving antidumping protection. I then limit the control group to plants in sub-industries that are above the 75th percentile in terms of their probability of receiving antidumping protection.[9]

Through these steps, I am able to construct a control group that is composed of plants in sub-industries that also applied for antidumping protection, were similar to the protected sub-industries in terms of the characteristics considered by the ITC, but did not receive protection. I then compare the restructuring activities of protected plants in the treatment group to unprotected plants in the control group using the methodology described immediately below.

3.3 Empirical Strategy

I calculate estimates of the effect of antidumping protection on plant-level restructuring behavior using the following difference-in-difference specification, as in Pierce (2011):

[7] These two sources of bias were first discussed in Konings and Vandenbussche (2008).

[8] The regressors are also drawn in part from Blonigen and Park's (2004) analysis of the determinants of success in antidumping petitions. The estimation is described in additional detail in Pierce (2011). Results from the logit specification are also reported in that paper.

[9] This cutoff was also employed in Konings and Vandenbussche (2008) and Pierce (2011).

$$y_{\mathrm{pt}}^{g} = \alpha + \beta_1 Treatment_{\mathrm{g}} * Post_{\mathrm{gt}} + \gamma_{\mathrm{t}} + \delta_{\mathrm{g}} + \varepsilon_{\mathrm{pt}} \quad (1)$$

Here, the dependent variable y_{pt}^{g} is one of the measures of plant-level restructuring described above, observed at plant p, producing product g, at time t. $Treatment_{\mathrm{g}}$ is an indicator variable that takes the value 1 if product g is in the treatment group (receives antidumping protection) and takes the value 0 if product g is in the control group (applied for protection but rejected by the government). $Post_{\mathrm{gt}}$ is a second indicator variable that takes the value 1 for years after the initiation of the antidumping investigation for product g, and 0 otherwise. The coefficient β_1 is the difference-in-difference estimator that measures the effect of antidumping protection on plant-level restructuring activities. γ_{t} and δ_{g} are year and product-level fixed effects, respectively.

Note that the difference-in-difference specification controls for any time-invariant differences between the treatment and control group. In fact, because Eq. (1) includes product fixed effects in place of a simple $Treatment_{\mathrm{g}}$ variable in levels, the specification controls for time-invariant differences between products within the treatment and control groups as well. The set of year dummy variables controls for macroeconomic shocks that affect the treatment and control group equally. Lastly, I note that I re-estimate all equations considered in this paper with plant fixed effects, in place of product fixed effects.

In addition, there are several reasons that plants' restructuring activities may depend not only on whether or not they receive protection, but also on the duration that the protection has been in place. First, in the presence of imperfect capital markets, plants may need to accumulate that cash flow that is associated with trade protection before being able to make restructuring investments. Second, with imperfect information about the effect of antidumping protection, plants may wait to determine how protection is affecting their product market before undertaking costly restructuring. Lastly, restructuring may simply involve lags that are associated with procuring new machines and hiring new employees.

I estimate the effects of the duration of antidumping protection by including an additional interaction term in Eq. (1), as follows:

$$y_{\mathrm{pt}}^{g} = \alpha + \beta_1 Treatment_{\mathrm{g}} * Post_{\mathrm{gt}} + \beta_2 Dur_{\mathrm{gt}} * Treatment_{\mathrm{g}} * Post_{\mathrm{gt}} + \gamma_{\mathrm{t}} + \delta_{\mathrm{g}} + \varepsilon_{\mathrm{pt}} \quad (2)$$

In this equation, the variable Dur_{gt} is the duration (in years) that antidumping protection has been in place for product g in year t and the coefficient β_2 estimates the effect of duration, separately from the standard difference-in-difference estimator, β_1.[10]

Lastly, Pierce (2011) shows that the effective duty rate can have a substantial effect on how plants respond to antidumping protection. That is, plants that are protected by high antidumping duty rates may react differently from those that are protected by low duty rates. To control for the effect of variation in the antidumping duty rate on plant-level restructuring activities, I further augment Eq. (2) as follows:

[10] The level of the *Dur* variable, as well as its interactions with *Treatment* and *Post*, individually, are not in the specification as they cannot be separately identified from the other covariates and fixed effects.

Table 2 The effect of duration of antidumping protection on restructuring activities

Variables	(1) ln(K/L)	(2) ln(NP/L)	(3) ln(K/L)	(4) ln(NP/L)
Treatment*Post	0.0381	0.0149	−0.0463*	0.0016
	0.0236	0.0109	0.0266	0.0104
Treatment*Post*Duration			0.0263***	0.0042
			0.0046	0.0026
Fixed effects	Product; Year	Product; Year	Product; Year	Product; Year
Observations	98,551	98,551	98,551	98,551
R-squared	0.2772	0.2325	0.2777	0.2325

Note This table summarizes OLS regression coefficients of the effect of antidumping protection on measures of plant-level restructuring activities. ln(K/L) is the natural log of the ratio of book value of capital to total employment. ln(NP/L) is the natural log of the share of non-production employment in total employment. Treatment*Post is the difference-in-difference term measuring the effect of antidumping duties and Treatment*Post*Duration is the interaction of the antidumping effect with a measure of the duration that the protection has been in place. Robust standard errors are reported below coefficient estimates, with clustering at the product-level in columns 1–4 and the plant-level in columns 5–8. ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Coefficient estimates of the constant and fixed effects are suppressed

$$y_{pt}^{g} = \alpha + \beta_1 Treatment_g * Post_{gt} + \beta_2 Dur_{gt} * Treatment_g * Post_{gt} + \beta_3 Rate_{gt} * Treatment_g * Post_{gt} + \gamma_t + \delta_g + \varepsilon_{pt} \quad (3)$$

The coefficient β_3 measures any differential effect of variation in the antidumping duty rate on plant-level restructuring activities. $Rate_{gt}$ is the effective duty rate on product g at time t, which is calculated as a trade-weighted average of the duty rates that apply to countries named in the antidumping investigation on product g. Trade weights are calculated in the year prior to the antidumping investigation to avoid incorporating the effect of preliminary duties on the value of imports.

4 Results

Results from estimating Eq. (1), which simply examines the level effect of antidumping protection on restructuring activities, are presented in columns 1 and 2 of Table 2.[11] In this specification, I find no statistically significant relationship between antidumping protection and plant-level restructuring, whether measured as changes in capital intensity or skill intensity. This result holds for both the capital-labor ratio and the share of non-production employees.

I do find evidence, however, that the effect of antidumping protection can differ based on the duration that the duties have been in place. In columns (3) and (4) of Table 2, I add the interaction of the antidumping effect with the duration of protection, as described in Eq. (2). The results for the capital-labor ratio, displayed in column 3 indicate that while antidumping duties have a negative effect on capital intensity in

[11] Note that the reported standard errors are adjusted to control for clustering at the product level.

Table 3 The duration of antidumping protection and restructuring activities-plant FE

Variables	(1) ln(K/L)	(2) ln(NP/L)	(3) ln(K/L)	(4) ln(NP/L)
Treatment*Post	0.0425**	−0.0017	−0.0423*	−0.0030
	0.0192	0.0110	0.0243	0.0130
Treatment*Post*Duration			0.0299***	0.0005
			0.0053	0.0027
Fixed effects	Plant; Year	Plant; Year	Plant; Year	Plant; Year
Observations	98,551	98,551	98,551	98,551
R-squared	0.8724	0.8705	0.8728	0.8705

Note This table summarizes OLS regression coefficients of the effect of antidumping protection on measures of plant-level restructuring activities. ln(K/L) is the natural log of the ratio of book value of capital to total employment. ln(NP/L) is the natural log of the share of non-production employment in total employment. Treatment*Post is the difference-indifference term measuring the effect of antidumping duties and Treatment*Post*Duration is the interaction of the antidumping effect with a measure of the duration that the protection has been in place. Robust standard errors are reported below coefficient estimates, with clustering at the plant-level in columns 1–4. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Coefficient estimates of the constant and fixed effects are suppressed

levels, there is a positive effect as the duration of protection increases. Specifically, I find that for each additional year that protection has been in effect, protected plants increase their capital intensities by 2.6 percent relative to unprotected plants. To determine the time at which the positive duration effect offsets the negative level effect of antidumping protection on capital intensity, I perform a linear hypothesis test summing the two coefficients. I find that antidumping protection has a positive and significant effect on capital intensity only when the duties have been in place for 4 years or more. I find no effect of antidumping protection, or the duration of protection, on the skill intensity of protected plants, as shown in column 4.

Table 3 presents results for the same specifications reported in Table 2, but with plant fixed effects in place of product fixed effects. The use of plant fixed effects allows me to control for unobserved time-invariant plant characteristics such as managerial quality or ownership structure. The results are highly similar to the baseline estimates with product fixed effects reported in Table 2. One key difference is that with plant fixed effects, I find a positive and significant relationship between the level effect of antidumping protection and capital intensity, as reported in column 1. In addition, the duration at which antidumping protection begins to have a positive effect on capital intensity is 3 years in the specification with plant fixed effects.

As mentioned above, plants may also respond differently to antidumping protection if the effective duty rate is high than when it is low. Table 4 reports results from estimation of Eq. (3), which includes an interaction of the antidumping effect with the effective duty rate. Columns 1 and 2 present results with product fixed effects, while columns 3 and 4 present results with plant fixed effects.

In the estimates employing product fixed effects, I find that increasing the duration of protection continues to have a positive effect on plant-level capital intensity. I also find that for a 1 year increase in the duration of protection, there is a 0.4 percent

Table 4 Additional controls for effective duty rate

Variables	(1) ln(K/L)	(2) ln(NP/L)	(3) ln(K/L)	(4) ln(NP/L)
Treatment*Post	−0.0224	0.0101	0.0000	0.0018
	0.0334	0.0150	0.0297	0.0160
Treatment*Post*Duration	0.0265***	0.0042*	0.0302***	0.0005
	0.0045	0.0026	0.0053	0.0027
Treatment*Post*Rate	−0.0015	−0.0005	−0.0027***	−0.0003
	0.0015	0.0005	0.0010	0.0006
Fixed effects	Product; Year	Product; Year	Plant; Year	Plant; Year
Observations	98,551	98,551	98,551	98,551
R-squared	0.2778	0.2326	0.8729	0.8705

Note This table summarizes OLS regression coefficients of the effect of antidumping protection on measures of plant-level restructuring activities. ln(K/L) is the natural log of the ratio of book value of capital to total employment. ln(NP/L) is the natural log of the share of non-production employment in total employment. Treatment*Post is the difference-in-difference term measuring the effect of antidumping protection, Treatment*Post*Duration is the interaction of the antidumping effect with a measure of the duration that the protection has been in place, and Treatment*Post*Rate is the interaction of the antidumping effect with the effective duty rate. Robust standard errors are reported below coefficient estimates, with clustering at the product-level in columns 1–2 and the plant-level in columns 3–4. ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Coefficient estimates of the constant and fixed effects are suppressed

increase in skill intensity, although this is the only specification in which this result is present. Increases in the effective duty rate are associated with declines in plant-level restructuring, but the relationship is only statistically significant for capital intensity in the within-plant estimates.

5 Discussion

The results indicate that antidumping duties are associated with some modest restructuring activities, but that plants only undertake these activities after the protection has been in place for a sufficient duration, which I estimate to be 3 or 4 years. One potential explanation for the delayed effect of antidumping protection on restructuring activities is the presence of imperfections in financial markets. Firms without access to financing for profit-augmenting restructuring investments, such as purchases of new equipment, will be forced to self-finance these investments. To the extent that antidumping duties increase domestic prices and profits, they will increase the ability of firms to self-finance restructuring investments, but it may take time for plants to generate the cash flow needed for investments. This need to generate sufficient cash flow may contribute to the effect of the duration of protection on plant-level restructuring activities.

In addition, in the presence of imperfect information about the effect of antidumping duties, plants may take time to gather information about how protection is affecting the market for their products before restructuring. This information-gathering could include determining the effect of duties on prices, entry in the domestic market, and

the likely duration of protection. Moreover, because antidumping duties are targeted against specific countries, plants may postpone making restructuring investments until they have determined whether imports from other non-subject countries will increase to replace imports from countries subject to the duties. In general, postponement of restructuring activities until additional information is available is consistent with models of irreversible investment under uncertainty.[12]

Finally, there may simply be lags that are associated with obtaining the new equipment or hiring the new employees needed for restructuring. For example, specialized machinery may not be immediately available once a plant has decided to make capital investments. Similarly, a plant's decision to hire additional skilled employees may be delayed by the search process that is associated with finding suitable workers.

In closing, I note that the results should not be interpreted as an indication that antidumping duties are welfare-enhancing in general or even productivity-enhancing in particular. Pierce (2011) shows that for the set of plants that report output data in physical units of quantity, physical productivity actually falls with the imposition of antidumping protection. The modest capital-deepening that is associated with the antidumping protection that is observed in this paper, therefore, is likely not a sufficient condition for productivity enhancement.

In addition, the results could potentially be affected by mismeasurement of the capital-labor ratio. The numerator of the capital-labor ratio is the book value of capital, which is deflated using industry-level input price indexes from the NBER-CES Manufacturing Industry Database.[13] These industry-level input price indexes suffer from two weaknesses when applied to plant-level data. First, they do not capture plant-specific variation in the price of capital within an industry. And second, their coverage of entire industries is generally broader than the products that are covered by antidumping investigations.

Each of these weaknesses could lead to over-estimates of the effect of antidumping protection on restructuring, as measured by the capital-intensity variable. If suppliers of capital goods are able to extract higher prices from protected plants than from unprotected plants, but these prices are not captured in an industry-level price index, one may observe a spurious increase in the physical capital stock. Indeed, Pierce (2011) shows that increases in prices that are associated with antidumping protection are not fully captured in industry-level price indexes, which leads to mismeasurement of revenue-based measures of total factor productivity.

6 Conclusion

This paper examines the effect of antidumping duties on the restructuring activities of U.S. manufacturing plants, as measured by changes in their capital intensity and skill intensity. I compare the behavior of protected plants to the behavior of unprotected plants in a control group, which is constructed to eliminate biases associated with

[12] See, e.g., Dixit and Pindyck (1994).

[13] See Becker and Gray (2009).

self-selection and government-selection. For this comparison, I estimate a difference-in-difference specification that controls for time-invariant differences between products or plants, as well as time-specific shocks that affect the protected and unprotected plants equally. The analysis benefits from the use of high-quality U.S. Census Bureau data, which contain information on the universe of U.S. manufacturing plants.

I find that antidumping protection is associated with modest capital-deepening, although the changes in capital intensity are only present as the duration of protection increases. In particular, the capital-labor ratios of protected plants increase by between 2.6 and 3.0 percent relative to unprotected plants for each additional year that the protection has been in effect, while the level effect of antidumping protection is zero or even negative. These offsetting effects imply that antidumping protection only begins to have a positive effect on capital intensity when the duties have been in place for 3–4 years. I find little effect of antidumping protection on skill intensity.

While the results indicate that antidumping duties may allow plants to undertake restructuring activities, they should be interpreted with caution. Pierce (2011) has shown that antidumping protection is associated with declines in physical productivity for the set of plants that report output data in quantity units. In addition, potential mismeasurement of the capital-labor ratio may lead to over-estimates of the effect of antidumping on capital-deepening.

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