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ABSTRACT

Competition between opposing lobbies is an important factor in the endogenous determination of trade policy. This paper investigates empirically the consequences of lobbying competition between upstream and downstream producers for US trade policy. The theoretical framework used is the well-known Grossman-Helpman model of trade policy determination suitably modified to account for the cross-sectoral use of inputs in production (the input-output matrix). Our empirical results, using US trade data, validate the predictions of the theoretical model with lobbying competition. Trade protection is found to be higher in industries with organized lobbies but lower when there are organized downstream users of the industry's output. Lobbying competition is additionally interesting as a candidate explanation for an empirical puzzle in the literature concerning the apparently nearly "welfare-maximizing" behavior of the US government in setting trade policy. Our estimates diminish the magnitude of the puzzle somewhat, but do not provide a full quantitative resolution of this question.

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I. Introduction

Interest-group theories of endogenous trade policy determination describe trade policy outcomes as resulting from the interaction between governments and special-interest lobbies. As lobbies representing different economic interests may each seek to move policy in a different direction, however, theoretical predictions regarding policy outcomes remain sensitive to the nature and extent of competition between lobbies. Consider, for instance, policy determination in the textbook, partial-equilibrium model of the market for final-good importables. Here, since trade barriers against imports raise profits of domestic suppliers, these suppliers have an incentive to lobby the government for such barriers to be imposed in their respective sectors; the more susceptible government policy is to capture by special interest lobbying, the greater the predicted departures from free trade.[1] Alternately, in a more general context, where producers are linked across sectors by their use of each others' outputs as intermediates in their own production, the pattern of lobbying and equilibrium protection can be expected to be more complex. In particular, manufacturers would have an incentive to lobby for lower tariffs on goods they use as inputs − in direct opposition to suppliers of these inputs who would favor high barriers instead. Since these competing lobbies may cancel each other out, free trade may emerge as an equilibrium even in settings where governments are highly amenable to lobbying. Thus, the degree of lobbying competition matters crucially and studying its scope and extent is important for understanding the determinants of the policies we observe.

It is the goal of this paper to examine empirically the political economy of US trade policy determination in the presence of lobbying competition − where the competition over policy is assumed to arise out of the opposing interests of upstream and downstream producers of goods. The approach we take here is a structural one. As a theoretical platform for our empirical analysis, we use the well-known interest-group model of endogenous trade policy determination provided by Grossman and Helpman (1994) - henceforth GH - who model

[1] While consumers are hurt by these barriers and may be expected to lobby against them as well, the analysis usually makes the (empirically compelling) assumption that consumers are not well organized into pro-trade lobbies. See Olson (1965) for potential explanations.

governments as trading away economic welfare for political contributions by lobbies. In GH, protection is thus sold to lobbies and the level of protection provided to any industry is derived as a function of certain industry characteristics (such as the presence of lobbies, the import-demand elasticity and the import-penetration ratio) and, importantly, the rate at which the government trades off welfare for political contributions. Our empirical analysis is based on a simple modification of this framework that takes into explicit account the extent of cross-sectoral use of intermediates in production (the input-output matrix).[2]

In addition to our intrinsic interest in the extent and consequence of lobbying competition, our study is motivated by a puzzle that has been identified in the empirical literature. Many empirical examinations of interest-group theory of trade policy determination using US data (Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000)) have found evidence supporting the idea that trade protection is indeed for sale. However, all of these studies report their estimates of the rate at which the government trades off aggregate welfare for lobbying contributions to be extremely low. That is, the government appears to be close to welfare-maximizing in its behavior − demanding very high political contributions in exchange for a small amount of distortionary protection. This finding sits poorly with casual observations on the extent of lobbying and regulatory capture that appears to be taking place in the US economy and with specific findings in other studies (albeit not related to trade policy) that, if anything, policy distortions are being sold very cheap. From the previous discussion, it should be clear that introducing lobbying competition offers the possibility of a resolution of this puzzle. Specifically, imagine that competition between lobbies leads to free trade as an equilibrium outcome with (as we have discussed above) a government that is willing to sell policy distortions cheap. Observing the free trade outcome, but ignoring the extent of lobbying competition, may lead an analyst to conclude − incorrectly − that policy is being set by a welfare-maximizing government instead. Our study allows the evaluation of lobbying competition as a candidate explanation for this puzzle.

[2]We should note that in GH, owners of capital in a given sector are able to lobby for lower protection on final goods that they consume. While this may serve as a reasonable theoretical proxy for intermediates use in production, from an empirical standpoint this framework suffer from at least the deficiency that consumption preferences of producers are assumed identical across sectors while intermediates use in different industries is clearly considerably heterogeneous in practice.

The rest of the paper is organized as follows. In Section II, we describe briefly the theoretical framework of endogenous protection that we use with cross-sectoral linkages in production and lobbying competition. The data and econometric methodology used to estimate the theory's prediction regarding the cross-industry pattern of trade policy in the presence of lobbying competition is discussed in section III. Section IV discusses results and Section V concludes.

II. Theory

This section presents the basic theoretical framework that guides our empirical analysis. We begin by describing endowments, preferences and production technology in a small open economy. As in GH, trade policy in this economy is assumed to be determined by the interaction between the government and organized interest groups − with the important modification that vertical linkages in production are taken into account to explore the role of lobbying competition.[3]

Consider a small open economy with $n+1$ tradable sectors. Individuals in this economy are assumed to have identical preferences over consumption of these goods represented by the utility function:

$$U = c_0 + \sum_{i=1}^{n} u_i(c_i), \tag{1}$$

where c_0 represents consumption of the numeraire good (good 0) and c_i represents the consumption of the non-numeraire goods $i = 1, \ldots\ldots, n$.

Goods in all non-numeraire industries (sectors) are produced perfectly competitively using sector-specific capital k_i, mobile labor l_i and as intermediates goods produced in (potentially) all other industries. Specifically, in all non-numeraire sectors, $i = 1, \ldots, n$, output, y_i is

[3]For earlier theoretical formulations, see the analysis of Cadot, deMelo and Olarreaga (2003) on trade policy determination with import duty drawbacks offered on foreign intermediates and Duttagupta and Panagariya (2003) who analyze how, in the presence of intermediates in production, the choice of rules of origin alters the political feasibility of free trade agreements.

assumed to be created using the following Leontief technology[4]:

$$y_i = min\left\{f_i(k_i, l_i)\ , \frac{x_{0i}}{a_{0i}}, ..., \frac{x_{ni}}{a_{ni}}\right\},\ i\ =\ 1, ...,\ n \tag{2}$$

where f_i denotes value-added produced using sector-specific capital and mobile labor, a_{ji} denotes the amount of good j necessary to produce one unit of good i, and x_{ji} denotes sector i's use of good j as an intermediate input. Finally, the numeraire good is produced under constant returns to scale using only labor so that the wage rate w is fixed (and normalized to one).

Let p_i^* be good i's world price and t_i denote the ad-valorem import tax (or subsidy if it is negative) on this good. Good i's domestic price is thus given by $p_i = p_i^*(1+t_i)$. Let $\mathbf{p}$ denote the n-dimensional domestic price vector.

We can now write down sector i's profits − given by revenues less costs of production as

$$\pi_i = p_i y_i - l_i - \sum_{j=1}^{n} p_j a_{ji} y_i. \tag{3}$$

Surplus derived by consumers in this economy from the consumption of the non-numeraire goods is given by

$$S(\mathbf{p}) = \sum_{i=1}^{n}(u(c_i) - p_i c_i). \tag{4}$$

Further, imports are given by

$$m_i = c_i - y_i + \sum_{j=1}^{n} a_{ij} y_j \tag{5}$$

and

finally tariff revenues are given by

[4]Since k_i is fixed in each sector, it will henceforth be omitted as an argument of the production function.

$$T(\mathbf{p}) = \sum_{\mathbf{i=1}}^{\mathbf{n}} \mathbf{m_i} \ (\mathbf{p_i} \ - \ \mathbf{p_i^*}) \tag{6}$$

Finally, assuming that individual income in this economy is augmented by lump-sum (and uniform) redistribution of income derived from trade taxes and subsidies, it is easy to show that the indirect utility function of the owners of capital in sector i, $v_i(\mathbf{p})$, is given by

$$v_i(\mathbf{p}) = \pi_i(\mathbf{p}) + \alpha_i T(\mathbf{p}) + \alpha_i S(\mathbf{p}) \tag{7}$$

where $\pi_i(\mathbf{p})$ denotes the profits in sector i, $T(\mathbf{p})$ denotes overall tariff revenue, $S(\mathbf{p})$ denotes aggregate consumer surplus and α_i denotes the share of the population that owns capital in sector i. The free trade level of utility derived by owners of capital in the various sectors can be obtained by evaluating (7) above at $p_i = p_i^* \ \forall i$. Trade interventions that move the domestic price vector $\mathbf{p}$ away from free trade vector of prices may bring higher utility levels to owners of capital in these sectors − giving rise to an incentive to lobby the government to implement such interventions. We use an indicator variable I_i to denote the sectors which are represented by organized lobbies. The set of sectors represented by organized lobbies is denoted here by $\mathbf{L}$; with I_i taking the value 1 if i belongs to $\mathbf{L}$ and 0 otherwise.

Lobbying and Endogenous Policy Determination

As in Grossman and Helpman (1994), the government is assumed to care about both the political contributions that it receives from organized lobbies and about aggregate welfare; contributions being valued because of their use in financing campaign spending or in the direct benefits they provide to office holders and social welfare being of concern to the government due to the higher likelihood of voters re-electing a government that has delivered a high standard of living. A linear objective function is assumed to represent these preferences:

$$G(\mathbf{p}) = \sum_{i \in \mathbf{L}} I_i C_i(\mathbf{p}) + a\mathrm{W}(\mathbf{p}) \tag{8}$$

where $G(\mathbf{p})$ is the objective function of the government, $C_i(\mathbf{p})$ is the contribution schedule of the i^{th} lobby, $W(\mathbf{p})$, is gross social welfare and a is the weight the government attaches to social welfare relative to political contributions. Clearly, the higher is a, the higher its concern for social welfare relative to its affinity for political contributions.

Lobby welfare net of contributions is given by $v_i(\mathbf{p}) - I_i C_i(\mathbf{p})$. Efficiency of interaction between the government and organized lobbies dictates that the policy outcome is one which maximizes their joint surplus. It is easy to see that this is achieved with tariffs that satisfy the following first order conditions:

$$\frac{\partial G}{\partial p_i} = \sum_{i}^{n} I_i \frac{\partial v_i}{\partial p_i} \ + \ a\frac{\partial W}{\partial p_i} = 0 \qquad \forall i \tag{9}$$

Using equations (1) through (9) above, and recognizing that $\frac{\partial \pi_i}{\partial p_i} = y_i(1 - a_{ii}) \ \ \forall \ i$ and that $\frac{\partial \pi_i}{\partial p_j} = -a_{ji} y_i \ \ \forall \ j \neq i$ gives us the equilibrium (protection-distorted) domestic prices p_i, as

$$\frac{p_i - p_i^*}{p_i} = \frac{I_i - \alpha_L}{a + \alpha_L} \cdot \left(\frac{1}{m_i|\epsilon_i|}\right) - \sum_{j=1}^{n} \left(\frac{I_j - \alpha_L}{a + \alpha_L}\right) \cdot \left(\frac{a_{ij}}{m_i \cdot |\epsilon_i|}\right) \tag{10}$$

where $|\epsilon_i|$ denotes the absolute value of the import-demand elasticity in sector i and α_L denotes the fraction of the population that owns sector-specific capital in any sector in the economy. (10) in turn can be re-written as

$$\frac{p_i - p_i^*}{p_i} = \frac{-\alpha_L}{a + \alpha_L} \left[\frac{1}{m_i \cdot |e_i|} \left(x_i - \sum_{j=1}^{n} a_{ij} x_j\right)\right] + \frac{1}{a + \alpha_L} \left[\frac{1}{m_i \cdot |e_i|} \left(I_i x_i - \sum_{j=1}^{n} I_j a_{ij} x_j\right)\right] \tag{11}$$

Equation (11) is the final theoretical prediction that emerges regarding trade protection in the presence of lobbying competition. The interpretation of terms appearing in (11) is straightforward. Recall that in addition to the price of the goods they supply, owners of capital in any sector care about prices of goods in other sectors for two reasons. First, since they derive consumption utility from their direct consumption of all goods, they would prefer to see lower prices (negative tariffs) on all goods. This is captured by the first term in (11) above. Note that this term reflects purely good i's value as a final consumption good; the entire term disappears if good i is a pure intermediate (i.e., if $x_i - \sum_{j=1}^{n} a_{ij}x_j = 0$). Note also that the smaller is the set of organized specific-capital owners as a fraction of the total population in the economy (i.e., the closer is α_L to zero), the smaller is their share of consumer surplus and the less relevant is this first term. Lobbying competition between upstream and downstream users to raise production profits is captured by the second term in square brackets on right hand side of the equation above. The presence of organized downstream users ($\sum_{j=1}^{n} I_j a_{ij} x_j \neq 0$) lowers the level of protection predicted. Further, this term can be positive (for instance, if sector i is represented by an organized lobby, $I_i = 1$, and there are no organized downstream users of i, $I_j = 1 \;\; \forall j \neq i$) or negative (if, for instance, the opposite is true, with $I_i = 0$ and $I_j = 1$ for some $j \neq i$ and $a_{ij} > 0$). For obvious reasons, this second term does not disappear even if organized producers are a highly concentrated group in the economy. (11) also indicates that tariffs are lower the greater is a, the relative value that the government places on aggregate welfare, and the greater is the import-demand elasticity (for the usual Ramsey-pricing reasons). Finally, note that while departures from free trade are only predicted here if there are at least some organized lobbies, the presence of organized lobbies does *not* necessarily imply protection. For example, if lobbies are highly concentrated ($\alpha = 0$ and upstream and downstream lobbies cancel each other out ($I_i x_i = \sum_{j=1}^{n} I_j a_{ij} x_j$), zero protection is predicted instead.

III. Data and Econometric Methodology

The parameters of our theoretically derived tariff equation, a and α_L, are estimated from the following stochastic version of (11) obtained by introducing an additive error term u_i which is assumed to be i.i.d. and normal.

$$\frac{p_i - p_i^*}{p_i} = \beta_U \left[\frac{1}{m_i \cdot |e_i|} \left(x_i - \sum_{j=1}^{n} a_{ij} x_j \right) \right] + \beta_L \left[\frac{1}{m_i \cdot |e_i|} \left(I_i x_i - \sum_{j=1}^{n} I_j a_{ij} x_j \right) \right] + u_i \qquad (12)$$

where $\beta_U = \frac{-\alpha_L}{a+\alpha_L}$ and $\beta_L = \frac{1}{a+\alpha_L}$.

We estimate (12) as a single cross-section of manufacturing industries at the 4-digit SIC level using data on the relevant variables obtained from the time period 1978-1983. As in Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), we measure the left-hand side of (12), trade protection, by the non-tariff barrier (NTB) "coverage" ratio which is the fraction of products within any given industry that are protected by non-tariff barriers.[5]

On the right-hand side, we need gross output, x_i, imports, m_i, intermediate input use (i.e., the values of $a_{ij} \forall\ i, j$), the import-demand elasticities, e_i and information on the political organization of industries so that we may construct the indicator variable I_i.

Output data are obtained from the 1982 census of manufacturing. Import data at the 4-digit SIC level for the year 1982 were obtained from Robert Feenstra's website(see Feenstra (1996)).[6] Intermediates use in production was measured using the 1982 input-output (IO) tables made available by the Bureau of Economic Analysis (BEA).[7] The IO tables contain data on the value of intermediates produced by each sector, disaggregated by their downstream users. These data can be arranged as a $n \times n$ matrix with row i containing the distribution of source sector i's output into intermediates use by sector j, $j = 1, \ldots, n$. For source sector i, $\sum_{j=1}^{n} a_{ij} x_j$ is thus measured by the row sum of the use matrix. Since our analysis concerns only manufacturing industries, the inputs matrix is restricted to include only manufacturing industries and intermediates use by sectors outside manufacturing, like the services sector, is ignored. The majority of the 366 input-output sectors in the BEA map one-to-one into 4-digit SIC industries via the BEA mapping. Where the mapping is many-to-one from the IO classification to the SIC classification, they are aggregated to the SIC level, while one-to-many mappings are instead simply replicated at the SIC level.

The second term in (12), $(I_i x_i - \sum_{j=1}^{n} I_j a_{ij} x_j)$, requires additionally information on the binary political organization indicator I_i. We use data on political action committee (PAC) spend-

[5]The merits and demerits of using the NTB coverage ratio as the protection measure in this context have been quite elaborately discussed in the literature and we have little to add to this discussion here. See, for instance, Gawande and Krishna (2003).

[6]Data downloaded from website http://www.internationaldata.org/.

[7]Downloaded from the BEA website http://www.bea.doc.gov/bea/dn2/i-o.htm.

ing between 1978-83 by each manufacturing industry, obtained from the Federal Election Commission, to construct this indicator. More specifically, PACs associated with politically organized firms make contributions towards election campaigns. Campaign contributions for House and Senate elections are used to construct I_i. In order to assess how much an industry contributes, a one-firm-to-many-industry mapping must first be devised for many politically organized multi-product firms whose products span a number of industries. Our solution to this problem is to divide a firm's contributions equally across the industries into which it maps. After mapping the contributions in this manner, aggregating across firms yields the total campaign contributions at the industry level for the three election cycles between 1978-83. The resulting contributions data indicates that every industry makes some contribution. But presuming every industry to be organized potentially overstates their participation in the trade policy arena. We follow Goldberg and Maggi (1999) in using spending thresholds to determine whether the political organization dummy variable I_i should be assigned a value of one or zero. Three PAC contribution percentiles were used as thresholds, the 15th, the 25th and the 50th percentile. For a given threshold, say the 15th percentile, industry i was assigned $I_i = 1$ if that industry's PAC spending was above the sample's 15th percentile. That is, the top 15 percent of industries in the sample, according to the ranking by PAC spending, is considered organized. The variable $[1/m_i \times (I_i x_i - \sum_{j=1}^{n} I_j a_{ij} x_j)]$ was then computed using each of the three thresholds indicated above to measure political organization.

Import-demand elasticities were taken from the well-known study by Sheills, Stern and Deardorff (1986) $-$ the only one of the necessary scope available for the period of this study. Since many of the estimated import-demand elasticities have high standard errors (especially the large elasticity estimates), the method of Fuller (1986) is used to correct for errors-in-variables to the extent possible.[8]

Of the possible 435 4-digit SIC (1972 basis) industries, complete data on the variables are available for 407 industries. This set of industries comprises the sample for the econometric estimation.

[8]See also Gawande and Bandyopadhyay (2000) for details on using Fuller's methodology with this data.

III.2 Methodology

Consistent estimation of the parameters of (12) using our cross-industry data requires a careful consideration of the endogeneity of the regressors in the model. In the first expression on the right-hand side of (12), the term $1/m_i \left(x_i - \sum_{j=1}^{n} a_{ij} x_j \right)$ is essentially the inverse of the import-penetration ratio for industry i, but where (gross) output is adjusted for the amount of downstream use of industry i's output by all other industries. Import penetration is clearly endogenously determined with trade barriers. In order to instrument for the adjusted import-penetration ratio we design instruments to account for the endogeneity in both, the upstream industry i's upstream component of import-penetration (x_i/m_i) as well as the downstream use component $(-1/m_i. \sum_{j=1}^{n} a_{ij} x_j)$.

As in Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), the instruments themselves are chosen on the basis of their correlation with import penetration and their relative invariance to trade policy. For upstream industries, these instruments are the capital-labor ratio, $(K/L)_i$, and average output per establishment or average establishment size, denoted here by $Scale_i$. As this literature has argued before, factor-proportions models of international trade motivate the use of industry capital-labor ratios as an instruments for trade flows. On the other hand, the cross-sectional variation in *Scale* may be thought of as largely technologically determined.[9] Furthermore, both variables are relatively invariant to trade policy changes in the short run – especially, and importantly, in relation to the magnitude of their variation in the cross-section. For any upstream industry i, the corresponding downstream instruments, $Scale_{ij}$ and $(K/L)_{ij}$, are measured, respectively, as the value of $Scale$ and K/L corresponding to the largest downstream user (that is, the j^{th} downstream user where $j = \text{argmax}_j \{a_{ij} x_j\}$). The second expression on the right-hand side of (12) contains endogenous political organization variables (I) corresponding to industry i and its downstream users. Following the idea of Stigler (1971) and Olson (1965) that highly concentrated industries are most likely to have effective lobbying power and the methodology of Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), we instrument

[9] On the links between technology and firm size, see for instance, Brynjolfsson et. al. (1994) and Kumar, Rajan and Zingales (1999).

political organization by the concentration ratio of firms in that industry, $Conc_i$, and use the concentration ratio corresponding to the largest downstream user, $Conc_{ij}$, to instrument for downstream political organization.

It is important to note that the endogenous variables appear nonlinearly on the right-hand side of (12). It is therefore not sufficient to use the six instruments linearly. We adopt instead Kelejian's (1971) solution of instrumenting for the nonlinear functions of the endogenous variables using linear and higher order terms of the set of instruments. Specifically, in the first stage, we estimate reduced form equations for the two issue variables on the right-hand side of (12), which are nonlinear functions of the endogenous variables, using as instruments the six variables described above and their squares.[10]

Account must be taken of censoring in the dependent variable in (12). The NTB coverage ratio is never negative, even though there is the theoretical possibility for import subsidization, especially with pressure from downstream users. Since the dependent variable is censored below zero, estimation in the second stage proceeds as a Tobit model. We estimate the model as a two-stage Tobit model, employing the method of Smith and Blundell (1986).

IV. Results

We begin by presenting estimation results from the benchmark model – without intermediate-use based counter-lobbying. The estimating equation in this case reduces to:

$$\frac{p_i - p_i^*}{p_i^*} = \beta_U \ \left(\frac{x_i}{m_i \cdot |e_i|}\right) + \beta_L \ \left(I_i \cdot \frac{x_i}{m_i \cdot |e_i|}\right) + u_i \tag{13}$$

[10]Kelejian shows that if the nonlinear expressions, for example, $\frac{X}{m} \cdot I$, are regressed on linear, squared and first-order cross products of the exogenous variables in the system (13)-(16), then the familiar two-stage least squares estimator may be directly used, and has the desirable properties of consistency and asymptotic efficiency. We must, however, balance this with the fact that excessive parameterization in the first stage may have the consequence of rendering the collective set of instruments "weak" (as measured by the first stage model F-statistic). The weak instruments problem has begun to receive serious attention since the seminal paper by Staiger and Stock (1997). We thus use the linear and squared terms but not the cross products, given our relatively small sample.

where, again, $\beta_U = \frac{-\alpha_L}{a+\alpha_L}$ and $\beta_L = \frac{1}{a+\alpha_L}$.

(13) is estimated using the two-stage instrumental variables Tobit model described in the previous section − using only those variables corresponding to the upstream industry i to form instruments in the first stage (i.e., using $Scale_i$, $(K/L)_i$ and $Conc_i$). Table I presents estimates of the parameters in (13) with three different threshold levels used to define the political organization variable I. As discussed earlier, at a cutoff of 0.15, for instance, the top 15 percent of industries in the sample, according to the ranking by PAC spending, is considered organized. As indicated there, in each case, the two coefficients have the expected signs, $\hat{\beta_U} < 0$ and $\hat{\beta_L} > 0$. The estimates of $\beta_L = \frac{1}{a+\alpha_L}$ may be used to infer the values of a. Note that the variables have been scaled by 100 and that $\alpha_L < 1$. The estimates of β_2 reported in Table I therefore imply quite high values of the government preference parameter − ranging from about 240 to 700. That is, the government places between 240 and 700 times as much weight on a dollar of welfare loss from protection as it does on a dollar of campaign contributions. Thus, our estimates of β_1 and β_2 match in sign and magnitude the estimates of these parameters obtained earlier in the literature, for instance, by Goldberg and Maggi (1999) and by Gawande and Bandyopadhyay (2000).[11]

We present next the instrumental variables estimates from the counter-lobbying model (12). As discussed earlier, the instruments in this case are formed by taking all six variables ($Scale$, K/L and $Conc$ for the industry as well as its most significant downstream user). The estimates of the parameters β_U and β_L of (12) are reported in Table II, with the same three thresholds used to define the political organization variable I.[12] In each case, the two coeffi-

[11] As we have noted earlier, this finding in the literature of a nearly "welfare-maximizing" government sits poorly with casual observations on the extent of lobbying and regulatory capture that appears to be taking place in the US economy and with specific findings in other studies that, if anything, policy distortions are being sold very cheap.

[12] Stock and Yogo (2004) provide a diagnostic based on the bias of the TSLS estimator relative to the (large sample) bias of the OLS estimator $E(\hat{\beta}^{TSLS} - \beta)/\text{plim}(\hat{\beta}^{OLS} - \beta)$. Whether or not instruments are too weak for reliable inference from TSLS estimation depends on the maximum relative bias that one is willing to tolerate. Their table of test statistics indicates that with thirteen instruments, a first stage F-statistic greater than 10 assures that with high probability the relative bias is no greater than 10%. The F-statistics from our first stage regressions in (13) and of the two composite right-hand side variables in (12) on the twelve instrumental variables described above (plus a constant) in each case are greater than 10 − indicating that the rule of thumb proposed by Staiger and Stock (1997) to ensure that models do not suffer

cients have the predicted signs, $\hat{\beta}_U < 0$ and $\hat{\beta}_L > 0$, thus validating the lobbying competition model. The values of the preference parameter a implied by the coefficient estimates are as follows. The smallest estimate of a comes from the model with I defined at the 15th percentile cutoff. The estimate $\hat{\beta}_L = 0.783$ implies a value of a of approximately 125. With I defined at the 50th percentile cutoff, the value of a is estimated to be approximately 515. Thus, the estimated values of a, while smaller than the corresponding estimates obtained assuming no lobbying competition, are still quite large in magnitude.

To investigate the counter-lobbying model (12) further, we divide up the right-hand terms separately into those representing upstream and downstream industries:

$$\frac{p_i - p_i^*}{p_i} = \beta_U \left[\frac{x_i}{m_i \cdot |e_i|}\right] + \beta_U^a \left[\frac{\sum_{j=1}^n a_{ij} x_j}{m_i \cdot |e_i|}\right] + \beta_L \left[\frac{I_i x_i}{m_i \cdot |e_i|}\right] + \beta_L^a \left[\frac{\sum_{j=1}^n I_j a_{ij} x_j}{m_i \cdot |e_i|}\right] + u_i \quad (14)$$

where $\beta_U = -\beta_U^a = \frac{-\alpha_L}{a+\alpha_L}$ and $\beta_L = -\beta_L^a = \frac{1}{a+\alpha_L}$.

Table III presents results from estimation of (14) with instruments formed using the same six variables as in the previous case. We have $\hat{\beta}_U > 0$, $\hat{\beta}_U^a < 0$, $\hat{\beta}_L > 0$ and $\hat{\beta}_L^a < 0$ in each case, which is consistent with the predictions and thus provides further validation of the lobbying competition theory. Protection is higher in industries represented by organized domestic lobbies ($\hat{\beta}_L > 0$) but lower in industries with organized downstream industries ($\hat{\beta}_L^a < 0$). Interestingly the magnitude of the coefficients on the downstream variables is larger than those on the corresponding upstream variables – $\hat{\beta}_U$ is smaller than $\hat{\beta}_U^a$ as is $\hat{\beta}_L$ relative to $\hat{\beta}_L^a$. The data therefore indicate that downstream lobbying is more effective in countering protection than the theory suggests.[13]

We finally address a data concern. If observations with large values of x_i/m_i and $I_i \cdot x_i/m_i$ are influential in determining the estimates on β_U and β_L in (13), and if the adjusted expressions with counter-lobbying in (12) do not significantly reduce those values, then the introduction of counter-lobbying will not significantly change the parameter estimates. We

from the weak-instrument problem is satisfied. The first stage results are available from us on request.

[13]Indeed, the recent furor over steel protection in the United States provides some casual evidence of the lobbying power of industries (automobiles, for example) that intensively use steel as an intermediate.

have attempted to prevent this by dropping observations with extreme values of the two variables (greater than 100). The distributions of x_i/m_i and $I_i \cdot x_i/m_i$ remain quite skewed, and we cannot eliminate influential data points without also deleting information. Unlike outliers, whose deletion improves standard errors without greatly altering coefficient estimates, the deletion of influential points deletes sizable amounts of information. While easy to understand, this problem is difficult to resolve. Nevertheless, we present in Table IV estimates from the counter-lobbying model (12) with further trimming of large values of the two variables (greater than 25), which reduces the sample by around 100 observations. The results are qualitatively and quantitatively robust to dropping observations with reasonably large values of the two variables. However, inference about a does not change in any significant manner.

We also investigated the robustness of the estimates to the inclusion of out-of-model explanatory variables that have been shown to be influential determinants of protection in the empirical political economy literature. Including variables such as percentage of employees that are managers, percentage scientists, percentage unskilled, percentage unionized, and a measure of geographic concentration does not qualitatively alter any of the inferences from the counter-lobbying model.[14]

As we have discussed earlier, our study was motivated in part by the puzzling finding in the earlier empirical literature of very low estimates of the rate at which the government trades off aggregate welfare for lobbying contributions. Lobbying competition is a candidate explanation for this puzzle. Even with highly susceptible governments, competing lobbies may cancel each other and bring about a free trade outcome. Observing the free trade outcome, but ignoring the extent of lobbying competition, may lead an analyst to conclude − incorrectly − that policy is being set by a welfare-maximizing government. As the results reported above indicate, the estimated values of a are lower in the models with downstream lobbying compared with the corresponding model without lobbying competition, but not greatly so. Comparing the parameter estimates in Table I relative to those in Table II

[14] These results are available from us upon request.

implies a range for a between 240 and 700 compared with values of a between 125 and 500 obtained from the lobbying competition model. Thus, our analysis, while finding support for the modified theory, indicates that accounting for intermediates usage does not appreciably change the estimates of the parameters relative to those obtained with the original model (13) without lobbying competition. It may be tempting to conclude that this is because the use of intermediates in manufacturing is itself limited in magnitude. This is however not the case. There is considerable usage of intermediates goods in US manufacturing.[15] Thus, lobbying by downstream industries, an attractive theoretical possibility for an elegant resolution of this puzzle, falls empirically short. The exploration of other theory-based and empirical explanations is left for future research.[16]

V. Conclusions

Competition between opposing lobbies is a potentially important factor in the endogenous determination of trade policy. This paper has investigated the consequences of such lobbying competition for US trade policy. The theoretical framework we have used for our empirical analysis is the well-known Grossman-Helpman model of trade policy determination suitably modified to account for the cross-sectoral use of inputs in production (the input-output matrix).

Our empirical results, using US trade data, validate the predictions of the theoretical model with lobbying competition. The presence of organized downstream users of an industry's output is found to reduce trade protection. As we have discussed, lobbying competition stands as a candidate explanation for a standing empirical puzzle in the literature concerning the apparently nearly "welfare-maximizing" behavior of the US government in trade policy determination. However, while our estimates diminish the magnitude of the puzzle

[15] The proportion of gross output used as intermediates by downstream industries has a sample mean of 0.36 and a sample standard deviation of 0.35.

[16] Recent extensions of the theory have indeed improved the empirical fit of the model. See, for instance, Matschke and Sherlund (2005) who introduce labor market factors into the analysis, Freund and Ozden (2004), who consider the implications for trade policy of "loss aversion" behavior on the part of lobbyists and Bombardini (2005), who considers empirically the implications of endogenous lobby formation as in the important model of Mitra (1999).

somewhat, they do not provide a full quantitative resolution of this question.

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Table I: Endogenous Trade Policy without Counter-Lobbying [*]

	Political Organization Cutoff		
Parameters	0.15	0.25	0.5
β_U	-0.409 (2.810)	-0.264 (3.380)	-0.128 (3.780)
β_L	0.411 (2.760)	0.269 (3.320)	0.144 (3.780)
N	408	408	408
$\mathbb{L}$	-147.90	-145.60	-144.00

[*]Marginals from 2-stage Tobit estimates of (13) reported. Right-hand variables in (13) scaled by 100. N denotes number of observations and $\mathbb{L}$ the log-likelihood. Numbers in parenthesis are t-statistics.

Table II: Endogenous Trade Policy with Counter-Lobbying *

	Political Organization Cutoff		
Parameters	0.15	0.25	0.5
β_U	-0.777	-0.354	-0.173
	(3.350)	(3.680)	(4.060)
β_L	0.783	0.363	0.193
	(3.350)	(3.720)	(4.240)
N	408	408	408
$\mathbb{L}$	-145.60	-145.00	-141.90

*Marginals from 2-stage Tobit estimates of (12) reported. Right-hand variables in (12) scaled by 100. N denotes number of observations and $\mathbb{L}$ the log-likelihood. Numbers in parenthesis are t-statistics.

Table III: Counter-Lobbying - Unrestricted Model*

	Political Organization Cutoff		
Parameters	0.15	0.25	0.5
β_U	-0.508	-0.189	-0.223
	(2.300)	(1.930)	(3.390)
β_U^a	0.659	0.421	0.718
	(1.880)	(1.790)	(3.010)
β_L	0.530	0.209	0.251
	(2.400)	(2.140)	(3.700)
β_L^a	-0.902	-0.672	-0.952
	(2.470)	(2.650)	(3.530)
N	408	408	408
$\mathbb{L}$	-135.90	-135.70	-134.40

*Marginals from 2-stage Tobit estimates of (14) reported. Right-hand variables in (14) scaled by 100. N denotes number of observations and $\mathbb{L}$ the log-likelihood. Numbers in parenthesis are t-statistics.

Table IV: Robustness †

	Political Organization Cutoff		
Parameters	0.15	0.25	0.5
β_U	-0.851 (2.610)	-0.588 (2.670)	-0.441 (2.500)
β_L	0.729 (2.100)	0.481 (1.940)	0.383 (1.830)
N	306	305	303
$\mathbb{L}$	-101.50	-101.60	-102.80

†Marginals from 2-stage Tobit estimates of (12) reported. Right-hand variables in (12) scaled by 100. N denotes number of observations and $\mathbb{L}$ the log-likelihood. Numbers in parenthesis are t-statistics.