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7 The Effects of Protection on Domestic Output

Robert E. Baldwin and Richard K. Green

Raising the level of import protection has become the standard government policy to assist industries seriously injured by increased imports. The political reasons for preferring import restrictions over alternative means of assistance, such as subsidizing domestic production or providing adjustment assistance to workers and firms, are not hard to understand. The benefits of protection are concentrated on the injured industry, whereas the costs are usually thinly spread over a large number of users of the protected product. Furthermore, unlike subsidies, no unpopular budgetary costs are involved, nor does protection, in contrast to adjustment assistance, send the unpopular message to the affected industry that the government thinks a decline in the number of firms and employed workers is appropriate.

A well-established body of partial equilibrium analysis demonstrating the output-increasing effects of import protection reinforces the preference of governments and import-injured industries for this policy. In the standard competitive model of profit-maximizing behavior, a tariff increase in an industry producing a homogeneous product enables domestic firms to increase output and capture a larger share of the home market by raising the costs of delivering the product from foreign compared to domestic production sources. If the product is differentiated, the increased delivery price of the variety produced abroad acts to shift demand toward the domestic substitute. The same expansion of domestic output also occurs in oligopolistic models under such commonly assumed conjectural behavior as Cournot-Nash or Bertrand.

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There is also a body of analysis, however, utilizing a more general equilibrium framework, that points out the ineffectiveness of import protection in stimulating domestic production under some conditions. Metzler (1949) demonstrates, for example, that, if the income effects associated with price changes are taken into account, protection may not accomplish its intended purpose. Specifically, if the sum of the elasticity (in absolute terms) of foreign demand for the exports of the tariff-imposing country and that country's own marginal propensity to spend on imports is less than unity, the domestic price of the protected good will decline and thus act to reduce rather than increase domestic production.[1]

Baldwin (1982) analyzes a number of situations in which certain protection effects that are usually ignored in the standard partial equilibrium analysis cause a smaller-than-expected increase in home production. Under conditions often satisfied, introducing quantitative restrictions induces a shift in the product mix of foreign suppliers toward higher-priced varieties of the protected product.[2] Thus, since the value of imports in the protecting country falls less than the quantity of imports, the value of domestic output and employment increases less than is expected and, in particular, less than if an ad valorem tariff had been used to reduce the total quantity of imports to the same level. Even when foreign firms shift production to the tariff-imposing country, the output-increasing benefits often accrue to firms and workers other than those that were injured by increased imports.

Another response that weakens the domestic output-increasing effects of protection is importing the protected product in either a less or more processed form than is covered by the protectionist action. Switching to substitute products is still another means by which consumer responses lessen the price-increasing and, thus, output-increasing effects of protection.

Protection will have no output-increasing effects at home when a quota on a homogeneous good is imposed selectively against suppliers in only a few foreign countries, and this quota, plus the quantity of the import good initially supplied in world markets by producers in nonaffected countries, is greater than the import demand of the restricting country. The latter producers merely shift to supplying the market of the restricting country, while producers in the country against which the selective quota is imposed shift their exports to other countries. Even when these required conditions are not satisfied, the selective quotas may have a very limited effect on domestic production due to transshipments through nonquota countries or the transfer of production facilities to these countries.

Recent theoretical work analyzing international behavior in imperfectly competitive markets suggests still other reasons why protection may not lead to the increased domestic production expected on the basis of the standard competitive model. Assume, for example, that foreign producers of differentiated products that compete with similar domestic products have incurred substantial sunk costs in setting up distribution and service systems abroad and in acquiring knowledge about the foreign government's relevant regulations. While some of these costs can be recouped if the foreign firms reduce foreign sales, others cannot be recovered. Consequently, when temporary protection increases their costs of selling abroad, these foreign firms may decide that the best policy in the long run is not to raise their prices and suffer a decline in market share abroad as domestic producers expand capacity, but instead to accept lower profits and maintain their market position. Yet these firms would not have initially expanded production and entered the domestic market so extensively had profits originally been at this lower level. Hysteresis in trade has occurred (Richard Baldwin 1986),[3] and the reduction in imports expected under the competitive paradigm does not occur.[4]

In some circumstances, the long-term profit prospects for the domestic industry may be so unfavorable that even if foreign supply does decrease and domestic profits rise, local firms do not utilize the increased profits to expand their output. Instead, managers of firms in the protected industry invest the profits in other industries.

Other writings that deal with the ineffectiveness of protection include Bhagwati and Hansen's (1973) analysis of how smuggling in response to protection can prevent the attainment of the desired level of domestic production, and Bhagwati and Srinivasan's (1980) analysis of the ways in which lobbying for protection or for obtaining the revenues resulting from protection may reduce domestic output in the protected sector.

The foregoing summary of the standard economic analysis of protection and also of the literature indicating why protection may be relatively ineffective in increasing domestic output suggests that empirical investigation of whether an increase in protection leads to increased domestic output in the protected industry is a worthwhile research topic. We use two approaches in carrying out such an investigation. The first involves examining reports by the International Trade Commission on the probable economic effect on a domestic industry if import relief is terminated. These reports invariably assess the effectiveness of the protection that had been granted and indicate if the commission finds any evidence in individual cases that supports the above analysis as to why protection may prove relatively ineffective in stimulating domestic output. We discuss the assessments of the commission on this matter in section 7.1.

Sections 7.2, 7.3, and 7.4 describe the more formal approach used to test for the effectiveness of import protection by utilizing cross-section and time-series data on output and protection levels within different industries. Specifically, section 7.2 outlines the vector autoregression model used to test the hypothesis that a change in the level of protection in an import-competing industry does not cause a change in the level of domestic output in the industry. Section 7.3 describes the estimation techniques, section 7.4 presents the estimation- and hypothesis-testing procedures, and section 7.5 discusses the data and testing results. The last section draws some conclusions from the two approaches used to study the effects of protection on domestic output.

We wish to stress that in using vector autoregression techniques we are not attempting to draw causal inferences without relying on a priori theory, a procedure that has recently been criticized by Leamer (1985). On the basis of a well-established economic model, one can hypothesize that increases in protection in an industry regularly precede increases in output in the industry. Failure to obtain statistical support for the null hypothesis is consistent with an economic model in which protection causes an increase in industry output. Such a finding, by itself, does not, as Leamer stresses, tell us anything about the direction of causality between protection and output.[5]

7.1 An Analysis of Section 203 Cases

Sections 201–3 of the Trade Act of 1974 specify the conditions under which an industry can obtain relief from injury caused by import competition. Representatives of the industry first file a petition with the International Trade Commission (ITC) seeking a finding of serious injury (or threat of serious injury) due to increased imports. If the ITC makes an affirmative determination, the president is directed to provide import relief for the industry unless he or she determines that such a step is not in the national economic interest of the United States. When the national interest condition is satisfied, the protection provided by the president must not exceed five years and must be sufficient to prevent or remedy serious injury or the threat thereof to the industry in question and to facilitate the industry's orderly adjustment to new competitive conditions.

Under the provisions of section 203, the president can extend protection for three years beyond the period for which import relief was initially granted, but first must take into account the advice of the ITC based on its study of the probable economic effect on the industry of the termination of the import relief.[6]

There have been thirteen section 203 reports under the Trade Act of 1974. In eight of these a majority of the commissioners concluded that termination of import relief would have an adverse effect on the industry and recommended continued protection. In four cases the commission determined that termination would not adversely affect the industry and recommended an end to import relief, while in one case the vote was evenly split. This section discusses the commission's views on whether the types of offsetting responses to protection described in the introductory section did occur in the cases investigated and, if they did, how important they were in rendering the initial protection ineffective. The views of other economists who have examined these protectionist experiences will also be considered.

7.1.1 Color Television Sets

Almost every report mentions responses that have tended to offset the output-increasing effects of increased protection, in some cases to a significant degree. As would be expected, protection was often the least effective when it involved selective quantitative restrictions, as in the example of the protection granted the domestic color television industry. In 1977 the U.S. government negotiated an orderly marketing agreement (OMA) quantitatively limiting Japanese exports of color television receivers and subassemblies thereof to the United States to about 70 percent of Japan's 1976 level. As a result, Japan's share of the U.S. market fell from 18.7 percent to 10.8 percent between 1976 and 1978.

But there was a fourfold increase in exports of color television sets from Taiwan and Korea, with their share rising from 1.5 percent to 7.2 percent in the same period, and the net result was that the import share from all sources only declined from 21.3 percent to 20.9 percent (Morici and Megna 1983, 19). Accordingly, the Carter administration negotiated OMAs with both Taiwan and Korea that became effective in 1979. That dropped the import share from all sources to 13.7 percent in 1979. But imports from Mexico and Singapore continued to rise during the period; their share of imports of complete and incomplete color television receivers increased from 16 percent in 1976 to 37 percent in 1979, while the share of the countries covered by the OMAs fell from 82 percent to 59 percent (ITC Report, 203-6, 1980, A-12).

Since unlimited imports of some subassemblies were allowed, another effect of the protection was to increase Japanese and Taiwanese investment in assembly facilities in the United States (ITC Report, 201-6, 1980, 6). Imports of subassemblies not covered by the OMAs doubled between 1976 and 1979. Production of the two largest U.S. producers fell, however (ITC Report, 203-6, 1980, A-18). Thus, as Hufbauer, Berliner, and Elliott (1986, 220) conclude, the overall impact of the OMAs on the injured firms was limited because of the shift in supply sources and the change in the composition of imports. The ITC recommended continued protection, however.

7.1.2 Nonrubber Footwear

The government negotiated OMAs with Taiwan and Korea in 1977 to protect the domestic nonrubber footwear industry. As in the color television case, a significant increase in imports from noncontrolled countries followed. While the volume of imported nonrubber footwear from Taiwan and Korea declined from 225 million pairs to 148 million pairs in the year after the OMA went into effect, imports from other sources increased from 142 million pairs to 225 million pairs (ITC Report, 203-7, 1981, A-8). To circumvent the quantitative restrictions in 1978, exporters from Taiwan allegedly tried transshipping through Hong Kong, but the practice was curtailed by requiring certificates of origin. With the increase in imports from noncontrolled sources, the total U.S. import share by volume increased from 47.0 percent in 1976, the last year before import restraints, to 51.0 percent in 1981, the last year of the restraint period, even though the import share of Taiwan and Korea fell from 25.4 percent to 22.0 percent between these years (Hufbauer, Berliner, and Elliott 1986, 210–11).

Significant quality upgrading by Taiwanese and Korean footwear exporters also occurred and served to reduce the impact of protection on domestic employment (Aw and Roberts 1986; Chang 1987). This is evident from the increase in the value share of imports from these countries in the U.S. market from 9.0 percent in 1976 to 13.1 percent in 1981, in contrast to a decline in their volume share from 25.4 percent to 22.0 percent between these years.

Still another response that weakened the positive effect of protection on the domestic industry was a manufacturers' change in the composition of athletic shoes that shifted their U.S. Customs classification from nonrubber footwear, on which quantitative restrictions were imposed, to noncontrolled rubber footwear. To be classified as nonrubber footwear, the upper part of footwear must be composed of more than 50 percent leather. Foreign producers simply changed the ornamental stripes on jogging shoes from leather to vinyl, thereby qualifying them for classification as rubber footwear. The domestic industry estimated that 55 million pairs of jogging shoes entered the United States through this loophole in 1978 (ITC Report, 203-7, 1981 A-10).

While the more rapid increase in the ratio of imports to consumption after decontrol in 1982 than during the control period suggests that the quantitative control had some restraining effect, the gradual rise in the import penetration ratio during the restraint period and the concomitant appreciable decline in domestic output and employment can hardly be regarded as a fulfillment of the president's presumed intention to "prevent or remedy serious injury" after the affirmative ITC finding.

7.1.3 Ceramic Tableware

Protection provided to the ceramic tableware industry is an example of import relief that became progressively less effective due to foreign suppliers shifting toward higher-priced import categories not covered by the escape clause action. For the first three years after the president granted import relief in 1972 by sharply increasing duties, this shift was modest but enough to prevent the import/consumption ratio for all earthen table and kitchen articles from falling. The ratio stood at 55 percent in 1971, 57 percent in 1972, and 58 percent in 1975 (ITC Report, 203-1, 1976, A-43). The recession of 1974–75 reduced the consumption of earthen tableware, but the import decrease between 1972 and 1975 in items covered by the escape clause action was 58 percent compared to only 17 percent for the products on which tariffs were not raised. Domestic shipments declined by 19 percent.

During 1976 and 1977, when total consumption of earthen table and kitchen articles increased appreciably, the shift toward noncovered items became so pronounced that the commission concluded that the probable effect on the industry of terminating the protection would be "minimal" (ITC Report, 203–4, news release). Imports of protected articles declined by 85 percent between 1975 and 1977 whereas imports of nonprotected varieties increased by 87 percent. The import penetration ratio for all earthen table and kitchen articles rose from 58 percent in 1975 to 69 percent in 1977, with protected items making up only 9 percent of total imports in 1977 in contrast to 28 percent in 1972 (ITC Report, 203-4, 1978, 40). Domestic shipments declined 2 percent between 1975 and 1977, while domestic consumption rose 35 percent. As a result of inflation in 1976 and 1977, an increasing percentage of imports originally subject to higher duties entered under noncovered higher value import categories (ITC Report, 203-4, news release).[7]

7.1.4 Bolts, Nuts, and Large Screws

Interestingly, the lack of substitution between imports and domestic production was the basis for the ITC's recommending termination of the 1979 tariff increase on bolts, nuts, and large screws. A majority of the commissioners, backed by an econometric study done by the ITC staff, concluded that "imposition of import relief in 1979 appears to have had at most a minor effect on import levels and domestic production" (ITC Report, 203-11, 1981, 9).

7.1.5 Stainless Steel and Alloy Tool Steel

The protection of domestic producers of stainless steel and alloy tool steel in the late 1970s by quantitative import restrictions illustrates another problem associated with protection, that in helping one industry, a restriction may injure another. Users of specialty steel were forced to hold larger inventories than prior to the quota system because of the surge of imports of specialty steel at the beginning of each quota period when foreign suppliers rushed to fill their country quota. These steel consumers complained that the higher financing and storage costs reduced the competitiveness of their end products with similar imported products (ITC Report, 203-5, 1979, A-14). The upgrading in product mix by foreign suppliers had a similar effect. Foreign steel producers reduced their exports of steel used to manufacture cutting blades, thereby forcing domestic manufacturers of cutting blades to purchase higher-priced domestic tool steels, putting them at a disadvantage vis-à-vis foreign competitors.

The U.S. stainless steel wire–producing industry was also severely affected by a shift in the product mix of imported steel. Wire is drawn from stainless steel rods, which were covered by the quota. The increase in the price of steel rods caused by the quota raised the production costs of domestic wire suppliers and led to an increase in imports of wire. Thus, as the commission report stated, "The result is that the U.S. stainless steel wire-producing industry is caught between tight supplies and rising prices of its raw material, which is under quota, and increased availability and more favorable prices from imports of its end product, wire, which is not under quota" (ITC Report, 203-3, 1977, A-36).

Even though there were these consumer problems with the quantitative restrictions, the commission staff concluded on the basis of its own econometric study that, while U.S. business expansion was the most important cause for the expansion of domestic output in the first year of the quota system (1977), the contribution of the import restraint program approached about half that of the business cycle.

7.1.6 Some Conclusions

A review of section 203 cases supports the view that market responses to protection sometimes significantly undermine its intended purpose of remedying the injury caused by increased imports. Such seems to have occurred in the television, footwear, and ceramic tableware cases. A more formal test of this proposition is undertaken in the next three sections, but some conclusions about situations in which protection is likely to be less effective can be drawn from the section 203 cases.

The television and footwear cases illustrate the problem of trying to increase domestic production by imposing selective quantitative import restrictions. Domestic producers are attracted to this approach because protection is likely to be granted more quickly. Also, it avoids their having to deal with the opposition of foreign suppliers whose exports to the country have not increased significantly and who would be injured themselves by a general cutback in imports, which government officials also appreciate. Even the country being discriminated against often does not object strongly because its producers receive the windfall gain associated with quantitative restrictions. The possibility of upgrading and shifting production to noncontrolled countries also helps to reduce its objections.

Yet, once there is acceptance of the principle of imposing import restrictions against only those countries from which imports have increased significantly, protection is likely to be ineffective during the often lengthy period of lobbying by the affected industry for protection from one country after another as production expands in noncontrolled countries. Both firms and workers are likely to believe that protection will work, and they tend to postpone the hard adjustment decisions that eventually must be made.

As the ceramic tableware case illustrates, a similar problem arises from changes in the import relief provisions of U.S. trade law that enable an industry to be defined narrowly. It is easier for a group of domestic firms competing with a selected set of products being imported in significantly greater quantities to show serious injury when the industry is less broadly defined. But the firms often discover that there is such a high degree of substitutability between the items covered by the protectionist action and other items covered by a broader definition of the industry that they are unable to increase their output and employment after receiving protection. The time elapsing before all the relevant products are covered by a protectionist action often seems longer than if the firms had waited until the entire industry was threatened with serious injury.

7.2 The Econometric Model

We now turn to a more formal approach for investigating the efficacy of protection: we use vector auto-regression techniques to test whether changes in protection from 1972 to 1982 in five major industries regularly preceded changes in output in these industries.

Consider the detrended variables x and y, which have many observations. The variable x is said not to "Granger-cause" the variable y if

$$(1) \quad E\{y_t : y_{t-1}, y_{t-2}, \ldots, y_1, x_{t-1}, x_{t-2}, \ldots, x_1) = E(y_t : y_{t-1}, y_{t-2}, \ldots, y_1\},$$

where $E\{y{:}\Theta)$ is the linear least-squares projection of y on the information Θ. Thus, if given the history of the y process, the history of the x process cannot improve the prediction of y_t, x does not help predict, or to use Granger's (1969) terminology, "cause" y. This is tantamount to saying that knowledge of the future of x gives us no knowledge of the future of y.[8]

To test empirically whether x "causes" y, we first estimate the equation

$$y_t = \alpha_o + \sum_{l=1}^{m} \alpha_1 y_{t-1} + \sum_{k=1}^{n} \delta_k x_{t-k} + u_t \,, \tag{2}$$

where the α's and δ's are parameters and the lag lengths m and n are sufficient to assure that $\{u_t\}_{t-l}^{s}$ is a white noise process. We then use an F-test to test the hypothesis $\delta_1 = \delta_2 = \ldots = \delta_n = 0$. Should we reject this hypothesis, we cannot say that x does not "Granger-cause" y.

For these tests to have sufficient power to be meaningful, large numbers of observations of x and y are needed. We have eleven years of consistent annual data of output, and tariffs at the four-digit SIC industry level; this is not enough observations for individual industries to test for Granger causality using the method outlined above. To overcome this problem, we can create panels at the two-digit level, with observations x_{it}'s, where i represents an observation on an industry at the four-digit level of detail, and t represents an observation on one year.

Obviously, looking at a panel multiplies the number of observations available for an individual industry. The procedure for determining Granger causality using panel data is not, however, a straightforward application of the model described above. Specifically, we must consider the impact of the individual characteristics of the various four-digit industries on their response to protection, and we therefore may not stack all the time series–cross section observations to estimate equation (2). Moreover, the problem of testing for Granger causality renders inappropriate many standard models of handling panel data.

We therefore use the techniques developed by Chamberlain (1983) and Holtz-Eakin, Newey, and Rosen (1985), and follow the exposition of these authors to describe the model we use. Consider a panel with N cross-sectional units observed over T periods, and let i index the cross-sectional observations and t the time periods. Because each cross-sectional unit has individual characteristics, we change equation (2) to

$$y_{it} = f_i + \alpha_o + \sum_{l=1}^{m} \alpha_l \, y_{it-l} + \sum_{k=1}^{n} \delta_k x_{it-k} + u_{it} \,, \tag{2a}$$

where f_i represents the individual characteristic of cross-sectional unit i. The common practice for estimating equation (2a) is to difference the data to eliminate f_i and then use ordinary least-squares (OLS) or generalized least-squares (GLS) on the equation:

$$\begin{aligned} (3) \qquad y_{it} - y_{it-1} = & \\ & + \sum_{l=1}^{m} \alpha_l (y_{it-l} - y_{it-l-1}) \\ & + \sum_{k=1}^{n} \delta_k (x_{it-k} - x_{it-k-1}) \\ & + u_{it} - u_{it-1} \, . \end{aligned}$$

The flaw with this approach in our context is evident. Because y_{it} depends on u_{it}, the error term $(u_{it} - u_{it-1})$ is correlated with the regressor $(y_{it} - y_{it-1})$, so any estimate produced using OLS or GLS on this equation will be biased.

We shall use instrumental variables to eliminate this problem. But before discussing the procedure we use to instrument out the bias, we should consider another problem with equation (3)—heteroskedasticity.

Equation (3) specifies that the parameters are constant not only across different units but also across time. It also specifies that individual characteristics are time-invariant. Such a specification is needlessly limiting, thanks to Chamberlain's procedure for allowing the parameters and individual characteristics to vary over time.

For expository purposes, consider a panel extending over four periods and a model with a first-order lag structure. So we have

$$\begin{aligned} (4) \qquad y_{i1} &= \alpha_{o1} + \alpha_{11} y_{i0} + \delta_{11} x_{i0} + \phi_1 f_i + u_{i1} \, , \\ y_{i2} &= \alpha_{o2} + \alpha_{12} y_{i1} + \delta_{12} x_{i1} + \phi_2 f_i + u_{i2} \, , \\ y_{i3} &= \alpha_{o3} + \alpha_{11} y_{i2} + \delta_{13} x_{i2} + \phi_3 f_i + u_{i3} \, , \text{ and} \\ y_{i4} &= \alpha_{o4} + \alpha_{11} y_{i3} + \delta_{14} x_{i3} + \phi_4 f_i + u_{i4} \, , \end{aligned}$$

where ϕ_t is the coefficient multiplying the individual effect in period t. The model in equation (2a) implicitly restricts the ϕ's to one in each period. Because y_{i0} and x_{i0} are not observed, the equation for y_{i1} cannot be estimated; it is included here because of the implication for later observations.

To test for Granger causality, we estimate the equation (4) jointly and determine if the restriction

$$(5) \qquad \delta_{11} = \delta_{12} = \delta_{13} = \delta_{14} = 0$$

can be accepted under the F-test. But the procedure for estimating equation (4) is not straightforward. Differencing will clearly not work, as the individual effects will not disappear. Rather, we must perform Chamberlain's transformation: we multiply each equation for time t by (ϕ_{t-1}/ϕ_t) and then subtract the result from the equation for time $t + 1$, yielding

$$
\begin{aligned}
(6) \qquad y_{i2} &= (\alpha_{o2} - r_2) + (\alpha_{12} + r_2)y_{i1} \\
&\quad - r_2\alpha_{11}y_{i0} + \delta_{12}x_{i1} - r_2\delta_{11}x_{i0} \\
&\quad + u_{i2} - r_2u_{i1}, \\
y_{i3} &= (\alpha_{o3} - r_3) + (\alpha_{13} + r_3)y_{i2} \\
&\quad - r_3\alpha_{12}y_{i1} + \delta_{13}x_{i2} - r_3\delta_{12}x_{i1} \\
&\quad + u_{i3} - r_2u_{i2}, \text{ and} \\
y_{i4} &= (\alpha_{o4} - r_4) + (\alpha_{14} + r_4)y_{i3} \\
&\quad - r_4\alpha_{13}y_{i2} + \delta_{12}x_{i3} - r_2\delta_{11}x_{i2} \\
&\quad + u_{i4} - r_2u_{i3},
\end{aligned}
$$

where $r_t = (\phi_t/\phi_{t-1})$. We then jointly estimate equation (6) and test the hypothesis (5). Now it is apparent why we postponed the discussion of instrumental variables: equation (6), the model we wish to estimate and use for testing, has some right-hand variables correlated with the transformed error term, so we are interested in finding the instruments required to consistently estimate the model.

The natural candidates for instruments are appropriately lagged values of x and y. It is therefore clear that not all the equations in (6) may be identified; in fact, in this specific setup, only the equation at time 4 is identified. The last equation (6) has four right-hand-side variables, so four instruments are required. We have four available instruments: x_{i1}, x_{i2}, Y_{i1}, and Y_{i2}; none of these variables is correlated with the error term in the last equation of (6). But it is clear that the other three equations may not be identified. Moreover, were we to add any further lags, none of the four equations could be identified. In general, to identify an equation for one time period under an m-order lag structure, we must have greater than $m + 3$ periods of data available. To put it another way, given that we have eleven years of annual data available, the longest lag structure we may try is eight years.

We have now described the Chamberlain-Holtz-Eakin et al. econometric model. It is a model that will test for Granger causality in a panel setup, allowing individual effects to vary with time and employing appropriate lagged variables to instrument out any bias. Following Holtz-Eakin, Newey, and Rosen, we now discuss precisely how such a model is estimated.

7.3 Estimation

The general form of equation (6) is

(7)
$$y_{it} = a_t + \sum_{l=1}^{n+1} c_{lt} y_{i,t-l} + \sum_{l=1}^{n+1} d_{lt} x_{i,t-l} + v_{it} ,$$

where $r_t = (\phi_t/\phi_{t-1})$,

$a_t = \alpha_{ot} - r_t\alpha_{0t-1}$,
$c_{1t} = r_t + \alpha_{1t}$,
$c_{lt} = \alpha_{lt} - r_t\alpha_{l-1,t-1}$,
$c_{m+1,t} = -r_t\alpha_{m,t-1}$,
$d_{1t} = \delta_{1t}$,
$d_{lt} = \delta_{lt} - r_t\delta_{l-1,t-1}$,
$d_{m+1,t} = -r_t\delta_{m,t-1}$, and
$v_{it} = u_{it} - r_t u_{i,t-1}$.

Note that the hypothesis $\delta_m = 0$ is the same in our case as $d_m = 0$ for all m.

Introducing additional notation, let

$Y_t = [y_{1t}, \ldots , y_{Nt}]$, where N is the number of four-digit industries, and analogously for X_t. In our context, Y is output or employment of the industries, and X is some measure of protection. Let

$$W_t = [l, Y_{t-1}, \ldots , Y_{t-m-1}, X_{t-1}, \ldots , X_{tim-1}],$$

where m is the number of lags assumed. W_t is the $N \times (2m + 3)$ vector of right-hand-side variables in our general model, and l is an $N \times 1$ vector of ones.

$$V_t = [v_{lt}, \ldots , v_{nt}]$$

is the $N \times 1$ vector of transformed disturbance terms, and

$$\beta_t = [a_t, c_{lt}, \ldots , c_{m+1,t}, d_{lt}, \ldots , d_{m+1,t}]$$

is the $(2m + 3) \times 1$ vector of coefficients for the equations. So we may write equation (7) as

(8)
$$Y_t = W_t\beta_t + V_t .$$

To combine all the observations, we can stack equation (8). Let

$$Y = [Y'_{m+3}, \ldots , Y'_T],$$
$$\beta = [\beta'_{m+3}, \ldots , \beta'_T],$$
$$V = [V'_{m+3}, \ldots , V'_T], \text{ and}$$
$$W = \text{diag}[W'_{m+3}, \ldots , W'_T],$$

where diag[ ] denotes a block diagonal matrix with the given entries along the diagonal. The observations for equation (8) may therefore be written

$$Y = W\beta + V. \tag{9}$$

This appears to be a classical simultaneous equation system where the equations are indexed by t and the observations by i. In the classical system, however, the same instrumental variables are used for each equation. In our approach, the matrix of variables that qualify for use as instruments in period t is

$$Z_t = [e, Y_{t-2}, \ldots, Y_1, X_{t-2}, \ldots, X_1],$$

which, of course, changes with t. To allow for different instruments for each equation, we chose the matrix of instruments for the system in equation (9) to be block diagonal. So we have the matrix

$$Z = \text{diag}[Z_{m+3}, \ldots, Z_t].$$

The orthogonality conditions assure that

$$\text{plim}_{N\to\infty}(Z'V)/N = 0,$$

so Z is the appropriate choice of instruments for equation (9).[9]

To estimate β, premultiply equation (9) by Z' to obtain

$$Z'Y = Z'W\beta = Z'V. \tag{10}$$

The orthogonality condition assures that GLS estimates of β will be consistent. To get a GLS estimator, we must have knowledge of the covariance matrix of disturbances $Z'V$. This covariance matrix, Ω, is given by

$$\Omega = E\{Z'VV'Z\}.$$

Clearly, Ω must be estimated. To do so, we get a preliminary estimator of β by estimating the coefficients of the equations for the time periods t using two-stage least squares on the equation for each time period alone. Call this estimator B_t. Now we use this estimator to form a vector of residuals for period t: $V_t = Y_t - W_tB_t$.

At this point, we depart from the procedure of Holtz-Eakin, Newey, and Rosen. In attempting to use their method, we found that in our case the difference between the largest and smallest eigenvalues of the Ω matrix is so large as to render it computationally singular. The method we use incorporates a restriction on the relationships of the variables across time that allows us to estimate a computationally nonsingular matrix. Because we have N different industries within each time period, we have no reason to believe that their error terms are homoskedastic.

We therefore use White's (1980) procedure to correct for heteroskedasticity. For each time period t, we estimate a covariance matrix

$$(11) \qquad (\Omega)_t = \sum_{i=1}^{n} (v_{it}v_{it}Z'_{it}Z_{it}),$$

where v_{ir} is the ith element of V_r and Z_{ir} is the ith row of Z_r. Now we reestimate B_t for each time period t:

$$B_t = [W_t'Z_t(\Omega_t)^{-1}Z_t'W_t]^{-1}W_t'Z_t(\Omega_t)^{-1}Z_t'Y_t .$$

We now use the residuals generated from this B_t to generate a covariance matrix $\tilde{\Omega}$ to use for joint estimation in the classical three-stage manner (see Judge et al. 1982).[10] Finally, we may use $\tilde{\Omega}$ to form a GLS estimator of the entire parameter vector, B, by using all the available observations:

$$(12) \qquad B = [W'Z(\tilde{\Omega})^{-1}Z'W]^{-1}W'Z(\tilde{\Omega})^{-1}Z'Y.$$

7.4 Hypothesis-Testing Procedure

We wish to determine if tariff protection "Granger-causes" output in protected industries. In our model—as described in equation (7)—this means testing whether $d_{lt} = 0$ for all l and t, subject to the provision that we have not estimated a model with lag-truncation bias. We follow the procedure outlined in Holtz-Eakin, Newey, and Rosen (1985). Let

$$(13) \qquad Q = (Y - WB)'Z(\tilde{\Omega})^{-1}Z'(Y - WB)/N,$$

where the terms on the right-hand side are defined as before. As N grows, Q has a chi-squared distribution. Now let

$$(14) \qquad Q_R = (Y - w\tau)'Z(\tilde{\Omega})^{-1}Z'(Y - w\tau)/N,$$

where w is the matrix of explanatory variables as transformed by our restrictions, and τ is the corresponding vector of restricted coefficients. Q_R is also distributed chi-squared as N grows. By analogy with the F statistic in the standard linear model, an appropriate test statistic is

$$(15) \qquad L = Q_R - Q,$$

which has the form of the numerator of the test statistic. The covariance matrix of the transformed residuals is by construction an identity matrix. L therefore has a chi-squared distribution as N grows with degrees of freedom equal to the degrees of freedom of Q_R minus the degrees of freedom of Q. When all parameters are identified under both the null and alternative hypotheses, the degrees of freedom of Q and Q_R are equal to the number of instrumental variables minus the number of parameters being estimated. L therefore has degrees of freedom equal to the dimension of B minus the dimension of τ.

7.5 Data and Results

Data on shipments, imports, and tariff revenues were collected at the four-digit SIC level for nineteen two-digit SIC industries for the years 1972–82. Many observations, however, are either missing or inconsistent. At this stage, we have been able to construct five panels of consistent data: four are the two-digit industries steel, food and kindred products, textiles, and apparel; the fifth is footwear, which is part of the two-digit industries leather products and rubber products. Information from Hufbauer, Berliner, and Elliott (1986) on nontariff trade barrier (NTB) tariff equivalents in the steel and footwear industries is also used. These data were used to estimate models for steel, footwear, textiles, apparel, and food and kindred products using tariffs alone, and for steel and footwear using tariffs plus the ad valorem equivalents of NTBs. All data were detrended; the detrended output and tariff data are available from the authors on request.

We used the general model outlined in section 7.3 to estimate steel, food and kindred products, textiles, and apparel; because of the small number of observations on footwear, a restricted form of the model was estimated by restricting all coefficients to be consistent across time.

We chose a lag length of three to estimate the covariance matrices for the models. Using these matrices, we performed tests to obtain the most parsimonious specifications possible, in order to get the sharpest consistent estimates of coefficients. In the cases of steel (both with NTBs added and without), food and kindred products, textiles, and apparel, we were able to specify consistent models with one lag. For footwear without NTBs added, we required three lags; for shoes with NTBs added, we required two. Guilkey and Salemi (1982) performed simulations indicating that in small-sample estimation, short lag lengths are less likely to produce errors in hypothesis testing.

We estimated equations for whether protection "Granger-causes" output for the last four available years. As the discussion on the econometric model suggests, we could identify coefficients for the last six years, but we wished to "reserve" data in the event that longer lag lengths were required. As we shall see, this is not the case, and an obvious extension is to estimate the data for six years. We did, of course, use all available data for instruments.

For the four unrestricted cases, we estimated nine coefficients in each time period—four lagged values of output, four lagged values of tariff rates divided by imports, and a constant—yielding a total of

Table 7.1 Steel without Nontariff Barriers Added

	Q	L	DF	.1 CV
1. $m = 3$	2.24	—	28	37.9
2. $m = 2$ (given 1)	3.80	1.56	8	13.4
3. $m = 1$ (given 2)	5.76	1.96	8	13.4
4. Exclude protection (given 3)	7.20	1.44	8	13.4

Notes: $N = 25$; Q = the test statistic representing the "fit" of each equation and follows a chi-squared distribution (see equation 13); L is the test statistic on the restrictions and also follows a chi-squared distribution (see equation 15); DF = degrees of freedom; and .1 CV is the 10 percent critical value of the chi-squared distribution.

Table 7.2 Steel with Nontariff Barriers Added

	Q	L	DF	.1 CV
1. $m = 3$	2.32	—	28	37.9
2. $m = 2$ (given 1)	3.89	1.57	8	13.4
3. $m = 1$ (given 2)	5.68	1.79	8	13.4
4. Exclude protection (given 3)	6.88	1.20	8	13.4

Notes: See table 7.1.

Table 7.3 Food and Kindred Products

	Q	L	DF	.1 CV
1. $m = 3$	1.22	—	28	37.9
2. $m = 2$ (given 1)	2.96	1.74	8	13.4
3. $m = 1$ (given 2)	4.46	1.50	8	13.4
4. Exclude protection (given 3)	4.73	0.27	8	13.4

Notes: See table 7.1. $N = 37$.

Table 7.4 Textiles

	Q	L	DF	.1 CV
1. $m = 3$	1.86	—	28	37.9
2. $m = 2$ (given 1)	3.27	1.41	8	13.4
3. $m = 1$ (given 2)	4.79	1.52	8	13.4
4. Exclude protection (given 3)	6.41	1.62	8	13.4

Notes: See table 7.1. $N = 28$.

Table 7.5 Apparel

	Q	L	DF	.1 CV
1. $m = 3$	1.77	—	28	37.9
2. $m = 2$ (given 1)	2.33	0.55	8	13.4
3. $m = 1$ (given 2)	3.00	0.67	8	13.4
4. Exclude protection (given 3)	3.51	0.51	8	13.4

Notes: See table 7.1. $N = 33$.

thirty-six estimated coefficients. The numbers of instruments for the four time periods are 13, 15, 17, and 19, yielding a total of 64. The degrees of freedom in these cases are therefore 28. In the restricted case of footwear, we estimated a total of seven coefficients, and had 13 instruments at our disposal, yielding 6 degrees of freedom. In testing for lag length and Granger causality, degrees of freedom are equal to the number of coefficients we restrict to equal zero.

After jointly estimating the equations using the three-stage technique described above, we obtained the minimized chi-squared test statistics (i.e., Q) presented in tables 7.1–7.7. Because inferences about causality will be incorrect if the lag distribution is incorrectly truncated, we chose critical values at the 10 percent level to determine the correctness of lag lengths rather than the standard 5 percent or 1 percent levels. Tables 7.1–7.7 reveal that for all five industries, we may safely accept a lag length of three. Moreover, tables 7.1–7.5 reveal that for steel, food and kindred products, textiles, and apparel, we may truncate the lags to one without fear of lag-truncation bias. For footwear without NTBs added, we must use three lags (see table 7.6); for footwear with NTBs, we must use two (table 7.7).

A glance at the tables shows the striking results of our tests for Granger causality. In six of seven cases, our test statistics, L, for barriers having no effect are safely under the appropriate 10 percent critical value: in these cases, if we have prior reason to believe the hypothesis that tariff rates do not "Granger-cause" output to be true, we may reasonably accept that hypothesis. The significance of these

Table 7.6 Shoes without Nontariff Barriers Added

	Q	L	DF	.1 CV
1. $m = 3$	1.81	—	6	10.6
2. $m = 2$ (given 1)	11.24	9.43	2	4.6
3. Exclude protection (given 1)	3.63	1.82	3	6.3

Notes: See table 7.1. $N = 5$.

Table 7.7 Shoes with Nontariff Barriers Added

	Q	L	DF	.1 CV
1. $m = 3$	0.58	—	6	10.7
2. $m = 2$ (given 1)	4.16	3.58	2	4.60
3. $m = 1$ (given 2)	10.35	6.19	2	4.60
4. Exclude protection (given 2)	9.04	4.88	2	4.60

Notes: See table 7.1. $N = 5$.

results is even more clear when one considers that the one case in which the test statistic is significant at the 10 percent level (footwear with NTBs) is a close call, and that we are using the most parsimonious justifiable specifications, which, if anything, would cause us to err on the side of rejecting the hypothesis of no effect.

At the same time, we recognize that the arguments set forth in the model rely heavily on asymptotics. These arguments could be legitimately questioned in light of our small sample sizes. Moreover, the small sizes of our data sets invite speculation as to how powerful our tests are. At the same time, because we use panel data techniques, we are able to exploit several years of data in order to increase our effective sample size. And even keeping these caveats in mind, we believe that our results are sufficiently strong to suggest that the inefficacy of protection is a proposition with considerable empirical backing.[11]

7.6 Conclusions

Evidence from section 203 investigations by the ITC and our econometric analysis of the relationship between trade barriers and domestic output in five industries lend support to the proposition that protection is not an effective means of stimulating domestic output. Various reactions by users and producers of the protected product tend to offset its output-expanding effects. Not only has the imposition of higher tariffs and more restrictive nontariff trade barriers often produced a disappointingly small output expansion, but in some cases the barriers appear to have had no success in accomplishing their intended purpose of increasing domestic output or even preventing a further output decline.

Ironically, recent trade policy changes that enable industries to secure import protection sooner and more easily than before tend to make it easier for foreign suppliers to avoid reducing exports to the protected market. For example, it is politically easier for a government to quantitatively restrict imports of a product from a few foreign suppliers than from all foreign suppliers of the product. Yet, the quality upgrading by suppliers subject to quantitative restrictions, these suppliers shifting production to noncontrolled countries, and the increase in exports by noncontrolled suppliers that is caused by this protection method tend to offset the domestic output-expanding purpose of the protection. The use of ad valorem tariffs, imposed on an across-the-board basis, would not produce these offsetting effects.

Similarly, defining an industry narrowly in product terms enables domestic firms producing these items to show serious injury from imports more easily than if the industry is defined as also including other substitute products. But when protection is increased only on the narrow list of products, the shift by users and foreign suppliers to the substitute items undermines the output-increasing benefits of the protection.

The conclusion that protection is not an effective means of remedying or preventing injury to an industry from increased imports, of course, leaves the question of what means would be effective. There is clearly a need for more experimentation with alternative measures, but we are inclined to believe that some of the new adjustment-assistance proposals, for example, those of Lawrence and Litan (1986) and Hufbauer and Rosen (1986), are likely to prove more efficacious in dealing with the import-injury problem than with protection—especially the proposed selective quantitative restrictions.

Notes

1. An elasticity of foreign demand for imports of less than unity in absolute terms, for example, implies a backward-bending foreign export supply curve due to the effect of a high income elasticity of demand in the foreign country for its own exports that more than offsets the substitution and production effects associated with a price increase for these exports. Under these circumstances, a tariff can lower the domestic price of imports in the tariff-imposing country even if the income elasticity of demand for imports in the tariff-imposing country is positive.

2. See Baldwin 1982, 11 for these conditions. See also Falvey 1979.

3. Baldwin illustrates hysteresis in trade under imperfectly competitive market conditions by assuming a temporary shock to the value of a country's currency, but his model can be used to derive the same outcome as a consequence of a temporary increase in protection.

4. If the protection takes the form of quantitative restrictions, the capacity of domestic firms is more likely to expand and increase their share of the domestic market after the protection is withdrawn.

5. Political economy theory (Baldwin 1985) suggests that declining output in an industry leads to increased protection by stimulating increased lobbying for protection. In this chapter we are not concerned with this hypothesis.

6. The injured industry can request continuation of the import relief, or the president or the commission can initiate a commission study to determine

whether the protection should be removed prior to the end of the initial period of protection.

7. Not only were duty categories defined in unit-value terms, but the tariffs on imports were compound duties, that is, they included both an ad valorem and a specific component, so that the rate of protection in percentage terms declined as prices rose.

8. For a proof of this statement, see Sargent 1979.

9. Holding T fixed, as N goes to infinity.

10. Our procedure is slightly different from that presented in Judge et al. 1982 (379–86), which has instruments that remain constant across time. As already noted, our instruments change across time.

11. We also tested for whether protection "Granger-causes" domestic output changes using regressions that included lagged values of import prices as explanatory variables. We collected completely different data series for this test: import prices were taken from BLS import price indexes, and import and tariff data were taken from Census Bureau 990 Trade Reports. The data were at the three-digit SIC level and were quarterly. In contrast to the tests reported in the text of the chapter, we were unable to pick up any lag structure in the quarterly output data. Because we would expect to find a seasonal component in the quarterly output data, we are suspicious of the validity of our result—that protection did not "Granger-cause" changes in domestic output—based on these data. We will continue to work with these data to attempt to increase their power, and therefore get more reliable econometric results (see Green 1988).

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Comment Robert C. Feenstra

This chapter follows the theme set in Baldwin's (1982) essay, "The Inefficacy of Trade Policy."[1] The author's efforts to bring a set of data to bear on this theme should be commended. This chapter is divided into two parts: the first looking at ITC reports and the second estimating the vector auto regressions (VARs). I found the ITC section helpful, but would have also liked to see summary statistics of the data set. Let me suggest that the authors construct unit values and price indexes at the two-digit level for each of their industries. A comparison of the unit values and price indexes should show *upgrading* for imports, fol-

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lowing the method of Aw and Roberts (1986). I speculate below as to what the comparison of unit values and price indexes for domestic output might show.

Turning to the VARs, the basic estimating equation is (7). It is a regression of output on lagged output (in the same four-digit industry) and lagged protection. If the tariff coefficients are significantly different from zero, then we say that tariffs "Granger-cause" output. Looking at this equation, we could immediately think of also regressing tariffs on their lagged values and lagged output. This would be a test of a political economy model in which industry conditions lead to protection. However, this alternative regression would certainly be subject to the Lucas critique, that is, any change in trade policy would affect the coefficients of that regression.

Returning to equation (7), I discuss the economic model that could lie behind this equation and use this model to check the specification. Consider a multi-input, multi-output production function of the form

$$F(y_t, y_{t-1}, L_t, K_t) = 0, \tag{C1}$$

where y_t is a vector of current outputs (e.g., various types of steel), y_{t-1} is lagged output, L_t is a vector of variable inputs, and K_t is fixed inputs. The firm chooses (y_t, L_t) to maximize profits $p_y'y_t - w_t'L_t$ subject to equation (C1), which gives

$$y_t = Y(p_t, y_{t-1}, w_t, K_t). \tag{C2}$$

Equation (C2) is simply the solution for optimal domestic supply, depending on prices, lagged output, and input prices and quantities.

Comparing equation (C2) with equation (7), our first observation is that the authors have omitted the input prices and quantities from their output equation. This omission may not be too serious, since the input variables may be rather slow moving. It could be corrected by gathering more data.

A more serious omission is that equation (C2) includes the entire vector of domestic prices p_t needed to predict the output of any single four-digit industry. However, the authors include in equation (7) only the level of protection in that industry. Thus, an obvious omission from equation (7) is the level of international prices in each industry. If the application of protection is concurrent with falling international prices (which seems likely on political economy grounds), then this strengthened import competition could itself explain why domestic output does not rise following the protection.

A further problem is that the entire vector p_t entering equation (C2) has been reduced to scalars x_t, x_{t-1}, . . . in equation (7). To understand the importance of this, we need to consider the type of protection used in these industries.

First, suppose the protection takes the form of an ad valorem tariff, so that $p_t = p_0(1 + \tau)$ where p_0 is the vector of international prices. Under fairly weak assumptions (F homogeneous in y_t), a change in τ will have an *equiproportional* effect on each industry output y_{it}. In this case equation (7) is correct, with industry outputs measured in natural logs. A change in the level of protection would have the *same* effect on each four-digit industry, measured by the coefficients d_{mt}.

However, the more realistic case is where imports are constrained by some system of quotas. Then $p_t = p_0 + s$, where p_0 is international prices and s is the vector of quota rents on each product. Under a quota on physical units (e.g., tons of steel), s would be equal across product types (e.g., \$10 of quota rents per ton of any kind of steel). More generally, selective quotas would lead to variations in the quota rents, reflected in the vector s.

A tightening of the quota will increase the quota rents. However, this will *not* generally lead to equiproportional changes in outputs across the four-digit industries. On the contrary, we would expect domestic firms to shift supply toward those products whose relative price has gone up. When s rises equally across product types, this means shifting supply toward the *lower*-priced products, or downgrading domestic output. This downgrading would occur for exactly the same reasons that imports are upgraded (see Falvey 1979): a dollar increase in all prices means that the relative price of the more (less) expensive goods goes down (up). It implies a *differential* effect of the quota on the domestic supplies of each product.

Looking again at equation (7), we see that the authors are forcing protection to have the same effect on each four-digit industry (measured by d_{mt}). This specification cannot capture the differential effects of a quota. I fear this misspecification is an important reason why d_{mt} is estimated as insignificantly different from zero. Thus, I would encourage the authors to move toward another specification for equation (7), which allows a differential response of domestic outputs. They could then test the weaker hypothesis that protection does not have an effect on "aggregate" industry output, while allowing some pattern of response at the four-digit level.

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Comment Robert M. Stern

My comments on the chapter by Baldwin and Green deal with four issues: (1) appropriateness of focusing on the domestic output effects of protection; (2) need for more discussion of the different types and consequences of protection; (3) use of the VAR model; and (4) selection of industries.

Policy Objectives

The focus on the domestic output effects of protection needs to be clarified and perhaps defended more explicitly in the chapter. Baldwin and Green assume that influencing domestic output is the objective of the policymakers, which it may well be, but they could have other objectives as well, for example, maintenance of employment, increased profitability, and providing more time for firms and workers to adjust (including a possible orderly decline in the industry and reallocation of resources to other sectors of comparative advantage).

The assumptions about firm behavior need to be clarified as well. That is, does it necessarily follow that protection will lead to increases in output in all cases? For example, if protection is viewed by firms as temporary, they might choose to diversify into other sectors, change the composition of their output to higher-value-added products, and maybe rationalize their production methods to become more cost-efficient. In these circumstances, output might well not increase.

This issue of firm behavior raises the more general point that firms in an industry may respond to protection in different ways and that perhaps the effects on profitability could be most important. Thus, for example, in the study by Hartigan et al. in the November 1986 *Review of Economics and Statistics,* the authors conclude (using events analysis) that there are perceptible effects of protection on firms as reflected in changes in stock prices. (These effects dissipate through time, however.) The issue, therefore, is that protection may have distinct effects on firms in the protected industry, but these effects may not necessarily show up in increases in output.

Different Types and Consequences of Protection

I would also like to have seen in the chapter more discussion of the different kinds of protection. From previous work by Baldwin and others we are familiar with the idea that trade policy may not be effective for a variety of reasons. The issue then is that some policies (for example, global quotas) may be more effective than others (such

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as selective quotas), and it will not be surprising when we note the failures involved.

In their analysis of section 203 cases, Baldwin and Green focus on the escape-clause actions that were terminated for one reason or another. It would also have been interesting to examine those (eight) cases in which the ITC recommended that protection be continued. It would seem in these cases that protection must have mattered to the firms and industries in question and that the removal of protection would jeopardize the benefits they had realized. Thus, it is useful to point out the various reasons why protection does not work in particular cases. But does this mean that it does not work in all cases? And does it matter what kinds of policy (tariffs or quotas) have been used?

Use of the VAR Model

If it is granted that the output effects of protection are an appropriate criterion to use for purposes of analysis, the question then is whether the use of the VAR model is the best way to proceed. The model as set forth seems oversimplified since it posits a relation between changes in protection and output. Are there no other variables that enter? For example, changes in imports may affect both the amount of protection and output. How then do omitted variables enter into the estimation model?

If one wishes to study the output effects of protection, is there some way to select a reference point and ask what the situation would be without protection and, alternatively, with protection? The question here is whether protection makes a difference and, if so, how much of a difference and for how long. The VAR model unfortunately does not provide this kind of information.

Selection of Industries

Finally, I have some questions about the industries that were selected for the econometric analysis. It would have been helpful if more information had been given about the protection experiences of the five industries chosen. Presumably, such information is in the data appendix, but this was not made available.

The food and kindred products industry was one of those chosen, and I would be curious to know if this industry was subjected to increased tariff protection in the 1972–82 period. Here one can think of the U.S. sugar restrictions and periodic quotas on imports of beef (although these may not have been binding at all times). But these types of restrictions are not reflected in the tariffs used in the computations. Further, with respect to textiles and wearing apparel, the Multifibre Arrangement (MFA) is obviously an important factor affecting U.S. imports and domestic output. Yet, only tariffs were taken into account in the estimation.

NTBs were taken into consideration in the remaining two industries—steel and footwear. It would be interesting to determine whether protection of steel was essentially selective or global during the period. The "trigger price" system was operative in the late 1970s and early 1980s, but it may not have been effective in restraining imports. More generally, the U.S. steel industry was in chronic difficulty during much of this period, and protection may have affected only the rate of decline of output. Also, some segments of the steel industry, in particular the minimills, have been highly profitable, whereas the larger and more integrated firms have experienced considerable difficulties.

When NTBs were taken into account in the case of footwear, this was the only instance in which the null hypothesis was almost rejected. While footwear had some special problems because it was only part of the relevant two-digit industry and required more lags for estimation purposes, it nevertheless raises the question of how important NTBs may be with respect to the impact on domestic output in the textile and apparel industries. If these obviously important protectionist barriers were taken into account in these two industries, the conclusions reached in the chapter might be changed. But I am not entirely certain about this point since the textile and apparel industries may have responded to the nontariff protection by altering their product mix and rationalizing their methods of production to become more cost-efficient.